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**The Impact of Digital Media on Informal Language Learning
and Teaching Engagement, Attitudes, and Pedagogical Practices**

**The case of Algerian second and fourth year EST students and teachers at
École Nationale Polytechnique (ENP)**

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Didactics

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DECLARATION

I hereby declare that the substance of this dissertation is entirely the result of my investigation and that the due reference of acknowledgement is made , whenever necessary , to the work of other researchers.

I am duly informed that any person practicing plagiarism will be subject to disciplinary sanctions issued by university authorities under the rules and regulations in force.

Date: 25/06/2025

Signed:

DEDICATION

This thesis is in memory of my dear father and beloved aunt Saliha

This work is dedicated to my mother, whose love and prayers have carried me through every challenge

To my siblings, Yacine, Amel and Lynda, for their encouragement and belief in me.

To my aunt, Farida, and my uncle Said whose strength and support have been a constant source of inspiration.

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ABSTRACT

The use of digital media has significantly changed the way learners interact with English beyond the classroom, but the effects of digital media on informal language learning and formal instruction have not been sufficiently studied. This study explores the connection between Informal Digital Learning of English (IDLE) and English for Science and Technology (EST) teaching and learning among Algerian engineering students at École Nationale Polytechnique, exploring patterns of engagement and attitudes and motivation towards formal teaching and learning. The study was conducted using a pragmatic paradigm with an explanatory sequential mixed-methods design that included questionnaires, study logs, student focus groups, and teacher interviews. The findings revealed a discrepancy in engagement dimensions, the behavioral and affective engagement was high whereas, the cognitive and linguistic engagement remained low, which shows consumption-based and not learning-based patterns. A disconnection was also observed in attitudes. A strong negative correlation was observed between affective engagement in IDLE and EST attitudes which is consistent with the conflict hypothesis that was suggested by the Self-Determination Theory in which Autonomous informal encounters can lead to the perception that formal instructional experiences are externally controlled. Likewise, the Motivational constructs (ideal L2 self, and IP) forecasted the consumption of entertainment, but not the intentional learning behaviours. Teachers, for their part noted that IDLE enhances pronunciation and fluency but they also identified register confusion, and the institutional constraints as integration barriers. At the theoretical level the findings question whether the existing IDLE frameworks apply to the current algorithm-driven, short-form environments they also extend Self-Determination Theory across instructional settings. From pedagogical standpoint, the study challenges the assumption that incidental digital exposure translates to academic language development and calls instead for explicit register awareness and metacognitive strategy instruction.

Key words: *Informal Digital Learning of English (IDLE), English for Science and Technology (EST), Self-determination theory, L2, motivation, attitudes, engagement.*

LIST OF ABBREVIATION

AMTB:	Attitude/Motivation Test Battery
CEFR:	Common European Framework of Reference for Languages
EFL:	English as a Foreign Language
EMI:	English as Medium of Instruction
ENP:	École Nationale Polytechnique
ESM:	Experience Sampling Method
ESP:	English for Specific Purposes
EST:	English for Science and Technology
IDLE:	Informal Digital Learning of English
L2MSS:	Second Language Motivational Self System
L2:	English as Second Language
LPA:	Latent Profile Analysis
MOOC:	Massive Open Online Course
Qual:	Qualitative
QUAN:	Quantitative
SDT:	Self-Determination Theory
SEM:	Structural Equation Model
STEM:	Science, Technology, Engineering, Mathematics

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GENERAL INTRODUCTION

The landscape of second language acquisition has undergone some transformation in the digital age. Contemporary language learners now interact in English to a considerable extent outside of the formal educational system through streaming media, social media, online gaming and digital content consumption. This pervasive engagement with English through digital media, which has recently been conceptualised in the literature, and also in the present study, as Informal Digital Learning of English (IDLE), is not simply a marginal addition to classroom education, but increasingly defines the background context in which many learners are first exposed to, and acquire their English competence (Lee, 2019; Lee & Dressman, 2018; Sockett, 2014). In highly mediatised environments, informal digital exposure has become the starting point and the main base of learners' English, with class time instruction being built on a foundation that was laid digitally and informally (Sundqvist, 2024).

This change in how and where language learning occurs has obvious implications both in terms of research in applied linguistics as well as language teaching. Scholars have pointed out that informal learning of L2 English should no longer be considered a minor addition to the second language acquisition research. Instead, it needs to be considered as an individual difference variable (like the learning styles for e.g) which is known to have effects on vocabulary, general proficiency and oral skills (Arndt & Woore, 2018; De Wilde et al., 2020; Peters, 2018; Sylven & Sundqvist, 2012). According to Sundqvist (2024) research which endeavours to explain the role played by L2 English proficiency or development cannot simply disregard informal digital learning; either it needs to take this as a variable in its design or at least needs to provide a rationale for not doing so.

From this point of view, there is a risk that studies that do not take informal digital practices of the learners into account fail to understand the context in which language development takes place (Sundqvist & Sylven, 2016, Sundqvist, 2024).

The current research fulfills this requirement by investigating the role of informal digital learning of English in relation to formal education in English as science and technology (EST) among Algerian students of technical education in the Ecole

Nationale Polytechnique (ENP). Throughout this study, the term *Informal Digital Learning of English* (IDLE) is used to refer to self-directed interaction with English via digital media beyond the traditional institutional context, such as online video consumption, social networking, gaming, as well as other daily internet practices performed in English (Lee, 2019; Lee and Dressman, 2018).

Even though the title implies the *impact* that digital media have on informal learning and teaching, the study does not assert any causal effects. In line with common usage in the context of applied linguistics and education, the term *impact* implies a convenient means of indicating the existence of systematic relationships and plausible influences of variables in real-world situations as opposed to experimentally proved causation (Mackey and Gass, 2016; Plonsky, 2015). The quantitative and qualitative studies hence concentrate on patterns of associations between digital media, the learners' attitudes and the practices of teachers; these patterns are regarded carefully as a matter of influence and relationships instead of robust causal arguments.

1.1 statement of the problem

The integration of English as the lingua franca of science and technology presents distinctive challenges for technical education in non-Anglophone settings (Ammon, 2001; Crystal, 2003). At institutions such as the National Polytechnic School, French is still the main language of instruction for core engineering courses, but English for Science and Technology has been introduced as a mandatory part of the curriculum for all five years of the program (Afia & Abdellatif Mami, 2020; Assassi, 2021; Messaoudi & Hamzaoui-Elachachi, 2017). This institutional commitment reflects a broader realization that technical professionals need English competence in order to access scientific literature, engage in international collaborations, and interact with professional communities around the world (Dudley-Evans & St John, 1998; Messaoudi & Hamzaoui-Elachachi, 2017).

At the same time, research has reported a significant and increasing interest in informal English learning via digital media among language learners in general (Guo & Lee, 2023; Lee, 2019; Sundqvist & Sylven, 2016; Toffoli & Sockett, 2010). What

is not clear, is the extent to which this phenomenon applies to non-specialised learners of English such as technical students whose field is engineering rather than language study , and whether formal EST instructors are aware of and responsive to such informal learning practices among their students.

A growing body of empirical work documents the prevalence of IDLE practices among university students in a variety of national contexts. There has been consistent research in Scandinavia, Belgium, France, Indonesia and Iran that shows that today's learners spend many hours per week using English language digital media often far in excess of their formal exposure to the subject of instruction (Sundqvist, 2009; De Wilde et al., 2019; Sockett, 2014; Indrayani et al., 2024; Rezai & Soyooof, 2024). Similar trends have been reported from Algeria, where students of Science, Technology, Engineering and Mathematics (STEM) demonstrate ubiquitous participation in YouTube tutorials, social media applications and other digital resources to learn English informally (Ghounane, 2022; Blizak et al., 2020; Touahmia & Bakar, 2024).

However, the articulation between such broad informal digital practices and students' orientations towards formal technical English learning is currently insufficiently theorised and insufficiently empirically investigated. Three opposing school of theoretical views have contradictory predictions. A skill transfer theory-based, complementarity hypothesis predicts that informal contact with English should increase attitudes to formal instruction by developing underlying competence and confidence. A conflict hypothesis, based on Self-Determination Theory (Deci & Ryan, 2000, 2017), is that learners whose experiences of learning in self-directed informal environments are characterized by high autonomy, competence, and relatedness may find controlled formal instruction relatively restrictive, which results in negative attitudinal transfer. An independence hypothesis suggests that informal and formal learning of English are psychologically compartmentalised in nature with little cross-contextual influence.

No prior research has empirically adjudicated among these competing perspectives within the context of technical English education. This theoretical gap is

supported by methodological limitations in existing IDLE research, which has mostly considered informal learning apart from formal instructional contexts with limited consideration of how informal practices link to attitudes associated with discipline-specific English instruction. Furthermore, there has been a dearth in the teacher voice of IDLE scholarship although the central role that instructor cognition, beliefs, and practices play in mediating relationships between informal and formal learning experiences. At the same time, the majority of empirical studies on IDLE have concentrated on its influence on EFL learners' formal outcomes and classroom-related variables such as proficiency gains, vocabulary development, or motivation in instructed settings (e.g. De Wilde et al., 2019; Lee, 2021; Soyoo et al., 2021), with comparatively little attention to how IDLE relates to specific domains of ESP such as EST.

The problem addressed in this thesis is thus multifaceted. At the empirical level, there is a lack of evidence regarding how Algerian non English majors engage with IDLE along multiple dimensions, the relevance of these engagement patterns to the different attitudes they have towards EST instruction, and also the motivational factors that predict different forms of engagement. At the theoretical level, the competing predictions of conflict, complementarity and independence hypotheses need to be tested empirically.

At the pedagogical level, there is insufficient knowledge about how EST teachers view, interpret, and respond to the informal digital practices of their students, and whether current approaches in the classroom make use of, or neglect, such a significant out-of-class English exposure. Addressing these interrelated issues calls for an integrated and comprehensive investigation that captures the patterns of learner engagement, relationships of attitudes, motivational predictors, and teacher cognition within an integrated research framework.

1.2 Purpose of the Study

The general purpose of this study is to examine the intersection of informal digital English learning and formal English for Science and Technology learning of the Algerian technical students by examining engagement patterns, attitudinal

relationships, motivational predictors and teacher perspectives using an integrated explanatory sequential mixed-methods research approach.

More specifically, this study aims to:

First describe the ways in which technical students interact with various types of media for informal English learning, exploring patterns of platform use, time investment and multidimensional engagement in terms of behavioural, affective, cognitive and linguistic dimensions as theorised in Arndt's (2019) engagement framework.

Second, Explore the interplay between IDL engagement and students attitudes towards EST instruction, operationalised through Gardner (1985) tripartite model encompassing cognitive, affective and behavioural attitude components, thereby providing empirical evidence to arbitrate between the competing theoretical predictions of conflict, complementarity and independence.

Third, Explore whether motivational constructs Ideal L2 Self (Dornyei, 2009) and International Posture (Yashima, 2002) are predictive of different dimensions of IDLE engagement, differentiating between consumption-oriented engagement (behavioural, affective) and learning-oriented engagement (cognitive, linguistic)

Forth, Investigate how EST teachers perceive and respond to informal digital language learning practices of students, including teacher awareness, beliefs about educational value of informal language learning and current integration practices, and perceived barriers to harnessing informal digital language learning for educational purposes

Through this multifaceted inquiry, this research aims to generate both the theoretical insight about informal-formal learning relationships and practical implications for EST pedagogy .

1.3 Research Questions

The study is guided by four primary research questions, each with associated sub-questions that specify the scope and focus of inquiry:

RQ1. How do technical students engage with different media types for informal English language learning (IDLE)?

- RQ1.1: What are the most frequently used media types (e.g. YouTube, video games, social media, podcasts)?
- RQ1.2: What is the average time spent per week on each media type?
- RQ1.3: How do students rate their behavioural, cognitive, affective, and linguistic engagement with each media type?
- RQ1.4: Are there patterns or profiles of engagement that group students into distinct categories?

RQ2. What are ENP technical students' attitudes toward EST instruction?

- RQ2.1: What are students' cognitive attitudes (beliefs about the value and relevance of EST)?
- RQ2.2: What are students' affective attitudes (feelings toward EST classes)?
- RQ2.3: What are students' behavioural attitudes (engagement intentions and effort in EST)?

RQ2a. What is the relationship between IDLE engagement and attitudes toward EST?

RQ2b. Which dimension(s) of IDLE engagement, if any, predict EST attitudes when examined simultaneously?

RQ3. Do motivational constructs predict IDLE engagement?

- **RQ3.1** (Confirmatory): Do motivational constructs predict consumption-oriented IDLE engagement (behavioural, affective)?

Specific hypotheses:

- H3.1a: Ideal L2 Self positively predicts behavioural engagement with IDLE
- H3.1b: Ideal L2 Self positively predicts affective engagement with

- H3.1c: International Posture positively predicts behavioural engagement with IDLE
- H3.1d: International Posture positively predicts affective engagement with IDLE
- **RQ3.2** (Exploratory): What is the relationship between motivational constructs and learning-oriented IDLE engagement (cognitive, linguistic)?

Sub-questions:

- RQ3.2a: What is the relationship between Ideal L2 Self and cognitive engagement with IDLE?
- RQ3.2b: What is the relationship between Ideal L2 Self and linguistic engagement with IDLE?
- RQ3.2c: What is the relationship between International Posture and cognitive engagement with IDLE?
- RQ3.2d: What is the relationship between International Posture and linguistic engagement with IDLE?

RQ4. How do EST teachers perceive and respond to students' informal digital language learning practices?

- RQ4.1: To what extent are EST teachers aware of students' informal English learning through digital media?
- RQ4.2: What beliefs do teachers hold about the educational value of students' informal digital language practices?
- RQ4.3: How do teachers currently incorporate students' informal learning practices into EST instruction?
- RQ4.4: What characteristics of EST instruction align with or differ from informal digital learning environments?

- RQ4.5: Do teachers provide guidance to help students engage strategically with informal digital English content?

RQ1 and RQ2 are mainly descriptive and answered with questionnaire data and study logs. RQ2a, RQ2b, and RQ3 are explanatory and exploratory and were addressed through correlational analyses and structural equation modelling. RQ4 is qualitative and explorative and addressed by semi-structured interviews with EST teachers, which also offers interpretative richness to the quantitative results.

1.4 Significance of the Study

The research provides contributions at theoretical, methodological, and practical levels, addressing the gaps of the current literature and providing practical insights on the EST pedagogy.

1.4.1 Theoretical Contributions

On the theoretical level, the current research offers a methodical empirical test of the opposing hypotheses of the relationship between informal and formal learning in relation to teaching technical English. The study expands the knowledge regarding cross-contextual motivating processes by focusing on the positive relational forms (complementarity), negative relational forms (conflict), and overall neutral positive relational forms (independence) of IDLE engagement to EST attitudes. The use of SDT (Self Determination Theory) to address the potential contrast effects, i.e. high autonomy satisfaction in less formal situations leads to increased perceived control in more formal situations, generalizes SDT to cross-contextual motivational phenomena.

The research also contributes to the IDLE theory because it investigates engagement as a multidimensional construct. Although a significant proportion of IDLE research has concentrated on behavioural indicators (frequency, duration, use of various platforms), this study provides a systematic separation of behavioural, affective, cognitive and linguistic dimensions of engagement, which discloses which dimensions appear to exert some explainable power on predicting formal learning attitudes. This distinction makes a step in understanding what students really do

when accessing informal English media that is beyond simple exposure metrics, to capture qualitative difference in exposure.

Furthermore, the focal construct of teacher cognition fills an important gap within the field of IDLE. After researching the teacher awareness, beliefs and practices with regard to the informal learning of the student, the study identifies that informal-formal learning associations are mediated not only by the characteristics of the learner but also the instructional contexts influenced by the educator opinions. This bidirectional approach of studying teacher cognition with respect to the learner engagement and the teacher cognition gives a more comprehensive view on how informal and formal learning interrelate in the educational systems.

1.4.2 Methodological Contributions

Methodologically, the study reveals the value of explanatory sequential mixed-method design as a means of exploring complex language learning phenomena. Quantitative breadth (large-sample survey data that would allow conducting statistical analysis of engagement patterns and attitudinal relationships) and qualitative depth (focus group discussion and teacher interview that would yield explanatory accounts) are combined to yield insights that would have been hard to be achieved by any of the two approaches independently. The quantitative analysis of the study with the use of multi-instrumentation compiling retrospective questionnaires and prospective seven-day study logs issues the drawbacks of single-method quantitative research by triangulating self-reported engagement with up-to-date behavioural tracking.

The use of adapted scales based on Arndt (2019) framework to operationalise the concept of multidimensional engagement, paired with the tripartite measurement of attitudes according to settled models (Gardner, 1985; Eagly and Chaiken, 1993) are psychometrically validated instruments that can be adjusted to fit other ESP/EST situations.

These instruments have been proven to be construct valid and reliable and therefore applicable in other educational contexts.

1.4.3 Practical Contributions

At the practical level the findings of this study have direct implications for the design of the EST curriculum and pedagogy. Understanding how students have engaged with informal English, which platforms they have used, how much time they have invested and what dimensions of engagement are characteristic of their practices, allows instructors to make informed decisions about whether and how to draw on students out-of-class experiences. If, as the study investigates, informal engagement is related negatively to formal attitudes, this finding would challenge assumptions that any English exposure is beneficial to formal instruction and would point towards specific pedagogical interventions to bridge informal and formal learning contexts

The examination of teacher perspectives generates insights for professional development. Gaining a clearer picture of what EST instructors understand, believe and currently do in relation to the informal English use of students and what is in the way of bringing those into the classroom can help shape more focused and practical support. This becomes of particular relevance in view of the well-documented difference between students' high degrees of engagement with non-formal varieties of English media and the generally lower degrees of students' motivation in formal English as a second language (EST) contexts.

1.5 Structure of the Thesis

The present study is structured into eight chapters that progress in the order of theoretical background, methodology, findings and interpretation to implications and conclusions.

Chapters One to three, are the theoretical background, which is thematically arranged in three interrelated areas. Chapter One provides the conceptual and empirical background of Informal Digital Learning of English, defining IDLE in the context of larger theories of informal learning, surveying theoretical processes of language acquisition in a digital setting, and analyzing the four-dimensional model of engagement of Arndt that organizes the empirical study. Chapter Two looks at

English as a Science and Technology as a specialised area of English language teaching, looks at the history of ESP/EST, characterizes the distinct features of technical English, and forms the attitudinal constructs (cognitive, affective, behavioural) that operationalise the orientations of students to EST teaching. Chapter Three deals with motivational frameworks applicable to informal language learning and examines the L2 Motivational Self System by Dornyei and International Posture construct by Yashima as well as formulates the theoretical rationale of the hypothesised relationships between motivation and engagement dimensions. Also, Chapter Four provides a literature review of the emerging literature on the awareness, beliefs, and pedagogical practices of teachers towards informal digital learning of their students, which reveals the lack of teacher-centered scholarship in the IDLE domain.

Chapter Four outlines the research methodology in considerably detail. It presents the pragmatic research paradigm used to guide the research, warrants explanation for the explanatory sequential mixed methods research design. It also describes the research context at the ENP, details the sampling of participants within the quantitative (N=253 questionnaire; n=40 study log) and qualitative (n=24 focus group; n=7 teacher interview) phases, explains the development and validation of instruments, provides data collection procedures, specifies quantitative and qualitative analytical methods, and finally addresses issues of validity, reliability and trustworthiness.

Chapters Five and Six report the empirical findings. Chapter five presents quantitative findings to Research Questions 1, 2 and 3 in the form of descriptive statistics on patterns of engagement; correlational and structural equation modelling analyses of relationships between IDLE-EST; and regression analyses from motivational predictors. Chapter Six provides qualitative findings from student focus groups that explains the depth of the quantitative patterns that were observed. Chapter seven presents findings from teacher interviews of Research Question 4, which focused on teacher awareness, teacher beliefs, current practices, and perceived barriers related to the informal digital learning of students.

Chapter Seven offers an integrated discussion of findings from all research questions, interpretation of results relating to the theoretical frameworks established in the literature review, discussion of convergence and divergence between quantitative and qualitative evidence, and situating findings in the context of the IDLE and EST literature more broadly.

Chapter Eight discusses implications on several levels: theoretical implications for IDL research and informal-formal learning relationships, pedagogical implications for EST instruction and curriculum design, and methodological implications for further research. The chapter also addresses limitations of the study and points to directions for future study.

The General Conclusion revisits the main findings of the study, outlines its contributions, acknowledges its limitations, and offers pedagogical implications as well as directions for future research.

CHAPTER I: Informal Digital Learning of English and Learner Engagement

1.1 Introduction

Contemporary language learners use English extensively outside of the classroom through streaming content, social media, online gaming and digital content. This practice, referred to as Informal Digital Learning of English (IDLE), is a fundamental shift in where and how language acquisition is carried out. This chapter provides the conceptual and empirical background for understanding IDLE. It places informal learning in the context of building learning in a wider educational framework, defines IDLE and its theoretical foundations and uses a four-dimensional engagement framework (behavioral, affective, cognitive, linguistic) to characterise the interaction between the learner and English across digital platforms. This foundation is then used to underpin further investigation of IDLE patterns among university students in the technical fields and the links between informal digital practices and formal English instruction.

1.2 Digital media and informal language learning

A clear conceptualization of informal learning and its differentiation from formal instruction is necessary to understand the impact of digital technologies on informal language learning practices. To begin with, this section starts by locating informal language learning within existing educational models, and then traces its evolution within the digital space, introducing Informal Digital Learning of English (IDLE) as the key object of the study. Building on this foundation, it then addresses the theoretical mechanisms of language learning in these contexts and finally brings together empirical studies on learners' digital interactions in various contexts.

1.2.1 Defining informal language learning

Before examining digital engagement, it is essential to place informal learning within the wider architecture of education. The distinction between formal, non-formal, and informal learning was first articulated by Coombs and Ahmed (1974) and has since been refined in subsequent frameworks (Eraut, 2000; European Commission, 2011). More recent studies have applied these categories specifically to language learning, with particular attention to informal and out-of-class contexts (Benson, 2011; Sundqvist & Sylvén, 2016; Johnson & Majewska, 2022). Clarifying

these distinctions makes it easier to see what is distinctive about learning that happens beyond institutional settings and why it merits attention.

As Coombs and Ahmed (1974) classically noted, learning can be situated along three broad categories: formal, non-formal, and informal. Formal learning takes place in institutionalised contexts, adheres to predetermined curricula, and culminates in recognised qualifications. Non-formal learning, while still organised and goal-oriented, occurs outside the formal system and is often delivered without certification .

The European Commission (2011) further refines this framework by identifying formal learning as structured and intentional, taking place within the formal education and training system and leading to certification. occupies a middle ground. It refers to organized and systematic learning activities that occur outside the formal education system. While it is intentional and structured, it is typically more flexible and voluntary than formal learning. Examples in language acquisition include attending a workshop at a community center, joining a structured conversation club, or taking a private tutoring course that does not lead to a formal degree. It serves specific learning goals but without the rigid framework of the formal system.

Informal learning, by contrast, is defined as “learning resulting from daily activities related to work, family or leisure...not organized or structured in terms of objectives, time or learning support and...in most cases unintentional from the learner’s perspective” (European Commission, 2011, p. 3). At the same time, Johnson and Majewska (2022) revisit these distinctions, examining how the categories of formal, non-formal, and informal learning can be more rigorously conceptualised and researched in contemporary contexts.

Within this tripartite framework, the present study focuses specifically on formal and informal learning, with the aim of analysing how unstructured learning can support structured learning within a higher education institution. To situate this focus more clearly, Table 1 summarises the key distinctions among formal, non-formal, and informal learning.

Table 1*Key Distinctions between Formal, Non-Formal, and Informal Learning*

Dimension	Formal Learning	Non-Formal Learning	Informal Learning
Setting	Institutional environments (schools, universities)	Organized settings outside formal systems	Everyday contexts (home, workplace)
Structure	Structured courses with time constraints	Flexible and adaptable structure	Unstructured and spontaneous
Intentionality	Explicit goals and objectives	Intentional learning activities	Incidental and experiential
Recognition	Formal credentials and certificates	May or may not lead to certification	No formal recognition
Instruction	Professional instructors/teachers	Trained facilitators or experts	Self-directed or peer learning
Assessment	Standardized testing and evaluation	Varied assessment methods	No formal assessment
Duration	Fixed duration and schedule	Variable duration	Ongoing and lifelong
Flexibility	Limited flexibility	High flexibility	Maximum flexibility
Outcomes	Recognized qualifications	Skills and competencies	Personal knowledge and experience

Note. Adapted from Johnson, M., & Majewska, D. (2022). *Formal, non-formal, and informal learning: What are they, and how can we research them?* Cambridge University Press & Assessment Research Report.

Informal language learning, as positioned here, is the least institutionalized form of learning. It occurs naturally, as learners participate in social life, perform tasks, or pursue personal interests. Language is acquired through exposure and use, not through explicit instruction. For instance, a learner might improve their English by casually interacting with peers, overhearing conversations at work, or engaging with

entertainment media, without setting out with the specific aim of studying the language.

The conceptual clarity provided by this framework is especially relevant in contemporary contexts where the line between everyday life and digital interaction is increasingly blurred. Informal language learning no longer occurs solely in physical environments; it has expanded into digital spaces where learners engage with English through streaming platforms, social networks, multiplayer games, online forums, and other user-driven content. These developments call for a closer examination of digitally mediated informal language learning, where the characteristics of informal learning intersect with the affordances and constraints of digital media.

The following section explores how informal language learning is impacted in the digital environments.

1.2.2 Conceptualizing Informal Digital Learning of English (IDLE)

With the development of new media technologies, informal language learning has moved beyond more traditional learning environments, such as radio, television and printed materials, to digitally mediated ones. Today, learning a second language outside the classroom often occurs through participatory and multimodal platforms accessed through computers, tablets and smartphones (Warschauer, Liaw & Ware, 2012; Sundqvist & Sylven, 2016). In response to these changes, a variety of terms have been introduced by researchers to describe and conceptualise this out-of-school learning. One such concept, *Online Informal Learning of English* (OILE), is defined as the learning of English that occurs incidentally in the context of leisure activities conducted online, as opposed to in the context of structured study (Sockett, 2014; Toffoli & Sockett, 2015). A wider term, *Extramural English* (EE), has been employed to refer to any engagement with English that takes place outside the school setting, whether it is digital or face-to-face (Sundqvist, 2009; Sundqvist & Sylven, 2016). More recently, *Informal Digital Learning of English* (IDLE) has become a central concept, with a focus on technology-mediated learning outside the formal educational setting, which is initiated and shaped by the learners themselves (Lee, 2019).

This research employs Informal Digital Learning of English (IDLE) as the core conceptual framework, given its several analytical advantages compared with alternative terms. Firstly, IDLE emphasizes the role of digital technologies which are essential to the informal language learning practices explored here. In contrast with EE which encompasses both analogue and in-person interaction, IDLE focuses on digital and often self-directed learning environments where much informal language acquisition now takes place (Sundqvist, 2009; Sundqvist & Sylven, 2016; Lee, 2019). Secondly, it puts learner agency at the forefront, emphasizing that content choice, timing, and mode of engagement are largely learner determined. Thirdly, the use of the term “digital”, in IDLE, is deliberately broader than “online” and includes the use of mobile apps or pre-downloaded podcasts, for example, as both connected and offline, and practices that otherwise might be overlooked if focus is limited to internet-based learning alone (Lee, 2019). Finally, the emphasis on English in the concept of IDLE is a reflection of the empirical reality that informal digital language learning occurs mostly in English. This focus enables the present study to add to the existing studies on the role of digital engagement outside formal education in the development of English language (Lee, 2019; Sauro & Zourou, 2019; Sundqvist & Sylven, 2016). English remains the dominant language in digital environments and represents approximately half of the indexed web content (W3Techs, 2023) and serves as the primary language of interaction on platforms such as Netflix, Twitch, and Steam (Netflix, 2023; Streams Charts, 2023; Valve, 2023). This dominance is further reinforced by the U.S. media productions, which accounted for almost two-thirds of the global box office in 2023 (The Numbers, 2023). These industry trends align with academic evidence that there is a lot of informal exposure to English through digital media (De Wilde, Brysbaert & Eyckmans, 2020; Sundqvist & Sylven, 2016).

1.2.2.1 Characteristics of IDLE:

Informal Digital Learning of English (IDLE) has been an important focus in Computer-Assisted Language Learning (CALL) research in recent years, as it represents a shift in the way English as a Foreign Language (EFL) learners are

interacting with the language outside of the classroom (Lee & Dressman, 2018; Zhang & Liu, 2022). In order to understand IDLE as a construct, it is useful to locate it within Benson's (2011) four-dimensional framework for Language Learning Beyond the Classroom (LBC), which provides a relatively structured lens through which out of class learning practices can be analysed. In his seminal work on learner autonomy, Benson (2011) presented a model with four related dimensions: location, formality, pedagogy and locus of control.

These dimensions were subsequently refined by Reinders and Benson (2017) in order to represent the varied ways in which learners use language in an out-of-classroom setting. Importantly, each dimension is conceptualized as a continuum, rather than a strict binary, given the complex nature of language learning in the contemporary digital context (Lee & Lee, 2019). The first dimension, **location**, is the physical or virtual space in which learning takes place. It separates activities which take place in the classroom and those which take place in the external environment (Benson, 2011; Reinders & Benson, 2017). IDLE by definition occupies the out-of-class end of this spectrum, including digital practices that take place apart from formal educational settings (Lee, 2019c). The second dimension is **formality**, which relates to the extent to which learning is organised and linked to institutional programmes or qualifications (Benson, 2011).

The nature of IDLE is essentially informal; it occurs outside the area of curricula, classroom schedule, and assessment systems (Lee & Lee, 2021). The third dimension, **pedagogy**, contrasts between instructed learning and naturalistic exposure. While formal teaching tends to follow predefined goals and methods, IDLE focuses on exposure to authentic language in digital environments with communication and meaning as the driving force. Depending on learner goals, there is a possibility of both form-focused and meaning-focused engagement where learners are concerned (Lee & Drajeti, 2019). The fourth dimension, **locus of control**, deals with who is in control of the learning. IDLE is usually learner-led: students choose their content, tools and routines based on their interests and needs

(Lee & Lee, 2021; Zadorozhnyy & Lee, 2023). This autonomy is indicative of the importance placed on learner agency in informal digital learning.

Building on this framework, Lee and Dressman (2018: 436) originally offered the following definition of IDLE: "self-directed, informal digital English learning independent of formal contexts." This was later refined by Lee and Lee (2021: 359) to "self-directed English activities in informal digital settings motivated by personal interests and undertaken independently without being assessed by a teacher." In accordance with Benson (2011), IDLE can be defined as an autonomous, technology-mediated out-of-class English learning that is: (a) informal, not tied to formal assessment; (b) focused on naturalistic interaction with language; and (c) learner-driven with personal interests and intrinsic motivation (Lee & Dressman, 2018; Lee & Lee, 2021; Zhang & Liu, 2022). Typical IDLE activities involve watching videos in English, playing online games, surfing websites, engaging in English language social media and contributing to online communities - all done voluntarily and outside institutional frameworks (Lee & Drajati, 2019; Soyoof et al., 2023).

1.2.2.2 Theoretical Foundations of IDLE

Language development in informal digital environments can be understood through three perspectives that are complimentary. Input processing theories examine conversion to intake via attention and memory. Usage based approaches focus on the importance of frequency and repetitions in the development of linguistic competence. Sociocultural paradigms emphasize mediate between learning through digital tools and peer interaction .Together, these perspectives are important to a richer understanding of the process of learning languages in informal digital environments.

➤ *Self-Determination theory*

Self-Determination Theory (Deci & Ryan, 2000, 2017) is a complementary motivational theory to explain why learners maintain interest in informal environments on digital platforms. SDT holds that human motivation falls on a

continuum from amotivation to extrinsic motivation to intrinsic motivation with the most autonomous, self-sustaining type being intrinsic motivation. According to the theory, three basic psychological needs, autonomy, competence, and relatedness need to be met in order for intrinsic motivation to occur and persist.

IDLE environments are structurally configured to provide these needs in ways that formal instruction often is unable to do. Autonomy is met with learner control over the choice of content and its pace, as well as over the choice of platform. Unlike prescribed curriculums, learners interact with materials that are commensurate with their personal interests, be it gaming streams, scientific documentaries or social media content.

Competence is supported using scaffolded input with learners choosing for themselves at appropriate levels of difficulty. digital affordances such as subtitles, playback control and pause enable the management of cognitive load Immediate feedback mechanisms i.e. comprehension through successful gameplay or meaningful social interaction competence validation without evaluative pressure. Relatedness arises from engagement in online communities created through shared interests, in which English becomes the medium of authentic communication and not the object of study.

Research confirms that these need-satisfying conditions are predictors of sustained engagement. Arndt (2019) found that IDLE participation of learners correlated significantly with perceived autonomy and intrinsic motivation but not with extrinsic motivators such as academic requirements. Lee and Drajati (2019) documented students spent far more time in self-selected digital activities than assigned homework precisely because the former addressed the needs of autonomy and relatedness. Ryan and Deci (2020) stress that when psychological needs are satisfied, learners will have formed an internalized motivation that continues to be driven without external rewards and surveillance-the a pattern that is clearly present in IDLE contexts, where motivation stems out of voluntary and often extensive engagement, completely outside the context of offering any academic credit.

➤ *Input Processing and Incidental Learning*

Based on the Input Hypothesis (1982, 1985), which has been highly influential in SLA theories, that exposure to a level of input beyond the learner's current level Capable of Comprehensible Input or $i+1$ can possibly lead to acquisition. This is transferred on to IDLE spaces where learners have the freedom to select what they find interesting and challenging. Data-based research (Sockett, 2014; Kussyk, 2017) substantiates and demonstrates that learners try to make conscious choices to input they can comprehend, allowing them further exposure over time. Empirical studies (Sockett, 2014; Kussyk, 2017) support this and reveal that learners strive to select input that they can understand, which facilitates continued exposure over time.

However, the hypothesis has been criticized continuously. Gass (2017) notes its lacking of detail about how input is processed cognitively - especially with respect to attention, parsing, and integration! - an oversight especially relevant in IDLE environments where no instructional support is provided. Researches on individual differences (Dornyei, 2005; Robinson, 2002) have also demonstrated that cognitive factors such as working memory and attentional control modify the success of language learning but the variables are not considered in Krashen's model. Thus, although comprehensible input is necessary, it is not a sufficient condition to ensure acquisition.

Hulstijn's (2001, 2003) distinction between incidental and intentional learning offers a more nuanced view of language development in IDLE contexts. Much of what occurs in IDLE is incidental learning that takes place without conscious effort or prior intention often driven more by enjoyment than by a goal to learn. Controlled studies have shown that learners can acquire vocabulary through media exposure, with estimates ranging from two to six new words per hour of television viewing (Peters & Webb, 2018). However, incidental learning has clear limitations. According to the Involvement Load Hypothesis (Laufer & Hulstijn, 2001), vocabulary retention depends on the depth of cognitive processing. High-frequency words encountered in meaningful contexts are more likely to be retained, while low-frequency or syntactically complex items often require focused attention to be

learned. As a result, IDLE is well-suited to developing conversational fluency and lexical chunks typical of entertainment registers, but it contributes less to the acquisition of academic or specialized vocabulary, such as that used in English for Science and Technology (see Section 2.4).

The role of consciousness in incidental learning is still debated. Schmidt's Noticing Hypothesis (1990, 2001) states that in order for the input to become intake it must be consciously noticed. While some studies have claimed that it is possible to learn implicitly, through focused attention (e.g. Williams, 2005), a meta-analytic study conducted by Godfroid et. al. (2015) found that noticing increased the strength of learning outcomes significantly. In terms of IDLE contexts, Arndt (2019) found that learners do often prioritize content over form - that is, report high levels of enjoyment and immersion, but low levels of metalinguistic awareness. In light of these findings, the issue of empirically evaluating attention to form becomes a question in this study, wherein we are examining the multifaceted nature of attention to speech forms through the lens of Arndt's linguistic engagement dimension (see Section 1.3).

➤ *Usage-Based Approaches to Language Learning*

In usage-based theories, language acquisition is redefined as the progressive internalisation of patterns through exposure and use (Ellis, 2002, 2017; Tomasello, 2003).. Rather than learning abstract rules, learners develop an inventory of constructions, that is, form-meaning pairings, through multiple encounters. The framework is based on Construction Grammar (Goldberg, 2006), which focuses on frequency-based learning processes.

IDLE environments are especially conducive to usage-based learning. Language input from digital media (e.g. television series, online games) is frequent and embedded in rich and contextualised settings. This is clearly seen in the use of formulaic expressions to entrenchment, such as "need backup" or "good game" in gaming, or character specific speech patterns in television. There is empirical evidence to support this view: Verspoor, Schmid and Xu (2011) found that repeated exposure to formulaic language enhanced the ability of learners to use it productively

and Peters (2019) found that recurrent sequences in episodes were associated with higher likelihood of acquisition than expressions that appeared only once.

However, their explanatory scope remains limited. According to Schmidt (1990), exposures are also not enough; to become an intake, the learners should actively observe the input, which is echoed by Ellis (2017). Repetition, without attentional engagement, is unlikely to result in acquisition. Moreover, the quality of the input cannot be overlooked. Language in informal digital contexts often is not directed by any standard forms and is commonly characterized by abbreviations, non-standard forms of spelling, and syntactic deviations.. In the absence of corrective feedback, such forms may be internalised. When communication proceeds unimpeded despite these inaccuracies, there is a risk that they become stabilised. Research on fossilisation (Han, 2004; Long, 2003) confirms that sustained exposure to non target like input can lead to persistent error patterns.

A further limitation of usage based models lies in their limited treatment of learner variability. While frequency of input is generally associated with greater learning potential, these models do not explain why some learners engage attentively with language input while others do not. Frequency alone cannot account for this divergence. To address these differences, it is necessary to consider motivational and engagement based frameworks (Svalberg, 2009; Deci & Ryan, 2000), which shift the focus from exposure itself to the conditions under which learners choose to process and respond to it.

➤ ***Sociocultural Mediation in Digital Environments***

Vygotsky's (1978) sociocultural theory positions learning as a socially mediated phenomenon, that is, a process which is determined by the interactions people have with each other and the tools that they use. Thorne (2008) introduces technology-mediated ZPDs in digital environments by applying the aforementioned model and suggesting the idea where digital features like subtitles, playback control, and translation tools provide the support rather than teachers or peers. The learners are enabled by these features to manage the input according to their preferences which, in turn, helps self-regulation and is consistent with Cognitive Load Theory (Sweller,

1988; Mayer, 2014) that posits the simultaneous enhancement of comprehension and reduction of mental load through input delivered in varied modes - seen, heard, and read.

However, the value of these tools depends on how they are used. Montero Perez et al. (2018) found that second language subtitles support the acquisition of vocabulary, but first language subtitles, although beneficial for understanding, tend to outweigh the engagement with the target language. Many learners take the easy way out: an option that is often linked to the weak use of metacognitive strategies (Oxford, 2017). In addition to the use of tools, there is also peer interaction. Online games, forums, and comment threads provide a space for collaborative learning spaces in which feedback and pragmatic development takes place (Peterson, 2012; Jin, 2018). Nevertheless, in these situations, participation is not the same for everybody; a lot of students are marginalized due to their anxiety about language or their dread of being caught making errors (Horwitz, 2010).

Digital Divide remains a unique factor that directly impacts learners' performance. Reinders and White (2016) inform that the issue of access is not the only point in digital engagement; a user must be totally conscious of his or her metacognitive skills while using digital tools. According to Lai (2017), effective learning managers are the only ones who apply digital resources strategically, whereas others are just a passive audience. Consequently, the blending of cognitive, usage-based, and sociocultural frameworks in the study of informal digital learning has added to the understanding but it still hasn't provided an answer to the question of what factors keep long-term engagement going. Hence, the current study adopts a multi-faceted engagement model, Self-Determination Theory, and L2 Motivational Self System to analyze how learners persist in IDLE environments and how this is connected with classroom teaching

1.2.2.3 Empirical Studies on IDLE

A growing body of empirical research has established IDLE as a widespread and persistent phenomenon across diverse educational and national contexts

Some of the earliest systematic investigations documented the media habits of Scandinavian learners. Sundqvist (2009) surveyed 80 Swedish secondary students (aged 15–16) and found they spent an average of 18.4 hours per week with English-language media through music, television, and digital games, with substantial individual variation ranging from zero to over 60 hours weekly. Parallel research in Belgium confirmed similarly extensive patterns: De Wilde et al. (2019) found that among 780 Flemish primary pupils (aged 11–12), 97% listened to English music daily, 80% watched subtitled audiovisual content, and 75% played digital games in English. These findings established that informal digital contact with English begins early in childhood and is often integrated into daily routines. At the tertiary level, Sockett (2014) found that 95% of French university students reported weekly contact with English via the internet, primarily through music, television series, and films, with engagement averaging several hours daily.

Recent results confirm that these patterns have continued. Davydova (2024), analyzing the data from the survey of 630 adolescents, aged 14-18, in Austria, reported a high occurrence of everyday English use on the contemporary platforms (YouTube, TikTok, Facebook) and determined that online English activities were strongly related to peer communication activity. Similarly, Indrayani et al. (2024) reported that among 302 EFL university students in Indonesia, the use of digital platforms is informal and frequent, and that the more frequently they use it, the better their self-reported language performance.

Rezai and Soyoof (2024), in the same way, analyzing the data of 365 Indonesian EFL learners, discovered a significant correlation of IDLE practices with vocabulary knowledge, confirming the informal engagement practice is still popular for tertiary level learners. These studies confirm a consistent pattern: although specific platforms evolve from early social media to today's short-form video and messaging apps,

widespread voluntary digital English exposure remains evident across diverse national and educational contexts.

Similar trends of widespread informal use of digital English can be observed in Algeria, where students in STEM (Science, Technology, Engineering, and Mathematics) fields show patterns of exposure that are highly consistent with the international ones despite varying linguistic ecologies and school systems. The accumulating data of various universities and areas proves that informal digital use of English is much broader than English majors. In a multi-site study of four Algerian universities, conducted during the COVID-19 pandemic, students had used asynchronous digital tools, especially YouTube and Facebook, to independently learn English-language out of the formal curriculum (Ghounane, 2022).

This trend is supported in discipline-specific studies: among 380 chemistry and hydrocarbon engineering students at the University of Boumerdes, students actively consumed informal materials available on YouTube on technical content in English (Blizak, Blizak, Bouchenak, and Yahiaoui, 2020), a large-scale, multi-group study involving 254 non-EMI engineering students across Algerian universities found that learners expressed strong instrumental orientations toward English, particularly valuing its relevance for accessing technological resources and participating in global academic and professional domains (Touahmia & Bakar, 2024).

Additional smaller-scale studies confirm these trends: Ghounane (2020) found that 88% of 45 Master's students spent at least an hour a week on YouTube consuming English material, whereas Asma and Khadidja (2023) reported that 84% of 125 undergraduates spent an hour a day on social media platforms, using English material similarly Bouhania (2016) documented gaming-related vocabulary gains among 100 university students. These findings suggest that despite contextual differences in formal English instruction and the dominance of French in Algerian higher education, digitally-mediated informal English exposure follows patterns remarkably consistent with international trends, with students across technical and scientific disciplines routinely accessing English content through entertainment, educational, and social platforms.

Although this informal digital English exposure is well documented in international as well as Algerian settings, less is known about how learners engage with such content and what the quality of those encounters are. Consistent empirical evidence suggests that learners' engagement with digital media is primarily for the purpose of understanding and entertainment and little active attention is paid to linguistic features. In a study of 60 users of TikTok, Davydova (2024) found that, for example, while participants reported daily exposure to English content, only 14% consciously paid attention to grammatical forms, vocabulary, or pronunciation. The interaction described by the majority was best described as passive consumption (repetition or imitation) by the group rather than any intentional linguistic interpretation.

Similar results are seen in Algerian contexts: Bouhania (2016) reported that although 68% of student gamers said they had acquired new expressions throughout game-playing, only 22% applied these expressions to academic discourse (spoken or written) thus indicating little carry-over from informal to formal use in the English language. Similarly, Sockett (2014) found that French university students' online English engagement was predominantly receptive; while they consumed content extensively through viewing, productive practices like writing and speaking remained rare. Additionally, instructors were largely unaware of these digital practices and therefore did not integrate or validate them in the curriculum.

Nevertheless, there is great individual variation in digital media exposure. While Sundqvist (2009) has found an average of 18.4 hours/week in Swedish students, individual exposure varied from no exposure to over 60 hours - a factor of six at the top end. Similarly, Arndt (2019) showed that 14% of German secondary school students did not engage in any digital engagement with English over a two-week diary period, with the top quartile showing more than seven hours per week. This was marked variation and demonstrated that aggregate statistics mask a good deal of heterogeneity: some learners are engaged to a much greater degree and possibly strategically, while others are scarcely or not at all engaged. These disparities lead to critical questions about what drives level and mode of participation.

This disparity between the widespread documentation of informal digital learning and the limited insight into learners' engagement patterns exposes a critical gap in existing research. If learners spend significant time consuming English media, and there is considerable diversity in the way in which learners process content, and the extent to which they attend to, and experience, these activities, then understanding IDLE's place in language development requires going beyond measures of frequency.

A descriptive framework that covers behavioral, affective, cognitive, and linguistic dimensions can help capture systematically the way learners experience and enact informal English use--variation that time-on-task measures cannot reveal. Such characterization has several uses: it allows researchers to identify unique engagement profiles, illuminates on the types of learners who engage in which types of engagements and for what reasons, and gives teachers empirically-grounded understanding of what students actually do instead of making assumptions grounded in volume of exposure. The following section presents the introduction of a multidimensional engagement framework that is designed to provide this systematic description and is based on the constructs and research developed in educational psychology to describe engagement, but adapted to the context of informal, digitally-mediated language learning.

1.3 Engagement in Informal Digital Learning of English

Informal Digital Learning of English (IDLE), as previously conceptualized, is a self-driven technology-mediated learning environment, where language exposure and interaction take place beyond formal education. However, frequency of access does not measure the quality, depth or learning potential of these experiences. In order to relate the role of such informal learning in language development, it is vital to see how learners are interacting with digital content itself-emotionally, cognitively, behaviorally, and linguistically. Thus, This section introduces a multidimensional model of engagement specifically adapted for IDLE contexts and explains the relationship between engagement and related constructs such as motivation and

attitudes, as well as synthesizing empirical evidence of how these dimensions play out in practice.

1.3.1 Conceptualizing Engagement in Informal language learning.

Although engagement is a well-established pedagogical concept used to describe learners' observable interactions, it has only recently gained analytical weight in Second Language Acquisition (SLA) (Philp & Duchesne, 2016; Hiver, Al-Hoorie, & Mercer, 2021). Alternatively, in educational psychology, engagement has long been theoretically and empirically defined and operationalised, with repeated findings as a strong predictor of academic persistence and performance (Fredricks, Blumenfeld & Paris, 2004; Appleton, Christenson & Furlong, 2008). However, engagement in SLA is conceptually underdeveloped, often described by definitional vagueness, competing categorisations and conflation between engagement and other constructs such as motivation or anxiety, which has deterred analytical consolidation (Fredricks, Filsecker & Lawson, 2016; Kahu, 2013).

To provide terminological clarity, this study adopts the formulation advanced by Svalberg (2009) who defines engagement with language as

a cognitive, and/or affective, and/or social process in which the learner is the agent and language is object (and sometimes vehicle). Cognitively, the engaged individual is alert, pays focused attention and constructs their own knowledge. Affectively, the engaged individual has a positive, purposeful, willing and autonomous disposition towards the object (language, the language and/or what it represents). (p. 247),

In the L2 learning context, this tripartite conceptualisations is usually extended to incorporate a linguistic dimension, i.e., those aspects of learning where the learner pays attention to form. Engagement is therefore conceived as a multidimensional construct that can be measured antecedently, that is, from outside in the form of behavior, and also from inside in the form of psychological states (Boekaerts, 2016; Arndt, 2019).

Importantly, engagement is not considered in the present study as an explanatory variable for the proficiency outcomes, but as an object of descriptive investigation.

The aim is to capture patterns of involvement in informal settings of digital engagement and explore their possible inter-relations with motivational disposition and attitudes towards formal learning. Such a position is representative of a growing academic consensus that engagement's analytical utility is conditioned upon the specification and contextualization of the dimensions that make-up the notion (Fredricks et al., 2016; Kahu & Nelson, 2018).

For analytical precision, engagement is distinguished from both motivation and attitudes. Motivation refers to the bases for action: learners' goals, values and expectancies, whereas engagement refers to the expression of this motivational force in the moment-to-moment experience of task participation (Skinner, Kindermann & Furrer, 2009; Sinatra, Heddy & Lombardi, 2015) and can thus be said to be motivated and disengaged, or temporarily engaged and poorly motivated. In this study, the motivational dispositions (e.g. Ideal L2 Self, International Posture) are used as predictors, while this chapter considers engagement as a construct in its own rights.

A further conceptual boundary separates engagement from attitudes. Engagement and attitudes are two separate aspects of language learning. Attitudes describe lasting beliefs, feelings, and intentions that remain steady across situations. Engagement is linked to what the learner does during a particular task. Both involve emotional, mental, and behavioural elements, but they do not apply in the same way: attitudes relate to a general view of a subject, while engagement concerns a specific activity.

These two aspects do not always align. A learner may take part actively in informal English use outside class, while holding a negative view of formal EST courses. The opposite may also be true. Whether there is a connection between the two is examined in Research Question 2 and discussed further in Section (2.3.)

Given that informal digital language learning (IDLE) is self-directed and voluntary, it is a particularly effective context for the study of engagement. In the absence of grades, institutional obligations, or external rewards, participation is sustained only by engagement itself; once it diminishes, learners simply disengage. IDLE is emphasized by the amount of time invested: East Asian learners claim 5-6

hours of IDLE per week (Lee, 2022), German learners about 3 hours (Arndt, 2019), and Algerian technical students 2.3 hours a day with English media; far beyond the 1.5 hours per week where EST is usually offered (Boucherit, 2019; Messaoudi & Hamzaoui-Elachachi, 2017). Thus time-on-task necessarily masks important qualitative differences. Two learners can consume similar amounts of English video material and differ radically in their affective, cognitive and linguistic engagement - one involving themselves in meaning, the other attending carefully to linguistic form and linking new input to background knowledge

Having established engagement as a distinct, multidimensional construct with theoretical and empirical salience for SLA, the following section introduces the framework used to operationalise and investigate its dimensions.

1.3.1.1 Four-Dimensional Framework for IDLE Engagement

This study adopts Arndt's (2019) four-dimensional engagement framework which is an extension of the well-known tripartite model of Fredericks, Blumenfeld, and Paris (2004).

1.3.1.1.1 Behavioral Engagement

Behavioral engagement refers to observable patterns of participation by learners - the frequency, duration and diversity of learners' participation in informal English language activities. Arndt (2019) defines it as involving "frequency, duration and variety of informal L2 learning activities outside of the classroom" (p. 24). These are watching media content, listening to music or browsing in English or using mobile applications. This dimension focuses on the way learners divide time and attention among various language-rich media

1.3.1.1.2 Affective Engagement

Affective engagement: refers to the learner's reaction to informal L2 activities - e.g. pleasure, interest, prolonged interest, personal relevance. As Arndt (2019) has put it, it reflects the extent to which learners find informal L2 practices interestingly engaging and emotionally rewarding. Given the self-directed nature of IDLE,

affective engagement is most important for sustained participation: learners will be more likely to persist if activities are pleasurable, stimulating and in line with personal goals (p. 24).

1.3.1.1.3 Cognitive Engagement

This dimension captures the mental effort, attention control, and strategic thinking learners apply during informal language exposure. Arndt (2019) defines cognitive engagement as "the degree to which learners exert mental effort, pay attention, and use strategic cognition during an interaction with an informal language input" (p. 24). It involves tasks like paying attention when a film is subtitled, substituting mentally the words in a sentence, or matching the meaning of a word, which are shown to involve greater cognitive engagement with the task.

1.3.1.1.4 Linguistic Engagement

Linguistic engagement is characterized as the degree of the learner's conscious attention to language form (e.g. vocabulary, syntax, pronunciation or discourse) rather than to processing input for meaning alone. As Arndt (2019) explains: "It refers to 'the extent to which learners focus on the linguistic aspects of the input rather than just the content'" (p. 24). This dimension is of utmost importance in SLA since it differentiates between incidental exposure on one hand and potentially acquisitional processing on the other. Without attention to form, uptake of language may be left at a superficial level.

The adoption of Arndt's four-dimensional engagement framework as the theoretical lens for this study is justified by several factors: First, unlike the framework of Fredricks et al. (2004), which has been widely cited, and which is based on classroom behaviors such as attendance, participation, and teacher interaction (Appleton et al., 2006; Kahu, 2013), Arndt's model reflects the autonomy, entertainment focus, and lack of teacher mediation that characterize IDLE. Similarly, SLA-oriented frameworks that focus on structured pedagogic tasks (Philp & Duchesne, 2016; Hiver et al., 2021; Reeve, 2013) are not well suited to learner-directed, media-rich digital practices. Arndt's model, in contrast, frames engagement

as a function of learner agency, or the choices they make about when, what, how and why to engage in technology-mediated language use.

Second, Arndt's inclusion of a linguistic dimension fills an important gap in general models of engagement. Beyond behavioral, affective, and cognitive processes, language learning requires that learners pay attention to linguistic form, that is, vocabulary, grammar, discourse, and pronunciation. This dimension separates passive exposure from form-sensitive processing and is essential to studying the question of whether incidental learning from digital media includes conscious attention to language (Schmidt, 1990; Hulstijn, 2013; VanPatten, 2004).

Third, the framework aligns with the research questions in this study. Its multidimensional structure permits the investigation of engagement profiles (RQ1), examination of possible relationships between dimensions and EST attitudes (RQ2) and testing of differential motivational predictors (RQ3). It also differentiates between consumption-oriented (behavioral, affective) and learning-oriented (cognitive, linguistic) engagement, which can be used to investigate in a nuanced way how IDLE supports second language development.

1.3.2 Empirical Evidence on IDLE Engagement Patterns

The following section is a review of how past studies have conceptualised the involvement of learners in informal use of digital language. This review is directed by two clarifications. First, most studies employ different frameworks or terminology; where possible, their measures and results are restated here in terms of the four dimensions defined above, behavioral, affective, cognitive, and linguistic, to enable comparison with the current study. Second, the present research considers engagement as a descriptive construct, with a focus on patterns and profiles of learner behavior, instead of an influential factor that determines language proficiency. Although the wider literature usually records the associations between engagement and achievement, the present study does not evaluate the proficiency outcomes. Rather, it seeks to define the way learners interact with informal practices of digital language. These parameters define the order of the next synthesis.

1.3.2.1 Behavioral patterns

Previous studies have been mainly concerned with measuring the frequency and duration of learners' informal digital language practices (e.g., Jurkovic, 2019; Kuppens, 2007, 2010; Cole, 2015; De Wilde et al., 2019; Sundqvist, 2009). However, such measures do not adequately capture the complexity of learner interactions with digital English content. Two recent studies have broadened this focus not only moving beyond frequency and duration, but also examining platform diversity and distinguishing between passive (consumption) and active (production) engagement. In doing so, they have effectively addressed the limitations of earlier research, while also revealing how different aspects of engagement relate to language learning outcomes.

A survey conducted by Lee (2022) on a large scale across East Asia revealed that there was a high level of engagement among learners. Korean university students ($N = 404$) reported spending an average of 5.18 hours per week ($SD = 3.67$, range <1 to >12 hours), with YouTube and gaming as the most common activities. Taiwanese undergraduates ($N = 326$) spent slightly more time ($M = 6.02$ hours, $SD = 4.11$), mainly on social networking. The average time spent by Indonesian high school students ($N = 291$) was 4.35 hours per week ($SD = 3.24$), most of which was spent on music and video materials. These findings suggest that informal digital practices are commonplace and assume different forms across national settings.

Arndt's (2019) diary-based study of German secondary students ($N = 354$) provided more detailed evidence, reporting that learners experienced 4.7 episode durations per week ($SD = 2.8$) and lasted on average 38 min ($SD = 17.5$) altogether amounting to ~ 2.9 hours a week ($SD = 2.1$). Critically, however, the distribution was highly skewed, with the top quartile reporting more than 7 hours of time each week, where the lowest quartile reported a little more than 1 hour of activity and 14% of students reporting no digital activity at all. This methodological contrast highlights one important limitation of survey based research which it can preclude the important individual variation of actual engagement patterns.

Digital platforms promote engagement based on different modalities that are receptive, productive and interactive and each provide different pedagogical affordances. Video-based material is the most common source of receptive input, as Rodgers and Webb (2020) established in a study of Japanese university students (N = 28): students learnt an average of 5.6 new word families per television episode, which shows incidental vocabulary learning via multiple exposure to language in a long-form content.

Fievez, Peters, and Puimiege (2023) compared binge-watching and spaced-viewing conditions with 108 EFL learners and found that even while experiencing significant vocabulary gains, the spaced-viewing condition significantly retained more general vocabulary at both the post-test and delayed post-test ($p < .05$). Similarly, the study by Pujadas and Munoz (2024), on university students in Spanish, showed that captions have better effects on comprehension in the case of lower-level learners, probably because of the lexical and contextual scaffolding that they provide. These findings are consistent with the meta analytic results of Montero Perez, Peters, & Desmet (2018), which indicate that captioned video is beneficial for incidental vocabulary learning because attention is drawn to linguistic form versus meaning. Arndt's (2019) diary data add to this as it was revealed that while average levels of engagement with the receptive practices of video and music were "moderate," there was substantial individual differences whereby some learners engaged with the material and others participated less.

Although not as systematically explored, audio based practices also a contributing factor in receptive language development. A quasi experimental study by Abdulrahman, Basalama, and Widodo (2018) involving Indonesian high school students (N = 60) found that the group using podcasts significantly outperformed the control group in listening comprehension (ANOVA significance level = 0.010, $p < .05$). Similarly, Gushendra's (2017) experimental study showed that learners exposed to English songs improved their vocabulary scores from a mean of 52.59 to 71.66, while the control group showed only a minimal gain from 51.52 to 55.81, suggesting that songs can support vocabulary retention. Although the study of audio usage is

widespread, the research on the engagement driven by audio is still undeveloped in contrast to those on video.

Productive digital interaction, by contrast, is much less common and is often restricted to short written exchanges. Arndt (2019) found that German secondary students had less than two productive episodes per week ($SD = 1.3$), each lasting only 10-15 minutes. In comparison, there were over four receptive episodes for every two productive episodes and productive use was less than 20% of total logged time. Still, these brief bursts of messaging, commenting, and posting are everyday parts of learners' digital repertoires. Social media platforms are a key context for such production. For example, a study by Maierova (2023) involving Czech university students ($N = 63$) using an Instagram based intervention found high rates of weekly posting (increasing to 46 per cent to 82 per cent) and a positive effect on pragmatic sensitivity especially in the use of mitigation and supportive moves.

Jin's (2018) study on 2430 Instagram comments by Chinese learners also found that learners' use of politeness strategies (common ground, indirect requests) gradually increased over a period of three months, which supports the idea that short written interactions give rise to pragmatic acquisition. Gaming chat and instant messaging are another great productive category. In his 2012 study, Peterson spent six months watching a small group of World of Warcraft players (six people who are not native speakers and one native speaker) and found that they frequently stopped to clarify their meaning and resolve any misunderstandings like people do in face-to-face conversations. That same observation also revealed how heavily they relied on collective problem - solving: to be successful at the game, the players had to constantly talk through and negotiate their strategies.

Based on those observations, Odínokaya and colleagues (2021) examined an 80 person cohort of Russian university students who had used Discord for three months. They found that the students who used the platform scored higher on a post test than their peers who did not (about 25 vs. 21 points) and had richer vocabulary in speaking assignments. In spite of the fact that most of the messages were short

(averaging fewer than 50 words), their frequent conversation produced a significant amount of meaningful learning of language.

Interactive practices are defined by reciprocal communication in real time - and gaming environments provide particularly fertile ground for this type of communication. In fact, in a large-scale survey of Swedish secondary students ($N = 1,134$), Sundqvist and Sylven (2016) found a significant vocabulary advantage among those who spend five or more hours per week playing games ($n = 381$), i.e., gamers, as compared to non-gamers ($M = 6,022$ vs. $4,781$ word families; $p < .001$). This advantage was found to be related to persistent peer interactions in multiplayer contexts. Supporting this, Peterson's (2012) analysis of forty hours of synchronous chat logs produced by twelve Japanese learners found that nearly a quarter (23%) of conversation turns were spent on meaning negotiation, a rate which is similar to that in face-to-face classrooms. Further reinforcing these findings, a systematic review of 34 empirical studies on online gaming published by Calafato (2024) and involving a sample of over 3,000 participants found consistent associations between online gaming and both vocabulary acquisition and communicative intent - particularly when it is the context of cooperative games. By only including studies which had comparison groups or pre/post-test designs, the review provides good and reliable evidence.

Similar trends have been observed in Algerian situations. Kirouni (2021) employed a comparative study with English majors at Guelma University ($N = 54$) and found that gamers significantly performed better than their non-gamer peers in performance tests ($M = 17.26$ vs. 8.07 ; $p < .001$). However, the correlation between frequency of gaming and vocabulary size was very small ($r = .39$, $p = .056$). Even so, 95.8% of participants agreed that gaming aided vocabulary development and two-thirds felt that the learning was effortless and entertaining. In a more general survey, Bennacer (2022) found similar results among Algerian University students ($N = 210$): Of them, 82% reported using English in their game-play (as chat or voice), 76% thought it was beneficial for vocabulary and pronunciation, and 70% thought it helped them become more confident and willing to speak. Although the findings are

based on self-reports, they still outline interesting, meaning pattern of interaction, in congruence with the global trends, indicating that Algerian learners are active in English and that learning in the classroom is not the only contact they have with the English language.

1.3.2.2 Affective orientations

Affective engagement in informal learning of English develops out of an interplay between the emotional experience and the affordances of digital learning environments. Two main themes, namely, negative emotion barriers, positive emotion facilitators, reflect distinct emotions in terms of their influence on engagement patterns and learning outcomes.

Environments that inspire feelings of enjoyment and pride lead to greater and deeper self-reinforcing involvement. Gushendra's (2017) experimental study about music enhanced vocab learning shows the role of enjoyment in the learning. Two sets of English as a foreign language (EFL) learners learned vocabulary through the medium of English songs or traditional exercises. The mean scores of the music group increased significantly by 52.59 to 71.66, whereas the control group only showed a small increase from 51.52 to 55.81. Participants also reported high level of enjoyment that was associated with increased repetition and better retention of lexical items, according to the author. This finding is consistent with other observations that positive emotional responses (in particular to culturally familiar media) can be a source of sustained and meaningful engagement.

A similar affective profile is found in the case of Algeria where informal online social spaces are very enjoyable. In a quantitative survey of 111 English major students, Khelkhal and Ouahmiche (2022) found that 92% of learners reported daily contact with social networks (Facebook, Instagram, and You-Tube) and rated them as "useful" and "efficient" for learning English ($M = 4.21/5$). Students followed English language lifestyle vloggers and content creators and reported positively about the experience, calling it both “fun” and “addictive”, which can be translated as sustained affective engagement. Likewise, Dendane and Dendane (2023) conducted a questionnaire survey with 78 Tlemcen University students to explore the

perception of the social media and the language apps, 84% of the participants expressed positive attitudes about English in the virtual world while 73% of them declared that when they interact with natives, it enhances their confidence and enjoyment. The study concluded that intercultural communication opportunities offered were emotionally motivating and added to a feeling of belongingness in online communities. These studies demonstrate that informal online environments show strong signs of enjoyment, similar to affective trends noted in other context. Yet, within this context, affective engagement is mostly assumed (as positive attitude and motivation) rather than measured, leaving the emotional side of informal digital English learning largely unexamined.

Empirical research shows that anxiety, boredom and frustration can have a significant limiting effect on learners' participation in informal digital English learning. Lee and Drajiati (2019) in a survey of 180 Indonesian university EFL students that are engaged with video, games and social networks, reported that informal digital learning was positively correlated ($r=.47$, $p < .01$) with willingness to communicate and negatively correlated ($r=-.36$, $p<.01$) with L2 anxiety. Motivation, confidence and grit were found to mediate this relationship, so it was suggested that lower anxiety levels help to promote engagement in non-formal contexts. Building on this, Lee (2024) used structural equation modelling with East Asian undergraduates to show that enjoyment and decreased anxiety mediated together the relationship between the intensity of out of class digital use and willingness to communicate. These results support the hypothesis that anxiety is a primary emotional constraint to informal digital language engagement. Boredom has a similar dampening effect. A synthesis of tertiary-level research published on *Frontiers in Psychology* and reported by Xie (2021) found consistent compelling negative correlations between boredom and engagement ($r \sim -.40$), as well as a negative correlation with task investment - again, indicating how repetitive or unchallenging digital activities may severely undermine persistence of learners.

In the Algerian context, the evidence on negative emotions is limited and restricted mainly to technological frustration. Boukrouche and Bencherifa (2021)

found that online participation by university students was significantly and negatively predicted by unreliable internet access ($\beta = - 0.48, p < .01$) and lack of familiarity with digital platforms ($\beta = - 0.48, p < .01$), suggesting that environment frustration is an important predictor of inefficient engagement. However, to date, no Algerian study has been conducted to explore the emotional variables of anxiety, boredom and frustration as emotion factors in informal digital English learning. As a result, the affective dimension in this context is still under explored and stands on more theoretical assumptions than on empirical evidence.

1.3.2.3 Cognitive strategies

In formal second language classrooms, attention to cognitive engagement has also received growing attention from researchers, using more advanced methods such as attention lapse tracking (Cummings Hlas et al., 2019), screen capture recall (Henderson et al., 2018) and real-time multimodal monitoring (e.g., ESM and videotaped observation in Austrian studies) to capture some of the learner's mental effort during instruction. These tools have led to an improvement in how we can quantify how students are focusing, processing meaning and regulating attention in structured learning environments. However, even in these spaces, cognitive and linguistic processing frequently overlap: the former being made up of mental attentiveness and comprehension, the latter referring to observation and analysis of linguistic form. Based on 247 systematic reviews Hiver and colleagues (2021) observed that only 39 of them discussed engagement as an active cognitive participation. This observation points to the long-standing inconsistency in the conceptualisation of engagement, even in well-supported, formal education settings.

This presents an empirical gap with potentially important theoretical implications. Arndt (2019) is among the few researching directly on cognitive engagement in informal L2 contexts. In her study, cognitive engagement, or the capacity to pay mental concentration and attention to the meaning of informal language use, was strongly predicted by motivational factors of instrumental obligation ($\beta = .72, p < .001$), Intrinsic Motivation ($\beta = .50, p < .001$), and by positive perceptions of both formal and informal learning experiences. Of interest, prior language proficiency

proved to be a negative predictor of cognitive engagement as there was a suggestion that lower proficiency learners tended to focus more intently during informal learning activities.

Empirically, the cognitive engagement was perceived to be highest during active activities such as reading, writing, speaking, and chatting when playing games, and lowest during passive activities such as listening to background music while playing. cognitive engagement also correlated highly with affective engagement ($r = .74$) and linguistic engagement ($r = .66$), showing that for learners who were more mentally focused, they tended to also enjoy the activity and also tended to focus on language forms. Although cognitive engagement did not significantly predict improvements to general language proficiency, it was a good predictor of positive motivational changes, namely a decrease in motivational distance (i.e., an increase in alignment between learners' actual and ideal L2 selves) and a reduction in instrumental obligation, which may indicate a shift toward more autonomous forms of motivation over time.

Although the findings of Arndt (2019) provide an important foundation, her framework and tools have received little adoption by the wider field. Research about IDLE goes on focusing mainly on cognitive traits such as self-efficacy and flow (Zadorozhnyy, 2023; Wu, 2023; Liu, Zhang, & Liu, 2022; Liu, Zhang, & Zhang, 2022). However, these studies tend to ignore the actual cognitive activity which learners engage in interacting with digital media during the learning process. This gap is highlighted in a recent review by Soyoof et al. that examined 123 studies of IDLE published between 2014 and 2023. While many did address learner behaviors and beliefs at a very general level, very few delved into the actual cognitive processes happening in real-time - so much of what goes on in informal learning remains underexplored and, as yet, largely invisible in the existing research.

1.3.2.4 linguistic Engagement

The Linguistic Engagement dimension, in Arndt (2019, 2023), was introduced as a distinct dimension of how learners engage in ISLPs (Informal second language

practices). This engagement dimension refers to how much learners pay attention to the linguistic aspects of the target language they access through digital media..

Arndt's study (2019) also identified low levels of linguistic engagement for learners during the informal language activities, in general. Most of the participants said that even when they were mentally focused or emotionally involved, they had little regard for language structure. This gap was further supported by qualitative interviews in which assumptions about noticing and incidental learning in informal use were questioned. Linguistic engagement was highest in productive activities such as writing, speaking and reading, and lowest in practices such as gaming in the context of chatting that involved high communicative engagement but little attention to linguistic form. Statistically, linguistic engagement was significantly related to intrinsic motivation ($b = .61, p < .001$) and instrumental obligation ($b = .35, p < .001$), albeit weakly related to prior proficiency ($b = .25, p < .01$), which may indicate that lower-proficiency learners are more conscious about form. While linguistic engagement did not contribute to overall gains in proficiency, it did associate to greater motivational distance ($b = .36, p < .05$), perhaps because focusing more on language form made the learners more aware of their own limitations.

Further research proves that linguistic engagement is different significantly across digital platforms. In a large-scale study of 2992 Chinese university students, Zhang and Liu (2024) concluded that the average score of learners utilizing vocabulary-focused apps (specifically designed for language learning) appeared to be higher than the average score of learners involved mostly on entertainment platforms such as YouTube or games (average score of 4.2/5, compared to 2.8). Similarly, Kusyk (2017) examined the use of social media in Polish EFL learning and found that the use of social media for English language learning has led to a higher awareness of grammar and vocabulary ($M = 3.9$ out of 7) among Polish language learners as compared to those who only used social media for entertainment purposes ($M = 2.1$ out of 7). Interviewees also spoke of attempts to "actively look for new expressions" and analyse the ways in which native speakers used language. These findings

highlight the distinction between apps specifically designed for language development and common IDLE platforms, which are designed for entertainment. They also highlight how both the affordances of the platform and learner intention shape form-focused attention in the case of informal learning.

1.4 Conclusion

This chapter has provided a foundation for an understanding of Informal Digital Learning of English (IDLE) through establishing it within the broader models of education, while highlighting some of the key theories and engagement as a core construct. While IDL is widespread, research has often focused on time spent rather than quality of learner involvement. The difference between formal, non-formal, and informal brings exposure to IDLE's spontaneous self-directed nature. Theoretical perspectives help to explain the process of digitally expose as learning, but are mostly on surface levels. Engagement: behavioral, emotional, cognitive, and linguistic, emerges as the connection of use and outcome. While the learning process involving learners in a digital area, particularly in video and gaming, emotional and cognitive dimensions have yet to be explored; especially among Algerian contexts. This study attempts to address those gaps by examining the informal interactions of Algerian technical students with English and what these interactions signify in terms of language learning.

CHAPTER II:

**Theoretical and Empirical Foundations: EST
Attitudes, IDLE Engagement, and Their
Motivational Underpinnings**

2.1 Introduction

This chapter builds the theoretical and empirical basis for the two main research questions of the study. It unfolds in three interrelated movements. The first one sets English for Science and Technology (EST) as the assumed formal instructional setting under study, revisiting its definition, its place in the Algerian higher education system and onto what we know affecting learner attitudes towards it. The former introduces IDLE Informal Digital Learning of English an explanatory variable that analyses the motivational constructs that compel students to voluntarily pursue digital (self-directed) engagement with English, and it makes distinctions between the dimensions of such informal engagement. The three theoretical perspectives explored in the third movement brings these two lines together and examine how IDLE engagement and EST attitudes may interact. This multi-grounded theoretical landscape yields the confirmatory hypotheses and exploratory research questions that complete the chapter.

2.2 English for Science and Technology (EST): Definition and Scope

English for Science and Technology (EST) was the first and for a while the dominant branch of English for Specific Purposes (ESP), which appeared in the 1960s. During this formative period, "ESP and EST were considered as nearly synonymous" (Ouarniki, 2023, p. 179), as EST was pivotal in establishing ESP as a field. Hutchinson and Waters (1987) defined ESP as "an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning" (p. 19), thereby emphasizing the centrality of learner needs.

Building on this perspective, Dudley-Evans and St. John (1998) have drawn a line between the characteristics that they consider to be essential to ESP (for example attention to learner needs, disciplinary practices and appropriate discourse) and those that vary from context to context (e.g. subject specialisation, proficiency level). Yet there remains scholarship contesting whether such distinctions adequately reflect the practical realities of the use of EST, or whether they impose narrow academic categories of distinction which do not reflect the variation in communicative situations and intentions of learners..

Orr (2002) offers a more functional and purpose-oriented conceptualization of EST, shifting the focus away from linguistic form toward communicative intent. He explains that:

“EST refers to all of the spoken and written English used in science labs and engineering classes; conferences, meetings, and trade shows; and at factories, corporate offices, and construction sites for academic or professional purposes related to technical or scientific aims. Some of this English is very general in nature, such as small talk before the start of a project meeting. Other forms are highly technical, such as lab reports, design specifications, and patent applications. What makes this domain of language ‘EST’ is not so much the characteristics of the English but, more importantly, the nature of its purpose for work or studies in scientific and engineering fields, which influences the form and content of the English” (p. 45).

This functional perspective effectively addresses Kennedy and Bolitho's view (1984) that "EST is too general to be of great use in the design of ESP materials" (as cited in Bouchareb, 2024, p. 19), as it shifts the emphasis of EST from being a static linguistic structure with hard boundaries to being a dynamic area that is defined by communicative purpose too. Although the difference between EST and general English is well established on paper, the boundary tends to seem blurred in practice, leading to a disconnection between notions and language practice (Hutchinson & Waters, 1987). Nevertheless, systematic comparison is still valuable in determining what is specifically the part that makes EST different from general English., namely: in terms of purpose, types of texts, lexical and syntactic features, rhetorical structure, pedagogical orientation and motivation of learners as summarized below:

Table 2

Contrast Between English for Science and Technology (EST) and General English

Aspect	English for Science and Technology	General English	Source
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	(EST)		
Primary Aim	Communication of scientific/technical content for academic or professional purposes	Broad communicative competence across social, academic, and professional contexts	Orr (2002)
Text Types	Lab reports, design specifications, patent applications, technical manuals	Personal letters, essays, narratives, general articles	Orr (2002)
Lexical Features	High density of discipline-specific terminology; low frequency of high-frequency general words	Balanced distribution of high-frequency general words and some discipline-specific terms	Kennedy & Bolitho (1984)
Syntactic Features	Frequent use of passive voice, complex noun phrases, embedded clauses	Variety of sentence structures, with greater use of active voice and simpler noun-verb constructions	Trimble (1985)
Rhetorical	Definition–classification,	Description, narration,	Tarone (2013); Kennedy &

Organization	process description, cause–effect, problem–solution sequences	exposition, argumentation	Bolitho (1984)
Teaching Approach	Needs analysis, target situation analysis, discipline- integrated tasks	Communicative activities, situational dialogues, skill- based practice	Hutchinson & Waters (1987)
Learner Motivation	Instrumental and professional motivations; often externally mandated	Mix of integrative, instrumental, and enjoyment motivations; often learner-driven	Ouarniki (2023)

A certain threshold of general English proficiency is generally acknowledged as a condition for successful participation in EST courses. Basturkmen (2010) argues that in order to productively work with EST materials, most learners must at least reach a B2 level on the Common European Framework of Reference for Languages (CEFR).

Similarly, Dudley-Evans and St. John (1998) warn the overwhelming effect of inadequate general language competence can have on the learner when the combined cognitive demands of complex technical content and unfamiliar linguistic structures can affect the learner's comprehension and motivation.

In Algeria, English for Science and Technology (EST) holds an official role within higher education. It is taught across technical universities and engineering institutes.

Since 2022, English has been introduced earlier in the school system, and during the 2023–2024 academic year, the government began a gradual shift toward using English as the medium of instruction (EMI) in scientific and technical subjects. These measures are intended to reduce reliance on French and to open up better access to international research and academic work. As Khenioui and Boulkroun (2023) observed, EMI is gaining ground in higher education, particularly in science and technology, as part of a wider effort to bring Algerian universities into closer contact with global academic practices. For EST, this signals a change in role. No longer seen only as a support course, it is increasingly viewed as a key part of preparing students to work within EMI settings (Costa & Mastellotto, 2022; Dafouz, 2021). EST now needs to provide more than just vocabulary and reading skills; it must help students follow lectures, write lab reports, and communicate effectively within their field using English (Zhang & Shao, 2024). In this way, current language policy places EST at the heart of science and technology education, where it supports and strengthens the move toward integrated learning through English (Costa & Mastellotto, 2022).

2.3 Attitudes towards EST: Conceptual Foundation

Attitudes are evaluative judgments that involve positive or negative evaluations of specific objects, ideas, or experiences (Eagly & Chaiken, 1993). In the study of second language acquisition, Gardner (1985) modified the well established tripartite model to conceptualize language attitudes as multidimensional constructs with three interrelated components: cognitive (beliefs about the value and utility of the language), affective (emotional responses toward the language) and behavioral (action tendencies concerning language use). The current study uses Gardner's framework as the theoretical base for conceptualization and subsequent measurement of EST attitudes using scales adapted from the Attitude/Motivation Test Battery (AMTB) developed in his socio educational model.

The role of attitudes in language learning has been well documented in the literature, with research consistently demonstrating that favorable attitudes toward a language predict increased practice time, greater persistence in learning efforts, and

higher achievement outcomes overall (Gardner, 1985; Dörnyei & Ryan, 2015). Within models of language learning, motivation, attitudes function as proximal determinants of behavior, that is, they translate evaluative judgments more directly and immediately into engagement decisions than do more abstract motivational orientations such as integrative or instrumental motivation (Gardner, 1985).

Attitudes and engagement are different concepts and empirical facts. Attitudes are described as general judgments of the object or situation that not only vary among people but also vary over the time dimension and may be identical in different situations, such as, "EST instruction is of instrumental value", or "I find ESP relevant to my future career". Engagement on the other hand looks at how the user interacts with the task at that specific point in time and is highly likely to change significantly based on the characteristics of the task, the conditions around the task, and the mood of the user (e.g. "I was fully engaged during this gaming session" or "I felt mentally challenged after reading this technical manual").

Thus, attitudes can be considered as operating on a macro level that describes learners' general orientations towards EST as a subject or area of study. In contrast, engagement can be viewed as a process happening at a micro level, which clarifies the nature and quality of involvement in particular learning episodes or activities. Accordingly, the present research poses an empirical question: whether and to what degree micro level engagement in IDLE activities is related to macro level EST attitudes. This is a matter of association between different constructs rather than definitional equivalence or conceptual overlap.

Following Gardner's (1985) methodological approach and subsequent empirical evidence demonstrating strong intercorrelations among the cognitive, affective, and behavioral components of attitudes (Breckler, 1984; Eagly & Chaiken, 1993), the current study treats EST attitudes as a unified, unidimensional construct for analytical purposes. While the tripartite distinction proves valuable conceptually by clarifying the multifaceted nature of evaluative judgments, composite attitude indices have been shown to provide more stable and reliable predictions of language learning behaviors than examining the three components separately (Gardner, 1985). This

approach recognizes that although theoretical distinctions between belief, emotion, and action tendency remain useful for understanding the nature of attitudes, empirically these components appear to reflect a coherent underlying evaluation rather than independent psychological phenomena.

2.3.1 Factors Influencing Attitudes Toward EST: Empirical Insights

The empirical literature examining EST attitude formation reveals a complex landscape of individual, and instructional factors. While this area has drawn increasing attention within ESP research, the subdomain of EST, as already defined in Section 2.2 remains relatively underexplored. As a result, the present synthesis foregrounds EST specific evidence where available and treats adjacent ESP/EMI findings as suggestive rather than definitive for EST.

This review draws together relevant findings around key themes that emerge across the available literature. These include learners' perceptions of EST's usefulness, their beliefs about their own ability to succeed (self-efficacy), and the influence of instructional practices. While these areas often intersect, considering them separately helps clarify how attitudes toward EST take shape in different contexts and what factors appear most relevant to sustained engagement and learning outcomes.

Across engineering contexts, students evaluate EST most favourably when course tasks and assessments mirror the communicative realities of their disciplines rather than decontextualized language exercises. The study conducted by Arnó-Macià, Aguilar-Pérez, and Tatzl (2020) focused on the potential of ESP instruction to encourage the involvement of engineering students in academic and professional communication. A total of 95 undergraduates were included in the study, comprising of three universities in Spain and Austria (UPC-Vilanova, $n = 52$; UPC-Barcelo, $n = 26$; FH Joanneum, $n = 17$).

The researchers used a combination of pre- and post-course questionnaires and reflective diaries of seven participants. The course presented different discipline-specific tasks, including project report writing, presentation of technical content, and

specialised reading. The students testified to a great improvement in vocabulary, reading fluency, and general familiarity with the professional genres. Many of the participants reported that they were better equipped to manage the communication in their fields, and the thoughts in their diaries tended to refer to the driving force of the utilization of the materials that they considered to be applicable to their future professions. Despite the fact that the study was conducted on the basis of self-reported perceptions and a convenience sample, the mixed-methods design enabled the authors to trace the change in attitudes over time. The findings support the claim that professionally relevant EST content enhances learner attitudes by strengthening instrumental beliefs and emotional engagement.

A number of Algerian studies put the correlation between course design and student attitudes into a clear focus. Outemzabet (2022) carried out an exploratory case study in electrical engineering at Laghouat University, which involved questionnaire-based responses of students and interviews with two ESP teachers (target population: 169 students and four instructors). The results show a dramatic discrepancy between the needs expressed by learners, including reading technical texts and writing scientific reports, and the course taught. Teaching was based on imported textbooks, which were not analyzed in terms of needs, and characterized by obscure evaluation standards. Although students placed a high instrumental value on English as an academic and professional tool, this disconnect led to demotivation and frustration, behaviorally reflected in higher absenteeism. While the study is limited by its small sample and narrow institutional focus, it provides valuable insight into how cognitive, affective, and behavioral components can be affected simultaneously.

A multi-stakeholder case study carried by Messaoudi and Hamzaoui Elachachi (2017), which involved the Manufacturing and Engineering master's programmes, used a triangulated methodological approach, which combined student and teacher questionnaire data with in-depth interviews with administrative staff and experts in the subject matter. Although the overall self-assessment of the English proficiency among students was mostly at the beginner level (83.4%), there were clear disciplinary writing priorities, with lab reports being rated as highly critical (85% of

them considered it very important), then technical manuals and study notes (83%), and oral communication tasks spread across presentations 68% of them participated in delivering presentations and 58% in listening activities, showing strong instrumental beliefs despite less positive emotional experiences. On the contrary, teachers noted that they used eclectic, frequently grammar-translation-based pedagogical methods and had little interaction with content experts.

From an attitudinal perspective, learners expressed high instrumental motivation associated with task alignment with disciplinary work but at the same time, they cited lack of contact hours and outdated instructional methodologies as major discouraging factors. Similar positive orientations towards English as a Specific Purpose (ESP) were reflected in complementary results of a needs-analysis survey reported by Izid and Zitouni (2017) of 50 mechanical engineering undergraduates, with a majority expressing a preference towards a combined syllabus incorporating both General English and ESP elements, and dissatisfaction with the exclusively general English courses, leading to negative emotional response despite continued cognitive recognition of EST value.

At the broader policy interface, Touahmia and Bakar (2024) mixed methods study in which they involved Algerian students (226 EMI students, and 254 non-EMI students) in engineering programs. Their analysis concluded that perceived career relevance was a significant predictor of cognitive attitudes ($\beta = 0.54$, $p < .001$) more than affective attitudes ($\beta = 0.32$, $p < .01$), hence, quantitatively reinforcing the idea that the different aspects of attitudes do not move uniformly with the varying influences of instruction.

Self-efficacy and task-specific confidence have been recognized as attitudinal determinants through empirical research. Task-specific self-efficacy includes learners' evaluations of their abilities to perform English tasks specific to each discipline (Bandura, 1997), with mastering experiences, successful task performance, being the most influential source of such beliefs.

A national survey of 796 Iranian engineering students using validated scales based on the motivational framework by Dornyei (2009) reported low satisfaction

with EST instruction in writing ($M = 2.3/5.0$) and speaking ($M = 2.1/5.0$), and a significant perception gap ($M = 1.8$) between students and instructors in terms of needs fulfillment. Such discrepancies were linked to a lack of self-efficacy, which was frequently expressed through frustration, anxiety, and decreased engagement (Mostafavi et al., 2021). However, although the research has strong statistical power and national coverage, its cross-sectional nature does not allow analyzing the developmental changes in attitudes at different academic levels.

Similarly, In Phan and Chen's (2022) longitudinal study of Taiwanese engineering students ($N = 122$) enrolled in a blended MOOC (Massive Open Online Course) on English Technical Writing, paired-samples t-tests revealed significant increases in self-efficacy from pre-course ($M = 6.109$) to post-course ($M = 6.920$) levels ($p < .001$). Pearson correlation tests revealed that there was a strong positive correlation between self-efficacy and academic performance ($r = .830$, $p < .001$) with students who reported higher self-efficacy scoring significantly higher course grades. The results indicate that in cases where engineering students have had successful completion of discipline-specific writing tasks, a major source of mastery experiences, self-efficacy enhances, which subsequently facilitates affective aspects of attitudes such as confidence, less anxiety, and continued academic involvement.

Likewise, the qualitative case study by Abbassi (2022) that used semi-structured interviews with 60 physics students (13 males, 47 females; age range 18-32 years) in undergraduate and graduate levels and 5 ESP instructors at the University of Tlemcen reported the negative impact of structural constraints on self-efficacy development. Even though students acknowledged the instrumental role of English as the language of science (cognitive component), the analysis of interviews showed that the number of contact hours did not allow students to practice and that the uneven knowledge of instructors in the subject matter did not provide many opportunities to receive meaningful feedback, which is a requirement of self-efficacy development through mastery experiences and social persuasion.

Results revealed gaps in terms of teachers, students, and teaching-learning conditions that limited the sense of competence in performing discipline-specific

English tasks, which in turn reduced self-efficacy, which was reflected affectively through decreased enthusiasm, anxiety, and voluntary engagement. The research demonstrates how structural limitations may divide the attitude formation: cognitive value beliefs were preserved, but the affective and behavioral elements were worsened when the instructional conditions did not facilitate the development of self-efficacy.

Instructional quality and pedagogical approach constitute a third category of influence on EST attitudes. Empirical studies in EST settings have reported the limiting nature of structural and systemic characteristics on autonomy-supportive pedagogy, and the resultant impact on learner attitudes. Messaoudi and Hamzaoui-Elachachi (2017) noted that the reduced number of contact hours reduced the chances of having long-term teacher-student interactions that would allow autonomy-supportive relationships to form, which led to student perceptions of courses as not relevant to professional needs.

Abbassi (2022) reported that prescribed ministerial syllabi limited the flexibility of instructors in adapting content, and teachers reported little interaction with subject-matter experts in trying to match instruction with discipline-specific communication requirements, a mismatch that students identified and which reduced their motivation to do EST coursework. Izidi and Zitouni (2017) found that students were dissatisfied with the large classes that did not allow them to receive personalized attention, individualized feedback, or responsive pedagogical adjustment, which was reflected in negative course ratings and decreased engagement.

Instructional quality and pedagogical style constitute a third key influence on EST attitudes, particularly through the lens of autonomy support. Based on Self-Determination Theory (Noels et al., 2000), autonomy-supportive instruction, characterized by choice, rationale, and responsiveness, has been found to boost cognitive value beliefs ($r = 0.41, p < .001$), affective engagement (e.g., enjoyment, reduced anxiety), and behavioral persistence ($r = 0.36, p < .001$). On the other hand, controlling styles reduce motivation ($r = -0.33, p = .001$).

Nevertheless, structural constraints hinder such pedagogy in Algerian EST contexts. Messaoudi and Hamzaoui Elachachi (2017) discovered that the number of EST contact hours per week was hardly more than 1.5, and the syllabi were determined at the ministerial level, which did not allow them to be responsive to the needs of learners. Their mixed-methods research, which relied on questionnaires and interviews, revealed that even though 85 % of students rated laboratory reports as very important, instructors did not have time and materials to modify instruction. Similar results were reported by Izidi and Zitouni (2017), who found that 62 % of mechanical engineering students were not satisfied with general English-only teaching and would have been more satisfied with mixed ESP-EGP content that better met the needs of the discipline.

Outemzabet (2022) further observed that such misalignment reduced emotional engagement and discouraged voluntary participation where 72.73% of Master's and 80.56% of Licence students preferred simplified reading materials, and 63.64% of Master students identified listening as a top priority. yet, teaching was still very textual and little emphasis was given to oral or interactive skills. Teachers, who were limited by ministerial syllabi and large classes, reported they had little time to differentiate materials to the needs of students.

One of the recurrent themes is the difference in stability across attitudinal dimensions. The cognitive evaluations of the instrumental usefulness of English by students are quite resilient (Messaoudi and Hamzaoui Elachachi, 2017; Abbassi, 2022; Touahmia and Bakar, 2024). These beliefs remain even when affective and behavioral elements subside. Students understand the importance of English in accessing research, international communication, and job opportunities. This awareness is not dependent on the quality of classroom instruction. However, Affective dimensions are more prone to change.

Instructional variables are responsive to interest, enjoyment, and anxiety (Outemzabet, 2022). These responses are especially affected by content relevance and mastery opportunities. The behavioral aspect comes out as the most vulnerable. It relies on intrinsic motivation and external scaffolding. Students can appreciate

EST both cognitively and affectively but withdraw when instructional support is not sufficient. On the other hand, others are maintained due to compulsion and not actual investment (Izidi & Zitouni, 2017).

A perceivable limitation characterizes existing research. While scholars have examined EST attitudes within classrooms extensively, the influence of informal English engagement remains unexplored. This oversight proves significant given evidence from Section (1.3.2.1) that students interact with English far more outside class than within it. Through social media, gaming, and digital content, learners accumulate exposure often surpassing their formal instruction. These informal encounters likely shape attitude patterns toward EST before or during the specialized courses, yet researchers have not examined this possible influence empirically.

2.4 Informal Digital Learning of English: Motivational Predictors of Engagement

With the factors defining attitudes towards formal EST instruction identified, the review now focuses on the other half of the relationship: IDLE engagement itself. Since IDLE is completely voluntary, it is a precondition to theorize how such engagement might affect students in their formal instructional attitudes, and it is essential to comprehend what drives students to participate in English in informal digital space, and how. Informal Digital Language Engagement represents a voluntary phenomenon, raising the question: What psychological factors motivate students to engage with English informally using digital media. Two potential psychological predictors: Ideal L2 Self (identity based motivation) and International Posture (orientation based motivation), and their relationships to four engagement dimensions: behavioral, affective, cognitive, and linguistic are examined.

The chapter first reviews theoretical foundations and empirical evidence for both motivational constructs, then introduces a distinction between consumption oriented engagement (time and emotional investment) and learning oriented engagement (strategic processing and attention to form). This distinction informs the investigation of whether motivation may predict not only participation quantity but also engagement quality. It concludes by formulating confirmatory hypotheses for

consumption oriented engagement and exploratory research questions for learning oriented engagement, establishing a conceptual framework for examining potential motivational drivers of voluntary language engagement among Algerian technical students.

2.4.1 The L2 Motivational Self System and the Ideal L2 Self

The L2 Motivational Self System (Dörnyei, 2005, 2009) conceptualized traditional integrative motivation through self-psychology, providing a more contextually appropriate framework for understanding L2 motivation in globalized contexts where learners possess minimal direct contact with native speakers yet demonstrate strong motivation to learn English. This section follows the theoretical evolution of the L2 Motivational Self System since its origins in the possible selves theory, outlines the three elements of the system with special focus on the Ideal L2 Self, surveys the empirical evidence that the Ideal L2 Self is related to informal digital language engagement dimensions

Dörnyei's (2005, 2009) L2 Motivational Self System (L2MSS) represented a significant shift from traditional integrative motivation theory. Rather than focusing on learners' desire to integrate into target language communities, Dörnyei drew on self psychology particularly Markus and Nurius's (1986) possible selves theory and Higgins's (1987) self discrepancy theory to explain L2 motivation where learners had minimal contact with native speakers. Possible selves theory maintains that individuals form not only their current self concepts, but also pictures of who they might become in the future. These future selves include aspirations (ideal selves) and fears (feared selves). The desire to move closer to ideal selves and move away from feared selves drives goal directed behavior as individuals work to reduce discrepancies between current self-states and future self states (Higgins, 1987).

This perspective gained traction through Dörnyei and Csizér's (2002) large scale Hungarian study, which found strong English motivation despite minimal native speaker contact. Dörnyei reconceptualized integrative motivation as internalized visions of successful L2 use, providing a more precise psychological account for globalized learning contexts. The theoretical foundations of the L2 Motivational Self

System are built to a large extent on Markus & Nurius's (1986) possible selves theory, which offered a cognitive framework of understanding of how future-oriented self-representations motivate present behaviour. In their seminal work, Markus and Nurius put the motivational power of imagined future states:

Possible selves are the ideal selves that we would very much like to become. They are also the selves we could become, and the selves we are afraid of becoming. The possible selves that are hoped for might include the successful self, the creative self, the rich self, the thin self, or the loved and admired self, whereas the dreaded possible selves could be the alone self, the depressed self, the incompetent self, the alcoholic self, the unemployed self, or the bag lady self. (Markus & Nurius, 1986, p. 954)

This tri-partite model of possible selves (hoped-for, expected, and feared) offers a psychological basis for understanding the role of self-images for the future in the regulation of current behavior. The theory suggests that people tend to try to shorten the gap between the present and the future self while also avoiding fearful results. This discrepancy-reduction mechanism provided one of the conceptual cornerstones of Dornyei's reconceptualisation of L2-motivation.

Equally central to this development is Higgins's (1987) self-discrepancy theory, which explains how different types of self-state representations produce distinct emotional and motivational outcomes. Higgins proposed that individuals possess self-guides that regulate behavior through discrepancy management:

We are motivated to reach a condition where our self-concepts match our personally relevant self-guides. The greater the magnitude of a particular type of self-discrepancy possessed by an individual, the more the individual will suffer from the type of discomfort associated with that discrepancy. (Higgins, 1987, p. 321)

Higgins further differentiated between ideal self-guides, associated with hopes and aspirations and promotion-focused motivation, and ought self-guides, associated with duties, obligations, and prevention focused motivation. This distinction was instrumental in Dornyei's formulation of the Ideal L2 Self and Ought-to L2 Self as

different motivational constructs with different regulatory functions. The ideal self operates via a promotion focus, that is motivating learners to achieve desired positive outcomes and move towards end-states, whereas the ought-to self operates via a prevention focus that is motivating learners to avoid negative outcomes and meet perceived obligations.

The L2 Motivational Self System consists of three main components:

1. the Ideal L2 Self, which is the L2-specific facet of one's ideal self; if the person we would like to become speaks an L2, this can act as a powerful motivator to learn the language.
2. the Ought-to L2 Self, which refers to the attributes that one believes one ought to possess to meet expectations and to avoid possible negative outcomes; and
3. the L2 Learning Experience, which concerns situated, executive motives related to the immediate learning environment and experience (Dörnyei, 2009).

Research consistently shows the Ideal L2 Self is the strongest predictor of L2 effort, persistence, and achievement. Al-Hoorie's (2018) meta-analysis of 32 studies (39,000 participants) found substantially larger effect sizes for Ideal L2 Self ($r = .61$) than Ought-to L2 Self ($r = .35$). Botes et al. (2020) confirmed this pattern with some cultural variation. The dominance of the Ideal L2 Self seems to be even more pronounced for informal digital engagement. While Lee and Drajati (2021) found ideal L2 Self predicted willingness to communicate in digital settings null effects in Ought-to L2 Self. Liu, Zhang, and Zhang (2023) similarly reported that Ought-to L2 Self did not have an influence on IDL participation of Hong Kong students.

Therefore, for the present study's focus on self directed IDLE engagement, the Ideal L2 Self presents the most theoretically appropriate predictor. The Ought-to L2 Self relates more to external obligations (wishes of parents, institutional requirements and societal pressures) is less pertinent in autonomous, leisure-based activities pursued in private digital spaces, where external monitoring is absent and no accountability structures exist (Lee & Drajati, 2021). Furthermore, while the L2 Learning Experience is an important situational predictor in classroom-based studies,

it is not included here as a predictor because the research design prioritizes direct motivational antecedents of informal engagement rather than classroom-mediated mechanisms.

Regarding the L2 Learning Experience component, attitudes toward English for Specific Technical Purposes courses as an outcome variable in subsequent research questions (RQ2). This allows the analysis to investigate whether IDLE engagement influences EST attitudes, rather than the reverse relationship.3.2.2 The Ideal L2 Self and Informal Digital Language Engagement

While the Ideal L2 Self has been extensively studied in formal instructional contexts, emerging research demonstrates its relevance to informal digital language engagement. Lee and Lee (2020) surveyed 661 South Korean EFL learners at the middle school, high school, and university levels (mean ages 13.2, 16.6, and 21.4), investigating how engagement in IDLE and the L2 Motivational Self System related to Foreign Language Enjoyment (FLE). The study adopted hierarchical regression analyses, measuring IDLE through a multimodal instrument tapping into receptive and productive digital activities outside of class. Results showed that engagement in IDLE and possessing a strong Ideal L2 Self were robust predictors of FLE across all age cohorts, with standardized regression coefficients exceeding .40 (all $p < .01$).

The predictive influence of the Ideal L2 Self appears to be shaped by contextual factors, varying between formal and informal learning environments. Lee and Drajiati (2019) surveyed 1,043 Chinese students comparing motivational influences on willingness to communicate (WTC) in classroom settings versus digital informal contexts (online games, virtual communities, social media). Using context-specific WTC scales, the study found that both Ideal L2 Self and Ought-to L2 Self significantly predicted classroom WTC ($\beta = .38$ and $.31$, respectively, $p < .01$). However, in digital informal contexts, only Ideal L2 Self maintained significant predictive power ($\beta = .42$, $p < .001$), while Ought-to L2 Self showed no effect ($\beta = .07$, ns). Lee and Drajiati attributed this divergence to the self-determined nature of digital environments, where learners choose activities based on personal interests

rather than external requirements, thus privileging identity-based motivation over obligation-based compliance.

2.4.2 The Ideal L2 Self and Informal Digital Language Engagement

The differential predictive power of Ideal L2 Self versus Ought-to L2 Self in informal digital contexts can be understood through the theoretical distinction between promotion and prevention regulatory foci. Dörnyei (2009a) noted the inherent limitations of obligation-based motivation for autonomous behaviour:

Because the source of the second component of the system, the Ought-to L2 Self, is external to the learner (as it concerns the duties and obligations imposed by friends, parents, and other authoritative figures), this future self-guide does not lend itself to obvious motivational practices. (Dörnyei, 2009a, p. 32)

This theoretical limitation is particularly pronounced in informal digital contexts where external accountability structures are absent. Learners engage with English media in private digital spaces where parental expectations, teacher requirements, and institutional pressures exert minimal influence. Consequently, the ought-to self, which derives its motivational force from the desire to meet external expectations and avoid disappointing significant others, lacks the contextual conditions necessary to influence behaviour. The Ideal L2 Self, by contrast, operates through internalised aspirations that remain active regardless of external monitoring.

Early qualitative evidence supporting this relationship emerged from Lamb's (2009) case study of Indonesian learners, which found that a highly developed Ideal L2 Self facilitated autonomous learning outside the classroom. Lamb observed that "the participant's vision of herself as a fluent speaker in the international community may partly account for her use of films and music to learn the language" (p. 243). This observation foreshadowed subsequent quantitative research demonstrating systematic relationships between future self-guides and informal engagement, while highlighting the particular relevance of imagined community membership—a concept closely aligned with International Posture for predicting voluntary engagement with authentic English materials.

Despite strong evidence that the Ideal L2 Self predicts informal digital engagement, existing research remains limited. All three studies focused solely on behavioural dimensions, operationalising Informal Digital Language Engagement through self-reported activity frequency, time investment, or willingness to communicate. None examined whether the Ideal L2 Self predicts not only how often learners participate but also how deeply they engage. Specifically, no study has explored whether learners with strong Ideal L2 Selves simply spend more time on informal activities or engage more strategically by attending to linguistic features, employing metacognitive processing, sustaining focus on meaning, and monitoring comprehension.

Arndt (2019) provides crucial evidence suggesting this distinction matters. In her study of German secondary students' informal second language practices, she found that Ideal L2 Self predicted variety of informal activities but not time investment, and crucially, motivational constructs showed complex, indirect relationships with cognitive and linguistic engagement dimensions. Students with stronger knowledge orientation (wanting to know English to pursue personal interests) demonstrated higher behavioral and affective engagement, but cognitive engagement (concentration and focus) and linguistic engagement (attention to form) showed unexpected patterns. This suggests that entertainment contexts may not naturally elicit strategic processing even among motivated learners: students watch English series or play English games for enjoyment and content access without necessarily processing linguistic information systematically

Whether Ideal L2 Self predicts not merely participation in IDLE but also strategic processing during IDLE remains an open empirical question, justifying the present study's dual confirmatory-exploratory approach. Based on established evidence that Ideal L2 Self predicts voluntary L2 behaviors and activity selection, we hypothesize that Ideal L2 Self will positively predict behavioral engagement (time, variety) and affective engagement (enjoyment, interest) with IDLE. However, whether Ideal L2 Self also predicts cognitive engagement (strategic focus on meaning) and linguistic

engagement (attention to form) remains theoretically ambiguous and thus subject to exploratory investigation.

2.4.3 International Posture

International Posture (IP) represents a reconceptualization of motivation for English learning in globalized, non-Anglophone contexts. The construct captures learners' openness to international communication, interest in global affairs, and desire to participate in imagined international communities where English serves as a lingua franca. This section first outlines the theoretical foundations and measurement of IP, then examines empirical evidence linking it to informal digital language engagement (IDLE), highlighting both its predictive potential and current research limitations.

International Posture (IP), first conceptualized by Yashima (2002), emerged as a reconceptualization of Gardner's (1985) integrativeness to account for motivational dynamics in contexts where learners lack sustained contact with native English speakers yet demonstrate strong motivation to learn English. Yashima (2002) noted that Japanese EFL learners never strongly identified with British or American communities thus traditional integrative motivation which has been defined as a desire to be identified and integrate within certain L2 communities is theoretically inadequate. Instead, these students geared towards global situations whereby the English language is more of a global lingua franca language and not belonging to specific countries.

IP is formally defined as "an interest in foreign or international affairs, willingness to go overseas to stay or work, readiness to interact with intercultural partners, and openness or a non-ethnocentric attitude toward different cultures" (Yashima, 2002, p. 57). The construct draws conceptually on Norton's (2001) notion of imagined communities, wherein learners envision membership in global communities accessed through English rather than integration into Anglophone national cultures. Yashima (2009) emphasized that "in a context where there is little daily contact with native speakers of English, learners are not likely to have a clear affective reaction to the

specific L2 language group" (p. 57), positioning IP as capturing cosmopolitan worldviews unconstrained by native-speakerism.

The theoretical necessity of International Posture as a construct emerged from empirical observations that traditional integrativeness failed to explain motivation in EFL contexts. Yashima (2009) articulated this limitation clearly:

In a context where there is little daily contact with native speakers of English, learners are not likely to have a clear affective reaction to the specific L2 language group. Instead, they are likely to develop their own imagined communities of international English speakers with whom they want to communicate. (Yashima, 2009, p. 145)

This reformulation re-oriented the motivational target from geographically bounded (native speaker) communities and moved to deterritorialized imagined communities which are available through English as a lingua franca. The concept of imagined communities (borrowed from Norton's (2001) work on identity and language learning) was found to be particularly appropriate for understanding motivation in the digital age because of the potential for participation in global online communities without physical mobility. Yashima's construct therefore anticipated the conditions of contemporary informal engagement with digital language, as learners promote access to international content, engage in global fandoms and communicate with English language speakers globally, through digital channels.

The relationship between International Posture and the Ideal L2 Self has been theorised as complementary and not redundant. Yashima (2009) showed that learners with higher International Posture exhibited a tendency to endorse Ideal L2 Self items more than others, which could suggest that global orientation supplies the content for future self visions. She stated that "International Posture theoretically and operationally encapsulates both integrativeness and instrumentality" and thus "captures self-determined types of extrinsic motivation more than genuinely intrinsic motivation" (p. 157). This characterisation positions International Posture as that attitudinal orientation which is shaping the content of the ideal selves of L2 speaking

learners: learners are viewing themselves, then, not just as competent English speakers, but as participants in international discourse, global professionals and cosmopolitan citizens.

Most importantly, IP distinguishes itself from integrativeness by combining what Gardner (1985) separated into integrative and instrumental orientations. While integrative motivation emphasizes affective identification with L2 communities and instrumental motivation emphasizes pragmatic career benefits, IP recognizes that in EFL contexts these orientations coexist: learners simultaneously desire global professional opportunities and intercultural connection. Botes et al. (2020), in systematic review of 66 studies of IP, demonstrated that the construct scored cross-culturally even outside of Japan, having been tested in Korean, Chinese, Polish, Chilean, Malaysian, and Omani contexts, with the factor structure of the construct differing slightly across cultures. These results emphasize the versatility of IP as a motivation framework that has the capacity to describe the global orientation of learners in a variety of sociolinguistic backgrounds, and is thus specifically applicable in the context of studying IDLE in a setting such as Algeria where English is utilized as a global rather than a local connection.

2.4.4 International Posture and IDLE Engagement

Although the concept of International Posture (IP) was initially formulated in relation to Japanese EFL learners, recent studies have investigated the applicability of the concept in diverse learning situations, particularly within the context of informal digital language use. There is an increasing amount of research demonstrating that those who have a strong IP are more inclined to interact with English beyond the formal environment.

For example, Mills (2018) conducted a study among 104 Japanese university students using paper-based surveys to evaluate the International Posture, Ideal L2 Self and self-perceived informal language learning through mobile devices. The findings of the analysis reveal that IP ($\beta = .42, p < .01$) and Ideal L2 Self ($\beta = .36, p$

< .01) significantly predict informal engagement in learning-related activities. By contrast, the Ought-to L2 Self did not predict engagement in this activity. These findings indicate that informal involvement is related internally to a sense of global orientation of learners, and not so much to externally imposed expectations.

Findings from mixed method research have been able to reveal how learners with high IP articulated their informal digital language learning through frequency and depth of engagement. Alnajashi (2024) adopted a sequential explanatory mixed methods research design with 92 Saudi EFL learners, offering quantitative and qualitative confirmation for the link between International Posture and that of informal digital engagement.

When examined quantitatively, International Posture and Ideal L2 Self accounted for 58% of the variance in online informal English learning ($R^2 = .58$, $p < .001$). During the qualitative stage of the study semi-structured interviews did reveal information that learners followed English-speaking news stations, international forums, global online communities not only for proficiency-building purposes but also for global belonging. “I subscribe to English newsfeeds to get a sense of what is happening in the world, not just to practise vocabulary,” explained one participant, revealing how International Posture can spur one to consume English media as a means of engaging in global discourse. These results indicate that learners with high International Posture perceive participation as a their evolving global identity rather than as an acquisition of skills.

Liu, Zhang, and Zhang (2024) further developed this line of inquiry with a mixed-methods study of imagination as a mediator of International Posture and Informal Digital Learning of English (IDLE). International Posture positively predicted IDLE practices ($\beta = .43$, $p < .001$) in the quantitative strand ($n = 361$), and the Ideal L2 Self partially mediated this association in the structural equation model.

Analysis of qualitative interview data from 24 purposively selected participants provided insights into the ways in which learners drew on imagination to converge on “imagined international communities” through themes, including “imagining possible selves” as global communicators, “negotiating access” to international

spaces, and “investing in IDLE” as a means to realizing those identity profiles. These results position imagination as key in understanding identity formation in informal English learning, and indicate that International Posture is a complex identity related phenomenon rather than simple, rational urge.

Although there is robust evidence connecting International Posture with involvement in IDLE, the few studies to date suffer from similar limitations as Ideal L2 Self research. The majority of research has concentrated on the behavioural aspects, assessing overall use outside the classroom or informal use of the L2, rather than on the quality of engagement.

2.4.5 Distinguishing Behavioral Participation from Strategic Processing: Consumption-Oriented vs. Learning-Oriented Engagement

Research on motivation and L2 behavior has consistently shown that motivated learners tend to be more active and persistent in language-related activities (Dörnyei & Ushioda, 2021). Yet, one crucial question is insufficiently addressed by this line of research: does motivation predict not only if learners engage but how they engage in terms of depth and quality of engagement? This differentiation becomes especially noticeable in casual digital environments as learners have full control over not only when to participate but also how to process participation.

As discussed in the Section 1.3.1, engagement is defined in terms of four dimensions as behavioural, affective, cognitive and linguistic based on Arndt's (2019) framework . also informed by Arndt's model, which demonstrated that the Ideal L2 Self corresponds differentially with these dimensions, suggesting the possibility that motivation may be a stronger predictor of certain types of engagement than others

On the basis of this diverging pattern for the different engagement dimensions demonstrated by empirical evidence, the present study proposes a conceptual distinction between consumption-oriented engagement and learning-oriented engagement.

consumption-oriented engagement involves the behavioural and affective components and is defined in terms of time spent, number of activities performed and emotional reactions to content described. learning-oriented engagement, on the other hand, consists of cognitive and linguistic elements and involves strategic behaviour and sustained attention to the meaning of the content. But to prevent misunderstanding, it may not be unnecessary clarify this conceptual distinction. This is not a new representational model of engagement measurement, and hence there is no need to validate the factor structure with confirmatory factor analysis (or related methods).

Instead, it can be seen as a theoretically motivated classification of four well-established and independently assessed aspects of engagement: behavioural, affective, cognitive and linguistic, in terms of their instrumental relevance to informal learning results, as demonstrated in Arndt's (2019) findings. Each dimension will be assessed individually, using established measures, but the consumption–learning dichotomy acts as an interpretive device in investigating the relationships of these dimensions with the motivation-derived predictors, and to inform an analysis of the results.

The distinction between consumption-oriented and learning-oriented engagement requires careful theoretical grounding to avoid mischaracterising the nature of informal digital language contact. Sockett (2014), in his foundational work on online informal learning of English, emphasised the primarily incidental nature of most digital engagement:

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Activities occurring in this context do not follow a set pattern and may not even be subject to conscious processing, since the aim of the learner is communication and

not explicitly language learning, which is merely a by-product of this choice. (Sockett, 2014, p. 13)

This characterisation highlights a fundamental tension in informal digital learning research: while engagement with English media may produce language learning gains, these gains are typically incidental rather than intentional. The present study's distinction between consumption-oriented and learning-oriented engagement acknowledges this tension while investigating whether motivational profiles predict not only participation but also the quality of attention during participation.

However, the boundary between incidental and intentional learning in informal digital contexts is not categorical. As Lamb and Arisandy (2019) observed: Intentionality is not clear cut; a young person might choose to watch an English language TV series on Netflix mainly for entertainment, but also knowing they may pick up some new language along the way, and use L1 subtitles (or not) more than once. (Lamb & Arisandy, 2019, p. 4)

This observation suggests that learners may occupy intermediate positions on the continuum between pure entertainment consumption and deliberate language study. The present study's exploratory research questions regarding cognitive and linguistic engagement dimensions investigate precisely this possibility: whether learners with strong Ideal L2 Selves and International Posture orient differently toward English media, perhaps noticing linguistic features or monitoring comprehension even when their primary purpose is entertainment. Such hybrid engagement patterns would have significant implications for understanding how informal digital contact translates into language development.

This distinction aligns with established theories in second language acquisition. Incidental learning theory (Schmidt, 1990; VanPatten, 2004) posits that in entertainment settings attention is naturally focused on meaning rather than on form of language as cognitive resources are used to process narrative and emotion. Therefore, we may find that even highly motivated learners are passive in their

media usage and also not consciously learning the language. In contrast, self-regulation theory (Zimmerman, 2000; Dörnyei & Ushioda, 2021) assumes that motivated learners are metacognitively aware and can make use of such exposure as an opportunity to learn, although findings suggest this transfer is not always consistent across informal learning contexts.

The pedagogical implications of this tension are significant. If motivation predicts both consumption- and learning-oriented engagement, as self-regulation theory suggests, instruction should focus on strengthening students' motivational profiles through identity work, reflective goal setting, and activities that foster International Posture. In such cases, motivated learners would autonomously apply effective strategies to informal media. However, if motivation predicts only consumption-oriented engagement, as incidental learning theory implies, explicit metacognitive strategy training becomes necessary. ESP instruction would then guide learners in transforming entertainment use into learning opportunities through reflection, noticing tasks, and targeted strategy instruction (Lai, 2015; Chik, 2014, 2018).

2.5 Theoretical Perspectives on the IDLE–EST Attitudes Relationship

With both terms of the relationship established, the nature of EST attitudes and the motivational architecture of IDLE engagement, it becomes possible to examine the theoretical predictions that different frameworks generate about the relationship between them.

To date, the relationship between engagement in Informal Digital Language Learning Environments (IDLE) and attitudes towards English for Science and Technology (EST) instruction remains unexplored in the empirical literature. However, theoretical accounts offer three competing hypotheses: conflict (negative association), complementarity (positive), and independence (no association). In light of this uncertainty, an exploratory rather than confirmatory approach is justified.

Moreover, students spend considerably more time with informal digital English (~2.3 hours/day) than with formal EST instruction (~1.5 hours/week) (Messaoudi & Hamzaoui Elachachi, 2017). Although these contexts differ in structure and purpose,

it remains unclear whether dominant informal engagement influences attitudes towards formal instruction.

2.5.1 The Conflict Hypothesis: Self-Determination Theory

Self-determination theory (SDT) suggests that human motivation is based on the fulfillment of three fundamental psychological needs: autonomy (sense of choice and volition), competence (sense of effectiveness and ability), and relatedness (sense of meaningful social connection). In situations where contexts facilitate these needs, people are intrinsically motivated; in contexts where contexts thwart these needs, controlled motivation or amotivation develops (Deci and Ryan, 1985, 2000, 2017).

IDLE contexts seem especially suited to meet these needs. Students have full control over what they learn, the speed of learning, and the learning objectives (autonomy), interact with self-selected levels of difficulty that give them immediate feedback on their understanding (competence), and connect with communities of learners around common interests (relatedness). EST contexts, in contrast, can frustrate these needs with prescribed curricula that provide little choice, externally imposed pacing, high-stakes testing, and instrumental goals that are based on degree requirements instead of personal interests.. (Messaoudi & Hamzaoui Elachachi, 2017; Outemzabet, 2022)

When students regularly meet their needs for autonomy, competence, and relatedness in IDLE environments, the more structured and controlled aspects of EST teaching may appear particularly confining in comparison. Studies in similar areas confirm this contrast effect: Deci et al. (1999) reported that the introduction of external rewards to intrinsically motivated tasks led to a significant decrease in motivation ($d = -0.36$ to -0.68), while Cordova and Lepper (1996) found that students who had first been exposed to autonomy-supportive teaching rated traditional instruction more negatively. Thus, high levels of IDLE engagement are likely to be associated with more negative attitudes toward EST, as the difference between self-directed informal learning and controlled formal instruction makes it clear that the latter has a “psychological cost.”

However, this prediction rests on unverified assumptions. First, it assumes Algerian EST contexts are controlling rather than autonomy-supportive, which needs to be empirically documented. Second, it assumes students perceive IDLE and EST as comparable language-learning contexts rather than serving fundamentally different purposes. Third, it assumes motivational orientations transfer across contexts rather than remaining domain-specific.

2.5.2 Complementarity Model of Transfer and Competence-Building Theory

According to transfer theory, competence developed in one context can enhance performance in another when the underlying cognitive processes are similar (Cummins, 2000). A complementarity possibility is supported by three pathways. First, IDLE develops general English proficiency by means of massive exposure, which expands vocabulary and enhances understanding. This increased competence can lead to a decrease in perceived difficulty of EST tasks, which produces more positive attitudes. Second, effective informal interaction builds confidence that is transferred to other contexts, eliminating anxiety and increasing engagement. Third, enjoyment in English in informal situations generates positive associations of the language in formal settings.

Empirical research in general EFL contexts provides some support. Sundqvist and Sylvén (2016) found that extramural English engagement correlated with positive classroom motivation, while Lee and Dressman (2018) documented that out-of-class engagement predicted higher formal learning motivation. Sockett (2014) found students viewed informal and formal learning as complementary rather than competitive.

Nonetheless, major restrictions limit the applicability of the results to EST situations. The cited works focus on general EFL with a classroom atmosphere more or less similar to informal interactions than EST. It is still unknown whether the complementarity holds for technical English, where the language used differs greatly from that of entertainment media. The gap in language usage between informal conversations in entertainment and heavy technical jargon may restrict the transfer.

Ability to follow entertainment discourse may not guarantee confidence in academic discourse if the registers differ a lot.

2.5.3 The Independence Model of Contextual Attitude Formation

Based on Boundary Theory (Clark, 2000) and the goals differentiation (Eccles & Wigfield, 2002), this model suggests that students keep psychological “borders” between casual digital English engagement and formal EST teaching. According to Boundary Theory, individuals keep apart their cognitive and behavioral areas, for example, leisure and studying, thus eliminating the possibility of one sphere's motivation affecting the other.

The theory of domain specificity suggests that evaluation of attitudes and competencies takes place in separate contexts instead of through generalization across activities that have only superficial similarities. Moreover, the distinction of goals explains that IDLE serves to entertain and socialize while EST fulfills academic and professional aims, thus activating different evaluative processes connected to each context's unique purposes. Therefore, the case is that attitudes to formal EST instruction need not be influenced by the extensive informal engagement when the learners have categorized these contexts as serving fundamentally different purposes.

2.5.4 Theoretical Uncertainty and Justification for Exploratory Approach

The three theoretical models provide different predictions of the IDLE-EST attitude relationship. The contrast model, which is based on the self-determination theory, proposes that the higher the need satisfaction in informal contexts, the more the negative assessment of formal EST will be made by perceptual contrast. The transfer model, based on competence-building and transfer theory, anticipates that skills and confidence gained informally will enhance attitudes toward EST. The independence model, which is based on the theory of boundaries and domain specificity, suggests no systematic relationship, because learners separate informal and formal contexts. Each model is supported by robust evidence in its original

domain, yet none has been directly examined in the specific context of IDLE and EST.

Moreover, the absence of research testing this relationship in EST contexts creates genuine theoretical ambiguity. In such circumstances, adopting an exploratory approach represents appropriate scientific practice. Rather than forcing predetermined directional hypotheses, exploratory investigation allows patterns to emerge from empirical observation, subsequently informing theoretical refinement. Importantly, all three possible outcomes offer substantive contributions.

2.6 Linking Motivation to Informal Digital Engagement: Hypotheses and Research Questions

Both the theoretical uncertainty that is reported in Section 2.5 and the empirical evidence that is discussed in Sections 2.3 and 2.4 result in both confirmatory hypotheses when the literature is sufficiently consistent and exploratory research questions when it is not.

This study takes both a confirmatory and exploratory approach. It aims to (a) test relationships that are already supported by theory, and (b) investigate connections between constructs where theory is still unclear or inconsistent. When existing research offers clear predictions, the study uses confirmatory analysis to test them directly. In areas where theories conflict or evidence is mixed, the study adopts an exploratory stance to identify patterns in the data that could clarify or expand theoretical understanding. This combined approach balances methodological precision with openness to new insights.

The confirmatory component examines whether motivational constructs predict consumption-oriented engagement in IDLE. Prior research indicates that both Ideal L2 Self and International Posture motivate learners' voluntary engagement with English outside formal settings (Lee, 2021; Lee & Drajati, 2019; Mills, 2018; Alnajashi, 2024). Accordingly, four hypotheses are tested:

- H 3.1a: Ideal L2 Self positively predicts behavioural engagement in IDLE.
- H 3.1b: Ideal L2 Self positively predicts affective engagement in IDLE.

- H 3.1c: International Posture positively predicts behavioural engagement in IDLE.
- H 3.1d: International Posture positively predicts affective engagement in IDLE.

The exploratory component investigates whether motivational constructs have an effect on the prediction of learning-oriented engagement in terms of cognitive and linguistic aspects. Alternative theories predict different outcomes. Self-regulation theory (Zimmerman, 2000; Dörnyei & Ushioda, 2021) proposes that motivated learners engage in strategic processing even in informal settings, sustaining attention, monitoring comprehension, and attending to language features. On the other hand, incidental learning theory (Schmidt, 1990; VanPatten, 2004) holds that entertainment media contexts are formed to prioritise meaning over form, thereby constraining attention to linguistic surface even for motivated learners.

Empirical findings are mixed. Arndt (2019) found that motivation predicted behavioural and affective engagement but not cognitive or linguistic engagement, suggesting that attention to form may stem from comprehension difficulty rather than motivation. Similarly, Cole (2015) observed that motivated learners achieved higher proficiency but used informal resources differently. These inconsistencies justify an exploratory approach without directional hypotheses.

Accordingly, four research questions are posed:

- RQ3.2a: What is the relationship between Ideal L2 Self and cognitive engagement in IDLE?
- RQ3.2b: What is the relationship between Ideal L2 Self and linguistic engagement in IDLE?
- RQ3.2c: What is the relationship between International Posture and cognitive engagement in IDLE?
- RQ3.2d: What is the relationship between International Posture and linguistic engagement in IDLE?

This exploratory design allows empirical evidence to clarify how motivational constructs influence deeper learning-oriented engagement and to assess the relative explanatory power of self-regulation and incidental learning perspectives.

2.7 Conclusion

The conceptual terrain of the current study was laid out in this chapter. It has initially framed EST into Algerian higher education demonstrating that although students always have high cognitive beliefs regarding its instrumental quality, affective and behavioral involvement is still responsive to the quality of instruction, relevance of content and self-efficacy development. It followed it up with an analysis of the motivational background of IDLE engagement, which showed that Ideal L2 Self and International Posture are predictors of voluntary behavioral and affective use of English in online settings, and their correlations with cognitive and linguistic use are theoretically unclear. This ambiguity was suggested to be structured analytically by proposing a conceptual divide between consumption-based and learning-based engagement. Lastly, three rival theoretical frameworks, namely conflict, complementarity, and independence, were introduced to contextualize the interplay between IDLE engagement and EST attitudes and the fact that previous empirical studies have not been done in this particular scenario warranted an exploratory design. The conceptual framework based on the methodological design, which was developed in Chapter Three, is given by the confirmatory hypotheses and exploratory research questions formed out of this review.

CHAPTER III: EST Pedagogy and Teacher Cognition Contexts for Integrating IDLE

3.1 Introduction

This chapter examines the ways in which teacher-related and contextual factors may shape the extent to which students' informal digital English practices are acknowledged or drawn upon in English for Science and Technology (EST) instruction. Building on prior findings that Algerian technical students engage actively in IDLE, it considers the extent to which such practices are acknowledged in formal classroom settings and how they relate to current instructional routines. Although the focus is on EST, the chapter draws on wider English for Specific Purposes (ESP) research where EST-specific studies are limited, since EST is historically and conceptually situated within the broader ESP domain. Drawing on Borg's (2003, 2006) teacher cognition framework and Self-Determination Theory (Deci & Ryan, 2000), the chapter investigates how teachers' beliefs, awareness, and motivation may interact with broader curricular and institutional conditions. It discusses areas such as knowledge limitations, digital skills, and the possible mismatch between learner autonomy in informal contexts and teacher control in formal instruction.

3.2 ESP/EST Pedagogy: Needs Analysis and Curricular Tensions

The following section begins by revisiting the foundational role of needs analysis in ESP, before examining how its application interacts with curricular constraints in EST contexts.

3.2.1 Needs Analysis as ESP's Defining Feature

One of the defining features of English for Specific Purposes (ESP) is the foundational focus on needs analysis, whereby language teaching is aligned with the specific goals, tasks, and contexts pertinent to the academic or professional field of the learners. Hutchinson and Waters (1987) famously stated that in ESP, "all decisions as to content and method are based on the learner's reason for learning" (p. 19), framing learner purpose as the central organizing principle of ESP pedagogy. This focus has been institutionalized in a bilateral sense through a number of models, including what Dudley-Evans and St. John (1998) refer to as target needs (what

learners need to do), present needs (what they are actually able to do) and learning needs (their preferred ways of learning). Over time, needs analysis has become both a methodological and pedagogical cornerstone in ESP curriculum design, ensuring that instruction responds to real-world communicative demands. In English for Science and Technology (EST), this is frequently seen in the teaching of specialist genres (e.g. lab reports, technical manuals or oral presentations) in accordance with disciplinary norms (Hyland, 2006; Basturkmen, 2010). Such specificity also allows students to learn the language and discourse features that are most pertinent to their intended careers.

However, by concentrating tightly on specific institutional or workplace requirements to inform the content of a course, there is a risk that other, more general or unexpected forms of language use might be ignored. For instance, a lot of learners regularly use English in digital spaces while watching science content on YouTube, taking part in online discussions, or reading technical blogs. These informal practices may impact language growth and motivation, but they are rarely included in needs assessments, which often focus on tangible academic or professional outcomes. From the Self-Determination Theory (Deci & Ryan, 2000) perspective, such informal digital practices often fulfill basic psychological needs (autonomy, competence, and relatedness) and can motivate users intrinsically. If these activities are not incorporated into curriculum design, there is a risk that motivationally relevant experiences are devalued not so much because of pedagogical ignorance, but because they lie outside the scope of the enquiry utilized in the needs analysis.

Therefore, although needs analysis continues to be a core strength in ESP and EST, its traditional formulations might be extended to take into account a broader spectrum of learner experiences. Taking account of the learners' digital and informal use of English in their lives beyond the classroom could inform course design, support more holistic learner development and bridge the divide between formal instruction and use of the language in the real world.

3.2.2 Needs Analysis and the Limits of Curricular Responsiveness

While needs analysis places ESP as a learner-centred approach, practice is often a matter of competing demands from the institution that limits curriculum flexibility. Though designed to adapt teaching to particular academic or professional needs, ESP programs are typically situated within larger educational contexts that constrain the possibility of fully attending to the needs of learners (Hyland & Hamp-Lyons, 2002; Basturkmen, 2010). prescribed syllabi, standardised testing procedures and accreditation regulations can limit the breadth of teaching to the favour of efficiency and accountability rather than responsiveness and adaptation.

Such tensions are exemplified in Basturkmen's (2010) categorisation of wide-angle and narrow-angle ESP. Wide-angle perspectives are meant to provide learners with generalizable communicative strategies applicable across academic disciplines, whereas narrow-angle courses are concentrated on a limited set of genres of discourse and specialized language within a particular discipline. In settings such as EST, where course time is restricted and goals are set externally by means of a narrow-angle perspective of course design may take priority by necessity over wider views of course design. This is especially true in Algerian technical institutions, where EST is typically allocated only 1.5 hours per week, taught from centrally prescribed syllabi, and delivered in large-class formats with few opportunities for pedagogical flexibility (Messaoudi & Hamzaoui-Elachachi, 2017; Outemzabet, 2022; Abbassi, 2022).

These conditions may constrain the inclusion of more expansive types of language engagement, such as informal or digital engagement, that are not always explicitly taken into consideration in traditional needs analysis models. According to Self-Determination Theory (Deci & Ryan, 2000), environments that minimise autonomy and constrain self-directed learning are less likely to support intrinsic motivation. When learners are given opportunities to make purposeful, self-selected use of language beyond the classroom, particularly in digital spaces, but face inflexible policies when in formal instruction, the result can be learner alienation and/or decreased commitment.

Hence, the challenge is not to deny the importance of needs analysis, but to broaden its perspective. With the spread of digital and informal English among learners, the design of ESP and EST courses could take advantage of a more comprehensive notion of "needs" that starts from the institutional or workplace demands and extends to consider the various forms students are using English in their own life.

3.3 Teacher Knowledge and Cognition in ESP/EST

With the evolving roles of ESP/EST teachers, their knowledge bases in relation to new digital requirements should be a focus of interest. The two sections discussed in the following are related to teacher cognition and digital pedagogical competence as two fundamental dimensions that influence instructional practice.

3.3.1 Teacher Cognition Framework

Exploring whether ESP teachers recognize and integrate students' informal digital practices necessitates examining the intricate relationship between teacher awareness, beliefs, and classroom action. Borg (2003, 2006) established teacher cognition as a foundational construct in language teaching research, defining it as "the unobservable cognitive dimension of teaching: what teachers know, believe, and think" (Borg, 2003, p. 81). His comprehensive synthesis demonstrated that teachers' content knowledge, pedagogical beliefs, and knowledge of context are not consistently translated into practice.

Building on this, the discrepancy between teachers' professed beliefs and their actual classroom practices is a well reported result in language education. After reviewing 64 studies, Phipps and Borg (2009) found that although teachers expressed support for communicative, learner-centred principles, many were still utilising transmission-based methodologies. Borg (2006, 2019) sees this discrepancy as being not the result of lack of competence but rather as a consequence of institutional constraints including time pressures, large classes, and exam-oriented cultures. Basturkmen (2012) similarly notes that teachers value learner-centred

pedagogy yet frequently adopt form-focused instruction when institutional priorities emphasise efficiency and assessment.

In light of these considerations, the present study is informed by the model proposed by Borg (2006, 2019) and differentiates three related, yet distinct constructs (awareness, beliefs, and practices in regards to teachers). Measuring students' Informal Digital Learning of English (IDLE) awareness on its own is not enough, as awareness does not necessarily lead to positive beliefs or to incorporation in light of contextual conditions. RQ4, therefore, investigates teachers' cognitive awareness, beliefs and integration practices, as well as the institutional constraints bridging their relationship in order to demonstrate how cognition and context collectively shape pedagogical action.

3.3.2 Digital Pedagogical Knowledge Demands

Beyond their disciplinary and language expertise, ESP teachers are now confronted with an increasing requirement to possess digital pedagogical competence: an understanding of how digital platforms influence learning, and the capacity to support learners in an informed manner to make strategic use of these (Redecker, 2017). The Technological Pedagogical Content Knowledge (TPACK) model formulated by Mishra and Koehler (2006) indicates that successful technology use in teaching is a matter of knowledge integration of content knowledge, pedagogy knowledge, and technology knowledge rather than technical knowledge of tools.

Yet, the recent studies indicate that the ESP instructors are inadequately trained in this respect. For instance, Rahman et al. (2021) who conducted a survey of 212 ESP teachers in Malaysian public universities, revealed that 71% said they had no formal training in assessing digital materials and 29% said they were using digital materials for summative assessment. A large-scale study was also conducted by Uzun and Kilis (2020) with 384 Turkish ESP teachers, reporting that 92% of the teachers used technology at least to some extent, yet only 41% of them employed it to facilitate discipline-specific communicative tasks such as simulations, roleplays and technical writing.

This general technology use versus domain-specific use of tools discrepancy highlights the particular challenges for ESP in that digital literacy has to be combined with subject knowledge. Hafner (2019) contends that ESP teachers need to make choices about the tools to use, but also to evaluate critically the linguistic accuracy and disciplinary appropriateness of online materials. The once-popular notion of “digital natives” (Prensky, 2001) has been challenged by Bennett et al. (2008) and Selwyn (2009), who argue that social media familiarity does not constitute pedagogical fluency.

Overall, these results suggest that digital pedagogical readiness is still a significant challenge for teaching ESP, particularly in environments where teachers need to support learners not only with language learning but also with communication in their fields of expertise through modern technology

3.4 Teacher Awareness and Beliefs: Empirical Evidence

Having evaluated theories and digital competency demands, this section examines what empirical research has found in relation to teachers' awareness of and beliefs about students' IDLE practices, starting with the state of ESP/EST research.

3.4.1 Limited Research in ESP/EST Contexts

Research into teacher cognition in ESP/EST is still limited. Although research has flourished addressing teacher cognition in general EFL contexts, little is known about how ESP or EST instructors perceive/respond to students' informal engagement with English on digital platforms. Foundational reviews (Basturkmen, 2012; Champion, 2016) have been critical of ESP teacher preparation and flexibility, yet there has been a lack of but few follow-up studies investigating the implementation of these issues in digitally mediated contexts.

Meanwhile, a growing number of studies on IDLE have emerged worldwide in the past ten years focusing on its potential for learner autonomy and language development (Sokkett, 2014; Chik, 2014; Soyoo, Reynolds, & Vazquez-Calvo, 2023). However, the intersection of ESP pedagogy, teacher cognition and IDLE remain underrepresented. This gap particularly large in the science / technical

domain, since learners' disciplinary engagement in English within digital environments (such as engineering tutorials, online coding communities, technical forums) offers them the prospect of receiving extensive, and immediately usable, input, but this is not yet accessible to teachers or to teaching methodology.

This lack of research in the literature indicates a significant line of inquiry. Investigating the perceptions of ESP/EST teachers on students' use of IDLE and the degree to which they may reflect this in their teaching, especially in less researched contexts, may help to provide a fuller picture of teacher cognition in technology-mediated environments.

3.4.2 Teacher Awareness of Students' Informal Practices

Research on teacher beliefs indicates that teachers frequently tend to separate the formal teaching and learning of English from students' informal digital use of English. An initial line of research (Chik, 2011; Toffoli & Sockett, 2013) suggested that although teachers were aware that students were exposed to English through digital media, they did not consider it as legitimate learning. These were typically recreational activities and did not feature in pedagogical consideration. Studies confirmed this trend. Lee and Draji (2019) revealed how teachers underestimated the transactional aspects of students' digital practices, and Lee and Dressman (2018) demonstrated that even when recognized, such digital practices are not typically incorporated into pedagogies. Teachers also seemed to prioritize traditional social media platforms, and by and large were unaware of the participatory spaces, further indicating the separation of what is taught in the classroom and how "digital" is used outside of school.

While most research focuses on EFL teachers, research on ESP and EST teacher cognition are still relatively scarce, but a number of recent studies have proved interesting. Cao et al. (2022) revealed that the beliefs of English for medical purposes teachers were influenced by teaching experience, disciplinary context, and role perception. Yang (2021) investigated ESP teachers' perceptions of motivational strategies and their implementation within the scope of English for science and technology. Bui (2022) explored the convergence between teacher and student views

in terms of ESP instruction. These represent a growing interest in the thinking of the ESP teacher but do not consider what teachers make of or how they respond to their students' casual digital English practice.

Although digital learning is drawing more attention in ESP (e.g., Bouguebs, 2023), the emphasis has been on digital literacy or the use of materials in the classroom not on teachers' perceptions of students' use of language outside of class in digitally mediated practices. Furthermore, reviews of IDLE (e.g., Guo et al., 2023) on a broad scale indicate that studies still place a greater emphasis on the learner, with little consideration given to teacher thinking and none specifically for discipline-specific language instruction. Even as tools for measuring teachers' own IDLE engagement emerge (e.g., Soyoo et al., 2023), these efforts remain confined to general EFL contexts.

3.5 Pedagogical Integration: Current Practices and Systemic Barriers

Having established that teacher knowledge, digital competence, and awareness of students' informal practices are all important as contextual factors in EST, this section explores the question of whether and to what extent these practices are reflected in formal instruction. It reviews the empirical evidence on the state of present approaches to integration and discusses the multilevel barriers that can constrain the pedagogical responsiveness of the teaching approach, even when teachers may hold positive beliefs or show a considerable awareness.

3.5.1 Minimal Integration Despite Widespread Student Engagement

Although there are extensive accounts of students' informal engagement with digital English (see Chapter 2) and theoretical reasons for its value as a pedagogical resource (Section 2.4.4), empirical investigations have consistently found little evidence of systematic adoption within formal language teaching. The divergence between policy and practice that students experienced presents a gap in modern language education.

Indeed, Empirical inquiries which capture how certain informal practices are appropriated in formal instruction are still sparse and suggest limited adoption.

Maristy's (2023) PRISMA review on Extramural English (EE) in ELT reveals some eight ELT-centered empirical studies at global level, conceptualize extramural activities like special programs or projects but not as regular curricular practice, citing that concerns of "inclusion of EE in EFL classrooms" are prevalent in merely small portion of the literature. At the same time, IDLE overviews the stress the fact that great majority of the research has been done on linguistic, emotional and digital literacy gains of learners in non-institutional contexts, with classroom utilization of such practices being entirely absent from the review of research agendas (Guo & Lee, 2023; Soyoof et al, 2023).

Studies on teachers also indicate that integration is still infrequent and marginal even when knowledge of students' informal involvement is high. In a cross-national survey of lower-secondary English teachers in Austria, Finland, France and Sweden, Schurz and Sundqvist (2022) reveal that although the majority of respondents acknowledge extensive student use of extramural English, their pedagogical responses are limited to occasional quotations of students' media usage rather than structured curriculum development around them.

In ESP contexts in particular, the inclusion of informal digital practices goes largely unnoticed within the mainstream research. A review of ESP teacher research published in Scopus indexed journals from 2010 to 2022 showed a limited number of recurring topics namely: teachers', identity, needs, collaboration, innovation, knowledge, and technology, and "linguistics inquiry and needs analysis were found to dominate ESP studies" (Supunya, 2023, p. 229). Even as technology is made more visible, it is represented largely as a constraint (shortage of training, infrastructure, and digital literacy), and not as a facilitator for students' autonomously online learning (Supunya, 2023, p. 232). Studies show that in ESP, digital tools are mostly utilised as delivery platforms (e.g., Google Classroom, Zoom, Quizizz, Nearpod) for content, collaboration and assessment, rather than as tools to bring students' digitally-mediated informal practices into the technical English courses (Rachmawati & Irawan, 2024). The lack of any systematic consideration of such integration in reviews and research articles on the topic would seem to suggest

either that such integration is absent in the ESP literature, or that remains entirely undocumented in the ESP literature.

3.5.2 Multi-Level Barriers to Integration

Research identifies barriers operating across institutional, pedagogical, professional development, and epistemological levels that constrain integration regardless of teacher awareness or beliefs. These barriers are mutually reinforcing, creating systemic resistance to change.

Institutional barriers create structural rigidity that limits teachers' capacity to adapt curricula. Prescribed syllabi and standardized assessments leave minimal room for teacher innovation. Hyland and Hamp-Lyons (2002) demonstrate that assessment systems fundamentally shape ESP curriculum: when accreditation or institutional advancement depends on measurable outcomes from standardized tests of discrete technical skills, teachers must prioritize content directly assessed. Informal learning by definition autonomous, variable, and difficult to standardize does not fit such assessment paradigms. Teachers face accountability pressures to demonstrate learning outcomes through quantifiable metrics, which informal practices resist by their very nature.

Contact hour restrictions add on to these institutional constraints. Messaoudi and Hamzaoui-Elachachi (2017) revealed that ESP courses in technical universities usually get only 1.5 hours of weekly teaching time, imposing severe priority choices on teachers between "essential" technical contents and exploratory or autonomous-supportive activities. Teachers are presented with zero-sum pedagogical choices: time spent focused in the classroom on investigating students intensive and informal practices with digital technologies is time lost from time devoted to the development of required technical genres, to specialized vocabulary, or to specialized skills dictated by disciplinary syllabus. Izidi and Zitouni (2017) documented that large class sizes in technical universities are a further hindrance to the interactive, individualized pedagogies that may successfully bridge formal and informal learning contexts, as it makes it logistically impracticable to engage with diverse student

interests, personalized guidance or meaningful discussions about the autonomous learning strategies.

Professional development gaps, on top of these structural barriers. EST teachers in Algeria, according to Abbassi's (2022) and Messaoudi and Hamzaoui-Elachachi's (2017) documentation, receive little in-service training, especially in the area of technology integration or the reconnection between formal and informal learning. Most were trained in general EFL methodologies rather than ESP-specific pedagogies and joined the profession before contemporary digital platforms were the dominant mode of media consumption for youth. The move from Web 1.0 (static content) to Web 2.0 (participatory platforms) to today's algorithmic, mobile first environments has exceeded the training of educators. Without explicit training in how to evaluate YouTube technical content for linguistic and disciplinary appropriateness; design bridging tasks that relate gaming discourse conversations to the language of laboratory reports; or teach metacognitive strategies for informal learning, there is a lack in procedural knowledge for integration even when awareness and positive beliefs are in place. They may intuitively feel that the digital engagement of students is important but may feel that they are not prepared to move from this intuitive understanding to concrete pedagogical action

Epistemological barriers develop when the underlying beliefs of EST/ESP teachers about what constitutes "real" learning of language place IDL as peripheral to legitimate curriculum content. Work on teacher cognition highlights the extent to which the practice of language teachers is heavily influenced by stable and experiential beliefs about valued knowledge and appropriate classroom activities (Borg, 2003).

In ESP/EST, such beliefs are strengthened through a disciplinary tradition which does makes needs analysis, specialist genres and tightly specified syllabi central objects in enquiry and design (Basturkmen, 2010, 2019), in which discipline-specific texts and technical lexis are the default maximum definition for teachable content. The work of IDLE research in particular has tended not to challenge this frame: the major reviews have documented the gains in learners' linguistic, motivational, and

digital-literacy competencies in informal environments but have commented that both classrooms and curricula are under-theorised as places where it is possible to marry such learning in (Guo & Lee, 2023; Soyoof et al., 2021).

At the conceptual level, informal learning is categorically defined as "unofficial, unscheduled, and impromptu" activity, outside planned instruction (Toffoli & Sockett, 2010, p. 93), and empirical work conducted with teachers at French universities reveals that, despite their awareness that students engage a great deal in online informal English, "few make use of this knowledge in their English courses" (Toffoli & Sockett, 2015, p. 7). Together, these strands point to an epistemic frame where specialist, text-based knowledge of curriculum is recognised as valid and assessable, whereas students' informal digital practices are built up as extra-curricular experience rather than as a valid source of evidence to inform EST/ESP pedagogy.

3.6 Conclusion

This chapter demonstrated that the autonomous use of English via digital media is still quite remote to what occurs in EST classrooms. The issue is not that educators lack acceptance of these practices, but that institutional constraints, fixed routines and assumptions reinforce a focus on discipline specific texts and seminal academic results. Under prescribed syllabi, limited time for contact and large groups, awareness of informal activities of students often does not become systematic classroom practice, particularly with the lack of workable models applicable to resource constrained settings. The next chapter establishes the methodological design adopted to probe these issues in an empirical manner, and explains how students' informal engagement and the EST context are examined in the study.

CHAPTER IV: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter presents the methodological framework for the study. It explains the underlying research paradigm and provides a rationale for the selected approach and design. The chapter describes the context and participant selection, outlines the instruments and procedures for data collection and analysis, and addresses considerations related to validity, reliability.

4.2 Research Paradigm and philosophical positioning

This study adopts a pragmatic research paradigm to explore the intersection of informal media-based English learning and formal technical English education among Algerian polytechnic students. The choice of pragmatism is driven by methodological demands rather than philosophical preference. As Morgan (2007) states, “We need to use our study of methodology to connect issues in epistemology with issues in research design, rather than separating our thoughts about the nature of knowledge from our efforts to produce it” (p. 68). This is particularly applicable in the situations where informal interaction with English serves as both an observable behavior and a place of individual meaning-making

4.2.1 Theoretical Necessity for Pragmatic Investigation

Informal English learning via digital media presents an epistemological challenge in that it is simultaneously quantifiable and interpretive. Watching YouTube tutorials, playing video games, or using social media can be quantified using the duration parameter, frequency, and platform used. At the same time, these practices often carry personal meaning tied to learners’ identities, motivations, and affective orientations.

This duality is most relevant in informal situations when it is self-led and directed both by strategic and emotional investment. Dörnyei’s (2005) *L2 Motivational Self System* exemplifies this tension. The *Ideal L2 Self* can be operationalised through validated instruments, yet also constitutes a dynamic aspect of learners’ evolving self-concept. In informal learning, this construct is not merely a latent variable but an

active influence on decision making and engagement behaviour. This view is supported by the notion of *International Posture* developed by Yashima (2002), which includes the noticeable trends of communication and the inner orientations towards the global involvement. When learners make decisions to use English instead of other languages that are available to them, they can be captured as data points, but they also represent larger cultural orientations and imagined affiliations

To address such complexity, the present study is situated within the pragmatic research paradigm. Pragmatism does not follow the strict adherence to one philosophical tradition, but rather focuses on the research problem itself (Creswell & Plano Clark, 2018). It is characterised by a focus on utility what Johnson and Onwuegbuzie (2004) describe as “what works” and, as Morgan (2007) notes, emphasises the consequences of inquiry over allegiance to specific methodological camps: “on the consequences of research, on the primary importance of the question asked rather than the methods” (p. 48).

In this paradigm, the research adopts a critical realist ontology (Bhaskar, 1978), which holds that there is a reality that exists beyond our perceptions (the realist position), but the only way we can access this reality is through language, culture, and measurement instruments (the critical position). Engagement in informal learning, attitudes towards English as a Science and Technology (EST), motivational orientations are some of the constructs that are considered as real phenomena in this perspective. Nevertheless, they cannot be observed directly. They are rather deduced based on proxies: self-report measures, behavioural indicators and interpretive accounts.

For example, the IDLE Engagement Scale captures specific dimensions of learner engagement, rather than engagement in its entirety. Attitudinal and motivational scales, also, offer reflections of beliefs and orientations expressed but not necessarily deep-rooted and stable orientations. These differences in epistemology are not purely theoretical: they influence the interpretation of the quantitative data obtained among the participants and underline the necessity to include qualitative data collected via

focus groups and teacher interviews to contextualise the statistical results and extend them.

4.2.2 Analytical Framework and Conceptual Model

The theoretical frameworks developed in Chapters 2–4 established the conceptual basis for the analytical approach of the present study. Figure 5.2 illustrates the analytical framework, demonstrating how each theoretical lens informs particular research questions and corresponding methodological choices.

Arndt's (2019) four-dimensional engagement model structures the investigation of engagement patterns (RQ1), providing the conceptual basis for examining behavioral, affective, cognitive, and linguistic dimensions of informal media use. Three competing theoretical perspectives on informal-formal learning relationships conflict through Self-Determination Theory, complementarity through skill transfer, and independence through contextual compartmentalization inform the exploratory examination of the IDLE-EST connection (RQ2). The absence of empirical evidence to adjudicate among these perspectives necessitates an exploratory rather than confirmatory approach. The Ideal L2 Self and International Posture constructs from L2 motivation research drive the analysis of motivational predictors (RQ3), with the theoretical distinction between consumption-oriented and learning-oriented engagement guiding hypothesis formulation. Borg's (2006, 2019) teacher cognition framework organizes the investigation of teacher awareness and pedagogical practice (RQ4), structuring the qualitative inquiry around beliefs, knowledge, and instructional decisions.

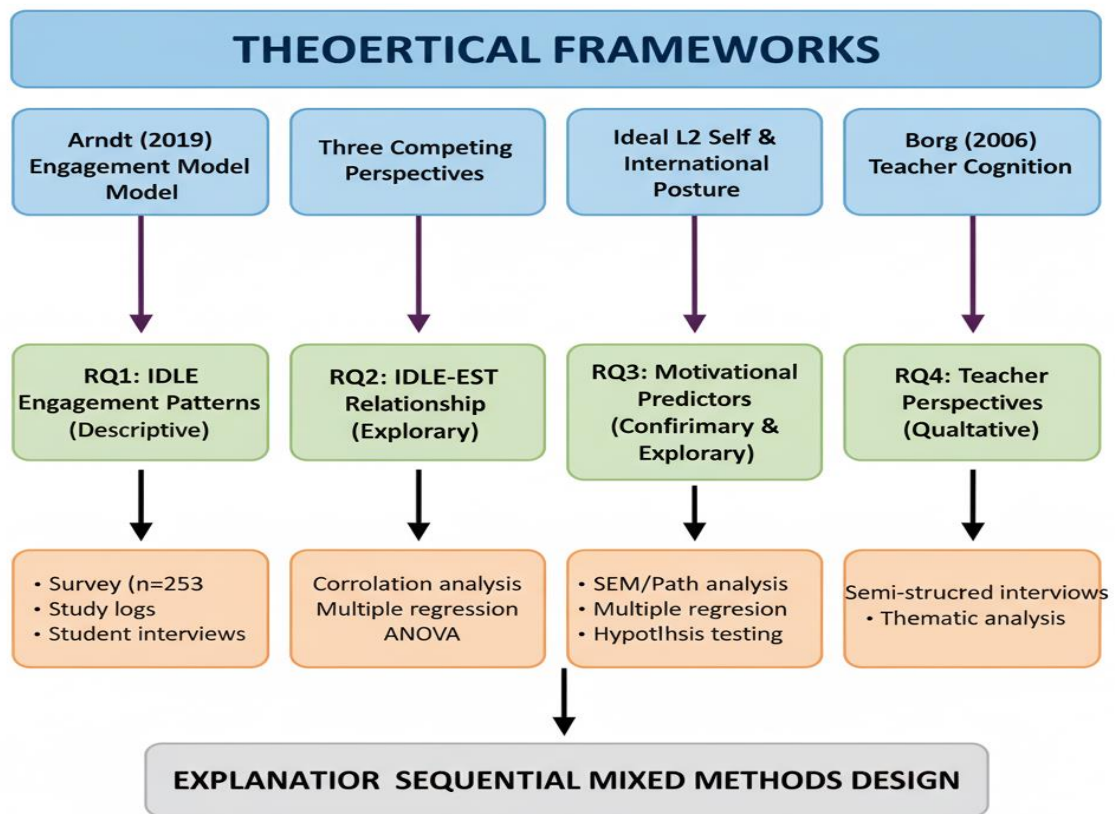


Figure 1

Analytical Framework Linking Theoretical Foundations to Methodological Approaches

The framework operationalizes these theoretical constructs through an integrated quantitative-qualitative approach aligned with the explanatory sequential design. Quantitative methods address RQ1, RQ2, and RQ3, while qualitative methods address RQ4 and provide explanatory depth for quantitative findings. The specific analytical procedures are detailed in Section 5.10.

4.3 Research Design

This study employs an explanatory sequential mixed methods design (Creswell & Plano Clark, 2018) to investigate the relationship between Algerian technical students' informal digital learning of English (IDLE) and their attitudes toward English for Science and Technology (EST) instruction. The design unfolds in two successive phases: the first phase is a quantitative phase that identifies patterns and

relationships among IDLE engagement, EST attitudes, and motivational predictors among a large sample, and the second phase is a qualitative phase that explains, elaborates and contextualize the quantitative results through focus group dialogues about the students and interviews with EST teachers.

4.3.1 Rationale for Explanatory Sequential Design

The explanatory sequential design is justified by both the nature of the research questions and the pragmatic paradigm that guides this investigation. Three features of this design are consistent with the aims of the study.

First, the four research questions require different methodological approaches: RQ1 (engagement patterns), RQ2 (IDLE–EST relationships), and RQ3 (motivational predictors) necessitate quantitative analysis to identify trends, correlations, and predictive relationships in a large sample, whereas RQ4 (teacher awareness and pedagogical integration) demands qualitative analysis to capture beliefs, practices, and institutional contexts that cannot be adequately explored through closed-ended instruments.

Second, the competing theoretical perspectives on informal–formal learning relationships (autonomy–control conflict via Self-Determination Theory, complementarity through skill transfer, or contextual independence) cannot be resolved solely through statistical associations. Quantitative analysis can reveal whether IDLE engagement correlates positively, negatively, or neutrally with EST attitudes (RQ2a), but explaining why such relationships exist or fail to exist requires access to learners' own accounts of how they experience the transition between autonomous informal practices and controlled formal instruction. Similarly, while it is possible to use regression models to determine which motivational constructs are predictive of engagement (RQ3), only qualitative data can shed light on the mechanism(s) by which motivation becomes specific patterns of media use and engagement quality.

Third, the study investigates not only learner behavior and attitudes but also the pedagogical context in which these phenomena occur. Teacher interviews (RQ4) provide essential contextual data on instructor awareness of students' informal practices, beliefs about their educational value, and the extent to which EST

instruction leverages or ignores these out-of-class experiences. This qualitative strand fills a gap that cannot be filled by purely quantitative methods: the role of institutional practices and teacher cognition in creating or failing to create the relationship between informal and formal learning experiences of students in English.

The explanatory sequential design, therefore, facilitates methodological triangulation and retains analytic priorities. As Creswell and Plano Clark (2018) note, this design is particularly suitable when researchers need quantitative results to "set the stage" for qualitative exploration, allowing the second phase to build upon, refine, or challenge initial findings (p. 78).

In this research, quantitative findings reveal what patterns exist (e.g., engagement profiles, magnitudes of correlation, motivational predictors), and qualitative data provides the how and why of the development of these patterns based on the lived experiences of learners and the pedagogical realities of EST instruction.

4.3.2 Design phases and procedures

The explanatory sequential design comprises two distinct but interconnected phases

- **Phase I: Quantitative (QUAN) – Dominant Priority.** The quantitative phase addresses RQ1, RQ2, and RQ3 through two data collection instruments:
 1. **Student Questionnaire:** A comprehensive survey of IDLE engagement on four scales (behavioral, affective, cognitive, linguistic), attitude to EST (cognitive, affective, behavioral), and two motivation variables (Ideal L2 Self, International Posture). Given to the complete sample of Year 2 and Year 4 technical students at ENP, the questionnaire offers cross-sectional data through which descriptive, correlation, regression, and structural equation modeling of motivational predictors can be conducted (RQ1, RQ2, and RQ3).
 2. **Study Log :** A structured seven-day tracking instrument administered to a purposively selected subsample representing varied IDLE engagement profiles. Participants document the following on a daily basis: (a) type of media used, (b) duration of time spent on each activity, (c) exact content used, and (d) real-time ratings of the quality of engagement (entertainment value, concentration, language vs. content focus, interest, perceived learning). The

study log provides longitudinal behavioral data that triangulates retrospective self reports from the questionnaire, captures within person variability in engagement over time, and generates more granular temporal data on actual media consumption patterns.

The quantitative stage generates statistical results on the frequency of various engagement patterns, the orientation and intensity of associations between IDLE and EST attitudes, the predictive value of motivational constructs, and the determination of specific learner profiles according to the engagement dimensions.

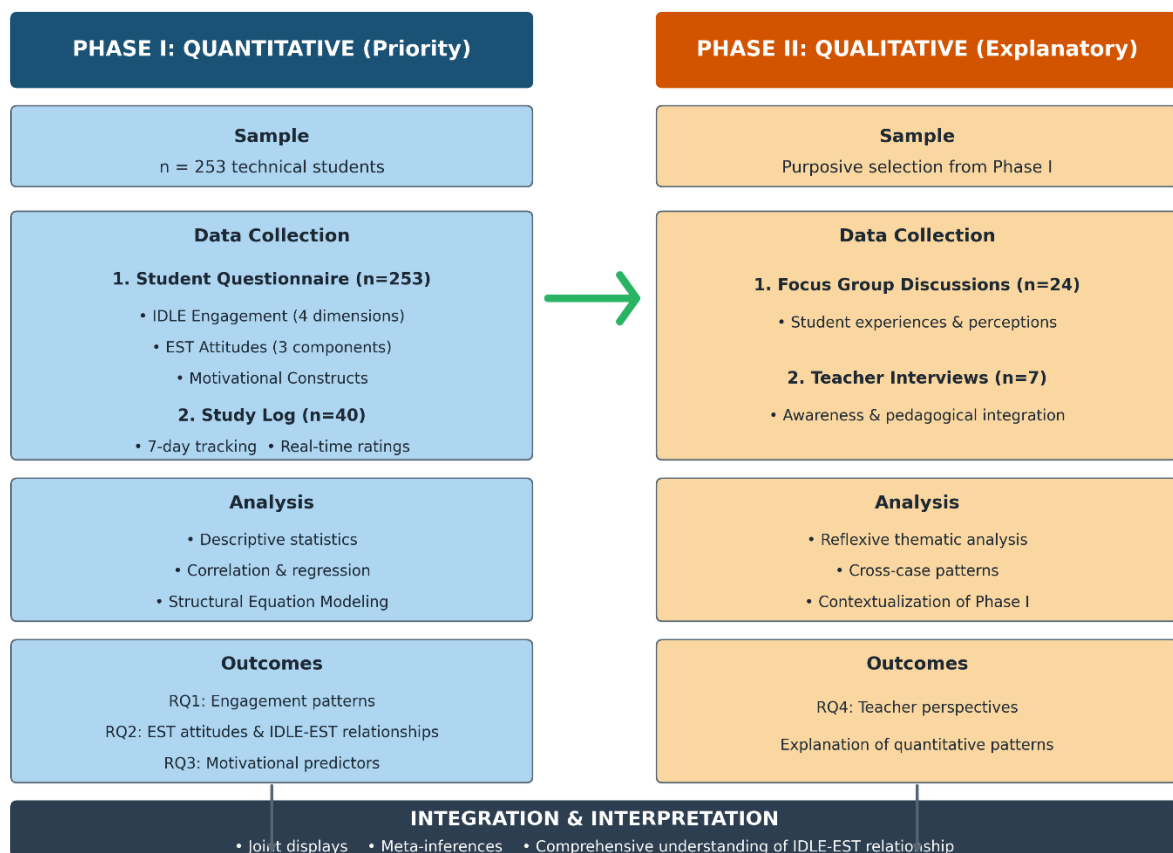


Figure 2

Explanatory Sequential Mixed Methods Design

➤ Phase II: Qualitative (qual) – Explanatory Priority

The qualitative phase explains/elaborates findings from Phase I through two data collection methods:

1. Focus Group Discussions (Students): Semi-structured discussions with students explore how they experience the relationship between informal and formal

English learning, their perceptions of EST instruction's relevance, effectiveness, barriers to productive language use, and the role of digital media in their language development. Focus groups provide peer interaction and collaborative meaning making (Morgan, 1997), where participants can build on each other experiences and negotiate common understandings that might not be elicited in individual interviews.

2. Teacher Interviews: Semi-structured interviews with EST instructors investigate their awareness of students' informal digital practices, beliefs about the educational value of informal learning, current and potential integration of IDLE into formal instruction, perceived alignments or tensions between informal and institutional learning environments, and barriers (pedagogical, institutional, curricular) to leveraging students' out-of-class English exposure.

4.3.3 Integration Strategy

Integration is present throughout the research process, making sure the sequential design is treated as a coherent structure and not parallel strands. As Creswell and Plano Clark (2018) explain, mixed methods integration involves merging, connecting, and building. This study applies all three, with connecting and building central to its structure.

First, integration occurs through ‘connecting’ at multiple sampling stages (Creswell & Plano Clark, 2018; Fetters, Curry, & Creswell, 2013). Within Phase I, study log participants (n=40) were purposively selected based on preliminary analysis of questionnaire engagement items. Rather than selecting study log participants randomly or through convenience, questionnaire data were rapidly screened during the final week of January to identify students representing varied engagement profiles including high, moderate, and low levels of engagement, balanced across academic years, gender, and technical fields. This within phase connecting integration ensured that the study log, despite its smaller sample size, captured behavioral tracking data across the full spectrum of engagement patterns rather than concentrating only on highly engaged or minimally engaged students.

The connecting strategy links phases by using Phase I results to guide participant selection for focus groups. Students were purposively sampled to reflect the range of engagement and attitude patterns found in both the questionnaire and study log data.

As Creswell and Plano Clark (2018) note, connecting is “the hallmark of sequential designs” where results from one phase inform data collection in the next (p. 222). This approach ensures the qualitative phase captures the full diversity of the sample.

Second, integration occurs through building during instrument refinement (Creswell & Plano Clark, 2018). Focus group and interview protocols were adjusted in response to Phase I results. Core questions remained the same whereas follow up prompts were designed to investigate any unexpected patterns, null findings, or subgroup differences. This building strategy, where “one database builds directly on the results from the other” (p. 221), ensures the qualitative phase serves as targeted explanation rather than broad exploration.

Third, integration occurs through merging at the interpretation stage using joint displays and meta-inferences (Guetterman, Fetters, & Creswell, 2015). Joint displays are used to align quantitative patterns with qualitative themes so that they can be compared in a systematic manner. They reveal convergence, divergence, and complementarity across strands. As Teddlie and Tashakkori (2009) note, meta-inferences combine both types of evidence into interpretations “that neither method alone could support,” generating insights beyond the reach of single method approaches.

This multi-level integration reflects pragmatism’s focus on methodological pluralism and complementarity (Morgan, 2007). Integration occurs within Phase I (questionnaire guiding study log sampling), between phases (quantitative findings informing qualitative selection), at instrument design (building tailored protocols), and during interpretation (merging through joint displays). This will guarantee the alignment of quantitative breadth and qualitative depth to describe the interaction of Algerian technical students with informal digital English and how they perceive formal EST teaching.

4.3.4 Timeline and phases of the Research

➤ Phase I: Quantitative Data Collection and Analysis (January–March 2024)

The quantitative stage was initiated by administering student questionnaires in scheduled EST classes in various sections. This step-by-step distribution allowed

better access to students and provided opportunities to answer any questions during completion. Following the collection of data, pre screening of responses was done to determine various engagement profiles. A smaller group of participants was then invited to fill in a 7-day digital study journal to record behavioral patterns and variability of engagement across time.

Throughout mid March, the participants completed the logs. The rest of the time was spent on data entry, and preliminary statistics analysis, which informed the creation of qualitative protocols and the choice of participants in the next step.

Phase II: Qualitative Data Collection (April–May 2024)

The qualitative phase began after quantitative trends were established. Focus group participants were selected to reflect a range of engagement and attitudinal profiles. Procedures were optimized to test particular patterns that were found in the previous stages especially those that were unintuitive or theoretically important. This was followed by teacher interviews, which enables the student discussion to be used in framing pedagogical questions.

Phase III : Integration and Final Analysis (May–July 2024)

The final stage involved advanced statistical modeling and reflexive thematic analysis. Integration was supported through joint displays and meta inferences, ensuring cross-strand coherence and generating a richer interpretation of the relationship between informal digital engagement and formal EST learning.

4.4 Research Context

4.4.1 Study Site: École Nationale Polytechnique (ENP), Algiers

This research was conducted at the École Nationale Polytechnique (ENP) in Algiers, one of the top institutions of higher education in Algeria. ENP is widely recognised for its elite academic profile and its central role in training engineers for national and international industries. In recent years, the institution has also become a site of interest for language policy shifts, particularly those promoting English for Specific Purposes (ESP), and more specifically, English for Science and Technology

(EST). ENP was chosen as the primary research site owing to its strategic position at the intersection of technical education and the expanding role of English, providing a suitable context for investigating students' formal and informal engagements with English.

4.4.2 ENP's Position in Algerian Higher Education

Originally founded in 1925 during the French colonial period, ENP has since come to symbolize academic prestige in scientific and technological domains. Having a total enrolment of about 1,400 students, its admission procedure is one of the most selective in the country: after two years in preparatory cycle, candidates are required to pass a competitive national examination. This ensures a student body characterized by academic excellence in mathematics, physics, and engineering a critical asset for research into cognitively demanding constructs such as engagement, motivation, and self-regulation.

The school is also structured as a technical and scientific institution, providing training in 13 specialties of engineering, such as civil, mechanical, electrical, electronics, computer science, chemical engineering, hydraulics, materials science, and mining. The institutional mission is to produce state certified engineers through rigorous, application driven training in line with industry expectations.

4.4.3 Language Policy and English Requirements

ENP is in a bilingual academic setting where French is still the main language of instruction for main science and engineering courses. This pattern aligns with post independence practice in Algerian higher education, where French has functioned de facto as the medium of instruction in STEM (Science, Technology, Engineering, and Mathematics) fields (Medfouni, 2024). At the same time, English is becoming increasingly salient, as a result of internationalization and a national shift towards English-medium instruction in science and technology. (Associated Press, 2023; Benguerba, 2024; Khenioui, 2023)

Despite the continued dominance of French in disciplinary instruction, English is a compulsory subject across all five years of the ENP curriculum. Instruction starts with the preparatory cycle where students are introduced to the basics of English for Science and technology and ends with the engineering cycle where more complex English for Science and Technology (EST) content is presented. This longitudinal integration is a manifestation of institutional commitment to EST pedagogy, and specifically to the development of students' ability to communicate professionally and technically in the fields of study.

4.4.4 English in the Engineering Curriculum

ENP's engineering education is organised into two main cycles:

- 1. Preparatory cycle (Classes Préparatoires aux Grandes Écoles – CPGE):**

The first is the Classes Préparatoires aux Grandes Écoles (CPGE), a two year foundational programme emphasising advanced instruction in mathematics, physics, and language education, including English. Within this cycle, English is taught as a compulsory subject, the content of which includes revising grammatical skills, technical reading, oral expression and introductory EST activities.

- 2. Engineering Cycle (Cycle Ingénieur d'État):**

Students that pass the national entrance examination advance to the second phase, the Cycle Ingénieur d'État. This three year programme is devoted to specialised engineering education in various lines of technical knowledge. English instruction continues during this phase, focusing on domain-specific terminology, scientific writing, and oral presentation skills relevant to both academic and industrial contexts.

Together, these two cycles ensure five years of continuous English instruction that continues from the basic EST skills in the preparatory years to EST specialized skills in the engineering programme.

This institutional trajectory is operationalised in a structured syllabus introducing progressive complexity of EST tasks across the two cycles, starting in the preparatory years with functional and technical communication moving towards professional and academic genres. According to the preparatory cycle syllabus, students work with applied ESP/EST tasks such as reading and interpreting graphs and technical diagrams, transforming descriptions into visuals, and producing genre specific documents (e.g., warning notices and instruction manuals) (ENP, 2024b). Units of Instruction are explicitly focused on Functional Language (safety instructions, Obligation/Condition, diagram based reasoning, lexico grammatical work on prefixes/suffixes and engineering specific terminology (ENP, 2024a). In the second preparatory year the emphasis shifts to professional and academic communication introductions and self presentation, CV writing, telephoning, engineering correspondence (letters, memos, emails), proposals, abstracts, summaries, and technical/lab/design reports supported by a classic ESP/EST bibliography (e.g., Dudley Evans; Widdowson; Cambridge titles such as Professional English in Use: Engineering) (ENP, 2024b).

At the engineering cycle level, the syllabus for year four English brings together reading and writing for professional and academic purposes to produce production of essays, reports, summaries, technical descriptions, instructions for use, process descriptions, technical article summaries at the higher order level (ENP, 2023c; ENP, 2023d). Recommended references (e.g., Oshima's Writing Academic English; Day's How to Write and Publish a Scientific Paper) and an assessment scheme based on tests, homework, written assignments, and a final exam are specified in the programme documents (ENP, 2024c; ENP, 2024d).

4.5 Participants and Sampling

This section outlines the participants and sampling strategies used in this explanatory sequential mixed methods study. The selection of participants was performed in a staged, strand specific logic; the quantitative phase was focused on representativeness and breadth, whereas the qualitative phase was focused on the

depth of interpretation (Greene, 2007). Sampling methods were aligned with the overall design structure and research objectives (Creswell & Plano Clark, 2018).

4.5.1 Quantitative Strand Participants

1. Questionnaire Sample Overview

The quantitative stage focused on students who were taking the English for Science and Technology (EST) classes in the National Polytechnic School (ENP) in the 2023-2024 academic year. Only the 2nd year and the 4th year students were included. The 2nd year students had been half-way through the preparatory cycle and had already been provided with foundational EST training. Year 4 students had declared engineering specialisations and completed several years of EST coursework.

Other year levels were excluded for the following reasons:

- Year 1: Insufficient EST exposure.
- Year 3: Lack of clear developmental contrast.
- Year 5: Final year thesis work typically excludes further EST coursework.

2. Sample Size Justification

The questionnaire was completed by 253 students. This sample size was determined based on requirements for Structural Equation Modeling (SEM), the main analytic technique. SEM requires larger samples due to the simultaneous estimation of measurement and structural models. Kline (2016) suggests a minimum number of 200 to use complex SEM models, whereas samples of 200-400 are recommended by Boomsma and Hoogland (2001) to obtain similar estimates and model-fit. The achieved sample ($n = 253$) falls within this optimal range.

3. Participant Distribution

The sample included 120 second year students and 133 fourth year students. This distribution provided contrast in development and also offered a wide spectrum of learner profile. The combination of preparatory and specialised students supported

the identification of diverse patterns in engagement, motivation, and informal language learning behaviors.

Table 3

Participant Distribution by Year and Gender (n = 253)

Cohort	n	% of Total	female (n)	Female (%)	Male (n)	Male (%)
Year 2 Preparatory Cycle	120	47.4%	36	30.0%	84	70.0%
Year 4 Engineering Cycle	133	52.6%	39	29.3%	94	70.7%
Total	253	100%	75	29.6%	178	70.4%

Year 4 Disaggregation by specialisation revealed proportional representation of Civil, Mechanical, Electrical, Chemical and Industrial Engineering with higher proportions of females in the Industrial Management and Chemical Engineering.

Table 4

Year 4 Participants by Specialisation and Gender (n = 133)

Specialisation	n	% of Y4	% of Total	Female (n)	Female (%)	Male (n)	Male (%)
Civil Engineering	28	21.1%	11.1%	8	28.6%	20	71.4%
Mechanical Engineering	28	21.1%	11.1%	6	21.4%	22	78.6%
Electrical Engineering	26	19.6%	10.3%	5	19.2%	21	80.8%
Chemical Engineering	22	16.5%	8.7%	8	36.4%	14	63.6%
Industrial Management	29	21.8%	11.5%	12	41.4%	17	58.6%
Total	133	100%	52.6%	39	29.3%	94	70.7%

4.5.2 Study Log Subsample

From the wider survey sample, forty students were invited to keep a seven-day study diary in which they recorded their use of English outside class, noting the type and duration of each activity together with a brief evaluative rating on a five-point scale for each entry. Students were included in this phase only if they had completed the questionnaire and agreed to further contact, and the group was stratified by year of study (Y2/Y4), gender and specialisation in order to maintain variation within the sample.

Maximum-variation purposive sampling (Patton, 2015) was adopted, with selection informed by profile indicators derived from the questionnaire scales (engagement dimensions, EST attitudes, Ideal L2 Self, International Posture). The aim was not to estimate how frequent particular profiles were, but to include those combinations of scores that were most likely to shed light on contrasts and boundary conditions within the sequential explanatory design (Creswell & Plano Clark, 2018). In line with the logic of theoretical sampling (Glaser & Strauss, 1967), invitations were therefore directed towards the following pre-specified constellations, while also observing modest stratification quotas:

1. Engagement Variation

Students were first grouped according to their overall level of IDLE engagement (high, moderate or low), using the behavioural data as a reference point so that different degrees of informal involvement were represented in the sample. In doing so, care was taken to include students who were less engaged as well

2. Media Platform Diversity

To explore differences in engagement across media types (RQ1.1), participants were selected to represent dominant preferences: YouTube, social media, gaming, music, and multi-platform use. This ensured IDLE was examined as a varied, not uniform, phenomenon.

3. Demographic Balance

The sample mirrored the broader questionnaire population in gender, academic year, and technical specialization. This avoided overrepresentation of any subgroup and supported more generalizable findings.

4. Voluntary Commitment

Only students who agreed to participate and showed clear interest in the diary phase were included. Those selected had provided full contact details and expressed a willingness to follow through with the seven-day commitment.

5. Feasibility

A sample of this size balanced the need for detailed analysis with the practical limits of managing diary data, researcher check-ins, and processing workload. It supported the depth and pattern-tracking needed for qualitative insights.

6. Avoiding Attitudinal Bias

Students' attitudes toward English self-regulation (EST) were not used in the selection process. Since RQ2a explores potential links between IDLE and EST, pre-selecting based on attitudes would have compromised analytical integrity. Attitudinal variation instead emerged naturally within the stratified sample.

This purposive, maximum-variation strategy ensured diverse representation across engagement levels, platform types, and demographics, yielding rich data to address RQ1 and support deeper analysis in Phase II.

4.5.3 Qualitative Strand Participants

1. Focus Group Participants

To strengthen the explanatory strand of the study, twenty-four students were selected from the log-keeping group to take part in focus group interviews, which explored their out-of-class use of English during the seven-day logging period. Focus

groups were chosen in order to draw on peer interaction and shared interpretation of experience (Krueger & Casey, 2015; Morgan, 1997). All diarists who had completed the log to the required standard and had agreed to be contacted again were treated as eligible.

Participants were recruited using purposive maximum-variation sampling (Patton, 2015), with the aim of recording contrasting patterns in the logs (while not gathering cases that were too similar to each other). Selection was based only on the diary data previously made available to the investigator; no additional testing was conducted. Attention was paid to overall weekly exposure (lower versus higher), range of media used (video, music, social media, gaming, reading/writing), the balance between exposure to receptive versus productive activity at home, day to day fluctuations (more stable versus more uneven use of media), self-ratings of attention, concentration and interest. Atypical cases were consciously preserved for instance, students that indicated high exposure, but low attention, or low exposure combined with high attention to probe the limits of the patterns observed and enhance the further analysis (Creswell & Plano Clark, 2018; Patton, 2015).

To maintain a basic level of heterogeneity, quotas were applied so that the group included students from both academic years (Y2/Y4), different genders and a range of technical specialisations. When a selected student declined to participate, the next eligible diarist with similar characteristics was invited in their place. The final sample consisted of 24 students, organised into four focus groups of six. This arrangement follows established guidance, which suggests that groups of five to eight participants across three to five groups are generally sufficient to generate key themes in relatively homogeneous samples (Guest, Namey, & McKenna, 2017; Krueger & Casey, 2015; Morgan, 1997). In the context of the sequential explanatory design, the focus groups were intended to shed light on patterns emerging from the quantitative phase. The emphasis was therefore placed on information-rich variation rather than statistical representativeness, resulting in a sample that was broad enough to reflect the diary-based profiles while still small enough to allow substantive discussion within each group (Creswell & Plano Clark, 2018; Patton, 2015).

2. Teacher Interview Participants

The qualitative phase also included interviews with seven EST instructors. All teachers who were active during the 2023–2024 academic year were invited and all agreed to participate, so a census-based sampling strategy was adopted (Fink, 2013). This approach allowed for full institutional coverage and removed the risk of selection bias. Teaching experience within the group ranged from three years for early-career instructors to fifteen years for the most senior participant (3, 3, 5, 8, 11, 14 and 15 years, respectively). This spread offered interpretive depth by bringing together different stages of professional development and varying degrees of institutional memory. By including all available instructors, the sample captured the full range of pedagogical viewpoints relevant to the EST programme.

4.6 Research Instruments

This study employed four instruments aligned with its explanatory sequential mixed-methods design: a student questionnaire and 7-day study log in Phase I (quantitative), followed by focus group discussions and teacher interviews in Phase II (qualitative). Table 5 provides an overview of these instruments and their purposes.

Table 5

Overview of Research Instruments

Instrument	Type	Participants	Purpose	RQ Addressed
Student Questionnaire	Quantitative survey	253 students	Measure IDLE engagement, EST attitudes, and motivational orientations	RQ1, RQ2, RQ3
7-Day Study Log	Quantitative/Qualitative diary	40 students	Document actual IDLE behaviors and experiences in real-	RQ1, RQ2, RQ3

Instrument	Type	Participants	Purpose	RQ Addressed
			time	
Focus Group Discussions	Qualitative	24 students	Explore meanings, and perceptions of IDLE and EST	RQ1, RQ2, RQ3
Teacher Interviews	Qualitative	7 EST teachers	Investigate teacher awareness, beliefs, and practices regarding IDLE	RQ4

4.6.1 Student Questionnaire

The English Learning Survey for Technical Students questionnaire (see appendix A) was designed to provide quantitative measures of three main constructs, grounded in established second language acquisition theory. Questionnaire development was informed by several well-known theoretical models. Affective, behavioural and cognitive engagement with English-language media was operationalised on the basis of Arndt's (2019) engagement framework. Attitudes towards EST were specified in three dimensions cognitive, affective and behavioural drawing on Gardner's (1985) tripartite model of attitude. The motivational scales were built around Dörnyei's (2009) Ideal L2 Self and Yashima's (2002, 2009) construct of International Posture. Together, these theoretical foundations provided a principled basis for operationalising engagement, attitudes and motivation, and supported the construct validity of the questionnaire.

The 76-item questionnaire comprised six sections administered in paper format, progressing from demographic and background information to complex psychological constructs. Table 6 provides the summary of the structure and measurement specification of each section, including the content focus, the number of items, the type of scale, and the sample items that operationalize the key variables in this study.

Table 6*Questionnaire Structure and Scales*

Section	Content	Items	Scale Type	Sample Item
1.Demographics & Exposure	Background data, proficiency, media usage	15	6-point proficiency; time ranges for media	"Daily YouTube use: Never / <30 min / 30min-1hr..."
2.IDLE Engagement	4 dimensions × 7 items	28	5-point Likert (Never/Strongly Disagree – Always/Strongly Agree)	"I watch movies or series in English" (behavioral)
3. EST Attitudes	3 components × 6 items	18	5-point Likert (Strongly Disagree – Strongly Agree)	"Learning EST is important for my future career" (cognitive)
4.Motivational Orientations	Ideal L2 Self (5) + International Posture (8)	13	5-point Likert (Strongly Disagree – Strongly Agree)	"Being good at English is part of who I want to be"
6.Follow-Up Recruitment	Voluntary Phase II participation	1	Yes/No + contact details	Optional for focus groups

The questionnaire incorporated both adapted and researcher-developed scales, reflecting the need to ground novel constructs in established theoretical frameworks while tailoring measures to the specific research context. Table 5.4 summarizes the source, adaptation approach, and theoretical basis for each scale.

- **IDLE Engagement Scale** (Adapted from Arndt, 2019). Engagement with informal digital learning of English was measured using a 28-item scale adapted from Arndt's (2019) four-dimensional engagement framework. This framework extends Fredricks, Blumenfeld, and Paris's (2004) tripartite model by adding a linguistic dimension specific to language learning contexts.

Behavioral engagement (7 items) measured frequency, persistence, and voluntary participation in informal English media use (e.g., "I watch movies or series in English"). *Affective engagement* (7 items) captured emotional responses including enjoyment, interest, and comfort with IDLE activities (e.g., "I feel excited when I find interesting English content online"). *Cognitive engagement* (7 items) assessed self-regulatory strategies and metacognitive processing during media consumption (e.g., "When I don't understand, I use context clues to guess the meaning"). *Linguistic engagement* (7 items) measured explicit attention to language form during informal use (e.g., "I notice how English words or phrases are used in real situations"), operationalizing Svalberg's (2009) conceptualization of cognitive and social engagement with language. Items were adapted to reflect contemporary digital media platforms and the Algerian technical education context.

- **EST Attitudes Scale** (Researcher-Developed). Attitudes toward English for Science and Technology instruction were measured using an 18-item scale grounded in the tripartite attitude model (Eagly & Chaiken, 1993; Ajzen, 2005). The *cognitive component* (6 items) assessed beliefs about EST's instrumental value and relevance (e.g., "Learning EST is important for my future career"). The *affective component* (6 items) captured emotional responses to EST instruction (e.g., "I enjoy attending EST classes"; "I find EST lessons boring" [reverse-coded]). The *behavioral component* (6 items) measured effort investment and participation intentions (e.g., "I work hard in my EST classes"). This operationalization follows established practice in language attitude research (Gardner, 1985; Dörnyei, 2005) while being tailored to the ESP instructional context.
- **Ideal L2 Self Scale** (Adapted). Five items measured learners' future self-image as proficient English users, adapted from Dörnyei's (2009) L2 Motivational Self System and validated scales by Taguchi, Magid, and Papi (2009). Items captured vision clarity (e.g., "I can picture myself using English in real life"), identity integration (e.g., "Being good at English is part of who I want to be"), and goal orientation (e.g., "My future plans need English"). The

original eight-item scale was reduced to five items representing conceptually distinct facets, consistent with precedents in L2 motivation research (Al-Hoorie, 2018).

- **International Posture Scale** (Adapted). Eight items measured orientation toward the international community, adapted from Yashima's (2002, 2009) validated scale. Items captured intercultural interest (e.g., "I want friends from other cultures"), international career orientation (e.g., "I want study or work that connects me to the international community"), and global engagement (e.g., "I feel part of a world community"). Adaptations emphasized facets relevant to digital-age learners, including online international community participation.

Table 7

Scale Sources and Development Approach

Scale	Items	Source	Approach	Theoretical Basis
IDLE Engagement (4 dimensions)	28	Arndt (2019)	Adapted	Fredricks et al. (2004); Svalberg (2009)
EST Attitudes (3 components)	18	Researcher-developed	New construction	Eagly & Chaiken (1993); Gardner (1985)
Ideal L2 Self	5	Dörnyei (2009); Taguchi et al. (2009)	Adapted/reduced	L2 Motivational Self System
International Posture	8	Yashima (2002, 2009)	Adapted/reduced	Intercultural communication willingness

Response format and bias mitigation

- **Response scales.** Three response formats were used in the questionnaire. Sections 2–4 relied on five-point Likert-type scales, with anchors adapted to

the content of the items: frequency items ranged from “Never” to “Always”, while agreement items ranged from “Strongly disagree” to “Strongly agree”. Aligning the response options with the item stems helped to maintain semantic consistency and reduce possible confusion for respondents (Krosnick & Presser, 2010). Section 1, by contrast, used categorical options for demographic information and ordered ranges for estimated media exposure. The five-point format was chosen as a compromise between measurement precision and the cognitive load placed on non-native respondents (Dawes, 2008).

- **Reverse-coded items.** To limit acquiescence, approximately one third of the Likert-type items were phrased in negative form and later reverse-coded (Paulhus, 1991; Weijters et al., 2013). This proportion follows Nunnally’s (1978) recommendation that a moderate number of such items is sufficient to detect response sets without disrupting the coherence of the scale. Negatively worded items were distributed across the engagement measures (e.g. “English entertainment usually bores me”; “My mind wanders and I stop paying attention”) and all three components of the EST attitude scale (e.g. “I find EST lessons boring”; “I only do the minimum work in EST”). Overall, the pool of items remained broadly balanced between positive and negative formulations, so that no systematic directional bias was built into the measures (Abad et al., 2011).
- **Additional bias controls.** Further steps were taken to reduce common method bias. The introduction stressed that responses were anonymous, would be used solely for research purposes, and that there were no “right” or “wrong” answers. Wherever possible, items referred to specific behaviours rather than evaluative self-descriptions (Podsakoff et al., 2003). Positively and negatively worded items were interspersed within sections, and the questionnaire moved from relatively neutral factual questions to more evaluative constructs, in line with survey design guidelines for reducing evaluation apprehension and satisficing (Dillman et al., 2014).

4.6.2 Study Logs

The 7-day study log was a structured self-report instrument designed to capture students' informal English use as it occurred in their daily routines. It consisted entirely of closed-ended items, including activity checklists, follow-up option lists, time-on-task fields, and anchored 5-point rating scales assessing behavioural, cognitive, affective, and linguistic engagement. A seven-day period was selected because it is sufficient to capture normal weekly patterns covering both weekdays and weekends while avoiding the fatigue and dropout risks associated with longer diary periods.

To maximise consistency and data accuracy, the logs were provided as paper booklets. A printed booklet allowed students to document activities directly, making it less likely that students would forget or rewrite information, and prevented issues associated with unequal digital access since students have different devices, data limits, and storage capacity. The booklet was, therefore, fully independent of the devices used for the English activity itself, could be kept beside the student throughout the day, and acted as a constant visual reminder to complete entries promptly. For each activity recorded, students noted the type of activity, the device used, the time spent, and then rated their engagement using the four dimensions adapted from Arndt's (2019, 2023) framework.

Affective engagement was assessed using two bipolar scales of entertainment value (between boring and entertaining) and enjoyment (between dislike and strong preference). These items captured emotional responses and affective investment in informal learning activities. Cognitive engagement was measured through its two parameters: the level of concentration (lack of attention to deep concentration) and the degree of perceived interest (uninteresting to very interesting). These scales measured cognitive investment and sustained attention during IDLE activities.

Linguistic and cognitive focus dimensions were operationalized through dual focus measures distinguishing between form-focused and meaning-focused engagement orientations. Language focus items assessed attention to linguistic

features (from no language awareness to complete language focus), while content focus measured attention to meaning and subject matter (from no content awareness to complete content focus). For example, participants responded to items such as "I was focused on language..." and "I focused on content..." using 5-point scales, with additional granular measures like "I focused on every word..." to capture intensive linguistic attention. Each activity entry concluded with a learning outcomes checklist where participants indicated perceived linguistic gains across five categories: Grammar, Pronunciation, Vocabulary, Expression, and Nothing. For instance, a participant watching an English tutorial might check "Vocabulary" and "Expression" to indicate specific linguistic elements they perceived learning, while someone watching entertainment content might select "Pronunciation" or "Nothing" depending on their focus orientation during the activity.

The study log was filled in once a day for seven consecutive days and had five primary components. It was designed to capture what students chose to do and the context in which they did these things and experienced up to three separate IDLE-based episodes a day.

- **Section 1:** Daily use and device. Students firstly indicated whether they had used English outside university that day (Yes/No), they wrote the date and ticked the device or devices used (phone, computer, tablet or television).
- **Section 2:** Activity selection. They then indicated the type of informal English activity, from ten options: social media, music, video games, film/TV, reading, writing, listening to spoken English, conversation, no English use, or "other". These categories were meant to reflect the major informal learning contexts reported in previous IDLE studies (Sundqvist & Sylven, 2016).
- **Section 3:** Follow-up activities that are specific to the activity. Follow-up questions were based on the activity selected. For social media, students identified the platform (Instagram, YouTube, TikTok, Facebook, Snapchat) used, and whether they primarily used the site to watch videos, read comments or write posts. For music, they shared information about whether

or not they had it playing in the background or if it was more concentrated and whether or not they were reading the lyrics or singing them. For video content more broadly, they said what sort of content it was, how they accessed the content and whether they used subtitles. These activity-specific questions enabled the log to differentiate not only between broad categories but also between different ways of engaging with each of the media.

- **Section 4:** Duration. For every episode among the records, a list was made indicating the duration of participation in the activity in hours and minutes, giving ongoing estimations on the total exposure days.
- **Sections 5** Engagement ratings. Finally, for a maximum of three episodes per day, students rated their experience for the day on seven bipolar five-point scales. Affective engagement was measured using entertainment value (Entertaining - Boring) and overall liking (Liked - Did not like). Cognitive engagement was coded in terms of concentration (Concentrated hard-Did not concentrate) as well as interest (Very interesting-Not at all interested). Linguistic engagement was covered by focus on language and by individual words (Not at all-Completely for both) and an additional item for content focus asked to what extent they were focused on meaning (Not at all-Completely). Each episode had a short checklist at the end of the episode in which the students could indicate what they felt they had learned, if anything (Grammar, Pronunciation, Vocabulary, Expression or Nothing).

Table 8*Study Log Components*

Component	Content	Function
Daily Use & Device	Yes/No; Phone/PC/Tablet/TV	Documents access patterns
Activity Selection	10 activity categories	Identifies IDLE type
Activity Follow-Up	Platform, mode, subtitles, partners	Captures activity-specific details
Duration	Hours and minutes	Measures exposure time
Affective Engagement	2 items: entertainment, enjoyment	Measures emotional response
Cognitive Engagement	2 items: concentration, interest	Measures attention and involvement
Linguistic Engagement	2 items: language focus, word focus	Measures form orientation
Content Focus	1 item	Measures meaning orientation
Perceived Learning	5-category checklist	Captures self-assessed gains

4.6.3 Focus Group Discussions

The focus group discussions served as a qualitative instrument designed to explore participants' meanings, motivations, and perceptions regarding informal digital English learning and its relationship to formal EST instruction. The focus groups were selected due to their unique methodological strength, namely, the appearance of data as a result of group interaction and not individual answers (Morgan, 1997). This interactive dynamic offers benefits particularly relevant to exploring IDLE, including naturalistic peer discourse that approximates how students typically discuss media habits, elaboration through interaction that reveals perspectives that "would be less accessible without the interaction found in a group" (Morgan, 1997, p. 2), and normalized disclosure in a group setting that can reduce social desirability bias when discussing sensitive topics like boredom in classes or anxiety about speaking.

Eight main questions with optional probes in a semi-structured protocol were used to ensure that key areas are addressed and that flexibility is provided to allow emergent issues to be discussed. The protocol was planned to proceed in a funnel format with the first questions being concrete and descriptive questions such as Which platforms or media do you use most to access English content and to what end? follow by descriptive questions such as How do you feel about speaking or writing English?and classroom attitudes including "How do you feel about EST classes?" The questions were formulated in a simple and informal language so that the respondents could easily engage in a free-flowing conversation without the use of academic terms.For example, rather than asking about "content selection processes," the protocol used "How do you decide what to watch, read, or listen to next?"

The protocol systematically addressed multiple dimensions of IDLE engagement and EST attitudes through targeted question clusters. The use of platforms was investigated with questions regarding preferences and purposes of media use, with questions probing content type, timing behaviors, and device use. Content selection processes were investigated through questions about decision-making, while language choice motivation was addressed via "Why do you choose English content rather than Arabic or French?"Attention patterns were investigated by asking "To what extent do you give attention to language features when using media?" and follow-up behaviors via "When something catches your attention, what do you do next?"

The preferences of content were discussed using "When do short clips work better, and when do you prefer longer content?"

The protocol concluded with questions about productive skills experiences and EST classroom perceptions, allowing participants to share their perspectives on both informal and formal learning contexts. Productive skills experiences were explored through "How do you feel about speaking or writing English? What happens when you consider actively using it?" with probes addressing anxiety, available opportunities, and distinctions between online versus face-to-face contexts. EST classroom perceptions were investigated via "How do you feel about EST classes? In

what ways are they useful or not? What would improve them?" with probes investigating relevance, level of engagement, and possible links to informal learning experience. This sequencing has allowed the exploration of participant experiences in the main constructs of the study in a comprehensive manner whilst preserving a natural conversation flow transitioning between the comfort of discussing the media habits to more contemplative issues on learning challenges and classroom experiences.

Table 9 presents the eight focus group questions mapped to their target constructs and corresponding research questions. The complete protocol, including introductory script, ethical reminders, and optional probes, appears in Appendix C.

Table 9

Focus Group Questions and Construct Mapping

Question	Focus	Target Construct	RQ
Q1. Which platforms do you use most for English content, and for what kinds of content?	Media ecology	Behavioral engagement	RQ1
Q2. When you open a platform, how do you usually decide what to play next?	Content selection	Behavioral/Cognitive engagement	RQ1
Q3. What are your reasons for choosing English content rather than content in your first language?	Language choice motivation	Affective engagement; International Posture	RQ1, RQ3
Q4. When does a short clip work better, and when is longer content the better choice?	Format preferences	Cognitive engagement	RQ1
Q5. To what extent do you pay attention to language features when using English media?	Language awareness	Linguistic engagement	RQ1

Question	Focus	Target Construct	RQ
Q6. When a word/phrase catches your attention, what do you do next?	Follow-up strategies	Linguistic/Cognitive engagement	RQ1
Q7. What explains why you speak or write less frequently than you consume English?	Productive skills barriers	Behavioral engagement; Ideal L2 Self	RQ1, RQ3
Q8. How is EST useful or not useful? How have your classes made you feel about it?	Classroom perceptions	EST Attitudes (cognitive, affective, behavioral)	RQ2

The protocol was administered in English, with participants permitted to code-switch to Arabic or French when expressing complex ideas. All sessions were audio-recorded with participant consent and transcribed verbatim for thematic analysis.

4.6.4 Teacher Interviews

The teacher interviews were a qualitative tool, which aimed at exploring awareness, beliefs, and practices of EST instructors regarding students' informal digital English learning activities. These semi-structured user interviews offered crucial educator insights to supplement student-centered data gathering, answering research question four by engaging with teacher cognition and institutional settings that define informal-formal learning relationships.

The interview plan consisted of 19 main questions that were structured into eight themes running in the direction of background details to future opportunities towards integrating pedagogy. This detailed framework allowed systematic exploration of educator thought about IDLE and still allowed a conversational flow with the use of strategic sequencing. The questions have integrated probes that enabled more elaboration and still made sure that the most important dimensions were covered throughout all the interviews. The design of the protocol was based on the existing principles of teacher cognition research which acknowledges that educator beliefs

and practices are influenced by multifaceted interdependencies between individual experience, institutional inputs, and pedagogical knowledge. (Borg, 2006, 2015).

The protocol started with a short discussion of the professional background of each teacher. For example, participants were asked, “Can you tell me a little about your teaching experience how long you’ve been teaching EST, the usual size of your classes, and the curriculum you typically work with?” Follow up probes invited teachers to reflect on how much freedom they had to adapt or modify the syllabus. This introductory part also served to contextualise the teaching situation of each participant and their practical limitations which was critical in interpreting their subsequent remarks regarding the opportunities to incorporate IDLE in their teaching.

Awareness and Belief Exploration : Teacher awareness of student IDLE practices was systematically investigated through questions such as "Outside of formal classroom instruction, do you think your students encounter or use English in their daily lives? Through what platforms or activities?" In what ways or what platforms?

Follow up probes prompted them to consider the particular space; YouTube, video games, social media, or stream services and respond to how frequently or intensive students appeared to consume those spaces. Other questions like, "Have students ever mentioned their informal English activities to you, and how did you become aware of these practices?" enabled the interview to reveal whether the teachers were informed in the classroom, as the student commented, or even as observers.

Teachers’ beliefs about the educational value of IDLE were explored through a series of questions that addressed perceived learning potential and links to EST. For instance, they were asked, “In your view, do these informal digital activities contribute to students’ English development? If so, in what ways?” Probes assisted in distinguishing between teachers who viewed such experiences as simple exposure and those who viewed them as real learning opportunities. The protocol also included EST-specific questions, such as, “Do you think these informal English activities have any relevance to EST instruction?” Lastly, educators were also asked

to comment on the benefits as well as possible disadvantages: “What would you identify as the main benefits, and what concerns do you have about students’ informal English practices?” Additional probes helped them elaborate on issues such as motivation, authenticity of input, linguistic accuracy, and the suitability of the content students encounter.

Practice Investigation and Institutional Context : Current integration practices were investigated through "Have you ever incorporated students' informal English activities into your EST teaching? If yes, describe what you did. If no, what prevents you from doing so?" with questions that investigate between-class strategies such as asking students about informal use, assigning tasks, using digital tools or recommending resources. This section revealed the gap between teacher beliefs and actual pedagogical practices while identifying barriers to integration.

A series of comparative questions were used to analyze the differences in the motivational pattern of the students. Teachers were asked, for instance, “Based on your experience, how would you describe students’ motivation in formal EST classes compared to their motivation when they use English on their own outside school?” This was followed by questions about learner autonomy, such as, “To what extent do students have any choice in your EST courses whether in selecting topics, materials, or the format of their assignments?” These cues combined motivated teachers to share any motivational differences they thought existed between formal classroom experiences and how the students informally and independently approached the English language.

Strategic Support and Future Possibilities: The protocol investigated metacognitive support through questions about learning strategies: "Do you teach students how to learn strategically from informal English encounters for example, how to notice language patterns, remember vocabulary, or reflect on their learning?" and self-regulation: "In your EST courses, do you teach any metacognitive or self-regulated learning strategies, such as goal-setting, self-monitoring, or planning?" These questions investigated whether teachers explicitly mediate between informal and formal learning by the use of strategic instruction.

The institutional constraints were covered in detail by questions such as *"What are the main challenges or constraints you face in EST instruction?"* also with time constraints, curriculum requirements, class size, testing requirements, resources and variances in student levels probes.

Integration barriers were specifically explored via *"If you wanted to connect students' informal English practices to your EST teaching, what would be the main obstacles?"* while flexibility questions addressed material choices, assessment design, and time allocation constraints.

The interview closed by inviting teachers to think beyond their current constraints and consider what might be possible under more favourable teaching conditions. They were asked, *"If you had more time, smaller classes, and curricular flexibility, would you incorporate students' informal digital practices? What would you need to do this meaningfully?"* This was followed by a broader, philosophy oriented question: *"Some educators argue that teachers should explicitly teach students how to learn from their informal digital activities. What do you think of this idea?"* The interview ended by encouraging teachers to stretch their thoughts beyond their present limits and think of what could be achieved given better teaching conditions.

Table 10 maps the 19 interview questions to Borg's (2006, 2015) teacher cognition dimensions. The complete protocol appears in Appendix F.

Table 10

Teacher Interview Questions and Construct Mapping

Section	Questions	Target Dimension
A. Background	Q1	Professional context
B. Awareness	Q2–Q3	Knowledge of student IDLE practices
C. Beliefs	Q4–Q6	Beliefs about IDLE value and relevance
D. Practices	Q7	Current integration practices
E. Motivation	Q8–Q10	Beliefs about formal-informal differences
F. Strategic Support	Q11–Q12	Strategy instruction practices
G. Constraints	Q13–Q16	Institutional barriers; Teacher autonomy
H. Future	Q17–Q19	Pedagogical intentions; Role beliefs

Interviews were conducted in English, audio-recorded with consent, and transcribed verbatim.

4.7 Pilot Study

The pilot study aimed to: (a) assess instrument clarity and comprehensibility for non-native English speakers, (b) verify completion time feasibility within a single class period, (c) identify problematic items requiring revision, and (d) test administration procedures prior to main data collection.

4.7.1 Pilot Sample and Procedures

Twenty students participated in pilot testing in December 2023. Participants were demographically similar to the target population (second and fourth-year students across multiple technical specializations, but excluded from the main study to prevent contamination effects. The questionnaire was administered under conditions identical to planned main administration: paper format, classroom setting, researcher present. Completion times were recorded and participants subsequently engaged in cognitive interviews.

4.7.2 Pilot Results and Instrument Revision

Mean completion time was 17.2 minutes ($SD = 2.8$) which confirmed the feasibility of the questionnaire to be comfortably completed in one class period. Students generally found the layout and sections easy to follow and nothing was judged to be inappropriate or irrelevant. What they did notice were a couple of points of wordings. In the cognitive engagement scale, there have been several students that stalled at the "context clues (images, sounds, other parts, or captions)" and asked what "context clues" meant, so this item was rephrased to focus on "using pictures, sounds or subtitles to guess the meaning." In the motivational section, one item ['My idea of my future English self helps me plan my learning'] was mentioned as 'too abstract', and it was reworded into more explicit, two-clause form (e.g., 'Thinking about how I will use English in the future helps me decide how to study now'). A few students could also not be sure about the word "world community" in the International Posture scale, which was replaced with the clear expression "of people

from many countries." These changes were refined wording only, the number of items and scale structure remained the same and no structural changes were required to the study log or interview protocols.

4.8 Data Collection Procedures

This section describes the concrete steps taken in the field to collect data in each phase of the study.

4.8.1 Phase I: Quantitative Data Collection

4.8.1.1 Questionnaire Administration

The questionnaire was administered during regular EST class sessions in January 2024, with formal permission from the ENP administration. Seven EST classes were selected in consultation with the English Department coordinator: two Year 2 classes and five Year 4 classes representing diverse technical specialisations (mechanical, civil, electrical engineering) taught by different instructors.

Administration Protocol. The researcher administered the questionnaire in person during the final 25 minutes of each session. A standardised five-step protocol was followed:

1. Introduction (3 minutes). The researcher introduced herself, explained the study's purpose (investigating informal digital English learning among technical students), emphasised voluntary participation and anonymity, and confirmed that responses would be used solely for doctoral research. Students were explicitly informed that their EST instructor would not see individual responses and that participation would not affect grades.

2. Informed consent (1 minutes). The researcher explained that completing the questionnaire constituted consent, and that students could decline or skip questions without penalty.

3. Instructions (2 minutes). Verbal instructions were provided: read each question carefully, mark responses clearly, answer honestly based on personal experience, and work independently.

4. Distribution and completion (20 minutes). Paper questionnaires were distributed with the researcher and EST instructor present. Students completed questionnaires individually. The researcher remained available for clarification questions but avoided substantive input. Completion time ranged from 13–22 minutes ($M = 17$ –18 minutes).

5. Collection (3 minutes). Completed questionnaires were placed face-down in a collection box to maintain anonymity.

Response Rate. Of 260 questionnaires distributed, 253 were returned completed (97.3%). Seven questionnaires with substantial missing data (>20% unanswered items) were excluded from analysis. Pattern analysis revealed no systematic differences in year level, gender, or specialisation between complete and incomplete cases, indicating random rather than systematic missingness.

4.8.1.2 Study Log Implementation

Participant Selection. From the 108 questionnaire respondents who volunteered for Phase II, 40 students were selected using the maximum-variation sampling criteria described in Section 5.5.2, ensuring representation across engagement levels, platform preferences, and demographics.

Log Period. The log period ran for seven consecutive days in March 2024, spanning weekdays and weekend days. Prior to starting, the researcher confirmed each participant's availability, explained the daily entry requirement, and stressed that participation was voluntary and could be discontinued at any time. Students were encouraged to carry the booklet with them and complete entries shortly after each activity to minimise recall bias.

Researcher Support. On Day 4, the researcher contacted all participants via text message to remind them to continue completing entries, offer assistance with any

questions, and reinforce that all levels of English use including none on particular days constituted valuable data.

Compliance. Of the 43 participants, 40 returned completed logs (95% return rate). Thirty-five completed all seven days (92.1%), two completed six days, and one completed five days, yielding an overall daily completion rate of 93.2%. Non-completion was distributed across engagement levels with no systematic pattern, suggesting practical scheduling conflicts rather than selective dropout.

4.8.2 Phase II: Qualitative Data Collection

Phase II began in May 2024, approximately three weeks after Phase I completion. This interval allowed time for preliminary quantitative analysis to inform qualitative protocols while maintaining continuity with participants.

4.8.2.1 Focus Group Discussions

Recruitment. Twenty-four students were selected from the log-keeping group using the purposive sampling criteria described in Section 4.5.3.1. Potential participants were contacted individually, reminded of their prior consent for follow-up, and invited to join a group discussion. Students were informed that discussions would be audio-recorded and that they could decline or withdraw at any point.

Session Arrangements. Four focus groups of six participants each were scheduled at times avoiding major lectures and exams, typically late afternoon. All discussions were held in a quiet seminar room on campus to ensure privacy. Sessions lasted 30–45 minutes.

Procedure. Each session began with the researcher re-introducing the study aims, clarifying voluntary participation, and obtaining consent for audio recording. Ground rules were established: respect for differing opinions, taking turns, and assurance that criticisms of classes would not be shared with teachers in identifiable form. The moderator followed the semi-structured protocol (Section 5.6.3) flexibly, encouraging participants to speak in English while permitting code-switching to Arabic or French for nuanced expression. Probing questions connected comments to

log-documented behaviours (e.g., "You mentioned watching tutorials that week, can you tell us more about how you choose them?").

Documentation. Sessions were audio-recorded in full using a phone. The researcher took brief field notes capturing non-verbal cues, group dynamics, and contextual details. Participants were thanked, reminded of their right to withdraw specific comments, and informed that pseudonyms would be used in all reporting.

4.8.2.2 Teacher Interviews

Recruitment. All seven EST instructors at ENP were invited to participate following departmental permission. The researcher approached each instructor personally or via email, provided a written study overview, and invited participation in an interview about EST teaching and students' informal English use. Teachers were informed that participation was voluntary, remarks would be anonymised, and no statements would be shared with administration in an evaluative manner. All seven agreed to participate.

Session Arrangements. Interviews were scheduled at times and locations convenient for teachers, typically in the staff room or an available meeting room. Sessions lasted 45–50 minutes.

Procedure. Each interview began with the researcher restating study aims, specifying expected duration, and obtaining written consent for audio recording. Teachers were reminded they could decline any question, pause recording, or withdraw at any time. Interviews followed the semi-structured protocol (Section 5.6.4), conducted primarily in English with code-switching to French or Arabic permitted for nuanced expression. Probing questions encouraged concrete illustrations specific classroom activities, student anecdotes, or institutional examples rather than abstract commentary.

Documentation. All interviews were audio-recorded in full, with supplementary field notes on contextual cues (interruptions, affective tone, gestures). At the close of

each interview, teachers were invited to add final reflections, thanked for their participation, and informed they could request a summary of findings.

4.9 Data Analysis Procedures

This section describes the analytical procedures employed for quantitative, qualitative, and integrated analysis. Consistent with the explanatory sequential design, quantitative analysis preceded qualitative inquiry, with Phase I findings informing Phase II data collection and interpretation (Creswell & Plano Clark, 2018).

4.9.1 Quantitative Data Analysis

All quantitative analyses were conducted using IBM SPSS Statistics (Version 28). Analysis proceeded through data screening, descriptive statistics, correlational analysis, regression modeling, and structural equation modeling.

4.9.1.1 Data Screening and Preparation

Prior to analysis, the dataset was screened for accuracy, missing values and some basic distributional properties in accordance with standard recommendations (Tabachnick & Fidell, 2019). Missing data were explored at item and case level with cases having a missing data rate >20% being removed ($n = 7$) resulting in 253 questionnaires for data analysis. Univariate normality was subsequently tested with the Kolmogorov--Smirnov test combined with examination of skewness and kurtosis; if $|\text{skewness}| < 2$, and $|\text{kurtosis}| < 7$, these variables were assumed appropriate for parametric procedures (Curran, West, & Finch, 1996), and all primary variables met these threshold values. Linearity and homoscedasticity were assessed visually using bivariate scatterplots and residual plots, respectively, based on these, the approximate linear relationships and homoscedasticity were verified to properly apply correlation and regression analyses (Hair, Black, Babin, & Anderson, 2019).

4.9.1.2 Descriptive Statistics (RQ1)

To address RQ1 on patterns of IDL engagement, descriptive statistics were calculated initially for all the primary variables, including: means and standard

deviations, minimum and maximum values including skewness and kurtosis, and frequency distributions were created for categorical and ordinal indicators such as the platform of use and the preferred activity types. For the four IDLE engagement dimensions (behavioural, affective, cognitive and linguistic), item-level frequency distributions on five-point scales were analyzed in order to trace response tendencies in more detail.

Study log data ($n = 40$) were analysed separately, using descriptive statistics and to describe temporal patterns (daily hours, weekly totals and differences between weekdays and weekends) and also to summarise activity-specific engagement ratings. In addition, participants were assigned to high-, medium- and low-engagement groups based on composite behavioural engagement scores from the questionnaire that enabled comparison of study log profiles from different overall levels of IDLE involvement.

4.9.1.3 Correlation Analysis (RQ2)

To examine bivariate relationships between IDLE engagement dimensions and EST attitudes (RQ2a), Pearson product-moment correlations were computed. Prior to analysis, statistical assumptions were verified:

Assumption	Test	Criterion	Result
Normality	K-S test	$D < .10$	Satisfied
Linearity	Scatterplots	Linear pattern	Satisfied
Homoscedasticity	Residual plots	Constant variance	Satisfied
Independence	Durbin-Watson	1.5–2.5	Satisfied
Outliers	Cook's distance	< 1.0	Satisfied

Correlation strength was interpreted following Cohen's (1988) conventions: small ($r = .10$), medium ($r = .30$), and large ($r = .50$). As a robustness check, Spearman rank-order correlations were also computed; results within .02 of Pearson values confirmed consistency regardless of distributional assumptions

5.9.1.4 Structural Equation Modeling (RQ3)

To investigate the unique predictive relationships between IDLE engagement and EST attitudes (RQ2b), a structural path model was estimated in the statistical package, IBM SPSS Statistics, Amos 28. Four exogenous latent variables (behavioural, affective, cognitive and linguistic engagement), were specified as predictors of a single endogenous latent construct representing overall EST attitudes, which was modelled as a second-order factor with three first-order components (cognitive, affective, behavioural), measured respectively by their respective questionnaire items. Direct paths were estimated from each engagement dimension to EST attitudes, and covariances were estimated freely among the four engagement factors. Parameters were derived by maximum likelihood with full information maximum likelihood methods (missing data), and standard fitting indices have been utilized to support the model (iterations, CFI, TLI, RMSEA, SRMR) in accordance with standard guidelines of SEM (Byrne, 2016; Hu & Bentler, 1999; Kline, 2016). Standardised path coefficients (beta) were then checked for size and significance.

5.9.1.6 Regression Analysis

To investigate motivational predictors of IDLE engagement (RQ3), multiple regression analyses were carried out after checking standard assumptions of linearity, independence of residuals (Durbin–Watson between 1.5 and 2.5), homoscedasticity, multicollinearity ($VIF < 10$) and normality of residuals. For consumption-oriented engagement (RQ3a), hierarchical regression was used: Ideal L2 Self was entered at Step 1 and International Posture at Step 2, to test whether the latter accounted for additional variance beyond the former. For learning-oriented engagement (RQ3b), both predictors were entered simultaneously in standard multiple regressions, and separate models were also estimated for each of the four engagement dimensions. Effect sizes were reported using R^2 and adjusted R^2 , and the relative contribution of each predictor was examined through standardised beta coefficients (β).

4.9.2 Qualitative Data Analysis

4.9.2.1 Transcription Procedures

All focus group discussions and teacher interviews were transcribed verbatim by the researcher. Transcription conventions included standard orthography with original grammar preserved, indication of pauses, notation of non-verbal elements relevant to interpretation (e.g., laughter, nodding, overlapping speech), and speaker identification codes (anonymised as Student A, B, C for focus groups; T1–T7 for teachers).

Code-switched segments in Arabic or French were transcribed in the original language with English translations provided in brackets. Transcripts were verified against audio recordings through a second complete listening, with corrections made as necessary.

4.9.2.2 Thematic Analysis

Qualitative data were analysed using thematic analysis (Braun and Clarke, 2006), which was selected for its flexibility and its adequacy with the explanatory aim of Phase II, to clarify the patterns emerging from the quantitative results. The researcher was familiarized with the material by repeated reading of transcripts and selective re-listening to the recordings and making initial observations. Transcripts were then manually coded, line by line, using a combination of inductive codes, which arose from the data and deductive codes, based on the conceptual frame of the study (Arndt's engagement dimensions, L2 motivation constructs and teacher cognition). Related codes were grouped together into candidate themes, which were reviewed and developed to ensure each theme was coherent internally, clearly differentiated from others and well supported by the data. Finally, themes were defined and named, in terms of their scope and central organising idea, so that they could be used as a clear interpretive lens in the presentation of findings.

4.9.2.3 Coding Framework Development

The coding framework was a combination of deductive and inductive procedures. Deductive codes were adapted from the theoretical lens of the study, namely Arndt's (2019) four dimensions of engagement (behavioural, affective, cognitive, linguistic), the motivational constructs of Ideal L2 Self and International Posture, and from Borg's (2006) work on teacher cognition, while other inductive codes were added to include unexpected patterns in the accounts of the participants. Coding was manual and on printed transcripts (colour highlighting) - a master codebook was created involving definitions and illustration of each code with short extracts. Theme prevalence was then estimated; this was to count the number of participants and sessions that each theme was present so that they could be compared systematically across the dataset.

4.9.3 Integration of Quantitative and Qualitative Findings

Integration is widely recognised as being the key feature that differentiates mixed methods research from studies that have simply collected both quantitative and qualitative data without genuine synthesis (Creswell & Plano Clark, 2018). In this explanatory sequential design, integration occurred at sampling, instrumentation and interpretation: Phase I survey and log results informed the purposive selection of Phase II focus group participants so that different profiles of engagement were represented; the qualitative protocols were drafted in direct response to patterns seen in the questionnaire and study log data, asking about and explaining in their own terms the patterns participants were referring to; and, at the interpretive stage, qualitative themes were read systematically against the main quantitative findings (e.g. the negative correlation between affective engagement and EST attitudes) to determine if they either confirmed, nuanced or questioned the statistical relationships.

4.10 Validity and Reliability

This section documents the validity and reliability evidence for quantitative instruments and the trustworthiness criteria applied to qualitative components. Because mixed methods research requires quality assurance across paradigms, this section also addresses integration quality (Creswell & Plano Clark, 2018).

4.10.1 Student Questionnaire Validity and Reliability

4.10.1.1 Content Validity

Content validity was established through three procedures. First, all scale items were adapted from validated instruments in the IDLE and L2 motivation literature: IDLE engagement items from Arndt (2019) and Arndt and Woore (2018), EST attitude items based on Gardner's (2004) tripartite model, Ideal L2 Self items from Taguchi, Magid, and Papi (2009), and International Posture items from Yashima (2002). Second, the assembled questionnaire was reviewed by two applied linguistics experts and one ESP specialist, who evaluated item clarity, relevance to the Algerian technical education context, and alignment with theoretical constructs. Reviewers' recommendations led to rewording of four items and addition of context-specific examples. Third, cognitive interviews with five students during piloting identified ambiguous phrasing, resulting in further refinements (see Section 5.7).

4.10.1.2 Construct Validity: Confirmatory Factor Analysis

Construct validity was assessed through confirmatory factor analysis (CFA) using AMOS 28. Separate measurement models were tested for each multi-item scale to verify that items loaded appropriately on their intended latent constructs.

IDLE Engagement. A four-factor model corresponding to the theoretical dimensions (behavioral, affective, cognitive, linguistic) was specified. The model demonstrated acceptable fit: $\chi^2/df = 2.14$, CFI = .94, TLI = .92, RMSEA = .067, SRMR = .052. All standardised factor loadings exceeded .50, ranging from .54 to .86, confirming that items adequately represented their intended constructs.

EST Attitudes. A three-factor model (cognitive, affective, behavioral) reflecting Gardner's tripartite structure was tested. Fit indices indicated good model-data correspondence: $\chi^2/df = 1.98$, CFI = .96, TLI = .94, RMSEA = .062, SRMR = .048. Factor loadings ranged from .58 to .84.

Motivational Constructs. Ideal L2 Self (6 items) and International Posture (8 items) were modeled as correlated factors. The two-factor model showed excellent fit: $\chi^2/df = 1.76$, CFI = .97, TLI = .96, RMSEA = .055, SRMR = .041. Factor loadings ranged from .62 to .81 for Ideal L2 Self and .59 to .78 for International Posture.

4.10.1.3 Convergent and Discriminant Validity

Convergent Validity. Convergent validity was evaluated using Average Variance Extracted (AVE) and Composite Reliability (CR). AVE values exceeding .50 indicate that latent constructs capture more variance from their indicators than from measurement error (Fornell & Larcker, 1981). CR values above .70 indicate adequate internal consistency at the construct level (Hair et al., 2019). Table 11 presents these indices.

Table 11

Convergent Validity Indices

Construct	AVE	CR
Behavioral Engagement	.52	.88
Affective Engagement	.56	.90
Cognitive Engagement	.51	.86
Linguistic Engagement	.54	.89
EST Attitudes (Overall)	.53	.91
Ideal L2 Self	.58	.89
International Posture	.55	.87

Note. AVE = Average Variance Extracted; CR = Composite Reliability. Thresholds: AVE > .50, CR > .70 (Fornell & Larcker, 1981; Hair et al., 2019).

All constructs met the AVE > .50 threshold, and all CR values exceeded .86, providing strong evidence of convergent validity.

Discriminant Validity. Discriminant validity was assessed using the Fornell-Larcker criterion, which requires that each construct's square root of AVE exceed its correlations with other constructs (Fornell & Larcker, 1981). This criterion was met for all construct pairs. Additionally, inter-factor correlations from CFA were examined; all correlations fell below .85, indicating that constructs were empirically distinct (Kline, 2016). The correlation between Ideal L2 Self and International Posture ($r = .485$) confirmed that these motivational constructs, while related, represent distinct dimensions with 76.4% unshared variance.

4.10.1.4 Internal Consistency Reliability

Internal consistency was assessed using Cronbach's alpha (α), with values above .70 considered acceptable and above .80 considered good (DeVellis, 2017). Table 12 presents reliability coefficients for all scales.

Table 12

Internal Consistency Reliability (Cronbach's Alpha)

Scale	Items	α	Rating
Behavioral Engagement	7	.87	Good
Affective Engagement	7	.89	Good
Cognitive Engagement	7	.84	Good
Linguistic Engagement	7	.88	Good
EST Attitudes (Overall)	18	.91	Excellent
Cognitive Component	6	.85	Good
Affective Component	6	.86	Good
Behavioral Component	6	.83	Good
Ideal L2 Self	6	.89	Good
International Posture	8	.87	Good

Note. Rating: Acceptable (.70–.79), Good (.80–.89), Excellent ($\geq .90$). All scales exceeded the .70 threshold.

4.10.2 Study Log Validity and Reliability

Content Validity. The study log structure was adapted from established diary study protocols in applied linguistics (Gass & Mackey, 2007) and IDLE research (Arndt, 2019). Log dimensions (activity type, duration, platform, engagement ratings) were aligned with Arndt's engagement framework. Expert review by two applied linguists confirmed that log items adequately captured the target constructs.

Reliability Indicators. While traditional reliability coefficients are not applicable to diary instruments, several indicators supported data quality. First, completion rates were high: 38 of 40 participants returned logs (95%), with 35 completing all seven days (92.1%) and an overall daily completion rate of 93.2%. Second, non-completion showed no systematic pattern across engagement levels, suggesting practical constraints rather than selective dropout. Third, log-reported engagement patterns correlated with questionnaire-based engagement classifications, providing concurrent validity evidence.

Minimising Recall Bias. Participants were instructed to complete entries shortly after each activity or by day's end. The mid-week researcher check-in reinforced this practice and addressed questions. Log brevity (single-page daily format) reduced participant burden, supporting consistent completion.

4.10.3 Qualitative Instrument Trustworthiness

Trustworthiness of qualitative components was addressed using Lincoln and Guba's (1985) criteria: credibility, transferability, dependability, and confirmability.

4.10.3.1 Focus Group Trustworthiness

Credibility was enhanced by the researcher's prolonged engagement with EST and the Algerian higher education context, by triangulating focus group data with survey and log data, and at the same time by validating emergent summaries with participants in the sessions; additionally, maximum-variation sampling was employed among various profiles of engagement in order to include contradicting perspectives. Transferability was enhanced by detailed description related to the

institutional context, participant demographics, and emergent themes, in conjunction with detailed description of quotes that allow participants' permission to speak. Dependability was enhanced by employing the same semi-structured guide in four different groups, by maintaining an audit trail of key analytical decisions, and by documenting how frequently particular themes were manifested across participants and sessions. Finally, confirmability was enhanced through reflexive journaling on the dual role of the researcher as EST teacher and researcher, by consistently basing interpretations on direct quotations, and by employing a coding strategy with theory-derived categories and additional codes which were grounded in the data.

4.10.3.2 Teacher Interview Trustworthiness

The credibility is based on the participation of all seven EST instructors at ENP and the length of interviews (45–75 minutes), enabling some degree of depth in topic discussion; the external status of the researcher facilitated rapport building and reflexive writing was employed as a means of interrogating taken-for-granted assumptions. Transferability is facilitated by comprehensive descriptions of teacher demographics, experience, and contextual factors at the institution level, which enables readers to consider the applicability of the findings to other ESP/EST contexts. Dependability was enhanced by use of a standard interview guide, verbatim transcription and identical coding procedures for all the cases, and confirmability was reinforced by basing the interpretations on direct quotes and by overtly considering the influence of the researcher's concurrent roles as colleague and investigator on the collection and interpretation of the data.

4.10.4 Mixed Methods Integration Quality

Mixed methods quality was addressed through Teddlie and Tashakkori's (2009) legitimation criteria, adapted for the explanatory sequential design.

1. Sample Integration. Phase II participants were systematically drawn from Phase I, with purposive selection ensuring that qualitative participants represented the

range of engagement patterns identified quantitatively. This nested sampling approach strengthens the explanatory connection between phases.

Given that study log analyses (N=40) represent a subset of the full questionnaire sample (N=253), it was necessary to verify that the subsample was representative of the broader population. Table 13 compares key characteristics between participants who completed study logs and those who completed only the questionnaire.

Table 13

Comparison of Study Log Subsample with Full Sample

Variable	Full Sample (N=253)	Study Log (n=40)	t / χ^2	p	d / V
Gender (% male)	61.7%	60.0%	0.04	.838	.01
Year Level (% Year 4)	52.6%	55.0%	0.08	.777	.02
Age M (SD)	20.8 (1.4)	20.9 (1.3)	0.45	.654	.07
Behavioral Engagement	3.89 (0.74)	3.94 (0.71)	0.42	.676	.07
Affective Engagement	4.24 (0.62)	4.29 (0.58)	0.51	.613	.08
Cognitive Engagement	3.52 (0.68)	3.48 (0.65)	-0.37	.714	.06
Linguistic Engagement	2.32 (0.89)	2.28 (0.84)	-0.28	.780	.05
Ideal L2 Self	4.10 (0.68)	4.15 (0.64)	0.46	.648	.08
International Posture	3.95 (0.65)	3.99 (0.61)	0.39	.699	.06
Overall EST Attitudes	2.73 (0.68)	2.70 (0.65)	-0.28	.783	.05

No significant differences emerged between the study log subsample and the full sample on any demographic or psychological variable (all $p > .60$). Effect sizes were uniformly negligible (all $d < .10$, $V < .05$), confirming that the 40 participants who completed study logs were representative of the broader sample. This validation supports the generalizability of behavioral patterns observed in the study log data to the full population of technical students.

2.Sequential Validity. The timing of phases followed the explanatory sequential logic: quantitative analysis was completed before qualitative data collection, allowing Phase I findings to inform Phase II protocols. Focus group questions explicitly addressed patterns requiring explanation (e.g., the affective engagement–EST attitude relationship).

3. Interpretive Consistency. At the interpretation stage, quantitative and qualitative findings were systematically compared. Where qualitative themes

confirmed statistical patterns, convergence was noted. Where findings diverged, discrepancies were examined as potential sources of insight rather than methodological problems, consistent with the complementarity purpose of mixed methods research (Greene, Caracelli, & Graham, 1989).

4.Paradigm Integration. The pragmatic paradigm provided philosophical coherence, privileging research questions over methodological orthodoxy. Both quantitative (measurement, generalisability) and qualitative (meaning, context) contributions were valued for their distinct strengths in addressing the study's aims.

4.11 Methodological Limitations

Several methodological limitations should be acknowledged when interpreting the findings of this study.

First, the research was conducted at a single institution (ENP), which, while providing depth of contextual understanding, limits the generalizability of findings to other Algerian universities or technical education contexts. ENP's elite academic profile and selective admission procedures may not reflect the experiences of students in less competitive institutions.

Second, the study relied predominantly on self-report measures for both the questionnaire and study log. Despite efforts to minimize social desirability bias through anonymity assurances and reverse-coded items, participants may have over-reported engagement behaviors or provided responses they perceived as favorable. The retrospective nature of questionnaire items also introduces potential recall bias.

Third, the cross-sectional design of the quantitative phase captures associations at a single point in time, precluding causal inferences about the relationships between IDLE engagement, EST attitudes, and motivational constructs. Longitudinal designs would be necessary to establish temporal precedence and developmental trajectories.

Fourth, the seven-day study log, while capturing weekly patterns, represents a limited temporal window that may not reflect seasonal variations or examination period fluctuations in informal English use. Additionally, the study log subsample ($n = 40$) was purposively selected, which enhances qualitative depth but limits statistical generalizability.

Fifth, although focus groups facilitate peer interaction and naturalistic discourse, they may suppress minority viewpoints or generate conformity effects. Some participants may have been reluctant to express negative attitudes toward EST instruction in a group setting.

Finally, the census-based teacher sample ($n = 7$), while comprehensive for ENP, represents a small number of participants, and findings regarding teacher cognition should be interpreted as context-specific insights rather than broadly generalizable patterns.

4.12 Conclusion

The research design formulated in this chapter was developed to study informality digital English language learning as visible behaviour and a field of identity investing. Adopting an explanatory sequential pragmatic design, Phase I presented statistical results concerning patterns of engagement, associations between IDLE and EST, and motivational predictors, while Phase II examined implications for the underlying mechanisms of these patterns in a qualitative way. Sampling, instrument & interpretation integration ensured continuity between phases while the psychometric analyses demonstrated that the quantitative measures were adequate and qualitative strand were supported through trustworthiness procedures. The combination of these factors provide thus the methodological basis to the findings as presented in the following chapters.

CHAPTER V: Quantitative Findings of Phase I

5.1 Introduction

This chapter presents findings from the study addressing the three research questions. The analysis draws primarily on quantitative data from questionnaires (N=253) and study logs (N=40) collected over seven days. First, I examine how technical students engage with different media types for informal English language learning, looking at platform usage patterns, time investment, and engagement across behavioural, affective, cognitive, and linguistic dimensions (RQ1). Second, I explore the relationship between IDLE engagement and attitudes toward formal EST instruction (RQ2). Third, I investigate which motivational factors predict IDLE engagement patterns, focusing on Ideal L2 Self and International Posture (RQ3). The findings reveal distinct patterns that help clarify how informal and formal English learning function in this technical education context.

5.2. Findings on engagement with IDLE

This section presents findings related to Research Question 1: How do technical students engage with different media types for informal English language learning? Results are organized into five subsections addressing platform usage patterns (RQ1.1), time investment (RQ1.2), multidimensional engagement across four theoretical dimensions (RQ1.3), engagement profiles (RQ1.4). Data are drawn from the survey (N=253), study logs (N=40, 7 days), and focus group discussions

5.2.1 Platform Usage Patterns

Table 14 presents the frequency distribution of platform usage across eight media types. Social media emerged as the most universally adopted platform, with 100% of participants reporting at least occasional use. YouTube (98.0%) and music (94.1%) also showed near-universal adoption. In contrast, podcasts showed the lowest adoption rate (56.5%), with 43.5% of participants reporting never engaging with this platform.

Table 14*Platform Usage Frequencies and Time Investment (N=253)*

Platform	Never n (%)	<30min n (%)	30min- 1hr n (%)	1-2hrs n (%)	2-3hrs n (%)	>3hrs n (%)	Usage %
Social Media	0 (0.0)	2 (0.8)	20 (7.9)	45 (17.8)	90 (35.6)	96 (38.0)	100.0
YouTube	5 (2.0)	10 (4.0)	30 (11.9)	50 (19.8)	80 (31.6)	78 (30.8)	98.0
Music	15 (5.9)	28 (11.1)	35 (13.8)	55 (21.7)	70 (27.7)	50 (19.8)	94.1
Video Games	25 (9.9)	25 (9.9)	35 (13.8)	65 (25.7)	60 (23.7)	43 (17.0)	90.1
Movies/Series	18 (7.1)	35 (13.8)	50 (19.8)	80 (31.6)	45 (17.8)	25 (9.9)	92.9
Websites	25 (9.9)	50 (19.8)	75 (29.6)	55 (21.7)	35 (13.8)	13 (5.1)	90.1
News Sites	28 (11.1)	50 (19.8)	65 (25.7)	55 (21.7)	40 (15.8)	15 (5.9)	88.9
Podcasts	110 (43.5)	80 (31.6)	35 (13.8)	20 (7.9)	6 (2.4)	2 (0.8)	56.5

Examination of high-intensity usage (>3 hours per week) revealed considerable variation across platforms. Social media dominated intensive engagement, with 38.0% (n=96) of participants reporting more than 3 hours of weekly use. YouTube showed similarly high intensive engagement (30.8%, n=78). At the opposite end, podcasts showed minimal intensive engagement (0.8%, n=2), consistent with their overall low adoption rate.

Figure 3 visualizes these patterns across two dimensions: adoption rate (Panel A) and estimated mean hours per week (Panel B). The data reveal a clear hierarchy of platform engagement, with social media and YouTube emerging as the most intensive platforms both in terms of breadth (adoption) and depth (time investment).

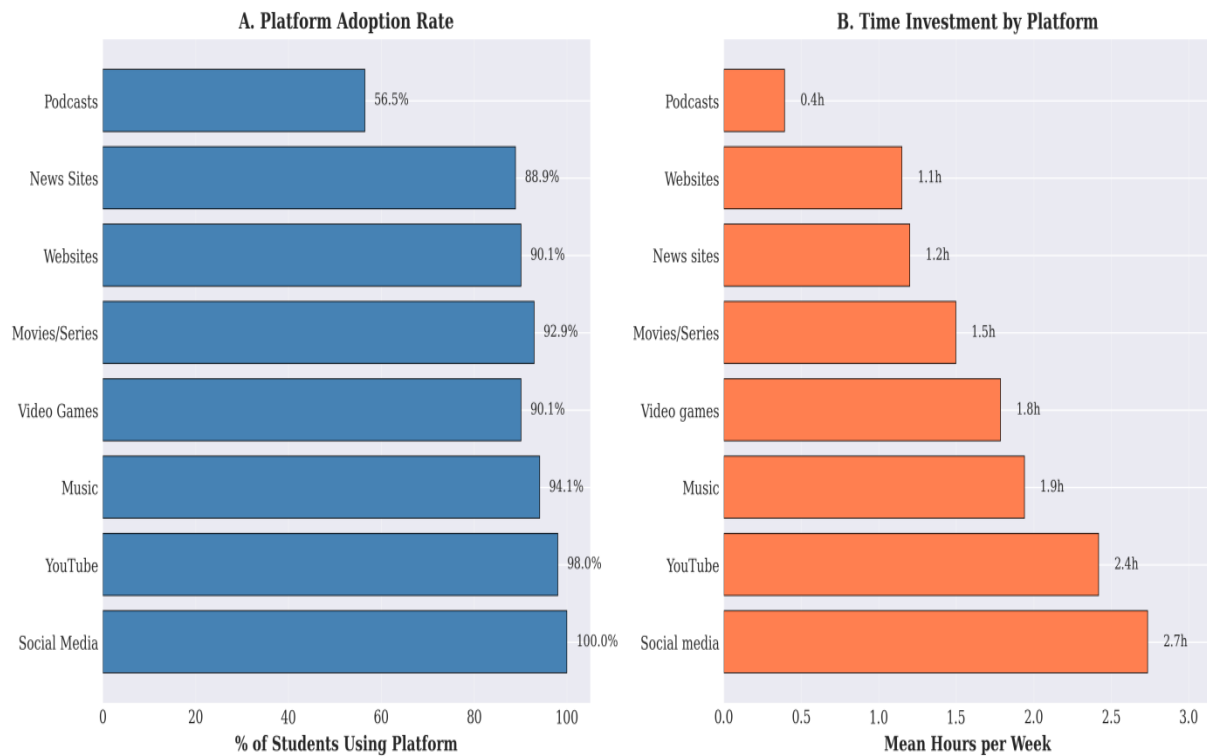


Figure 3

Platform Usage Patterns and Time Investment (N=253)

5.2.2 Time Investment

Study log data from 40 participants over seven days provided detailed temporal patterns of IDLE engagement. Table 15 summarizes key temporal metrics.

Table 15

Time Investment Summary Statistics (Study Log Data, N=40)

Metric	Mean	SD	Range
Weekly hours	14.3	6.2	3.5 – 32.1
Daily hours	2.0	0.9	0.5 – 4.6
Activities per week	22.9	8.7	8 – 47
Activities per day	3.3	1.2	1.1 – 6.7
Weekend daily mean	3.8	—	—
Weekday daily mean	3.0	—	—

Participants engaged with English media an average of 14.3 hours per week (SD=6.2), equivalent to approximately 2.0 hours daily (SD=0.9). This weekly average substantially exceeded typical EST contact hours (1.5 hours per week), representing approximately 9.5 times more English exposure through informal channels than through formal instruction.

Temporal distribution analysis revealed significant weekend concentration. Weekend days (Friday-Saturday) accounted for 33.5% of weekly activities despite representing only 28.6% of the week, indicating 26.7% higher per-day engagement on weekends relative to weekdays. Tuesday showed the lowest engagement (12.6% of weekly activities), possibly reflecting mid-week academic demands. Figure 4 visualizes this weekly distribution pattern.

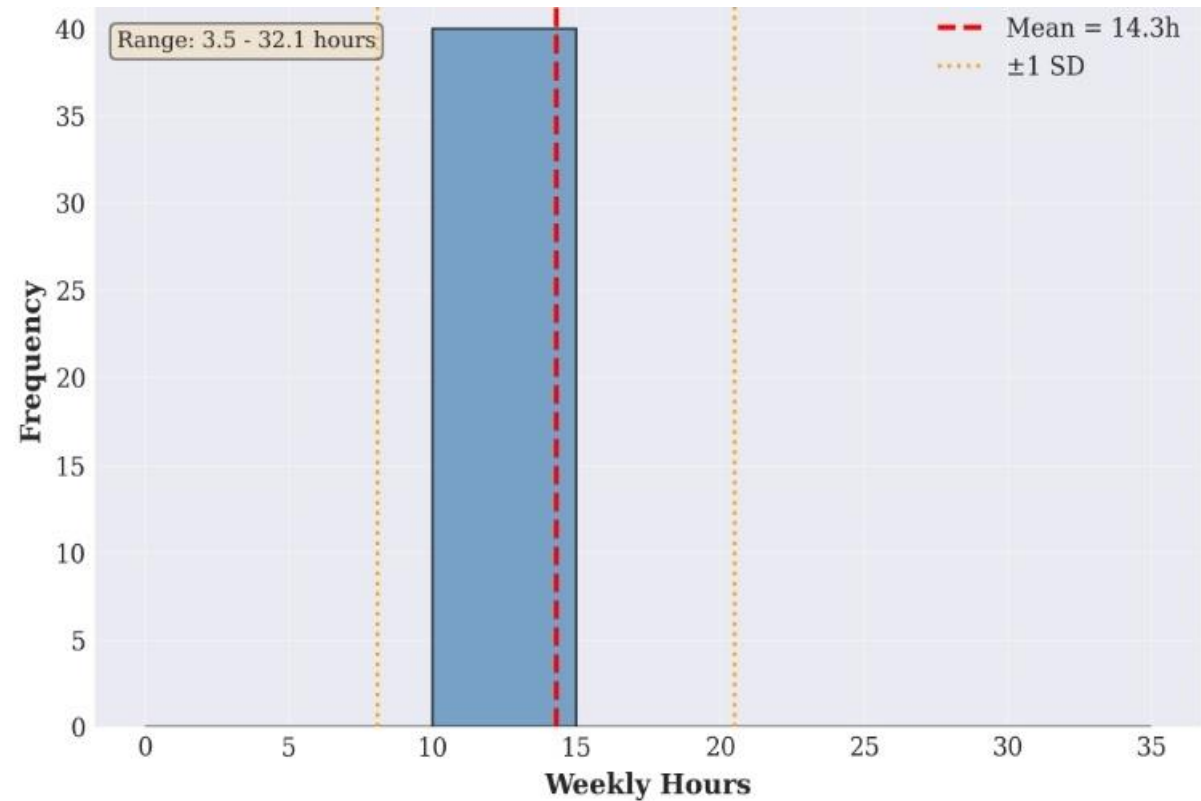


Figure 4
Weekly Time Investment Distribution (N=40)

Activity duration patterns (Figure 7) showed strong skew toward brief engagements. The majority of activities (54.5%, n=486) lasted under 30 minutes, with an additional 29.9% (n=267) between 30-60 minutes. Extended engagements exceeding two hours were rare (3.6%, n=32), suggesting a preference for frequent, brief interactions over sustained exposure.

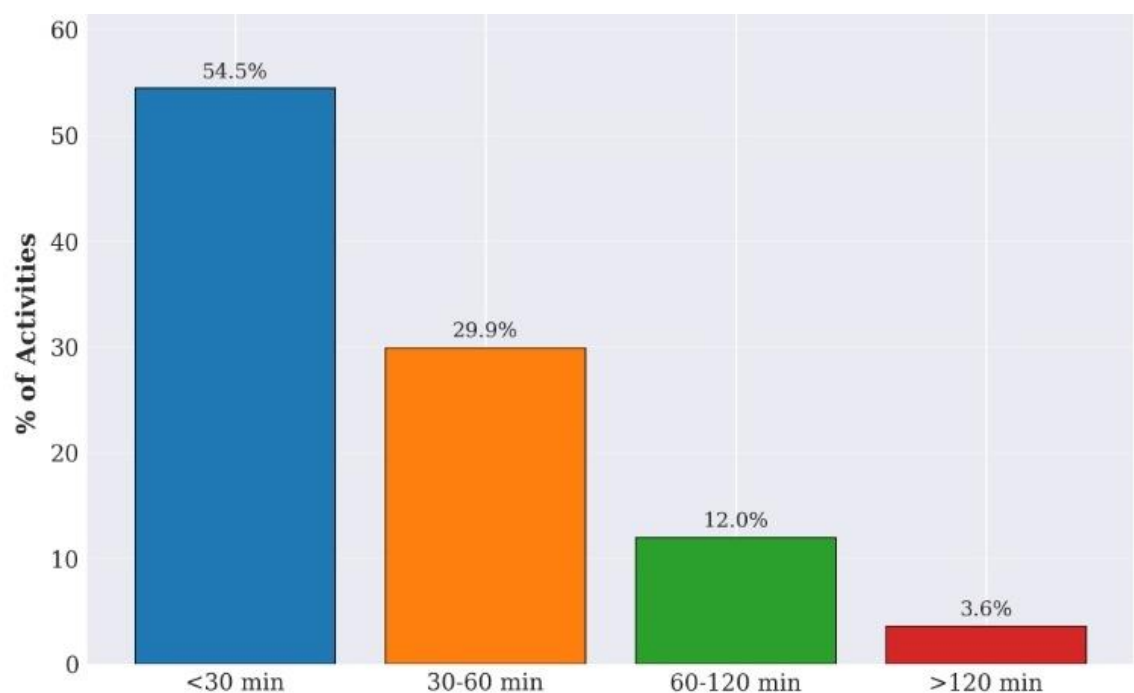


Figure 5

Duration Distribution (Study Logs)

5.2.3 Multidimensional Engagement

Engagement was assessed across four theoretical dimensions based on Arndt's framework: behavioral, affective, cognitive, and linguistic. Each dimension is reported separately below.

5.2.3.1 Behavioral Engagement

Table 16 presents behavioral engagement frequencies across seven activity types. All items used a 5-point frequency scale (1=Never, 5=Always).

Table 16*Behavioral Engagement Frequency Distribution (N=253)*

Activity	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	M (SD)
Watch movies/series in English	5 (2.0)	11 (4.3)	29 (11.5)	97 (38.3)	111 (43.9)	4.17 (0.95)
Listen to English music	4 (1.6)	7 (2.8)	24 (9.5)	93 (36.8)	112 (44.3)	4.10 (1.01)
Play video games in English	26 (10.3)	32 (12.6)	44 (17.4)	89 (35.2)	62 (24.5)	3.51 (1.28)
Use social media in English	5 (2.0)	14 (5.5)	36 (14.2)	86 (34.0)	125 (49.4)	4.30 (0.87)
Browse websites in English	8 (3.2)	19 (7.5)	43 (17.0)	95 (37.5)	88 (34.8)	3.93 (1.06)
Spend time learning through media	11 (4.3)	29 (11.5)	68 (26.9)	84 (33.2)	61 (24.1)	3.61 (1.12)
Use English vs Arabic/French media	13 (5.1)	36 (14.2)	63 (24.9)	77 (30.4)	64 (25.3)	3.57 (1.19)

Behavioral engagement was generally high across activities, with mean scores ranging from 3.51 to 4.30. using social media showed the highest behavioral engagement (M=4.30, SD=0.87), with 86.2% of participants reporting 'often' or 'always' engaging in this activity. Watching movies/series (M=4.17, SD=0.95) and Listening to English music (M=4.10, SD=1.01) also demonstrated strong behavioral engagement, with over 78% reporting frequent engagement for each. Video gaming showed the widest variability (SD=1.28) and lowest mean engagement (M=3.51),

reflecting substantial individual differences. However, even for gaming, 59.7% of participants reported 'often' or 'always' engaging, indicating majority adoption despite lower overall frequency relative to other platforms.

5.2.3.2 Affective Engagement

Table 17 presents affective engagement patterns. Three negatively-worded items (boredom, nervousness, frustration) were reverse-coded; all reported values reflect positive affect orientation.

Table 17

Affective Engagement Distribution (N=253)

Affective Item	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	M (SD)
Enjoy English entertainment	2 (0.8)	5 (2.0)	15 (5.9)	100 (39.5)	131 (51.8)	4.40 (0.76)
Excited finding English content	1 (0.4)	6 (2.4)	20 (7.9)	110 (43.5)	116 (45.8)	4.30 (0.77)
Not bored with English entertainment*	5 (2.0)	10 (4.0)	15 (5.9)	95 (37.5)	128 (50.6)	4.31 (0.91)
Not nervous with English entertainment*	5 (2.0)	20 (7.9)	30 (11.9)	98 (38.7)	100 (39.5)	4.06 (1.00)
Not frustrated using English*	8 (3.2)	30 (11.9)	30 (11.9)	90 (35.6)	95 (37.5)	3.92 (1.12)
Fully focused with English entertainment	2 (0.8)	4 (1.6)	20 (7.9)	105 (41.5)	122 (48.2)	4.35 (0.76)
Prefer English for entertainment	4 (1.6)	6 (2.4)	18 (7.1)	90 (35.6)	135 (53.4)	4.37 (0.85)

Affective engagement was uniformly high, with all items showing means above 3.90. Participants expressed strong enjoyment (M=4.40, SD=0.76) and excitement

when finding English content ($M=4.30$, $SD=0.77$), with over 89% agreeing or strongly agreeing with these statements. Most notably, participants demonstrated a clear preference for English over other language options for entertainment ($M=4.37$, $SD=0.85$), with 53.4% 'always' preferring English, indicating voluntary and sustained engagement rather than obligatory consumption.

Negative emotions were consistently rejected. After reverse coding, boredom ($M=4.31$, $SD=0.91$), nervousness ($M=4.06$, $SD=1.00$), and frustration ($M=3.92$, $SD=1.12$) all reflected predominantly positive affective experiences. However, frustration showed the most variability ($SD=1.12$) and lowest positive valence, suggesting some participants encounter challenges in informal English contexts.

5.2.3.3 Cognitive Engagement

Table 18 presents cognitive engagement strategies. Items CE6 and CE7 (mind wandering, giving up without fixing) represent disengagement patterns and are interpreted inversely.

Table 18

Cognitive Engagement Strategy Use (N=253)

Cognitive Strategy	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	M (SD)
Keep focus, ignore distractions	14 (5.5)	51 (20.2)	104 (41.1)	61 (24.1)	23 (9.1)	3.10 (1.00)
Focus on main idea, not every word	3 (1.2)	10 (4.0)	29 (11.5)	112 (44.3)	99 (39.1)	4.15 (0.86)
Use context clues when lost	6 (2.4)	19 (7.5)	49 (19.4)	103 (40.7)	76 (30.0)	3.89 (1.01)
Pause/go back to check understanding	21 (8.3)	56 (22.1)	101 (39.9)	54 (21.3)	21 (8.3)	2.85 (1.09)
Follow and connect main ideas	5 (2.0)	13 (5.1)	55 (21.7)	111 (43.9)	69 (27.3)	3.90 (0.93)
Mind wanders, stop paying attention	8 (3.2)	27 (10.7)	61 (24.1)	96 (37.9)	61 (24.1)	3.69 (1.05)

Keep going without trying to fix it	6 (2.4)	19 (7.5)	53 (20.9)	95 (37.5)	80 (31.6)	3.89 (1.04)
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Cognitive engagement patterns revealed selective strategy use. Meaning-focused strategies dominated: focusing on main ideas ($M=4.15$, $SD=0.86$) and following connections between ideas ($M=3.90$, $SD=0.93$) were most frequently reported. Context clue usage was also common ($M=3.89$, $SD=1.01$). In contrast, metacognitive monitoring strategies showed lower frequency: pausing to check understanding ($M=2.85$, $SD=1.09$) and maintaining focus against distractions ($M=3.10$, $SD=1.00$) were employed less consistently.

Disengagement markers were notably frequent. Mind wandering occurred 'often' or 'always' for 62.0% of participants ($M=3.69$, $SD=1.05$), and continuing without attempting to resolve comprehension difficulties was similarly common ($M=3.89$, $SD=1.04$, with 69.1% reporting 'often' or 'always'). These patterns suggest a content-over-accuracy orientation where participants prioritize general comprehension over complete understanding.

5.2.3.4 Linguistic Engagement

Linguistic engagement was assessed through both questionnaire responses ($N=253$) and study log ratings ($N=40$). Questionnaire items measured participants' self-reported attention to linguistic features during informal English consumption, while study logs provided activity-specific ratings. Table 19 presents questionnaire findings across seven dimensions of linguistic engagement.

Table 19

Linguistic Engagement Items (Questionnaire, $N=253$)

Item	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	M (SD)
Pay attention to how English words or phrases are used	68 (26.9)	58 (22.9)	78 (30.8)	35 (13.8)	14 (5.5)	2.26 (1.18)
Notice new vocabulary and try to remember it	72 (28.5)	62 (24.5)	65 (25.7)	41 (16.2)	13 (5.1)	2.19 (1.20)

Think about English grammar rules or sentence structures	85 (33.6)	68 (26.9)	55 (21.7)	32 (12.6)	13 (5.1)	1.99 (1.18)
Try to improve my pronunciation by repeating what I hear	79 (31.2)	61 (24.1)	62 (24.5)	35 (13.8)	16 (6.3)	2.16 (1.25)
Look up words or phrases I don't understand	55 (21.7)	52 (20.6)	78 (30.8)	47 (18.6)	21 (8.3)	2.53 (1.26)
Focus on learning English while consuming entertainment	81 (32.0)	67 (26.5)	58 (22.9)	35 (13.8)	12 (4.7)	1.95 (1.16)
Practice using new English expressions I encounter	74 (29.2)	59 (23.3)	68 (26.9)	38 (15.0)	14 (5.5)	2.14 (1.21)

Note. Scale: 1=Never, 5=Always.

Linguistic engagement was consistently low across all measured dimensions, with means ranging from 2.21 to 2.72, all falling well below the scale midpoint of 3.0. The most common response was "Rarely" (34.0-37.9% across items), with over 60% of participants reporting "Never" or "Rarely" for most items. The highest engagement was observed for looking up unknown words ($M=2.72$, $SD=1.20$), though even this remained in the low-to-moderate range. Focusing on learning while consuming entertainment showed the lowest engagement ($M=2.21$, $SD=0.97$), with 64.4% reporting they "Never" or "Rarely" maintain such focus.

Linguistic engagement was also assessed through study log ratings of language focus, word-level attention, and content focus during activities. Table 20 presents engagement ratings by activity type (1=minimal, 5=maximal).

Table 20

Linguistic Engagement by Activity Type (Study Logs, N=40)

Activity Type	Language Focus	Word Attention	Content Focus	Entertainment	Concentration	Interest	n Activities
Social Media	1.9	1.7	4.6	1.8	3.4	2.1	287
Video Games	2.2	2.0	4.5	1.4	2.3	1.6	196
Film/TV/Video	2.1	1.8	4.7	1.6	2.7	1.8	178
Music	1.5	1.4	4.8	1.9	4.1	2.0	143
Reading	3.2	3.4	3.8	2.8	2.1	2.4	42

Linguistic engagement was consistently low across entertainment-oriented activities. Language focus ratings ranged from 1.5 (music) to 2.2 (video games), all falling well below the scale midpoint. Word-level attention showed parallel patterns (1.4-2.0 for entertainment activities). In stark contrast, content focus was uniformly high (4.5-4.8), indicating participants strongly prioritized meaning over form.

Reading activities diverged notably from this pattern, showing substantially higher language focus (M=3.2) and word attention (M=3.4), though still prioritizing content (M=3.8). The entertainment-language focus relationship was inverse: activities rated as most entertaining (gaming=1.4, film/TV=1.6) showed minimal language focus, while less entertaining activities (reading=2.8) demonstrated greater linguistic attention.

Despite minimal explicit language focus, 64.3% of activities (n=573) yielded self-reported learning outcomes. Table 21 presents the distribution of learning types across activities.

Table 21

Self-Reported Learning Outcomes by Activity Type (Study Logs)

Activity Type	Vocabulary %	Expressions %	Pronunciation %	Grammar %	Nothing New %
Video Games	48.2	24.1	22.4	9.7	35.8
Film/TV/Video	39.3	28.7	18.5	8.4	33.1
Social Media	28.6	31.4	7.3	6.6	35.2
Music	15.4	12.6	19.6	3.5	52.4
Reading	57.1	23.8	9.5	16.7	23.8

Vocabulary emerged as the dominant learning outcome (35.0% of all activities), followed by expressions (21.0%) and pronunciation (15.0%). Grammar learning was minimal (7.6%), consistent with the content-over-form orientation. Video games showed the highest vocabulary learning rate (48.2%), while reading demonstrated the most balanced learning profile. Music showed the lowest learning outcomes overall, with 52.4% of music activities yielding no self-reported learning.

Table 22 summarizes descriptive statistics for the four IDLE engagement dimension composites, providing an overview of central tendency, variability, and distributional characteristics across the sample.

Table 22

Descriptive Statistics for IDLE Engagement Dimension Composites (N=253)

Dimension	M	SD	Min	Max	Skew	Kurt
Behavioral Engagement	3.89	0.74	1.43	5.00	-0.38	-0.21
Affective Engagement	4.24	0.62	2.14	5.00	-0.52	-0.18
Cognitive Engagement	3.52	0.68	1.71	5.00	-0.15	-0.32
Linguistic Engagement	2.32	0.89	1.00	4.86	0.41	-0.28
Consumption-Oriented*	4.07	0.59	2.21	5.00	-0.44	-0.15
Learning-Oriented**	2.92	0.67	1.36	4.79	0.18	-0.25

A clear hierarchy emerged across engagement dimensions. Affective engagement (M = 4.24, SD = 0.62) was highest, indicating strong emotional connection to English media consumption. Behavioral engagement (M = 3.89, SD = 0.74) was also elevated, reflecting frequent participation in IDLE activities. In contrast, cognitive engagement (M = 3.52, SD = 0.68) and especially linguistic engagement (M = 2.32, SD = 0.89) were substantially lower, with linguistic engagement falling below the scale midpoint.

The composite indices revealed this pattern more starkly: consumption-oriented engagement (M = 4.07, SD = 0.59) substantially exceeded learning-oriented engagement (M = 2.92, SD = 0.67), a difference of 1.15 scale points. This disparity confirms that students' informal English engagement is characterized by high participation and enjoyment but limited deliberate attention to language form.

Distributional characteristics supported the use of parametric statistical procedures. Skewness values ranged from -0.52 to 0.41, and kurtosis values from -0.32 to -0.15, all falling well within acceptable limits (± 1.0 ; George & Mallery,

2019). Affective engagement showed mild negative skew, reflecting ceiling effects where most students reported strong positive affect toward English media.

To examine the internal structure of multidimensional IDLE engagement, Pearson correlations were computed among the four engagement dimensions. Table 23 presents the complete inter-correlation matrix.

Table 23

Inter-Correlations Among IDLE Engagement Dimensions (N=253)

Dimension	1	2	3	4
Behavioral Engagement	—			
Affective Engagement	.58	—		
Cognitive Engagement	.24	.19	—	
Linguistic Engagement	.21	.15	.47	—

The correlation matrix revealed two distinct clusters within the four-dimensional engagement structure. Behavioral and affective engagement showed a strong positive correlation ($r = .58$, $p < .001$), suggesting that frequent participation and positive emotional experience co-occur. Similarly, cognitive and linguistic engagement were moderately correlated ($r = .47$, $p < .001$), indicating that attention to comprehension and attention to language form tend to co-vary.

Cross-cluster correlations were substantially weaker. Behavioral engagement showed only small correlations with cognitive ($r = .24$) and linguistic ($r = .21$) dimensions. Affective engagement demonstrated the weakest cross-cluster relationships, correlating minimally with cognitive ($r = .19$) and linguistic ($r = .15$) engagement. This pattern provides empirical support for the theoretical distinction between consumption-oriented engagement (behavioral-affective cluster) and learning-oriented engagement (cognitive-linguistic cluster), with the two clusters representing related but distinct modes of informal digital language contact

5.2.4 Engagement Profiles

To address RQ1.4 regarding distinct engagement patterns, participants in the study log phase (N=40) were classified into three groups based on their Phase 1 questionnaire engagement scores: high engagers (n=12, 30.0%), medium engagers (n=16, 40.0%), and low engagers (n=12, 30.0%). Table 24 compares these groups across six key dimensions of IDLE engagement.

Table 24

Engagement Profile Comparisons Across Groups (Study Logs, N=40)

Dimension	High Engagers (n=12)	Medium Engagers (n=16)	Low Engagers (n=12)	Gradient Ratio
Mean activities per week	34.2 (SD=6.8)	22.6 (SD=4.3)	13.8 (SD=3.9)	2.5:1
Mean daily hours	3.2 (SD=0.9)	2.0 (SD=0.6)	1.1 (SD=0.4)	2.9:1
% Gaming activities	31.4%	20.8%	12.7%	2.5:1
Activity diversity (types)	5.2	4.3	3.1	1.7:1
Mean language focus rating	2.3	2.0	1.8	1.3:1
% Reporting learning	71.2%	64.8%	54.1%	1.3:1
Weekend increase	+42%	+28%	+19%	2.2:1

The three groups showed clear quantitative differentiation. High engagers averaged 34.2 activities per week compared to 13.8 for low engagers (2.5:1 ratio), translating to 3.2 daily hours versus 1.1 hours (2.9:1 ratio). This confirms that self-reported engagement levels from the questionnaire reflected actual behavioral differences observed in the study logs.

Activity type preferences varied systematically across groups. Gaming showed the steepest gradient (2.5:1 ratio), with high engagers devoting 31.4% of their activities to video games compared to 12.7% for low engagers. Activity diversity also scaled with engagement level: high engagers utilized an average of 5.2 different

platform types compared to 3.1 for low engagers (1.7:1 ratio), suggesting that higher engagement involves both greater frequency and broader platform exploration.

Linguistic engagement showed more modest differentiation. While high engagers reported slightly higher language focus ($M=2.3$) than low engagers ($M=1.8$), yielding a 1.3:1 ratio, all groups remained predominantly content-focused. Similarly, learning outcomes varied from 71.2% (high) to 54.1% (low), a 1.3:1 ratio, indicating that increased exposure yields moderately more perceived learning but does not fundamentally alter the content-over-form orientation.

Temporal flexibility also scaled with engagement. High engagers showed a 42% increase in weekend activity compared to weekdays, substantially exceeding the 19% increase observed among low engagers (2.2:1 ratio). This suggests that high engagers appear to dedicate a larger proportion of their free time to IDLE, particularly on weekends

Figure 6 visualizes these profile differences across six dimensions, illustrating the graduated nature of engagement differentiation. The profiles suggest that IDLE engagement exists along a continuum rather than representing discrete types, with quantitative differences in frequency, duration, diversity, and temporal patterns characterizing high versus low engagers.

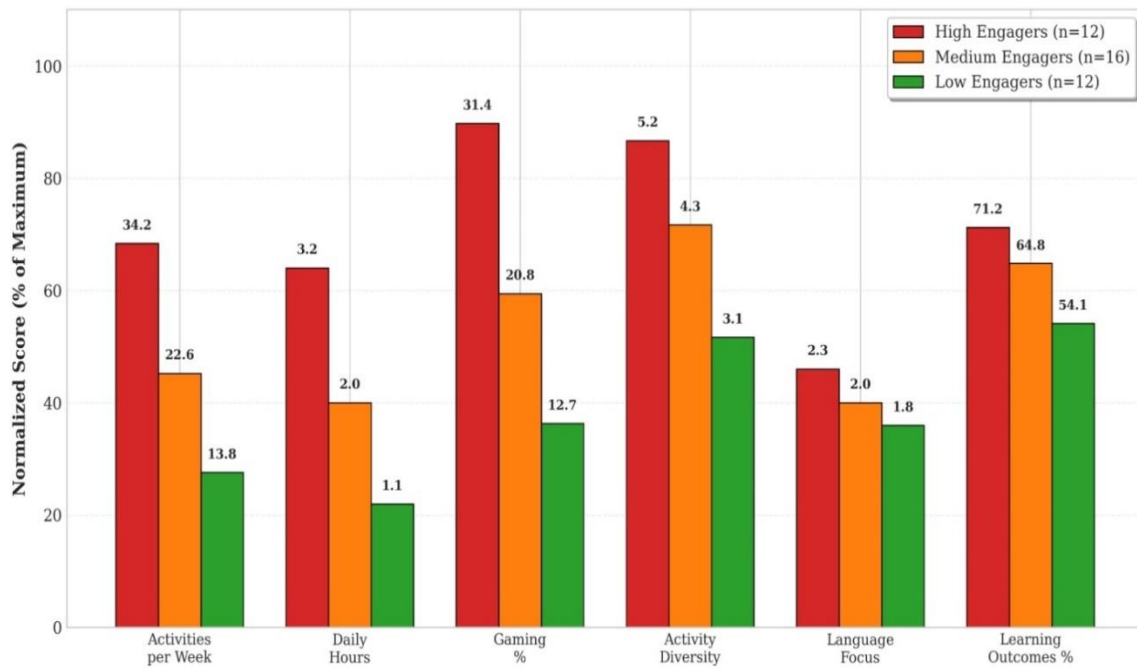


Figure 6

Engagement Profile Comparisons Across Groups (Study Logs, N=40)

To examine whether IDLE engagement patterns differed across academic progression, independent samples t-tests compared Year 2 (n = 120) and Year 4 (n = 133) students on all engagement dimensions. Table 25 presents results.

Table 25

IDLE Engagement Dimensions by Academic Level (N=253)

Dimension	Year 2 M(SD)	Year 4 M(SD)	T	df	P	d
Behavioral	3.84 (0.76)	3.93 (0.72)	0.98	251	.329	0.12
Affective	4.21 (0.64)	4.27 (0.60)	0.77	251	.444	0.10
Cognitive	3.49 (0.70)	3.55 (0.66)	0.71	251	.480	0.09
Linguistic	2.29 (0.91)	2.35 (0.87)	0.54	251	.590	0.07
Consumption-Oriented	4.03 (0.61)	4.10 (0.57)	0.95	251	.344	0.12
Learning-Oriented	2.89 (0.69)	2.95 (0.65)	0.72	251	.474	0.09

No significant differences emerged between year levels for any IDLE engagement dimension (all $p > .30$). Effect sizes were uniformly negligible (all $d < 0.15$), indicating that academic progression does not systematically alter patterns of informal digital English engagement. Year 4 students showed marginally higher means across all dimensions, but these differences were neither statistically nor practically significant.

This stability contrasts with the significant year-level difference observed for Ideal L2 Self (see Section 6.4.3), where Year 4 students reported stronger identity-based motivation. The finding suggests that while motivational orientations may develop across the curriculum, the behavioral manifestation of these orientations in IDLE practices remains stable. Students appear to establish relatively consistent patterns of informal English engagement early in their university studies, which persist despite increased EST exposure and strengthening English-using identities.

5.3 IDLE-EST Relationship

This section addresses Research Question 2: What is the relationship between IDLE engagement and attitudes toward EST? The analysis proceeds in four stages: (1) descriptive analysis of EST attitudes and year-level comparisons (Section 4.3.1), (2) exploratory bivariate correlations examining relationships between all engagement dimensions and EST attitudes (Section 4.3.2, RQ2a), (3) multivariate structural equation modeling identifying unique predictors when all dimensions are tested simultaneously (Section 4.3.3, RQ2b), and (4) component-specific analysis characterizing the nature of the affective engagement-EST relationship (Section 4.3.4).

5.3.1 EST Attitudes: Descriptive Statistics and Year-Level Comparisons

The following table presents descriptive statistics for overall EST attitudes and three theoretical components (cognitive, affective, behavioral) across all participants.

Table 26*Descriptive Statistics for EST Attitudes (N=253)*

EST Component	M	SD	Min	Max	Range	Skewness	Kurtosis
Overall EST Attitudes	2.73	0.68	1.00	5.00	4.00	0.15	-0.41
Cognitive Component	3.40	0.84	1.00	5.00	4.00	-0.22	-0.18
Affective Component	2.34	0.11	1.00	5.00	4.00	0.08	-0.35
Behavioral Component	2.47	0.21	1.00	5.00	4.00	0.19	-0.27

Overall EST attitudes (M=2.73, SD=0.68) fell below the scale midpoint of 3.0, indicating generally neutral-to-negative perceptions of EST instruction across the sample. Component-level examination revealed systematic variation across the tri-dimensional attitude structure. Cognitive attitudes (M=3.40, SD=0.84) substantially exceeded the midpoint, demonstrating students' recognition of EST's instrumental value for technical studies and career preparation. However, affective attitudes (M=2.34, SD=0.11) and behavioral attitudes (M=2.47, SD=0.21) fell considerably below the midpoint, indicating low emotional engagement (e.g., low enjoyment, high boredom) and minimal behavioral investment (e.g., low effort, high avoidance) in EST classes.

The standard deviations revealed differential variability across components. Overall (SD=0.68) and cognitive (SD=0.84) attitudes showed moderate between student variability, suggesting individual differences in EST perceptions. Affective (SD=0.11) and behavioral (SD=0.21) components demonstrated substantially lower variability, indicating relatively homogeneous negative responses across students.

Distributional examination revealed acceptable normality for all subscales. Skewness values ranged from -0.22 to 0.19 (all $|\text{skewness}| < 0.50$), and kurtosis values ranged from -0.18 to -0.41 (all $|\text{kurtosis}| < 0.50$), supporting the use of

parametric statistical procedures including correlation and regression analyses. Cognitive attitudes showed slight negative skew (-0.22), reflecting mild ceiling effects where most students endorsed EST's instrumental value despite low affective-behavioral engagement.

To examine the internal structure of EST attitudes, Pearson correlations were computed among the three theoretical components. Table 27 presents the inter-correlation matrix.

Table 27

Inter-Correlations Among EST Attitude Components (N=253)

Component	1	2	3
Cognitive	—		
Affective	.28	—	
Behavioral	.35	.72	—

The EST attitude components showed differential inter-relationships. Affective and behavioral components were strongly correlated ($r = .72$, $p < .001$), suggesting that emotional engagement and behavioral investment in EST classes covary closely. This strong association indicates that students who enjoy EST classes also tend to exert effort, while those experiencing negative affect also disengage behaviorally.

In contrast, cognitive attitudes showed only moderate correlations with affective ($r = .28$) and behavioral ($r = .35$) components. This pattern indicates partial dissociation between recognizing EST's value (cognitive) and experiencing positive engagement (affective-behavioral). Students may simultaneously acknowledge EST's instrumental importance while feeling disengaged from or negative toward EST instruction a pattern consistent with the qualitative finding of 'useful but boring' (see Chapter 7).

Year-Level Differences in EST Attitudes

Independent samples t-tests examined whether EST attitudes differed systematically between second-year (L2) and fourth-year (L4) students. Table 28 presents results.

Table 28

EST Attitudes by Academic Level (N=253)

Component	Year 2 M (SD)	Year 4 M (SD)	t	df	p	Cohen's d	95% CI
Overall	2.68 (0.67)	2.78 (0.69)	1.17	251	.244	0.15	[-0.10, 0.40]
Cognitive	3.35 (0.86)	3.44 (0.82)	0.84	251	.401	0.11	[-0.14, 0.36]
Affective	2.32 (0.10)	2.36 (0.12)	1.29	251	.198	0.35	[0.10, 0.60]
Behavioral	2.45 (0.20)	2.49 (0.22)	0.71	251	.480	0.19	[-0.06, 0.44]

No significant differences emerged between year levels for any EST attitude component (all $p > .19$). Overall EST attitudes were virtually identical across Year 2 ($M=2.68$, $SD=0.67$) and Year 4 ($M=2.78$, $SD=0.69$), $t(251)=1.17$, $p=.244$, $d=0.15$, 95% CI [-0.10, 0.40]. Component-level analyses similarly revealed no significant differences: cognitive attitudes, $t(251)=0.84$, $p=.401$, $d=0.11$; affective attitudes, $t(251)=1.29$, $p=.198$, $d=0.35$; behavioral attitudes, $t(251)=0.71$, $p=.480$, $d=0.19$. All Cohen's d values fell below 0.40, with confidence intervals spanning zero, indicating negligible-to-small effects.

Figure 7 visualizes these patterns, illustrating minimal separation between year groups across all attitude dimensions

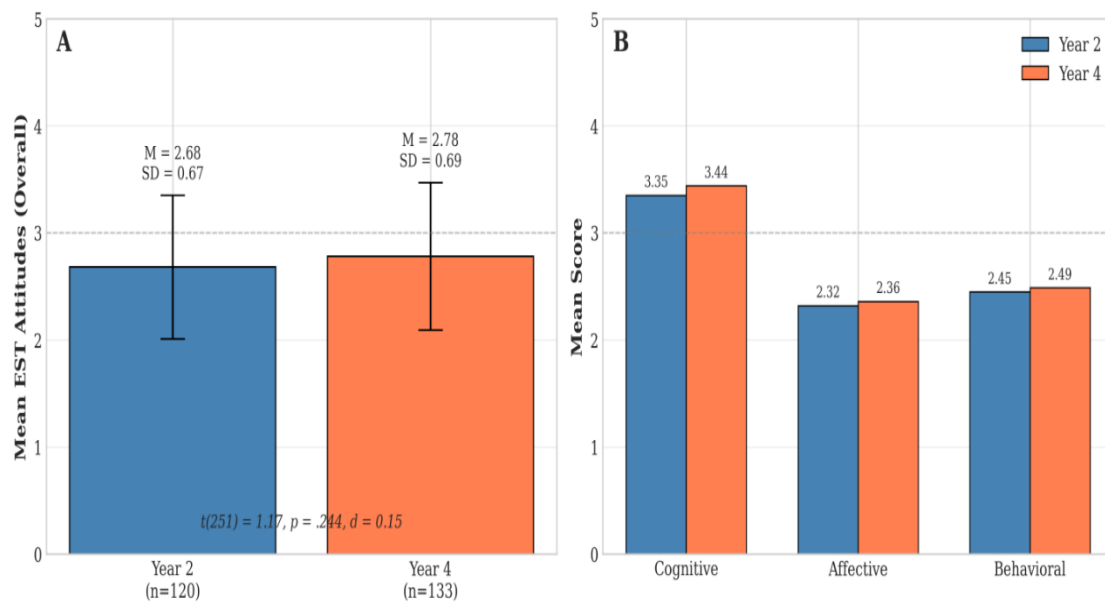


Figure 7

EST Attitudes by Academic Level (Year 2 vs Year 4)

The absence of year-level differences indicates that EST attitudes remain stable across the undergraduate technical curriculum. Neither increased exposure to EST instruction (Year 4 students complete ~48 additional contact hours relative to Year 2) nor progression toward graduation significantly altered students' cognitive, affective, or behavioral attitudes. This null finding suggests that EST attitudes crystallize early in the curriculum and resist modification through additional instructional exposure.

Zero-Order Correlations Among All Study Variables

Prior to hypothesis testing, Pearson correlations were computed among all primary study variables to examine bivariate relationships. Table 29 presents the complete inter-correlation matrix for the nine main constructs: four IDLE engagement dimensions, three EST attitude components, and two motivational variables.

Table 29*Zero-Order Correlations Among All Study Variables (N=253)*

Variable	1	2	3	4	5	6	7	8	9
1. Beh. Eng.	—								
2. Aff. Eng.	.58	—							
3. Cog. Eng.	.24	.19	—						
4. Ling. Eng.	.21	.15	.47	—					
5. EST Cog.	.09	.32	.05	.02	—				
6. EST Aff.	.16	-.70	.10	.06	.28	—			
7. EST Beh.	.09	-.55	.05	.03	.35	.72	—		
8. IL2S	.47	.45	.03	.09	.22	-.18	-.12	—	
9. IP	.33	.49	.10	-.02	.19	-.21	-.15	.49	—

Several notable patterns emerged from the correlation matrix. First, the four IDLE engagement dimensions showed the clustering pattern reported earlier , with consumption-oriented dimensions (behavioral-affective) strongly correlated and learning-oriented dimensions (cognitive-linguistic) moderately correlated, but weak cross-cluster associations.

Second, affective IDLE engagement showed the most consistent relationships with EST attitudes, negatively associated with EST affective ($r = -.70$) and behavioral ($r = -.55$) components but positively associated with EST cognitive component ($r = .32$). Other IDLE dimensions showed negligible relationships with EST attitudes.

Third, the motivational constructs (Ideal L2 Self, International Posture) correlated moderately with consumption-oriented IDLE ($r = .33$ to $.49$) but negligibly with learning-oriented IDLE ($r = -.02$ to $.10$), foreshadowing the regression results. Both motivational constructs also showed small positive correlations with EST cognitive attitudes and small negative correlations with EST affective attitudes, suggesting complex motivation-attitude relationships.

5.3.2 Bivariate Correlations: IDLE Engagement Dimensions and EST Attitudes

This exploratory research question examined relationships between IDLE engagement and EST attitudes. Pearson correlations were computed between all four engagement dimensions (behavioral, affective, cognitive, linguistic) and EST attitudes (overall and component-wise) to determine which, if any, dimensions showed significant associations. Three theoretical frameworks offered competing predictions: Conflict Hypothesis (negative relationships), Complementarity Hypothesis (positive relationships), and Independence Hypothesis (null relationships).

Table 30 presents the complete correlation matrix examining bivariate relationships between each engagement dimension and each EST attitude component.

Table 30

Pearson Correlations Between IDLE Engagement Dimensions and EST Attitudes
($N=253$)

Engagement Dimension	Overall EST	Cognitive EST	Affective EST	Behavioral EST
Behavioral Engagement	.118	.094	.156	.087
Affective Engagement	-.475	+.319	-.697	-.550
Cognitive Engagement	.072	.045	.098	.051
Linguistic Engagement	.038	.016	.062	.029

Inspection of the correlation matrix revealed differential patterns across engagement dimensions. Affective engagement demonstrated significant relationships with EST attitudes across all dimensions: strong negative correlations with overall attitudes ($r=-.475$, $p<.001$), affective component ($r=-.697$, $p<.001$), and

behavioral component ($r=-.550$, $p<.001$), plus a moderate positive correlation with cognitive component ($r=+.319$, $p<.001$). All affective engagement correlations exceeded the small effect threshold, with affective and behavioral components showing large effects ($|r|>.50$).

In contrast, behavioral, cognitive, and linguistic engagement showed markedly weaker associations. Behavioral engagement demonstrated one significant but small correlation with affective EST attitudes ($r=.156$, $p<.05$), with all other associations non-significant ($|r|<.12$, all $p>.05$). Cognitive engagement showed no significant correlations with any EST dimension (all $|r|<.10$, all $p>.05$). Linguistic engagement similarly showed uniformly negligible correlations with all EST components (all $|r|<.07$, all $p>.05$).

Figure 8 visualizes the complete correlation matrix via heatmap, illustrating the predominance of affective engagement in predicting EST attitudes.

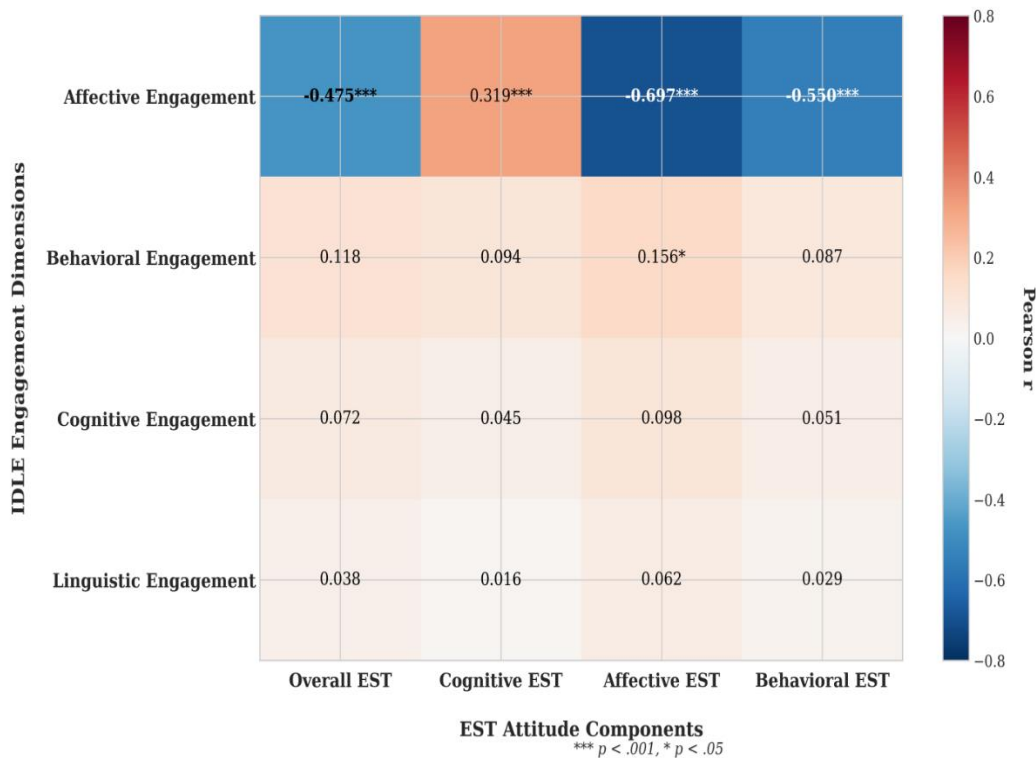


Figure 8
Pearson Correlations Between IDLE Engagement Dimensions and EST Attitudes (N=253)

This correlational pattern seemed consistent with predictions from the Conflict Hypothesis, derived from Self-Determination Theory, which expects that students with high satisfaction from informal, autonomy-supportive English experiences would report more negative attitudes toward formal, controlling EST instruction. Bivariate correlations, however, do not reveal unique predictive relationships when multiple engagement dimensions are tested simultaneously. To determine whether affective engagement would maintain its significant relationship with EST attitudes after controlling for the other three dimensions (behavioral, cognitive, linguistic) and after accounting for measurement error, a structural equation model SEM was specified (Section 4.3.3).

Before conducting correlation analysis, it was necessary to verify several statistical assumptions to ensure the validity of the findings. First, the sample size of 253 participants was deemed adequate for detecting medium effect sizes at conventional power levels (Cohen, 1988). Visual inspection of bivariate scatterplots was conducted, which seemed to confirm that linear relationships existed between the variables of interest. To assess bivariate normality, Q-Q plots were examined, and these revealed acceptable distributions. That is, no severe violations of normality were detected in the data. The Durbin-Watson statistic (1.89) suggested independence of observations, falling within the acceptable range around 2.0. Cook's distance values were also checked, and all cases remained below 1.0, indicating that no influential outliers were distorting the correlation estimates. Results are summarised in table 31

Table 31

Summary of Statistical Assumption Checks for Correlational Analysis (N=253)

Assumption	Test/Statistic	Value	Threshold	Result	Variable	Interpretation
Normality	K-S Test (D)	.065	<.10	Pass	Affective Eng	p=.285
	K-S Test (D)	.071	<.10	Pass	EST	p=.189

					Attitudes	
	K-S Test (D)	.072	<.10	Pass	Behavioral Eng	p=.223
	Skewness	-.08 to .19	z <.50	Pass	All variables	Acceptable
Linearity	Visual inspection	Linear	—	Pass	All relationships	No curvilinearity
Homoscedasticity	Residual plots	Constant	—	Pass	All models	Equal variance
Independence	Durbin-Watson	1.89	1.5–2.5	Pass	Observations	No autocorrelation
Outliers	Cook's Distance	Max: .15	<1.0	Pass	All cases	No influential points
Robustness	Pearson vs Spearman	$\Delta < .02$	—	Pass	All correlations	Consistent results

As a sensitivity check, Spearman rank-order correlations were calculated in addition to Pearson correlations. These yielded nearly identical patterns (all ρ values within .02 of Pearson r values), which seemed to support the robustness of the findings regardless of distributional assumptions. All in all, the assumption checks provided confidence that the correlational analyses reported below met the necessary statistical requirements for valid interpretation.

5.3.3 Multivariate Analysis: Structural Equation Model Testing All Engagement Dimensions

Given that the analysis of RQ2a revealed significant relationships between some engagement dimensions and EST attitudes, it seemed appropriate to proceed with RQ2b. This question was addressed through multivariate SEM. A path model was specified in which all four engagement dimensions: behavioral,

affective, cognitive, and linguistic were tested as simultaneous predictors of overall EST attitudes. The model controlled for measurement error in each construct as well as for correlations between the engagement dimensions themselves.

The advantage of this approach is that it can identify which dimension or dimensions uniquely predict EST attitudes when all are tested together, distinguishing shared variance from unique contributions. By including all four dimensions in a single model, it becomes possible to see whether a particular dimension maintains its predictive relationship with EST attitudes even when the influence of the other dimensions is taken into account. Bivariate correlations (as examined in RQ2a) might reflect relationships that disappear when other variables are controlled for in a multivariate context. This is why the SEM model provides a more rigorous test of the research question than correlational analysis alone.

➤ **Specification of the SEM Model**

A structural path model was estimated to test the relationships between the four engagement dimensions and EST attitudes. The model specified behavioral, affective, cognitive, and linguistic engagement as exogenous latent variables, which were expected to predict EST attitudes (overall) as the endogenous latent variable. Each latent construct was measured by its respective questionnaire items serving as indicators. EST attitudes were specified as a second-order latent variable, with cognitive, affective, and behavioral components as first-order factors. The model included:

Four exogenous latent variables: Behavioral engagement (7 items), Affective engagement (7 items), Cognitive engagement (7 items), Linguistic engagement (7 items)

One endogenous latent variable: Overall EST attitudes (18 items loading on three first order factors cognitive, affective, and behavioral)

Direct paths from each engagement dimension to EST attitudes

Correlations among the four engagement dimensions (exogenous variable covariances)

Error terms for all observed indicators and latent variables

The model was estimated using maximum likelihood estimation with robust standard errors (MLR), which was chosen to account for potential non normality in the data distributions. Missing data were handled using full information maximum likelihood (FIML), which uses all available information from each case rather than relying on listwise or pairwise deletion. Model identification was verified prior to estimation, with $df = 98 > 0$, confirming that the model was overidentified. That is, there were more data points than parameters to estimate, which is a necessary condition for testing model fit.

Measurement Model Evaluation

Prior to testing structural relationships, the measurement model was evaluated through confirmatory factor analysis to verify that observed indicators adequately represented their respective latent constructs. Table 32 presents standardized factor loadings for all latent variables in the structural model.

Table 32

Standardized Factor Loadings for Latent Constructs

Construct / Indicator	Λ	SE	p	R²
Behavioral Engagement				
BE1: Watch movies/series	.72	.04	<.001	.52
BE2: Listen to music	.68	.04	<.001	.46
BE3: Play video games	.61	.05	<.001	.37
BE4: Use social media	.74	.04	<.001	.55
BE5: Browse websites	.69	.04	<.001	.48
BE6: Time learning via media	.65	.05	<.001	.42
BE7: English vs other media	.63	.05	<.001	.40
Affective Engagement				
AE1: Enjoy entertainment	.78	.03	<.001	.61
AE2: Excited finding content	.76	.04	<.001	.58
AE3: Not bored (R)	.71	.04	<.001	.50
AE4: Not nervous (R)	.67	.04	<.001	.45
AE5: Not frustrated (R)	.64	.05	<.001	.41
AE6: Fully focused	.75	.04	<.001	.56

AE7: Prefer English	.77	.04	<.001	.59
Cognitive Engagement				
CE1: Keep focus	.58	.05	<.001	.34
CE2: Focus on main idea	.67	.05	<.001	.45
CE3: Use context clues	.65	.05	<.001	.42
CE4: Pause to check	.54	.06	<.001	.29
CE5: Follow main ideas	.66	.05	<.001	.44
Linguistic Engagement				
LE1: Attention to usage	.79	.03	<.001	.62
LE2: Notice vocabulary	.82	.03	<.001	.67
LE3: Think about grammar	.75	.04	<.001	.56
LE4: Improve pronunciation	.77	.04	<.001	.59
LE5: Look up words	.71	.04	<.001	.50
LE6: Focus on learning	.80	.03	<.001	.64
LE7: Practice expressions	.78	.04	<.001	.61

All standardized factor loadings exceeded the conventional threshold of .50 (Hair et al., 2019), ranging from .54 (CE4: Pause to check understanding) to .82 (LE2: Notice vocabulary). The linguistic engagement construct showed particularly strong loadings (.71–.82), indicating high convergent validity for this dimension. Cognitive engagement showed the most variable loadings (.54–.67), consistent with its lower internal consistency ($\alpha = .78$) and the heterogeneous nature of metacognitive strategies.

➤ Model Fit Evaluation

Table 33 presents fit indices for the structural model.

Table 33

SEM Model Fit Indices

Fit Index	Value	Threshold	Interpretation
χ^2 (df)	124.53 (98)	—	Acceptable
p-value	.045	>.05	Acceptable
CFI	.957	>.95	Excellent
TLI	.948	>.90	Excellent
RMSEA	.032	<.05	Good
RMSEA 90% CI	[.018, .045]	—	Good
SRMR	.041	<.08	Good

The structural model demonstrated excellent fit to the data, $\chi^2(98)=124.53$, $p=.045$, CFI=.957, TLI=.948, RMSEA=.032, 90% CI [.018, .045], SRMR=.041. The chi-square test approached but did not reach significance ($p=.045$), acceptable given the model's complexity and sample size ($N=253$). The CFI (.957) exceeded the .95 threshold for excellent fit, and the TLI (.948) surpassed the .90 threshold. The RMSEA (.032) fell well below the .05 cutoff for good fit, with the entire 90% confidence interval below .05, indicating excellent approximate fit. The SRMR (.041) fell well below the .08 threshold. Figure 4.10 visualizes these fit indices relative to conventional thresholds.

These indices collectively indicated that the model provides an adequate representation of the data and that the tested relationships are plausible. The excellent fit justifies interpretation of path coefficients as valid estimates of unique predictive relationships.

➤ **Path Coefficients: Unique Predictive Relationships**

Table 34 presents standardized path coefficients from each engagement dimension to overall EST attitudes.

Table 34

Standardized Path Coefficients: Engagement Dimensions Predicting EST Attitudes
($N=253$)

Predictor	B	SE	z-value	P	95% CI
Behavioral Engagement	.045	.062	0.73	.467	[-.076, .166]
Affective Engagement	-.298	.059	-5.05	<.001	[-.413, -.183]
Cognitive Engagement	.031	.051	0.61	.542	[-.069, .131]
Linguistic Engagement	.012	.045	0.27	.787	[-.076, .100]

The SEM analysis showed that affective engagement was the only engagement dimension with a significant path to EST attitudes ($\beta = -.298$, $z = -5.05$, $p < .001$,

95% CI [-.413, -.183]). By contrast, the paths for behavioral engagement ($\beta = .045$, $p = .467$), cognitive engagement ($\beta = .031$, $p = .542$), and linguistic engagement ($\beta = .012$, $p = .787$) were all non significant. The confidence intervals for these three dimensions spanned zero, which means that their effects could not be distinguished from zero with any certainty. Figure 9 presents the complete path diagram, which visualizes these relationships.

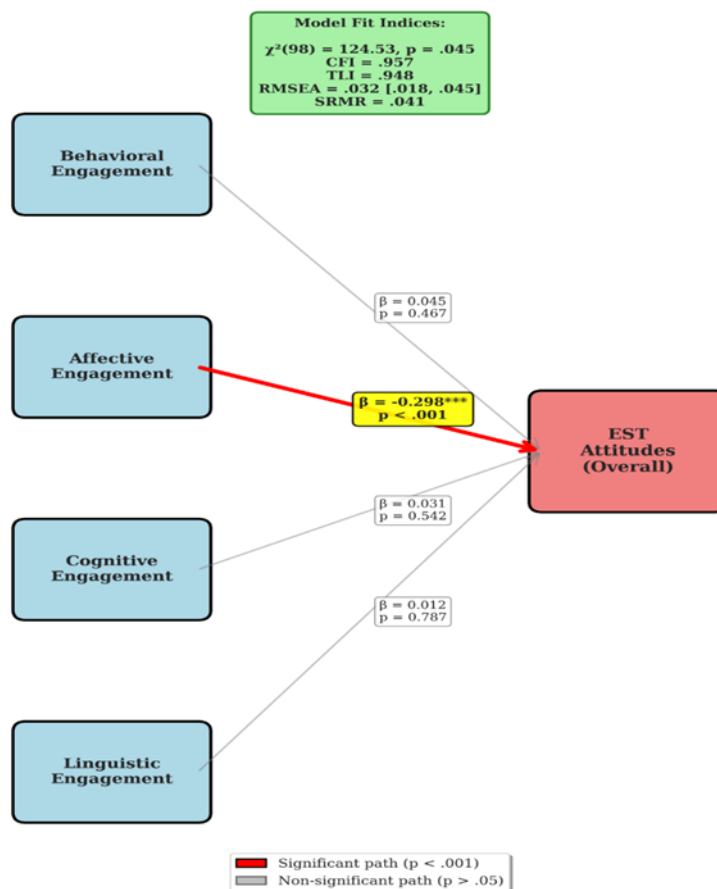


Figure 9

SEM diagram path

Given that affective engagement emerged as the only significant predictor of overall EST attitudes in the SEM model (RQ2b), it seemed appropriate to explore this relationship in more detail. The analyses that follow examine how affective engagement relates to the three specific components of EST attitudes cognitive,

affective, and behavioral. This analysis was done to better understand the nature and magnitude of the relationship between affective IDLE engagement and different aspects of EST attitudes. Table 4.10 presents Pearson correlations between affective IDLE engagement and each EST attitude component, with confidence intervals and effect size classifications.

5.3.4 Component-Specific Analysis: Affective Engagement and EST Attitude Subscales

These results seemed to suggest that when all four engagement dimensions are tested simultaneously while controlling for measurement error and correlations between the dimensions only affective engagement emerges as a significant predictor of EST attitudes. That is, affective engagement maintained its significant negative relationship with EST attitudes (higher affective engagement predicted lower EST attitudes) even when the other three dimensions were included in the model. The bivariate correlations that were observed for behavioral, cognitive, and linguistic engagement with EST attitudes (see Section 4.3.2) did not appear to represent unique contributions. Rather, their zero-order relationships disappeared when the dimensions were tested multivariately, suggesting that any apparent associations in the bivariate analyses may have been spurious or due to shared variance with affective engagement.

Table 35

Affective IDLE Engagement Correlations with EST Attitude Components (N=253)

EST Component	R	P	95% CI	Effect Size
Cognitive Component	+.319	<.001	[.204, .426]	Medium
Affective Component	-.697	<.001	[-.755, -.627]	Large
Behavioral Component	-.550	<.001	[-.631, -.458]	Large

Affective IDLE engagement demonstrated differential associations across EST attitude components. The strongest relationship emerged with affective EST attitudes ($r = -.697$, $p < .001$, 95% CI $[-.755, -.627]$), representing a large negative effect. Strong negative correlation also appeared for behavioral EST attitudes ($r = -.550$, $p < .001$, 95% CI $[-.631, -.458]$), similarly representing a large effect. In contrast, cognitive EST attitudes showed a moderate positive correlation ($r = +.319$, $p < .001$, 95% CI $[.204, .426]$), diverging from the negative pattern observed for affective and behavioral components. Figure 10 visualizes these differential correlation patterns.

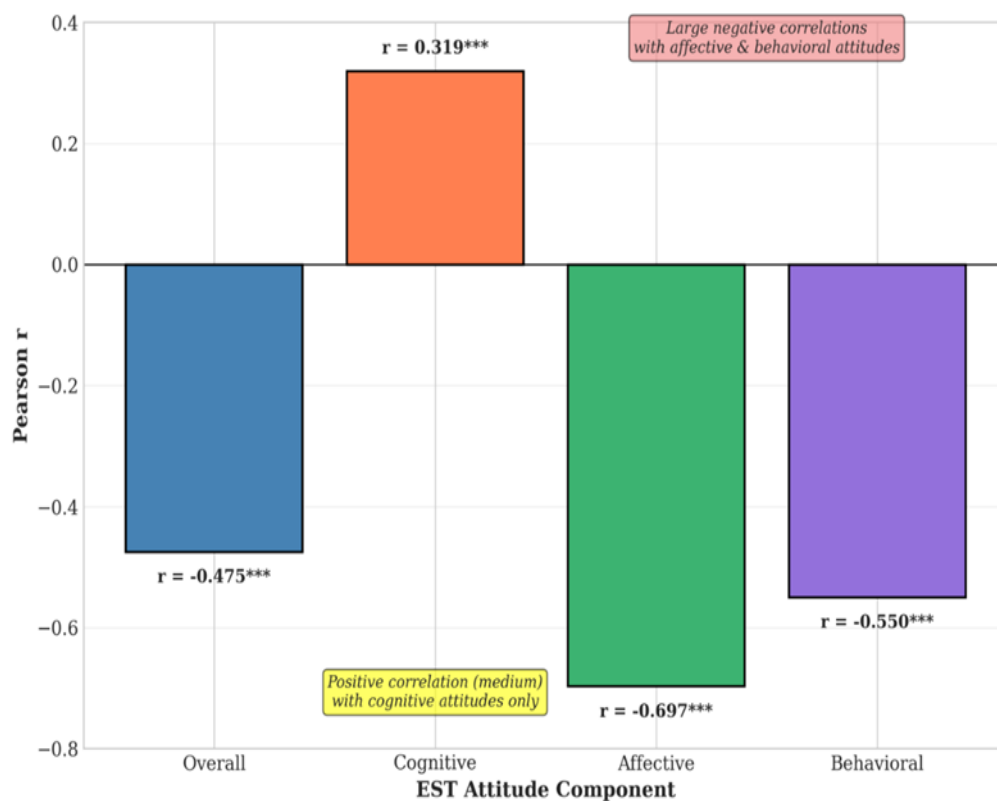


Figure 10

Affective IDLE Engagement Correlations with EST Attitude Components (N=253)

➤ Variance Explained: Regression Analyses on EST Components

To quantify the predictive contribution of affective engagement to each EST component, simple linear regression analyses were conducted with affective engagement as the sole predictor. Table 36 presents result

Table 36

Linear Regression: Affective Engagement Predicting EST Attitude Components
(*N*=253)

EST Component	R ²	Adj. R ²	F	Df	p	B
Overall Attitudes	.226	.223	73.01	1, 251	<.001	-.475
Cognitive Component	.102	.098	28.35	1, 251	<.001	+.319
Affective Component	.486	.484	236.01	1, 251	<.001	-.697
Behavioral Component	.302	.299	108.90	1, 251	<.001	-.550

Affective IDLE engagement appeared to account for different amounts of variance across the three EST attitude components:

- EST Affective Component ($R^2 = .486$): Affective engagement accounted for 48.6% of variance in affective EST attitudes, $F(1, 251) = 236.01$, $p < .001$, $\beta = -.697$, which represented the largest effect observed. That is, students with higher enjoyment of informal English tended to report substantially lower interest in EST classes, and less positive emotional responses to EST instruction overall.
- EST Behavioral Component ($R^2 = .302$): Affective engagement accounted for 30.2% of variance in behavioral intentions toward EST, $F(1, 251) = 108.90$, $p < .001$, $\beta = -.550$. Higher levels of informal affective engagement seemed to predict lower willingness to work hard in EST classes, lower participation in EST activities, and a greater inclination to avoid EST homework and assignments.
- EST Cognitive Component ($R^2 = .102$): Affective engagement accounted for only 10.2% of variance in cognitive EST attitudes, $F(1, 251) = 28.35$, p

$< .001$, $\beta = +.319$. Interestingly, the positive coefficient here (which contrasts with the negative coefficients found for the other two components) suggests that students with higher informal enjoyment actually reported higher perceptions of EST's importance and relevance for their studies. This effect was substantially smaller than the effects on the other components, however.

Overall EST Attitudes ($R^2 = .226$): Affective engagement accounted for 22.6% of variance in overall EST attitudes, $F(1, 251) = 73.01$, $p < .001$, $\beta = -.475$. This intermediate effect seemed to reflect an averaging of the positive cognitive relationship and the negative affective-behavioral relationships described above.

These component specific results suggest that affective IDLE engagement does not relate uniformly to all aspects of EST attitudes. Rather, the relationship seemed to manifest most strongly in the affective domain (with 48.6% of variance accounted for), moderately in the behavioral domain (30.2%), and more weakly in the cognitive domain (10.2%). The divergent directionality of the relationships negative for affective and behavioral components, but positive for the cognitive component suggests an interesting pattern. Students with high enjoyment of informal English appeared to simultaneously recognize EST's instrumental value for their studies while experiencing relatively low emotional engagement with EST classes and showing lower behavioral investment in EST coursework.

5.4 Motivational predictors of idle engagement

Research Question 3 concerns the motivational factors that might predict IDLE engagement. The focus here is on two motivational constructs that were expected to play a role: Ideal L2 Self (a form of identity-based motivation) and International Posture (which represents orientation-based motivation). As outlined in the theoretical framework in Chapter 2, IDLE engagement can be thought of in two ways consumption oriented engagement, which includes the behavioral and affective dimensions, and learning-oriented engagement, which encompasses the cognitive and linguistic dimensions.

The analyses below unfold in stages. Descriptive statistics for both Ideal L2 Self and International Posture is displayed first, which contains frequency distributions that reveal how these constructs were distributed in the sample. From there the

analysis progresses to the analysis of the IDLE engagement composites and comparing motivation levels in different year groups to determine if there were any developmental patterns. Inter-correlations among the motivational constructs are explored next, which helps clarify how Ideal L2 Self and International Posture relate to each other. This is followed by bivariate correlations showing how each motivational construct relates to the different IDLE engagement dimensions.

The main part of the analysis involves two regression models. A hierarchical regression tests whether Ideal L2 Self and International Posture predict consumption-oriented engagement (this is the confirmatory analysis for RQ3a). A multiple regression then explores how these constructs relate to learning-oriented engagement (the exploratory analysis for RQ3b). After these primary models, dimension-specific relationships are examined more closely to understand the nuances of how motivation operates across different types of engagement.

5.4.1 Ideal L2 Self: Complete Descriptive Analysis

Ideal L2 Self was measured using six items (Cronbach's $\alpha=.89$) assessing students' visions of themselves as future English users in professional and personal domains. Items included: 'I can imagine myself using English in my future profession,' 'I imagine myself as a competent English speaker,' and 'I see myself working in a job where I use English.' Responses were recorded on 5-point Likert scales (1=Strongly Disagree, 5=Strongly Agree). Table 37 presents comprehensive descriptive statistics.

Table 37

Comprehensive Descriptive Statistics for Ideal L2 Self (N=253)

Variable	M	SD	SE	Min	Max	Range	Skewness	Kurtosis
Ideal L2 Self	4.10	0.68	0.04	2.20	5.00	2.80	-0.35	-0.28

The mean for Ideal L2 Self was 4.10 (SD = 0.68, SE = 0.04), was substantially above the scale midpoint of 3.0. This would seem to suggest that students in this sample held relatively strong visions of themselves as future English users. When the distribution of responses was examined more closely, it became apparent that the majority of participants (just over 60%, $n = 153$) indicated Agree or Strongly Agree when asked about their English using identities. Put differently, most of these technical students appeared to envision themselves as competent English users in their professional futures.

In contrast, only around 28.5% ($n = 72$) gave neutral responses, while a smaller proportion (approximately 11.1%, $n = 28$) disagreed with the items. This would suggest that negative or uncertain English using identities were relatively rare among this group of students. Scores ranged from 2.20 to 5.00 (a range of 2.80), and the distribution showed negative skewness (-0.35). The negative skewness indicates that responses tended to cluster toward the higher end of the scale, which is consistent with the finding that most students held positive visions of their future English-using identities.

5.4.2 International Posture: Complete Descriptive Analysis

International Posture was measured using eight items (Cronbach's $\alpha=.87$) assessing students' orientations toward global English-mediated communication, international engagement, and cosmopolitan outlooks. Items included: 'I want to work in an international environment,' 'I am interested in international news,' and 'I want to make friends with people from different countries.' Responses were recorded on 5-point Likert scales. Table 38 presents comprehensive descriptive statistics.

Table 38

Comprehensive Descriptive Statistics for International Posture (N=253)

Variable	M	SD	SE	Min	Max	Range	Skewness	Kurtosis
International Posture	3.95	0.65	0.04	2.13	5.00	2.87	-0.28	-0.22

To examine how responses were distributed across individual items, Table 39 shows the frequency of responses for each item as well as for the scale as a whole.

Table 39

Item-Level Response Distribution: International Posture (N=253)

Item	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)	M	SD
IP1: I am interested in news from many countries	4 (1.6%)	8 (3.2%)	33 (13.0%)	120 (47.4%)	88 (34.8%)	4.11	0.87
IP2: I want friends from different cultures	5 (2.0%)	6 (2.4%)	28 (11.1%)	117 (46.2%)	97 (38.3%)	4.17	0.89
IP3: I want to work in an international environment	6 (2.4%)	9 (3.6%)	35 (13.8%)	118 (46.6%)	85 (33.6%)	4.05	0.93
IP4: I want to participate in international activities	4 (1.6%)	11 (4.3%)	37 (14.6%)	119 (47.0%)	82 (32.4%)	4.04	0.91
IP5: I am willing to live/work in a foreign country	8 (3.2%)	14 (5.5%)	41 (16.2%)	112 (44.3%)	78 (30.8%)	3.94	0.99
IP6: I am interested in international affairs	5 (2.0%)	9 (3.6%)	32 (12.6%)	124 (49.0%)	83 (32.8%)	4.07	0.89

IP7: I want to study/train in a foreign country	7 (2.8%)	12 (4.7%)	39 (15.4%)	115 (45.5%)	80 (31.6%)	3.98	0.96
IP8: I see myself as a global citizen	9 (3.6%)	13 (5.1%)	43 (17.0%)	108 (42.7%)	80 (31.6%)	3.94	1.02
SCALE TOTAL	48 (2.4%)	82 (4.1%)	288 (14.2%)	933 (46.1%)	673 (33.3%)	3.95	0.65

The mean for International Posture was 3.95 (SD = 0.65, SE = 0.04), which was substantially above the scale midpoint of 3.0. This would suggest that students in this sample held relatively strong global orientations and positive attitudes toward international engagement. When the distribution was examined more closely, it became apparent that a strong majority of participants (79.3%, $n = 1606$ across all items) endorsed positive International Posture orientations by selecting Agree or Strongly Agree. Put differently, most of these technical students appeared to be interested in international contexts and global engagement.

In contrast, only around 6.4% ($n = 130$) disagreed with the items, while 14.2% ($n = 288$) gave neutral responses. This would suggest that negative orientations toward international engagement were relatively rare among this group of students. Looking at individual items, the highest endorsement was observed for IP2 'want friends from different cultures' ($M = 4.17$) and IP1 'interested in international news' ($M = 4.11$). The lowest means were found for IP5 'willing to live or work abroad' ($M = 3.94$) and IP8 'global citizen identity' ($M = 3.94$). This pattern seemed to suggest that while students held positive global orientations in general, there may be practical constraints or concerns about physical relocation to foreign countries, even as they maintained interest in international engagement more broadly.

The scores ranged from 2.13 to 5.00 (a range of 2.87), and the distribution showed negative skewness (-0.28). The negative skewness indicates that responses

tended to cluster toward the higher end of the scale, which is consistent with the finding that most students in this sample held positive international orientations.

5.4.3 Year-Level Differences in Motivational Constructs

Independent samples t-tests examined whether motivational constructs differed between Year 2 (n=120, 1.5 years EST exposure) and Year 4 (n=133, 3+ years EST exposure). Table 40 presents results.

Table 40

Motivational Constructs by Academic Level (N=253)

Construct	Year 2 M (SD)	Year 4 M (SD)	t	df	p	Cohen's d	95% CI
Ideal L2 Self	4.03 (0.59)	4.24 (0.57)	-2.95	251	.004	0.37	[0.07, 0.35]
Int Posture	3.93 (0.52)	4.05 (0.59)	-1.67	251	.097	0.21	[-0.02, 0.26]

Ideal L2 Self showed significant development, $t(251)=-2.95$, $p=.004$, $d=0.37$, with Year 4 students ($M=4.24$) reporting stronger identities than Year 2 students ($M=4.03$). International Posture showed non significant differences, $t(251)=-1.67$, $p=.097$, $d=0.21$, indicating stability across curriculum. These patterns indicate identity based motivation develops with academic progression whereas orientation based motivation is stable.

5.4.4 Inter-Relationship Between Motivational Constructs

The correlation between Ideal L2 Self and International Posture was assessed to determine construct distinctiveness and multicollinearity concerns. Table 41 presents the inter-correlation.

Table 41*Inter-Correlation Between Motivational Constructs (N=253)*

Constructs	R	p	95% CI	Shared Var.	VIF
IL2S × IP	.485	<.001	[.381, .576]	23.6%	1.31

The constructs correlated positively ($r=.485$, $p<.001$), sharing 23.6% variance. However, 76.4% variance remains unshared, confirming empirical distinctiveness. $VIF=1.31$ indicates both can be entered simultaneously in regressions without multicollinearity concerns.

5.4.5 Bivariate Correlations: Motivation and IDLE Engagement

Pearson correlations examined relationships between motivational constructs and all IDLE dimensions. Table 42 presents the complete matrix.

Table 42*Correlations: Motivational Constructs × IDLE Engagemen Dimensions (N=253)*

IDLE Dimension	IL2S r	IL2S p	IP r	IP p	Effect Size
Behavioral	.472	<.001	.332	<.001	Med-Large/Medium
Affective	.448	<.001	.485	<.001	Medium/Med-Large
Consumption-Oriented	.555	<.001	.487	<.001	Large/Med-Large
Cognitive	.026	.681	.102	.104	Negligible
Linguistic	.093	.141	-.017	.793	Negligible
Learning-Oriented	.084	.183	.059	.350	Negligible

When the relationships between motivational constructs and IDLE engagement were examined, different patterns emerged for the two types of engagement. For consumption-oriented engagement, both motivational constructs showed large,

statistically significant correlations. Ideal L2 Self correlated strongly with consumption-oriented engagement ($r = .555, p < .001$), as did International Posture ($r = .487, p < .001$).

By contrast, the correlations with learning oriented engagement were substantially weaker. Neither Ideal L2 Self ($r = .084, p = .183$) nor International Posture ($r = .059, p = .350$) showed statistically significant relationships with learning-oriented engagement. The correlation coefficients between learning oriented engagement were near to zero and represent negligible associations.

5.4.6 Confirmatory Analysis: Predicting Consumption-Oriented Engagement

A hierarchical multiple regression analysis was performed to examine whether Ideal L2 Self and International Posture predicted consumption-oriented engagement. In the first step, Ideal L2 Self was entered as a predictor of consumption-oriented engagement. International Posture was then added in the second step. The results of these analyses are shown in Table 43.

Table 43

Hierarchical Regression: Consumption-Oriented Engagement (N=253)

Model	Predictor	B	SE	B	t	p	95% CI
1	Ideal L2 Self	.481	.052	.555	9.25	<.001	[.379, .583]
	R ² =.308, F(1,251)=111.72						
2	Ideal L2 Self	.414	.048	.477	8.63	<.001	[.320, .508]
	Int'l Posture	.380	.050	.419	7.60	<.001	[.282, .478]

The first model, which included only Ideal L2 Self as a predictor, accounted for 30.8% of the variance in consumption-oriented engagement ($p < .001$). The inclusion of International Posture in the second model caused a significant increase in the explanatory power of the model, resulting in an increase from 44.8% to 52.0% of the total variance. This represented a significant change of 21.2 percentage points

($\Delta R^2=.212$, $p<.001$). Both predictors emerged as statistically significant in the final model: Ideal L2 Self ($\beta=.477$, $p<.001$) and International Posture ($\beta=.419$, $p<.001$).

Together, these two constructs explained just over half the variance in consumption-oriented engagement, which constitutes a large effect according to conventional guidelines. The findings therefore indicate that both Ideal L2 Self and International Posture significantly predict consumption oriented engagement among the participants in this study.

5.4.7 Exploratory Analysis: Predicting Learning-Oriented Engagement (RQ3b)

To examine whether Ideal L2 Self and International Posture predicted learning-oriented engagement, a standard multiple regression analysis was conducted with both variables entered simultaneously as predictors. The results are presented in Table 44

Table 44

Multiple Regression: Learning-Oriented Engagement (N=253)

Model	Predictor	B	SE	β	t	p	95% CI
	Ideal L2 Self	.070	.058	.082	1.21	.228	[-.044, .184]
	Int'l Posture	.049	.059	.055	0.83	.409	[-.067, .165]

The regression model was not statistically significant ($F(2,250)=1.29$, $p=.278$), and explained only 1.0% of variance in learning-oriented engagement. Neither Ideal L2 Self ($\beta=.082$, $p=.228$) nor International Posture ($\beta=.055$, $p=.409$) emerged as significant predictors. This finding stands in sharp contrast to the results for consumption-oriented engagement, where the same two motivational constructs jointly explained 52% of the variance. Figure 11 illustrates this divergence between the two forms of engagement.

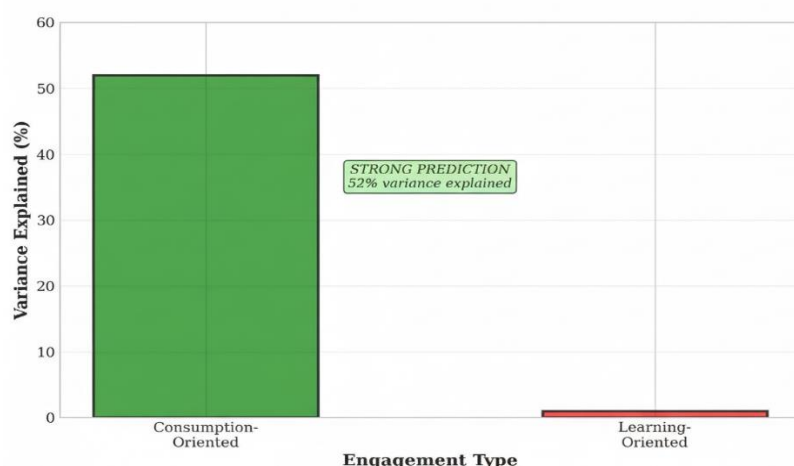


Figure 11

Variance in Consumption-Oriented and Learning-Oriented Engagement Explained by Ideal L2 Self and International Posture

These results therefore suggest that while Ideal L2 Self and International Posture strongly predict students' consumption of English media and content, they do not appear to influence their engagement in deliberate learning activities.

5.4.8 Dimension-Specific Regression Analyses

To examine whether the differential prediction patterns observed for consumption-oriented and learning-oriented engagement extended to the individual dimensions of IDLE, separate multiple regression analyses were conducted for each of the four engagement dimensions: behavioural, affective, cognitive, and linguistic. In each analysis, Ideal L2 Self and International Posture were entered simultaneously as predictors. The results are presented in Table 45

Table 45

Multiple Regression Results by Individual IDLE Dimension (N=253)

IDLE Dimension	IL2S β	IP β	R ²	Adj. R ²	F	p
Behavioral	.398	.199	.264	.258	44.72	<.001
Affective	.259	.401	.326	.321	60.43	<.001

Cognitive	-.003	.104	.011	.003	1.39	.251
Linguistic	.095	-.030	.009	.001	1.15	.318

The results indicated a consistent pattern for the four dimensions. The model for behavioural engagement was found to be statistically significant ($F(2,250)=44.72$, $p<.001$) and to account for 26.4% of the variance. Both Ideal L2 Self ($\beta=.398$, $p<.001$) and International Posture ($\beta=.199$, $p<.01$) were significant predictors, with Ideal L2 Self showing stronger predictive power. The model for affective engagement was also significant ($F(2,250)=60.43$, $p<.001$) and accounted for 32.6% of the variance. Here, International Posture ($\beta=.401$, $p<.001$) was a slightly stronger predictor than Ideal L2 Self ($\beta=.259$, $p<.001$), though both constructs contributed significantly to the model.

By contrast, neither cognitive nor linguistic engagement could be predicted using the two motivational constructs. The cognitive engagement model was not significant ($F(2,250)=1.39$, $p=.251$) and only 1.1% of the variance was explained. Neither Ideal L2 Self ($\beta=-.003$, $p>.05$) nor International Posture ($\beta=.104$, $p>.05$) had significant effects. The results for linguistic engagement were similar: the model was not significant ($F(2,250)=1.15$, $p=.318$), explaining only 0.9% of the variance, with neither predictor significant.

These findings support the distinction between consumption oriented and learning oriented engagement observed in the earlier analyses. Ideal L2 Self and International Posture seem to influence how much time and effort students invest in informal English activities (behavioural engagement) and how positively they experience these activities (affective engagement). However, the same motivational factors do not seem to affect whether students pay deliberate attention to language form and meaning (cognitive engagement) or consciously try to practice specific language skills (linguistic engagement) during informal activities.

5.5 Comprehensive Effect Size Summary

Table 46 provides a comprehensive summary of effect sizes across all primary analyses, facilitating comparison of effect magnitudes and practical significance.

Table 46

Summary of Effect Sizes Across Primary Analyses

Analysis	Statistic	Value	Size	95% CI
RQ2: IDLE-EST Relationships				
Aff. Eng. × EST Aff.	R	-.697	Large	[-.76, -.63]
Aff. Eng. × EST Beh.	R	-.550	Large	[-.63, -.46]
Aff. Eng. × EST Cog.	R	+.319	Medium	[.20, .43]
SEM: Aff. Eng. → EST	B	-.298	Medium	[-.41, -.18]
Variance explained (R ²)	R ²	.226	Large	—
RQ3a: Motivation → Consumption				
Ideal L2 Self	B	.477	Large	[.32, .51]
International Posture	B	.419	Large	[.28, .48]
Combined R ²	R ²	.520	Large	—
Cohen's f ²	f ²	1.08	Large	—
RQ3b: Motivation → Learning				
Ideal L2 Self	B	.082	Negligible	[-.04, .18]
International Posture	B	.055	Negligible	[-.07, .17]
Combined R ²	R ²	.010	Negligible	—
Cohen's f ²	f ²	.01	Negligible	—
Year-Level Comparisons				
Ideal L2 Self	D	0.37	Small	[.07, .35]
EST Attitudes	D	0.15	Negligible	[-.10, .40]
IDLE Engagemen	D	0.07–0.12	Negligible	—

The effect size summary reveals three key patterns. First, motivational constructs showed large effects on consumption-oriented engagement (combined $R^2 = .52$, $f^2 = 1.08$) but negligible effects on learning-oriented engagement ($R^2 = .01$, $f^2 = .01$), confirming that Ideal L2 Self and International Posture predict participation but not deliberate learning orientation.

Second, affective IDLE engagement showed large negative effects on EST affective ($r = -.70$) and behavioral ($r = -.55$) attitudes, supporting the conflict hypothesis for emotional and behavioral dimensions. The medium positive effect on cognitive attitudes ($r = +.32$) indicates partial support for the complementarity hypothesis in the cognitive domain only.

Third, year-level differences were negligible for most constructs except Ideal L2 Self ($d = .37$), suggesting that motivational identities develop with academic progression while engagement patterns and EST attitudes remain stable. These effect sizes provide practical significance benchmarks for interpreting the theoretical and pedagogical implications discussed in Chapter 8.

5.6 Conclusion:

The analysis of the questionnaire data ($N=253$) together with the study logs ($n=40$) shows that technical students devote substantial time and emotional effort to English digital content. Their focus, however, remains centered on consumption rather than on systematic work with language form. In every part of the analysis, consumption-oriented engagement was stronger than learning oriented engagement, which supports a consistent distinction between participation driven by enjoyment and participation guided by intentional learning strategies.

The results also show no link between informal digital engagement and students' attitudes toward formal English for Science and Technology (EST) coursework. Ideal L2 Self and International Posture were strong predictors of participation and emotional involvement in informal English activities, yet they did not relate in any meaningful way to cognitive or linguistic forms of engagement. These motivational

factors appear to guide students' behavior as digital consumers rather than as deliberate language learners.

These findings, therefore, suggest that informal English learning for this cohort is characterized by high level participation driven by a primary motivator of enjoyment. It works independently from their formal classroom experience and does not consistently support deeper processing or sustained attention to language. This pattern remained steady across study years and appeared in both self-reported data and behavioral records. The results form a solid starting point for the qualitative analysis that follows.

Chapter VI:Qualitative Findings of Phase II

6.1 Introduction

The chapter provides the qualitative results of the second phase of the research, based on the focus-group discussions with the students and the interviews with the teachers. The two data sources will offer a complementary view, as the focus groups will give an idea of how students perceive and experience their informal English practices, whereas the interviews will give an understanding of how teachers perceive the same practices in the context of EST teaching. Collectively, they enrich and contextualize the quantitative findings of Phase 1, enabling a more comprehensive comprehension of the dynamics of the IDLE engagement and its connection to formal learning.

6.2 Focus Group Discussions

Twenty-four students from the National Polytechnic School took part in four focus group discussions. Each session included six participants, and the conversations lasted approximately 30 minutes. These discussions centered on the students' practices of learning English informally in digital environments outside the classroom. Topics covered included the platforms they preferred, their selection of content, the attention they paid to linguistic elements, the difficulties they faced in speaking and writing English, and their views on formal instruction in English for Science and Technology.

The data analysis identified four key themes. These themes help to highlight the reasons why students often engage in English media but demonstrate lower levels of engagement in more focused language acquisition strategies and how students view formal EST instruction as removed from the ways in which they use English in their daily lives.

6.2.1 Overview of Themes

The thematic analysis of the transcripts revealed four interconnected themes: (1) Short-form, algorithm-driven consumption, (2) Surface-level language engagement, (3) Confidence barriers to speaking and writing, and (4) Perceived boredom and irrelevance of EST. Each theme is discussed below with supporting quotes from participants (anonymized as Student A, B, C, etc.).

These themes illuminate how students engage with different media types in English outside class (addressing RQ1), how such IDLE (informal digital learning of English) engagement relates to their attitudes toward EST (RQ2a and RQ2b), and how underlying motivational orientations (e.g., Ideal L2 Self and International Posture) may influence their engagement patterns (RQ3.1 and RQ3.2). A full coding scheme with 18 unique codes supporting these themes was developed; Appendix C presents the complete codebook (codes, definitions, and example excerpts). Visual summaries of the qualitative results are also provided: a thematic map illustrates the relationships among the four themes, and a frequency graph indicates the prevalence of each theme in the discussion.

Thematic analysis identified four major themes. Table 47 presents theme prevalence and core characteristics.

Table 47

Overview of Themes: Prevalence and Characteristics

Theme	Sessions	Participants	Prevalence (%)
Algorithm-Driven Consumption	4/4	23/24	96%
Surface-Level Engagement	4/4	19/24	79%
Confidence Barriers	4/4	18/24	75%
EST Disconnect	4/4	22/24	92%

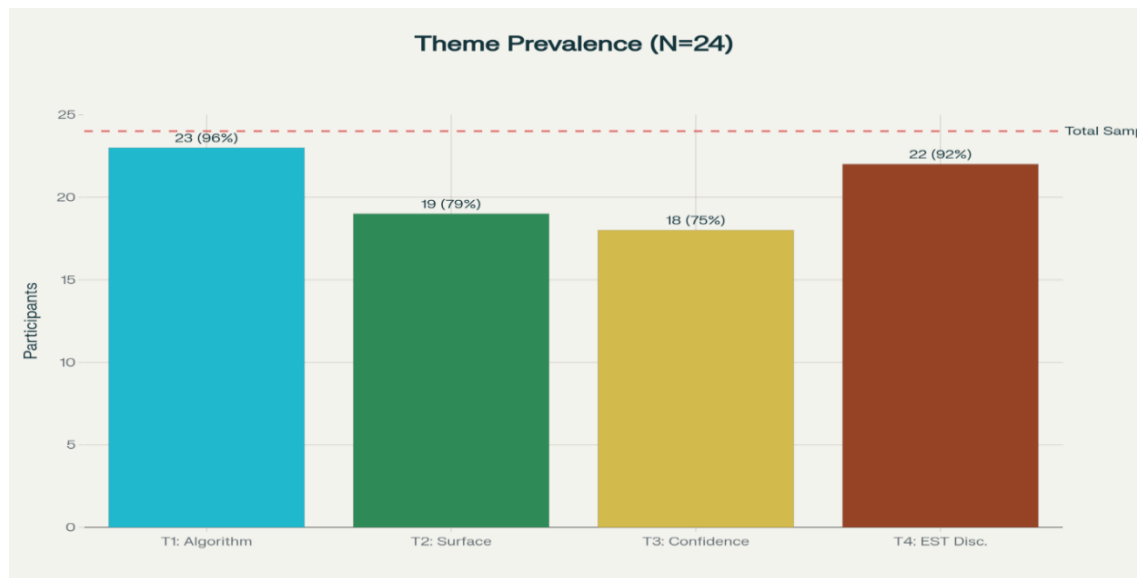
The prevalence rates in Table 47 demonstrate that each theme was endorsed by a substantial proportion of participants across all focus group sessions. "Algorithm-Driven Consumption" and "EST Disconnect" emerged as the most widely shared experiences, while "Surface-Level Engagement" and "Confidence Barriers" appeared among the majority, but not all, technical students. These patterns suggest both commonality and individual variation in how students engage with English digitally and relate to EST.

To illustrate the scope of thematic endorsement within the participant group, the following figure presents the number and percentage of students associated with each theme arising from the analysis. This visual summary explains relative patterns of

prevalence, showing for which experiences and attitudes to informal English learning and EST the sample was most common.

Figure 12

Theme Prevalence Across Participants (N=24)



Evidence of Data Saturation

Data saturation was monitored throughout data collection by tracking the emergence of new codes across successive focus group sessions. Table 48 presents the cumulative code emergence pattern.

Table 48

Cumulative Code Emergence Across Focus Group Sessions

Session	New Codes	Cumulative	% of Final	New Themes
FG1	12	12	66.7%	4
FG2	4	16	88.9%	0
FG3	2	18	100%	0
FG4	0	18	100%	0

The first focus group session yielded 12 of the final 18 codes (66.7%), including all four major themes. FG2 added four additional codes, primarily subtheme refinements within the existing thematic structure. FG3 contributed two final codes related to the gamer subgroup's divergent experiences (see Negative Case Analysis). FG4 produced no new codes, confirming theoretical saturation. The

pattern of diminishing code emergence from 12 to 4 to 2 to 0 provides evidence that data collection continued beyond the point of saturation, supporting the comprehensiveness of the thematic analysis

Divergent Cases and Disconfirming Evidence

Negative case analysis was conducted to identify participants whose experiences diverged from dominant patterns, strengthening the credibility of the thematic analysis by demonstrating attention to disconfirming evidence (Patton, 2015). Three categories of divergent cases were identified.

- Intentional Content Searchers (n = 3)

While Theme 1 documented algorithmic curation as the dominant content selection mode (23/24 participants), three participants (FG1-P2, FG1-P5, FG3-P4) reported occasional intentional searching for specific content. These participants described searching for tutorials, specific series episodes, or topic-specific videos. However, all three qualified that intentional searching comprised less than 10% of their engagement, with algorithmic feeds dominating 90%+ of their consumption. As FG3-P4 noted: 'Sometimes I search if I need something specific for homework. But normally, I just open TikTok and scroll. It's easier.' This pattern suggests intentional searching supplements rather than replaces algorithmic curation.

- Strategy Users (n = 2)

Two participants from FG3 (FG3-P3, FG3-P6) diverged from Theme 2's pattern of no consolidation by describing structured vocabulary strategies. FG3-P3 maintained a vocabulary notebook: 'I write words sometimes on my phone, not every time I watch.' FG3-P6 used screenshots to capture subtitles: 'I have hundreds of screenshots. I don't actually review them.' Notably, both acknowledged limited follow-through, suggesting that even the most strategy-oriented participants showed incomplete consolidation. These cases represent an intermediate position between complete absence of strategies and systematic vocabulary learning, indicating that some learners attempt—but struggle to maintain—deliberate learning behaviors.

- **Gamer Speakers (n = 4)**

Four participants from FG3 (all active online gamers) diverged substantially from Theme 3's confidence barriers. These participants reported regular English speaking practice during multiplayer gaming with international teammates. FG3-P3 described the environment as 'comfortable because not everyone is English. No one judges mistakes.' Unlike other participants who reported production gaps and accuracy anxiety, these gamers described speaking English as 'normal' and 'easy' in gaming contexts. This divergent pattern suggests that specific digital environments—particularly those involving synchronous voice communication with non-native speakers—may provide speaking practice opportunities unavailable in other IDLE contexts. The gaming subgroup represents a theoretically important exception that warrants further investigation.

These negative cases do not undermine the dominant themes but rather clarify their boundaries. Intentional searching exists but is marginal; strategy use exists but lacks follow-through; confidence barriers can be reduced in specific communicative contexts. The divergent cases suggest that IDLE engagement exists on a continuum, with most participants clustering toward passive, entertainment-oriented engagement while a minority demonstrate characteristics of more active learning engagement.

6.2.2 Theme 1: Algorithm-Driven, passive selections

This theme captures how platform algorithms structure students' informal English engagement. Almost all participants across four sessions reported overwhelming reliance on short-form content platforms primarily TikTok, Instagram Reels, and YouTube Shorts, with engagement driven almost entirely by algorithmic recommendation. Three patterns that were interrelated were identified: algorithmic curation over intentionality, adaptation to short attention spans, and passive selection.

6.2.2.1 Algorithmic Curation Vs Human Intentionality

In all four sessions, when asked how they selected content, participants described algorithmic recommendation as their primary source. Twenty-one of 24 students

(87.5%) explicitly used language emphasizing passivity: 'I follow,' 'it gives me,' 'the algorithm shows.'

In Focus Group 2, one participant (FG2-P1) explained: 'The For You page knows what I like. It gives me exactly what I want. It makes it easy.' Five other participants immediately agreed [multiple voices overlapping]. Another participant (FG2-P3) elaborated with a concrete example:

'When I open Instagram Reels, I don't think about what to watch. The app already decided for me. Yesterday I watched one video about Marvel, then my whole feed became Marvel content. I just scroll and watch. It's comfortable because I don't have to search.'

A third participant (FG2-P5) concurred: 'My phone knows me, so I follow the suggestions.'

This pattern of accepting algorithmic curation without intentional selection recurred across all sessions. In Focus Group 4, one participant (FG4-P2) summarized the consensus: 'We click on the app and we find videos.' In Focus Group 1, when asked about searching for specific content, a participant (FG1-P4) explained: "I watch what comes on my screen. I don't look for anything special."

Only three participants (FG1-P2, FG1-P5, FG3-P4) reported occasional intentional searching, typically for specific tutorials or series episodes. However, even these participants qualified that algorithmic feeds dominated 90% of their engagement. As one (FG3-P4) noted: 'Sometimes I search if I need something specific for homework. But normally, I just open TikTok and scroll. It's easier.'

The term 'automatically' appeared 12 times across transcripts, indicating consumption without conscious choice. Participants framed this algorithmic control positively, using terms like 'comfortable,' 'easy,' and 'convenient' to describe platform curation.

6.2.2.2 Preference for Short-Form Content

A substantial portion of participants, 18 out of 24 (75%), reported that they typically favour videos shorter than one minute. During the first focus group, this inclination became apparent when one individual (FG1-P1) observed, 'If it's more than one minute, I scroll,' a remark that prompted others in the group to nod along or

express verbal agreement. Another student (FG1-P3) reflected, 'I don't have patience,' while a third (FG1-P6) candidly explained, 'My concentration is low.'

Time and again throughout the sessions, students attributed their interest in brief clips to the fatigue that accumulates with academic demands. One made the connection explicit (FG2-P4): 'When I'm tired from studies, long content feels heavy. So I choose short.' In discussing how language shaped their viewing preferences, members of the third group drew distinctions: 'I like long K-drama episodes, but not for English. For English, short is better because I don't stress about understanding' (FG3-P2). Meanwhile, another reported the practical advantage of concise formats: 'With TikTok, one minute and I get the information. With YouTube long videos, maybe 10 minutes for the same thing' (FG4-P5).

Beyond simple preference, six participants spoke about mental load as a decisive factor. According to one (FG2-P6), 'Short videos, I can watch many. If I don't understand one, I skip. No problem. But long videos, if I don't understand, I feel I wasted time.' This attitude where minor lapses in comprehension do not interrupt viewing characterised the approach reported by most. In this context, some participants offered additional details: 'I only watch longer YouTube videos when I eat or when I want to sleep, it just keeps me company.' Another admitted, 'If I need information and the video is long, I speed it.'

6.2.2.3 English as Default Language of Quality Content

This pattern was evident in every session: the decision to use English language media was informed by the availability and quality of content, and not a conscious decision to practise English. Specifically, nineteen out of twenty-four participants (79.2%) identified content variety and overall production standards as the decisive factors behind their engagement with English media.

When students were asked about their reasons for favouring English content, the issue of quality consistently overshadowed any discussion of language learning. Group consensus was strong, especially in discussions where participants pointed out: 'the best series, the funniest videos, the most interesting YouTubers they're all in English', prompting five others in Focus Group 3 to express agreement either by nodding or verbal affirmation. Another (FG3-P1) went further: 'If the same content

existed in Arabic, maybe I would watch in Arabic. But it doesn't. Everything good is in English.'

This perception extended beyond entertainment to other genres. One student (FG1-P6) commented, 'all the big movies are in English. We wait for them, we watch them the day they come out.' The pattern held in music and podcasts, as well as documentaries: 'The best podcasts, the interesting documentaries, they come out in English first. Sometimes they never get translated, so if you don't watch in English, you miss it completely.' The gaming context also reflected this trend: 'In gaming, if you want to watch pro players, tutorials, funny moments it's all in English. Maybe there's some Arabic content, but it's... not the same quality.'

The preference for English was closely connected to the language's dominance in global youth culture. In one session, a participant (FG2-P4) asserted, 'TikTok trends start in English. Memes are in English. If you want to understand what's happening globally, you need English content,' which was met with immediate agreement from three others. Another participant (FG3-P5) highlighted the relevance of English for accessing new material: 'English content comes first. We get new episodes, new trends, new everything before they're translated or adapted.'

Some participants were prompted about Arabic and French alternatives. The group generally acknowledged Arabic content but found it lacking in range: 'There is Arabic content, yes. But for all topics? English has better explanations, more resources' (FG4-P5). Another noted, 'Arabic YouTubers exist, but they usually switch to English when discussing serious topics anyway' (FG4-P1). French resources were typically perceived as 'too formal' or 'not as entertaining' as their English counterparts.

The frequency data for Theme 1 subthemes is summarized in table below

Table 49

Theme 1 Subtheme Frequency: Algorithm-Driven, Content-Oriented Consumption

Subtheme	Sessions	Participants	Percentage	Quotes	Pattern
Algorithm-Driven Passive Selection	4/4	24	100%	33	Accept what algorithms provide

Short-Form Preference	4/4	18	75.0%	14	Sub-minute clips
Quality Content Default	4/4	19	79.2%	16	Content over language
TOTAL	4/4	24	100%	63	All contributed

6.2.3 Theme 2: Surface-Level Language Engagement Without Consolidation

Twenty-two of 24 participants (91.7%) described minimal deliberate attention to vocabulary, grammar, or pronunciation, with no systematic follow-up when language caught attention. Three patterns emerged: accidental noticing, no consolidation, and confusion between exposure and learning.

6.2.3.1 Accidental Noticing Rather Than Intentional Focus

When participants were asked whether they paid attention to language features while watching or listening to content, they generally described their noticing as occasional and shaped by emotion rather than intention. Twenty-two of the twenty-four students (91.7 percent) said that language stood out mainly when something was humorous, surprising, or emotionally engaging. In Focus Group 2, one participant (FG2-P1) explained: “When something is funny or emotional, I remember words. But I don't stop the video or try to write.” Another (FG1-P6) added: “Only sometimes. Like if I hear a nice expression, I repeat it in my head. But I don't look for the meaning or grammar.” Across groups, students described similar moments of brief attention that did not lead to further follow-up. Several students also mentioned that they did not focus on grammar when viewing content. One participant (FG3-P4) stated: “I don't focus on grammar. I just watch. If I understand the meaning, it's okay.” This perspective appeared often. Seventeen of the twenty-four students said they did not attend to grammar, with one (FG4-P3) noting: “Grammar makes it complicated. I watch to enjoy, not to study.” A smaller number of participants (n = 6) said they sometimes noticed pronunciation, usually when a word sounded “beautiful” or when something seemed unclear. One participant (FG2-P5) explained: “Sometimes I hear a word and think it's pronounced wrong. But I don't check. I just

continue watching.” These comments point to brief noticing rather than any attempt to confirm or analyze what they heard.

6.2.3.2 Unelaborated Noticing Patterns

Even when language features caught their attention, most participants described limited follow-up. 19 out of 24 (79.2%) said that what they noticed tended to stay at the surface level.

In Focus Group 1, one participant (FG1-P1) explained: “I replay once. Sometimes slower speed. But I don't check the dictionary” [two nod]. Replaying content, which is an option made easy by platform tools, was the most common way participants revisited language, though often in a light-touch way. As another (FG3-P2) put it: “I replay if I'm curious. But if I still don't understand, I skip. I don't search for the meaning.”

A few students across three sessions mentioned saving videos with the idea of reviewing them later, though follow-through was rare. One student (FG1-P6) said: “I save some TikToks because I want to learn later, but I never go back,” which sparked laughter and quick agreement from others. “Same. I say I'll check it later. Never happens” (FG3-P5). Another (FG4-P2) explained: “When I save, I think I will study it. But when I open TikTok later, the For You page shows new interesting videos. I forget about the saved ones.”

Two participants (both from FG3) described more structured strategies. One (FG3-P3) mentioned keeping a vocabulary notebook: “I write words sometimes on my phone. not every time I watch.” Another (FG3-P6) used screenshots to capture subtitles: “I have hundreds of screenshots. I don't actually review them.”

While most did not use formal learning techniques, a few participants mentioned moments when language stuck with them or sparked interest. One student (FG2-P4) noted: “Sometimes I remember a word because it sounded cool, and later I hear it again in a song.” Another (FG1-P3) shared: “I learned some slang from a show. I used it with friends, and they laughed. That helped me remember.” These small wins

suggest that even casual engagement can lead to meaningful moments of language growth.

6.2.3.3 Confusion Between Exposure and Learning

16 out of 24 participants (66.7%) expressed the belief that regular exposure to English, especially through media, was enough to support improvement, even without focused study or practice. The notion of language "coming naturally" through repeated contact came up more than once, with ideas about a shared expectation that language would develop over time, with little more than watching or listening.

One participant (FG3-P2) explained: "I also want to improve my English but I don't do school learning. I just watch, you know? Natural." Others echoed this view, not as a rejection of effort, but as a preference for learning through enjoyment. "I watch English content every day, maybe two, three hours. This is enough for learning," said one student (FG4-P5). Another (FG2-P4) added: "My friends who watch a lot of English series, their English is good. So I think if I watch more, mine will improve too."

Rather than emphasizing grammar or vocabulary drills, many participants saw time spent with content as the main driver of progress. For them, understanding and language growth were expected to follow from frequent exposure, without needing to break down language forms or rules directly.

The following table presents frequency data for Theme 2 subthemes.

Table 50

Theme 2 Subtheme Frequency: Surface-Level Engagement

Subtheme	Sessions	Participants	Percentage	Quotes	Pattern
Accidental Noticing	4/4	22	91.7%	16	Emotion-driven
No Consolidation	4/4	19	79.2%	12	Abandoned intentions
Exposure = Learning	4/4	16	66.7%	11	"Natural" beliefs
TOTAL	4/4	22	91.7%	39	Most contributed

6.2.4 Theme 3: Confidence Barriers to Productive Skill Development

Twenty of 24 participants (83.3%) reported psychological barriers preventing transformation of receptive exposure into productive practice. Three patterns emerged: understanding-production gap, accuracy anxiety, and environmental constraints.

6.2.4.1 Understanding-Production Gap

Participants in all focus groups consistently described a noticeable gap between what they could understand and what they were able to produce in English. This issue was raised by 20 of the 24 learners (83.3%), many of whom expressed a sense of limitation or dissatisfaction.

In Focus Group 2, several students affirmed their ability to follow content: “We understand” (multiple participants), but this was immediately followed by a contrasting view: “But we cannot speak like the videos” (FG2-P1) [four nod]. The difference between comprehension and production was a recurring theme. As one student in FG3 (FG3-P6) explained: “When I watch, I understand maybe 80%. But when I try to speak, maybe 20% comes out. The words are in my head but they don't come to my mouth.”

For many, the difficulty was not about knowing the vocabulary, but about being able to access and use it in real time. One participant (FG4-P4) reflected: “It's not that I don't know the words. When I read or hear, I recognize them. But to produce... it's different. I need to think about grammar, pronunciation, if the word is correct. It's too much.”

A distinction also emerged between words learners could recognize and those they could actively use. As one student from FG2 (FG2-P5) put it: “I have maybe 1000 words I understand. But to speak, maybe 200 words only.” This observation was echoed by others who noted that while comprehension gave them confidence, speaking remained a challenge.

6.2.4.2 Accuracy Anxiety and Overthinking

Concerns about accuracy emerged as a significant factor shaping participants' willingness to engage in spoken production. Of the 24 learners, 18 (75.0%) reported that fear of making mistakes often inhibited their attempts to speak, a pattern that recurred across all four focus groups.

In Focus Group 4, one participant described this hesitation succinctly: "When I try to speak, I think too much grammar, pronunciation... and I block" (FG4-P6) [three nod, one says "exactly"]. Another (FG2-P3) elaborated on the internal disruption that accuracy monitoring can cause: "In my head, I want to say something. But then I think: is this grammar correct? Is this the right word? How do I pronounce it? And while I'm thinking, the moment passes."

Participants frequently attributed this anxiety to fear of negative evaluation from peers, feelings of self-consciousness, or a lack of confidence in their speaking ability. One participant (FG2-P4) remarked: "Sometimes I think people will laugh if I say something wrong, so I just stay quiet." Another (FG3-P2) reflected: "I'm afraid of looking stupid. Even if I know the word, I worry I will say it wrong and others will notice."

Participants also noted a difference in how they approached receptive versus productive skills. For instance, one learner observed: "When I watch TikTok, I don't worry about understanding every word. If I miss something, okay. But speaking? I want every word to be correct. Maybe this is the problem" (FG1-P5).

These comments reflect a tension between the desire for correctness and the need for fluency, with many learners experiencing this as a psychological barrier that constrained their oral participation. The pressure to avoid errors often led to overthinking, which in turn appeared to disrupt the flow of speech and reduce learners' willingness to take communicative risks.

6.2.4.3 Environmental Constraints and Lack of Interlocutors

A number of participants, particularly those outside of organized language learning settings, identified limited opportunities for spoken English practice in their

immediate environments. This issue was raised by 12 participants (50.0%), spanning three of the four focus groups (with no instances in FG3).

In Focus Group 1 one participant reflected on the apparent artificiality of having to speak English in familiar contexts: "We don't have people to speak English with. It feels strange to speak English with my Algerian friends" (FG1-P3) [two agree]. Similarly, another participant from FG4 (FG4-P1) noted the absence of English in their daily linguistic routines: "My family doesn't speak English. My friends, we speak French or Arabic. So where do I practice?"

Several learners talked about trying self-talk or most solo rehearsal, but oftentimes these efforts were short-lived. One participant (FG2-P6) commented: "I tried to talk to myself in English."But it feels... silly? Unnatural. After few days, I stopped." Another (FG4-P5) highlighted the social discomfort surrounding such efforts: "If I speak English alone in my room, my family thinks I'm strange."

Also in contrast, four participants from FG3 all gamers reported more regular and supportive speaking opportunities. One learner (FG3-P3) described the environment as encouraging: "during video games, we practice speaking every week. It's comfortable because not everyone is english. No one judges mistakes." These accounts made it clear the importance of accessible, and non-judgmental spaces in which learners could engage in spoken interaction without the fear of error, or social discomfort.

The following table presents frequency data for Theme 3 subthemes.

Table 51*Theme 3 Subtheme Frequency: Confidence Barriers*

Subtheme	Sessions	Participants	Percentage	Quotes	Pattern
Production Gap	4/4	20	83.3%	13	Comprehension not Production
Accuracy Anxiety	4/4	18	75.0%	10	Overthinking correctness
Environmental	¾	12	50.0%	8	No interlocutors
TOTAL	4/4	20	83.3%	31	Strong majority

6.2.5 Theme 4: Perceived Disconnect Between EST and Informal Digital Englis

All 24 participants (100%) described EST as disconnected from informal practices despite acknowledging career value. Three patterns emerged: value with disengagement, content irrelevance, and pedagogical monotony.

6.2.5.1 Recognition of Career Value with Simultaneous Disengagement

Across all four focus groups there was evidence of a common recognition of the relevance of English for Science and Technology (EST) to their future professional pathways. All 24 learners explicitly linked EST to career advancement. However, this instrumental valuation was always accompanied by a lack of affective engagement. The prevailing sentiment could be summarised as "useful but boring."

This ambivalence emerged many times. One of the participants added: "EST is useful but very boring" (FG2-P1) [unanimous nodding, some laughter]. Another learner elaborated on the perceived mismatch between usefulness and classroom experience: "For career, maybe yes, we need technical English. For engineering documents, presentations. But in class it feels very boring. Too much reading, no videos" (FG3-P6)

Similarly, a participant from FG4 acknowledged the value of EST while expressing disengagement: "I know EST is important for my future. But I just need vocabulary" (FG4-P2).

Several participants described this disconnect in terms of an internal conflict between obligation and motivation. As one student replied: "I should study EST seriously. But I don't want to" (FG1-P4). Another echoed this tension: "When I think about my career, I know I need technical English. But when I'm in EST class, I just want it to finish" (FG2-P5).

This external motivation and internal disengagement contrasted with the description of informal digital language engagement (IDLE) among the participants. While EST was framed in terms such as "boring" "heavy," or an "obligation," IDLE was associated with enjoyment and ease, using descriptors like "comfortable," "enjoyable," and "fun."

6.2.5.2 Challenges with Technical Vocabulary and Pedagogical Framing

While participants generally recognised the relevance of technical English to their academic and professional futures, 22 of 24 (91.7%) expressed concerns about how technical vocabulary was introduced and integrated into EST instruction. Rather than rejecting specialised terminology, learners pointed to issues of accessibility, contextualisation, and the limited range of practice opportunities available in class.

One participant (FG1-P2) explained: "The vocabulary is too technical. We don't use it in real life." This comment did not imply the vocabulary lacked value, but rather that it was presented in isolation from practical or familiar contexts. Another participant (FG3-P4) offered a similar reflection: "In EST, we learn words like tensile strength, thermodynamics. These are important for engineering, okay. But we don't really get to use them in situations like reports, emails, presentations. Just in definitions or readings."

Participants also described a mismatch between the format of EST materials and the types of communication expected in their future professional settings. One

student (FG2-P3) noted: “We read about materials and processes, but it’s very theoretical. In real jobs, engineers also explain things, give instructions, make slides. We don’t practice that.” Another (FG4-P4) added: “We learn hard words, but we don’t practice how to say them clearly. It would help to connect the vocabulary to speaking or writing tasks.”

These responses suggest that the issue lies less in the content itself and more in how it is taught. Learners valued technical language but expressed a need for instruction that better supported its practical application, especially in oral and written communication relevant to engineering practice.

6.2.5.3 Pedagogical Monotony and Lack of Multimedia

A significant number of participants (21 out of 24; 87.5%) voiced dissatisfaction with the instructional methods employed in EST classes. The primary concern centered on an overreliance on written texts, with little to no use of multimedia or varied pedagogical approaches.

Across the sessions, learners described their EST classes as heavily focused on reading comprehension and technical terminology exercises. As one participant remarked: "Every class, same thing. Read the text, answer questions, translate technical terms. It's always text, text, text" (FG1-P6). Another echoed this sentiment, stating: "No videos, no audio, no interactive activities. Just papers" (FG3-P1).

Participants expressed a clear preference for a more dynamic approach to technical language instruction. In Focus Group 2, one learner proposed: "If EST used more videos or short clips, maybe we enjoy more" (FG2-P1), which prompted enthusiastic agreement from others [five participants immediately respond positively, overlapping voices]. Another participant suggested a more discipline-specific adaptation: "Show us engineering videos in English. Real engineers explaining projects. Not just written texts about theory" (FG2-P4).

Several learners pointed out the irony that a wealth of technical English content is readily available online such as video tutorials, professional presentations, and

project explainers yet these resources were rarely used in EST classrooms. As one student observed: "On YouTube, I can find hundreds of videos explaining engineering concepts in English. But in EST class, we never watch these. We just read old textbook articles" (FG4-P3).

The data suggest a strong learner preference for pedagogical practices that reflect the multimodal and media-rich nature of contemporary technical communication. Participants advocated for more authentic, audiovisual input to complement and contextualise the written materials that currently dominate their EST experience.

The following table summarizes frequency data for Theme 4 subthemes.

Table 52

Theme 4 Subtheme Frequency: EST Disconnect

Subtheme	Sessions	Participants	Percentage	Quotes	Pattern
Value + Disengagement	4/4	24	100%	14	Useful but boring
Content Irrelevance	4/4	22	91.7%	11	Technical disconnect
Pedagogical Monotony	4/4	21	87.5%	15	Text-heavy
TOTAL	4/4	24	100%	40	Universal consensus

6.2.6 Analytical Overview: Quantifying Qualitative Patterns

Two analytical tools provide quantified perspective on the qualitative patterns that emerged from thematic analysis. Table 53 presents keyword frequency analysis, documenting how often participants used specific phrases across all four transcripts. This linguistic evidence demonstrates that themes reflect participants' actual language rather than researcher interpretation alone.

Table 53*Keyword and Phrase Frequency Analysis Across Transcripts*

Keyword/Phrase	Frequency	Sessions	Theme	Interpretation
Algorithm / For You page	34	4/4	Theme 1	Algorithmic curation
I follow / just follow	28	4/4	Theme 1	Passive agency
Short / one minute	23	4/4	Theme 1	Brevity preference
Best content is in English	19	4/4	Theme 1	Content quality
Natural / naturally	14	4/4	Theme 2	Implicit learning belief
I don't focus on grammar	17	4/4	Theme 2	Form avoidance
Save but never check	8	3/4	Theme 2	Abandoned intentions
Understand but cannot speak	11	4/4	Theme 3	Production gap
Too much grammar thinking	9	4/4	Theme 3	Accuracy anxiety
Shy / afraid of mistakes	13	4/4	Theme 3	Performance anxiety
Useful but boring	7	4/4	Theme 4	Value-engagement split
Too technical	15	4/4	Theme 4	Content irrelevance
No connection / disconnect	19	4/4	Theme 4	EST-IDLE separation
Videos / TikTok style	21	4/4	Theme 4	Multimedia request
English we watch online	12	4/4	Theme 4	Informal vs formal

Figure 13 displays participation rates for all 12 subthemes, showing the proportion of the sample that endorsed each pattern. Together, these analyses demonstrate both the linguistic basis and prevalence of identified themes."

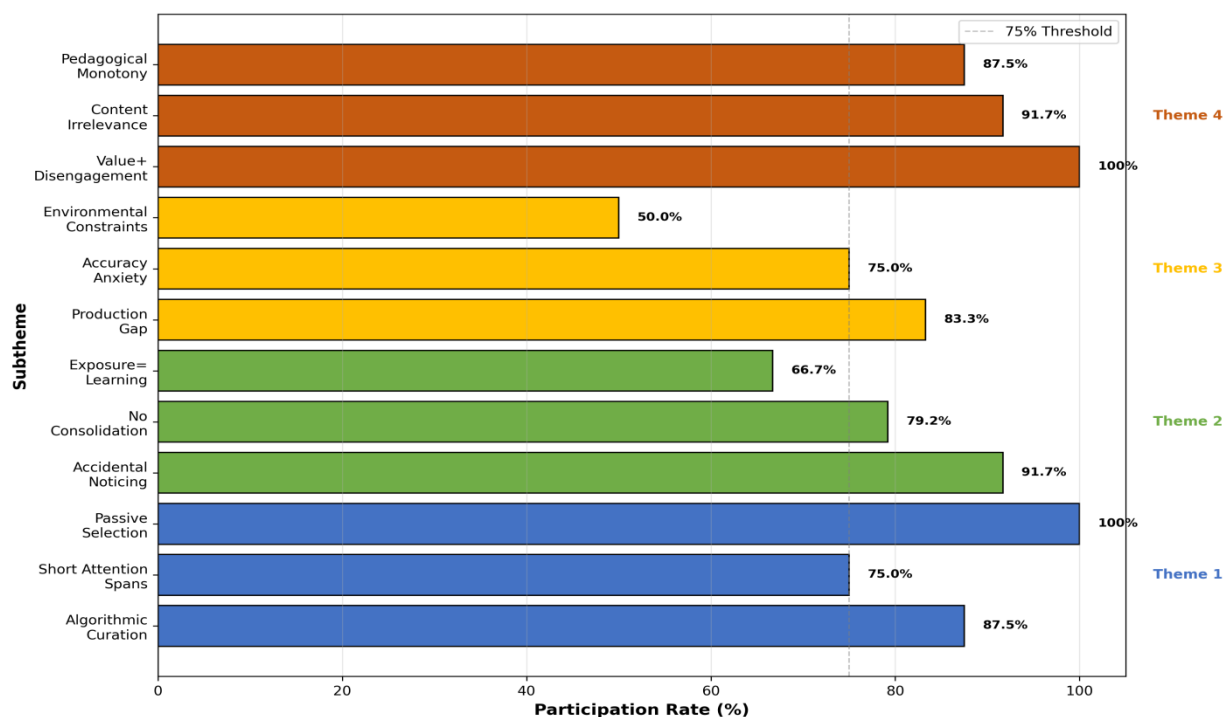


Figure 13

Subtheme Participation Rates by Theme

Table 52 and Figure 13 give quantitative evidence of the patterns found during the thematic analysis. The prevalence of algorithm-driven consumption (100%), EST disconnect (100%) among all participants, and the similarity of linguistic indicators recorded in the analysis of keywords, proves that the themes are not unique experiences but common ones. Together, these findings of the focus groups shed light on the student attitude towards IDLE engagement and its connection with formal EST instruction. In the next section, the teacher views on the same phenomena are provided, as they provide a complementary perspective that will allow triangulating the findings with the groups of participants

Distribution of Illustrative Quotations

To ensure that the qualitative findings reflect diverse participant voices rather than overrepresentation of particularly articulate individuals, the distribution of illustrative quotations across participants was examined. Table 54 presents quote counts by participant.

Table 54

Distribution of Illustrative Quotations by Participant (N=24)

Quotes	Participants	% of Sample	FG1	FG2	FG3	FG4
0	2	8.3%	0	1	0	1
1-2	8	33.3%	2	2	2	2
3-4	9	37.5%	2	2	3	2
5+	5	20.8%	2	1	1	1
Total	24	100%	6	6	6	6

The quote distribution indicates reasonable representation across participants. Only two participants (8.3%) contributed no individual quotations, though both participated in group consensus moments captured in the analysis. The majority of participants (70.8%) contributed 1-4 quotations, with 20.8% contributing 5 or more. Importantly, high-quote contributors were distributed across all four focus groups rather than concentrated in a single session. The most-quoted participant (FG1-P1, n = 7) represented only 5.1% of total quotations, indicating no single voice dominated the findings. This distribution supports the conclusion that themes emerged from collective patterns rather than individual perspectives.

6.3 Teacher Interviews

This section presents the qualitative findings from semi structured interviews with seven EST teachers working at ENP. The interviews were carried out to answer Research Question 4 (RQ4): What role do EST teachers play in recognizing and leveraging students' informal English learning practices?

Chapter 2 provided quantitative evidence regarding students' engagement with Informal Digital Learning of English (IDLE), their attitudes toward EST

instruction, and the motivational factors predicting engagement patterns. The teacher perspective, however, remained unexplored. Understanding how EST teachers perceive, interpret, and respond to students' informal digital English practices is necessary for developing a comprehensive picture of the relationship between informal and formal English learning in technical education contexts.

6.3.1 Overview: Mapping Themes to Research Questions

The analysis yielded eight themes that address the RQ4 sub-questions. Table 55 presents each theme with its operational definition, frequency of mention across the seven teacher interviews, and the specific RQ4 sub-questions it addresses. The complete codebook with coding definitions, examples, and inclusion/exclusion criteria appears in Appendix G. All seven teachers discussed six of the eight themes, demonstrating substantial consensus on core aspects of IDLE recognition and integration. Two themes concerns about informal language and student motivation patterns emerged in six teacher interviews, while strategies for connecting informal and formal learning appeared in five interviews

Table 55

Overview of Themes: Definitions, Frequency, and Research Question Mapping

Theme	Definition	Frequency	Related RQ4 Sub-Questions
Theme 1: Teacher Awareness of Students' Digital Media Use	Teacher knowledge of platforms students use for English exposure	7/7 teachers (100%)	RQ4.1
Theme 2: Reported Linguistic Benefits	Observed improvements in language skills from media exposure	7/7 teachers (100%)	RQ4.2
Theme 3: Concerns About Informal Language	Issues with slang and register confusion in academic contexts	6/7 teachers (85.7%)	RQ4.2
Theme 4: Current Integration	Whether and how teachers	7/7 teachers (100%)	RQ4.3

Practices	incorporate media into EST teaching		
Theme 5: Views on Professional Responsibility	Teacher beliefs about obligation to address students' informal learning	7/7 teachers (100%)	RQ4.2, RQ4.3
Theme 6: Structural Teaching Constraints	Curriculum, time, and institutional limitations affecting integration	7/7 teachers (100%)	RQ4.3, RQ4.4
Theme 7: Student Motivation Patterns	Observed differences in engagement with media versus EST instruction	6/7 teachers (85.7%)	RQ4.4
Theme 8: Strategies for Connecting Informal and Formal Learning	Specific techniques teachers reported using to bridge contexts	5/7 teachers (71.4%)	RQ4.3, RQ4.5

6.3.2 Theme 1: Teacher Awareness of Students' Digital Media Use

This theme addresses RQ4.1: *To what extent are EST teachers aware of the digital media platforms and informal English learning activities their students engage with outside the classroom?*

Across the seven interviews, all teachers demonstrated some level of awareness that students engage with English language digital media outside the classroom. This awareness ranged from general impressions to more detailed, experience-based knowledge. Teachers consistently identified platforms such as Instagram, TikTok, YouTube, streaming services (e.g., Netflix, Disney+), video games, and music as the main spaces where students interact with English informally.

Several teachers described actively asking students about their digital habits during warm up activities or casual conversations in class. These teachers were more likely to possess accurate information about the nature of the content followed by students, a platform they choose, and how exposure to digital influences the knowledge students have on vocabulary or pronunciation.

"I am somewhat aware... I asked them a few times what they watch, especially when we're doing warm-up activities or when they mention something from a series." (T1)

"Very aware. I ask them regularly about what they're watching, what games they play, what they listen to. It helps me understand where they're getting their English from." (T3)

Other teachers showed low awareness, limited to having a general knowledge that students are very active on the internet. These teachers did not routinely inquire about specific digital practices. Some viewed such information as peripheral to their instructional routines; others followed tightly structured materials that left little room for exploration of students' informal practices.

"Not very aware, honestly. I prefer to rely on textbooks and structured materials. I know they use the internet, but I don't ask specifically what they watch or do." (T6)

Overall, the data reveal that there is significant difference in awareness of media practices of students among teachers. Although every teacher admitted that students practice online English informally, the intensity and extent of such understanding were quite different. The teachers that had a more informal interaction with the students by conversing with them through small talk, warm ups, or questions about their personal interests indicated that they had a more nuanced and detailed understanding of the practices of the students in regard to their IDLE practices compared with those who were informed on a broader scale.

6.3.3 Theme 2: Perceived Linguistic Benefits : Pronunciation, Fluency, and Confidence

This theme addresses RQ4.2: *What beliefs do teachers hold about the educational value of students' informal digital language practices?*

Across the interviews, teachers consistently reported noticing specific linguistic advantages among students who engaged regularly with English-language digital media. These perceived benefits were concentrated in pronunciation, listening comprehension, oral fluency, speaking confidence, and spelling accuracy. Teachers referred to concrete classroom observations such as students' willingness to speak, their ease in understanding fast speech, or their spontaneous use of natural expressions to illustrate these perceived outcomes.

Another benefit that was frequently mentioned was the enhanced spelling especially in those students who watch series with English subtitles more often. Teachers attributed fewer spelling errors to repeated exposure to written forms of words in digital contexts.

"I see positive effects in spelling and in spoken confidence. Students who watch series with subtitles make fewer spelling mistakes, and they're more willing to participate in oral activities because they've heard the language used naturally." (T2)

Teachers also described students' speech as more natural and less formulaic when they had substantial exposure to informal media. These students were perceived as using contractions, intonation patterns, and phrasing that more closely resembled authentic spoken English.

"They speak more naturally, less mechanically than students who only learn from textbooks. You can tell when someone has been immersed in English media--they use contractions, they have rhythm, they don't sound like they're reading from a script." (T1)

Listening comprehension was another area where teachers identified clear differences. Participants noted that students who regularly played online games or followed fast-paced content exhibited greater tolerance for rapid speech in classroom audio materials.

"The ones who play online games understand fast speech much better. When I play audio in class, the gamers don't struggle the way others do. They're used to processing English at speed because of gaming." (T4)

the teachers also highlighted positive improvements - especially oral fluency and accuracy in pronunciation. Students that subscribed to particular online creators or were engaged in the active communication with spoken material were seen to acquire certain pronounced characteristics of the pronunciation and a sense of confidence when attending the discussion in the classroom.

"One student learned really good pronunciation from listening to youtube creators. He could mimic the American accent almost perfectly. It wasn't something we taught in class he picked it up from repeated exposure." (T7)

6.3.4 Theme 3: Risks and Limitations: Slang, Informality, and Register Inappropriateness

Alongside the perceived benefits of students' informal digital engagement, teachers highlighted a set of recurring concerns related to the type of language students adopt from online environments. Throughout the interviews, the issues that arose among the interviewees (85.5%) had to do with slang, internet jargon, colloquialisms, and the informal style students tended to employ in their formal classroom work. Teachers described these issues as frequent in written assignments, and spontaneous classroom interactions.

A common concern was the use of vocabulary based on entertainment media, fantasy information or social media trends in places where technical or academic vocabulary is needed. Teachers reported having to intervene and correct students to more acceptable terminology when informal terms were used in assignments.

"They used the word 'squib' from Harry Potter during a classroom interaction. I had to stop and explain that this is fantasy vocabulary, not academic English,

and we needed to use 'non-functional component' or 'defective unit' instead." (T1)

Students also used internet slang in class, sometimes inserting memes or viral expressions into formal speaking tasks. This pattern required repeated interventions to reinforce expectations for academic and professional communication.

"They use slang constantly 'slay,' 'periodt,' 'no cap,' all kinds of internet language. They even use memes when speaking, which makes their English sound very informal. I constantly remind them that this language is fine with friends but not appropriate for professional or academic communication." (T3)

Teachers also noticed that students were replicating expressions they found online without any comprehension of the literal or pragmatic meaning. These moments were explained as confusion both to the teacher and also for the students themselves.

"They say things like 'I literally died' without understanding what 'literally' means. They're copying expressions they've heard online without grasping the semantic or pragmatic rules. It creates confusion because they think they're being accurate, but they're using hyperbole inappropriately." (T6)

These concerns centered around register mismatch. Students' informal learning exposed them to mainly conversational and entertainment orientated language whereas the classroom required formal and discipline specific English. Teachers did not think that the informal language was wrong but was used inappropriately in academic settings. This perception influenced their responses in the classroom, which was generally reactive and they responded to informal expressions when they arose but reported on no systematic practices for developing student awareness of register differences and/or supporting shifts between informal and formal linguistic choices.

6.3.5 Theme 4: Varying Degrees of Pedagogical Integration of Digital Med

At the more integrative end, some teachers described using digital or youth oriented content deliberately to enhance engagement, especially during speaking focused sessions. These practices were not tied to technical subject matter, but were to create an atmosphere of relaxation and relate to students to everyday experiences involving digital technologies. Teachers who followed this approach used media or popular language strategically as an incentive for participation and reduced anxiety of students during oral tasks. As one teacher explained:

"Films discussion or literacy from songs." (T2)

Another teacher illustrated this approach by noting:

"To make the session more fun, I use GenZ language to make them feel comfortable with me, specially during speaking sessions sometimes I say 'your outfit is serving miss ma'am' and they start laughing and think I'm cool and so they open up and speak freely, but then I go back to standard English." (T3)

Other teachers reported integrating content selectively when it aligned with specific lesson topics. This integration was topic driven rather than media driven and centred on helping students connect classroom content to current innovations relevant to their engineering field.

"I have a lesson related to recent innovations in building titled 'In the News'. Students are already aware about the last materials and techniques used." (T5)

In contrast, some teachers had minimal or no integration of digital media in their teaching. They attributed this to heavy syllabi and limited class time and a preference for structured materials which directly support assessment objectives. One teacher stated:

"Almost never. Time is limited, and the syllabus is very heavy. We have specific learning objectives to cover, and I don't see where media would fit without sacrificing core content." (T6)

Similarly, another teacher noted:

"Not often. Maybe once per semester if there's a relevant news article or video, but it's not systematic. Time is limited, and I prefer to focus on the technical vocabulary and grammar structures that will be assessed." (T4)

These varying practices reflect a continuum from deliberate integration to minimal use, shaped primarily by competing demands of curriculum coverage, assessment pressures, and available class time. The three approaches engagement driven integration, topic driven selection, and minimal/no integration revealed different underlying beliefs about the role of informal digital content in formal EST instruction.

6.3.6 Theme 5: Professional Role Perception Responsibility to Acknowledge IDLE

Views on whether to acknowledge the informal English learning of students is part of EST professional responsibilities differed significantly. Responses varied from a clear agreement to a lack of certainty, an indication of varying understandings of the extent of the EST instructor's role beyond the formal curriculum.

One perspective argued that EST instructors should consider students' informal English practices in order to bridge instruction to the students' existing practices.

"Absolutely. Students are bringing knowledge to the classroom that we didn't give them. Our job is to help them refine it, extend it, make it more academic. Ignoring their informal learning is like pretending they're blank slates, which they're not." (T7)

Other teachers expressed more neutral or uncertain views, emphasizing that the relevance of students' informal English learning depends on the specific lesson or instructional goals.

As one teacher commented:

" It depends on the lesson and the objectives. Sometimes students' informal

knowledge is helpful; other times it's irrelevant or even distracting. I don't think it's always our responsibility to incorporate it." (T3)

Another teacher highlighted a focus on curricular requirements: "I'm not sure. My responsibility is to teach the curriculum and prepare students for exams. If their informal learning helps with that, fine, but I don't see it as my job to systematically integrate their hobbies into my teaching." (T6)

Overall, teachers reports revealed divergent experiences of their professional roles for students' informal English learning. Some saw respecting such learning as part of effective practice and others saw this as optional or dependent on instructional context. These differences added to variation in the degree to which teachers focused on informal English use of students in their class.

6.3.7 Theme 6: Curriculum Restrictions and Time Constraints as Structural Barriers

Across the interviews, all seven teachers cited structural conditions especially curriculum density, the lack of instructional time and fixed syllabus as key factors that hinder their ability to draw on students informal English experiences in EST classes. Teachers always referenced that the curriculum is very challenging and tight-structured without any scope for addition and a deviation in the content. One teacher explained the severity of the curriculum workload

"The curriculum is very heavy, and time is extremely limited. We have to cover a huge amount of technical terminology, grammar structures, and genres in one semester. There's no time to explore students' media consumption even if I wanted to." (T1)

Time pressure was repeatedly mentioned as a central challenge, regardless of teachers' personal interest in using media or students' informal learning: "Time is the biggest challenge. I would love to do more with media, but I barely have enough time to teach the core material." (T4)

The teachers also explained that the exam-focused nature of the program shaped their classroom decisions. Activities not directly linked to assessment were described as difficult to justify within the available time:

"Exams take up most of our focus. If I use class time for things that won't appear on the test, it becomes hard to manage the syllabus. I value informal learning, but I have to stay aligned with exam content." (T5)

Overall, teachers characterised these structural factors as hindering their capacity to incorporate or explore students' informal English practices in the class time. Their accounts focused on workload, pacing requirements, standardized assessments, and lack of flexibility of the existing curriculum.

6.3.8 Theme 7: Motivational Asymmetry : High Engagement with Media, Lower Engagement with EST

A clear motivational contrast emerged between students' engagement with English language digital media and their engagement with EST coursework. All seven participants recognized this pattern and viewed it as logical and self evident. Students were highly active, enthusiastic, and self-driven when using English informally through digital platforms, while their engagement with EST materials was generally more restrained and task oriented.

This divergence is based on a correlation between the contents in the media and personal interests. Students select digital media based on their individual preferences, and this may have contributed to their high engagement with informal English activities.

As one teacher observed:

"Students are very motivated by media because they choose what to watch based on their interests. They watch football analysis, gaming tutorials, beauty videos--things that matter to them personally. EST doesn't offer that kind of choice." (T1)

Teachers commented that the general pleasure in English is not always extended to technical vocabulary or technical readings that these are often found demanding or even intimidating.

One teacher explained:

"They enjoy English in general, but EST vocabulary scares them. The terminology is intimidating, and the topics don't always connect to their lives outside engineering. Media feels accessible; EST feels like work." (T4)

On the whole, the teacher interviews demonstrate a common awareness of the magnitude and the effect of IDLE by students, but they also indicate unequal awareness of how this learning should be connected to EST teaching. Although teachers recognize obvious linguistic advantages, they also define linguistic threats, organizational obstacles, and an existing motivational divide between informal and formal learning. These observations indicate the difficulty of introducing IDLE in EST classrooms and emphasize the necessity of pedagogical strategies that consider the digital practices of students and the institutional limitations that influence the practice of teachers.

6.4 Conclusion

The qualitative results indicate that the digital English practices of students and the realities of teachers in the classroom are complexly related. The focus groups showed that students are very active online in reading English, but this activity is very passive, entertainment-based, and not related to the linguistic requirements of EST. These patterns were verified by the teacher interviews, which also revealed the linguistic benefits that students can obtain in informal settings and the difficulties that they introduce to the academic environment, such as register, slang, and a lack of an opportunity to practice productively. Educators also mentioned structural and curricular barriers that hinder effective implementation of IDLE in EST classrooms. Combined, these observations reflect the disconnect between the informal and formal uses of the English language, and the necessity of strategies that can connect the digital experiences of students with the objectives of teaching the technical aspects of the language.

CHAPTER VII : DISCUSSION OF THE RESULTS

7.1. Introduction

This chapter provides an integrated interpretation of the study's findings in relation to the four research questions. Using the quantitative findings from the questionnaire and study logs and the qualitative information from the student focus groups and teacher interviews, it analyzes the Informal Digital Learning of English (IDLE) practices by students, the relationships between these practices and their attitudes to English for Science and Technology (EST), the relationship between Ideal L2 Self and International Posture and students' engagement patterns, and the perceptions of the EST teachers regarding students' informal learning. The discussion connects these results to the theoretical and empirical literature on IDLE, learner engagement, motivation, and input-based learning, and clarifies how the different strands of data relate to one another within the study's conceptual framework.

7.2. Interpreting IDLE engagement patterns

RQ1 focused on the ways technical students engage with different media types for informal English learning. This section interprets the engagement patterns revealed in the data by examining how platform use, time investment, and the four engagement dimensions fit within current theories of informal learning, learner autonomy, and digital language exposure, as well as within the sociolinguistic and institutional context of technical education.

7.2.1 Behavioral Engagement: frequency of participation

The results suggest a strong level of immersion among the Algerian technical students in Informal Digital Learning of English (IDLE) with constant engagement in a wide range of digital media. The ubiquity of such practices is evidenced by the fact that all participants reported accessing English-language social networking platforms, and 98% reported regular viewing of YouTube content. High usage rates were also recorded for English music (94%) and video games (90%), while comparatively lower engagement was observed with more academically aligned resources such as news websites (89%) and, notably, podcasts (56%). This media use stratification supports the prior studies that indicate that IDLE practices are more

likely to be socially and recreationally oriented platforms instead of structured and pedagogically driven resources (Lee and Drajiati, 2019; Soyooof et al., 2023).

This platform hierarchy is an expression of patterns observed in diverse EFL contexts. The dominance of entertainment-based over academically aligned resources is similar to Davydova's (2024) findings from Austria in which contemporary platforms (YouTube and TikTok) were most dominant adolescent English language exposure, and Indrayani et al.'s (2024) results from Indonesia showing similar informal platforms tendencies from university students. The relatively low podcast engagement (56%) is especially striking considering the potential capabilities of podcasts to encourage prolonged exposure to discourse, an apparently surprising fact for which one can only speculate that Algerian technical students, like their international counterparts, are more likely to gravitate towards visually mediated algorithmically curated content over audio-only that require sustained linear attention.

The level of this involvement is also evident in the number of hours students spend on informal use of English; they reported an average of 14.3 hours per week, or approximately 2 hours of exposure per day. This is in sharp contrast to the amount of time they spend on English instruction in the course of Science and Technology (EST) which is about 1.5 hours per week. This tendency is in line with the modern trends in the field of digital learning, where the access to English beyond the institutional framework has become not only prevalent but also easy to maintain (Benson, 2011; Lee, 2019).

In Benson's (2011) terms, these practices clearly fall within the "out-of-class, informal, learner-controlled" domain of language learning contexts. The students exercise autonomy regarding the place of learning (digital environments outside school), its degree of formality (non-institutional and linked to leisure), its pedagogy (exposure rather than explicit instruction), and the locus of control (choices determined by personal interests). This position corresponds to Lee's (2019) characterisation of IDLE as "self-directed English activities in informal digital settings motivated by personal interests and undertaken independently without being assessed by a teacher". The behaviour of the students in the present study fits this

definition: they choose to watch, play, listen and read in English for enjoyment or personal interest rather than for assessment purposes. Their activities are voluntary, not externally required, and are undertaken in order to satisfy personal needs or preferences rather than institutional expectations.

7.2.2 Affective Engagement: Emotional Connection and Enjoyment

Affective engagement was consistently high across the sample, indicating that students' participation in IDLE is driven by genuine enjoyment rather than external pressure. A total of 90% of respondents reported that they enjoy using English-language media and feel excited when they encounter new English content. The mean affective engagement scores were all above 3.9 on the 5-point scale, suggesting that intrinsic satisfaction in these activities is widespread. This pattern corresponds with the principles of Self-Determination Theory, which emphasises that learners engage more readily when activities are personally meaningful.

The interview data support this interpretation. Teachers described students as “highly active, enthusiastic, and self-driven” in their use of English digital media. One teacher noted that learners willingly watch “football analysis, gaming tutorials, [and] beauty videos – things that matter to them personally. EST doesn’t offer that kind of choice” (T1). This contrast indicates an important motivational distinction: affective engagement is strongest when IDLE aligns with students’ personal interests and offers autonomy, whereas formal instruction, despite its structure, does not elicit the same level of emotional involvement.

7.2.3 Cognitive Engagement: The Consumption-Learning Asymmetry

The results of cognitive engagement indicate the notable contrast with the apparent behavioral and affective engagement in other areas. The extent of intellectual engagement dedicated to the acquisition of language is much less, despite the fact that the students actively consume English digital media and claim to experience a high level of enjoyment. The latter gap can be illustrated by what Arndt (2019) refers to as the difference between the entertainment based and learning based engagement. In comparison to the German sample studied by Arndt (cognitive $M = 3.23.8$), the Algerian students in the current study were even less focused in terms of

cognition and language, and it is possible that there is a stronger disposition to focus more on consumption rather than learning.

Students made use of several meaning focused strategies while engaging with English media. Focusing on main ideas ($M = 4.15$), using context clues ($M = 3.89$), and connecting ideas ($M = 3.90$) were relatively common. These strategies helped learners follow narratives, understand humour, and enjoy gameplay, which aligns with their primary purpose for accessing this media. However, strategies requiring deliberate monitoring of comprehension were less frequent. Pausing to check understanding was reported at modest levels ($M = 2.85$), and maintaining sustained concentration seemed to be only an occasional occurrence ($M = 3.10$). These results indicate that students generally succeeded in extracting meaning but seldom engaged in reflective monitoring of how well they were understanding.

Indicators of disengagement were notable. A total of 62% reported mind-wandering “often” or “always” ($M = 3.69$), and 69% continued watching or listening even when comprehension difficulties arose ($M = 3.89$). These trends indicate a 'good enough' understanding strategy, in which learners process information to a degree that is adequate to sustain entertainment but does not put in additional effort to fix failures.

This approach can be explained through the lense of Cognitive Load Theory (Sweller, 1988; Mayer, 2014): when pleasure is the primary objective, it is possible that the allocation of more cognitive resources to control or fix understanding decreases the enjoyment that the activity brings to students. Students appear to maintain affective engagement and involvement in part by limiting effortful processing.

This processing pattern is consistent with what Arndt (2019) referred to as the difference between entertainment-based and learning-based engagement in which German secondary students showed a similar tendency of investing strong affect with little metacognitive monitoring. The "good enough" comprehension strategy seen here also echoes Sockett's (2014) finding that the online engagement of French university students in English was primarily receptive - that is, students consumed content in great amounts but did not often transition into modes of productive or

analytical processing. From a Self-Determination Theory perspective, this is a predictable pattern: the process of metacognitive monitoring introduces evaluative pressure that jeopardizes the autonomy and enjoyment that makes IDLE intrinsically motivating. Students may be unconsciously avoiding comprehension checking behaviors precisely because such behaviors would turn leisure into studying.

Platform design may further contribute to this pattern. Algorithmic recommendation systems on TikTok, Instagram Reels, and YouTube Shorts reduce the cognitive effort involved in selecting content, encouraging passive forms of consumption. In the focus groups, students described this dynamic using statements such as “it gives me,” “the algorithm shows,” and “I just scroll.” This decreases the effort of decision making, which reduces extraneous cognitive load, but also reduces the possibility of deliberate, strategic interaction with language.

7.2.4 Linguistic Engagement : The Missing Dimension

Linguistic engagement was found to be low on all the dimensions measured. Mean ratings ranged from 1.95 to 2.53, and 49.5% of students reported “never” or “rarely” on most language-focused items. For the statement “Focus on learning English while consuming entertainment,” 32.0% selected “Never” and 26.5% “Rarely,” totalling 58.5%. The result of the study logs supported this trend: the language-focus ratings of entertainment activities were only 1.5-2.2 out of 5 points, which is far below the midpoint of 3.0. These results show that students are more concerned with content rather than with the linguistic forms in which that content is conveyed.

From a usage-based perspective (Ellis, 2002, 2017; Tomasello, 2003), this has important implications. Linguistic learning relies on the repeated exposure to form-meaning pairs, and frequency promotes entrenchment. When learners focus on meaning but overlook form, opportunities for such entrenchment remain limited. Yet the data also show that 64.3% of logged activities produced self reported learning outcomes. Vocabulary accounted for 35% of these outcomes, idiomatic expressions for 21%, and pronunciation for 15%. The question then is how learners can see significant gains when there is little linguistic engagement.

Three mechanisms help explain this pattern.

First, incidental learning of vocabulary is possible due to repetition of contextual exposure. According to research conducted by Rodgers and Webb (2020), long term input, without conscious focus, facilitates vocabulary development when high frequency items repeat within episodes or gameplay situations. Students' preference for series and gaming may therefore provide sufficient exposure to domain-specific lexical items to produce noticeable gains.

Second, noticing can occur reactively. Schmidt's (1990, 2001) Noticing Hypothesis posits that comprehension breakdowns caused by an unfamiliar word that interferes with comprehension can lead to momentary attention to form. Such reactive noticing may account for the learning of concrete vocabulary even in entertainment driven contexts.

Third, affective engagement may support phonological and formulaic sequence learning. As shown in Verspoor et al. (2011) and Peters (2019), repeated exposure to preferred content can memorize pronunciation patterns and fixed expressions, fairly without intended learning of language taking place.

These mechanisms, however, have limits. They explain receptive vocabulary growth and acquisition of high-frequency expressions but do not support morphosyntactic development or academic register control. As Han (2004) and Long (2003) note, repeated exposure to non-standard language forms, common in entertainment media, may entrench errors rather than correct them. Without metalinguistic awareness, incidental learning risks fossilising inaccurate forms or inappropriate usage.

Teacher observations are consistent with this interpretation. They reported clear benefits in areas such as pronunciation, listening fluency, and spelling, particularly among students who frequently watched subtitled series or engaged in online gaming. At the same time, teachers described persistent problems with register and pragmatic appropriateness. Students often incorporated slang or internet expressions into academic contexts, used exaggerated expressions without understanding their pragmatic weight, or reproduced stylistic patterns from entertainment genres that were unsuitable in professional or classroom communication. These examples illustrate that while exposure fosters receptive competence and confidence, it does

not reliably develop the metalinguistic sensitivity needed for accurate or context-appropriate production.

These findings, therefore, suggest that extensive IDLE exposure, in the absence of attention to linguistic form, may lead to a plateau. Learners benefit in vocabulary, pronunciation and listening, however development in grammar, academic register and pragmatic accuracy is limited. This is similar to VanPatten's (2004) and Ellis's (2017) claim that form-focused attention is required for morphosyntactic development outside of formulaic sequences. The linguistic gains seen here thus seem less related to the amount of input as to the type of attention that the learners pay to that input.

7.3 IDLE in the Age of Algorithm-Driven Platforms

The patterns of engagement observed in this study must be interpreted in the context of the modern digital platforms, which are quite different compared to those studied in the original IDLE studies. Initial research was done on gaming (Sundqvist, 2009), television series (Sockett, 2014), and self-selected YouTube content (Lee, 2019) media that involve conscious selection and in many cases prolonged attention. Today's dominant platforms are the reverse: Algorithmic curation takes the place of user selection, short form content replaces long form view and passive scrolling displaces active search.. These changes have some bearing on the manner in which IDLE operates as a language learning environment. This section examines platform affordances and the move to short-form content (8.3.1), and the consequences of algorithmic curation for engagement quality (8.3.2).

7.3.1 Platform Affordances and the Shift to Short-Form Content

A key finding of RQ1 concerns not only the overall volume of students' engagement with digital English already well documented in earlier IDLE work (Sundqvist & Sylvén, 2016; Lee, 2019; Sockett, 2014) but the changing nature of the input they consume. The current data indicate a large shift from the long form, narrative based materials from previous studies to short form, algorithm curated clips, which predominate platforms of today.

Previous IDLE research often described continued involvement with full episodes of television (Sundqvist, 2009), feature films (Rodgers & Webb, 2020), extended

periods of gaming (Sylvén & Sundqvist, 2012) or YouTube videos (Lee, 2022). By contrast, 75% of the students in this study reported preferring videos under one minute, and 54.5% of logged activities lasted less than 30 minutes. The platforms they commonly use are TikTok, Instagram Reels, and YouTube Shorts, which are aimed at a fast, high turnover consumption. As one participant put it, “If it’s more than one minute, I scroll” (FG1-P1).

From a usage-based perspective (Ellis, 2017; Tomasello, 2003), this shift is significant. Long-form media offer stable contexts, repeated vocabulary cycles, and extended discourse structures all of which support pattern detection, construction consolidation, and the acquisition of formulaic sequences (Peters, 2019; Verspoor et al., 2011). The single 30 minute episode naturally recycles vocabulary and structures from scene to scene.

This change has implications for the theoretical mechanisms discussed in Section 1.2.2.2. Vygotsky's (1978) idea of technology-mediated ZPDs, as reiterated by Thorne (2008), meant that learners would engage with digital affordances (such as subtitles and playback control) to scaffold the creation of understanding affordances which take sustained engagement with long content. Short forms content remove these scaffolding opportunities: it is more challenging to pause a short clip and examine an unfamiliar construction within it, and it is equally challenging to find the contextual redundancy that enables inferencing within such clips. The digital mediation supporting informal learning according to theory is thus undermined by the same set of platforms that students prefer nowadays.

Short form clips provide the opposite conditions: frequent context shifts, minimal repetition, and high lexical turnover. Thirty one-minute clips entail thirty unrelated linguistic environments. Such fragmentation weakens opportunities for form-meaning mapping even when the total exposure time is substantial.

This might help to understand one of the paradoxes in our findings, despite reporting 14.3 hours of weekly English input, and despite a high behavioural (82-86%) and affective engagement ($M > 3.9$), students demonstrated low linguistic

engagement ($M = 1.95 - 2.53$). The platforms that dominate their IDLE practices are optimised for entertainment and speed rather than sustained cognitive processing.

7.3.2 Algorithmic Curation and Passive Consumption

The influence of algorithmic recommendation systems adds another layer to how students engage with English online. Across the focus groups, 87.5% of participants described their media use in unmistakably passive terms—“I follow,” “it gives me,” “the app decided for me,” “I just scroll.” One student expressed this dynamic especially clearly: “When I open Instagram Reels, I don’t think about what to watch. The app already decided for me” (FG2-P3). These accounts point to an interaction pattern in which the platform, rather than the learner, directs the flow of content.

Cognitive load theory (Sweller, 1988; Mayer, 2014) helps clarify why this matters. When algorithms handle the work of searching, comparing, and selecting content, they remove the cognitive effort normally involved in decision-making. This frictionless delivery keeps students watching, but it also reduces the metacognitive monitoring that supports deeper learning. With little need to reflect, plan, or evaluate, learners remain absorbed in the stream of content rather than in how they process it.

This is reflected directly in the cognitive engagement results. Students reported strong reliance on meaning-focused strategies, such as attending to global meaning ($M = 4.15$) and using context clues ($M = 3.89$). However, they engaged far less in comprehension monitoring ($M = 2.85$) or pausing to check understanding ($M = 3.10$). When meaning breaks down, they rarely attempt to resolve the difficulty; instead, they simply move on to the next clip. The algorithm makes this easy, reinforcing a “good enough” processing style.

This pattern contrasts sharply with earlier IDLE contexts described in the literature. In those settings, learners had to choose which games to play (Sundqvist, 2009), decide which online communities to participate in (Sokkett, 2014), or actively search for particular videos (Lee, 2022). Such practices required intentional selection and greater cognitive investment, which in turn created more opportunities for noticing (Schmidt, 1990, 2001). In today’s algorithm-driven environments, however, high levels of exposure coexist with reduced agency and minimal strategic

processing. The result is a form of engagement that feels rich and immersive, yet remains shallow in cognitive depth.

7.4 Engagement Profiles: Heterogeneity Within Patterns

The three engagement groups identified in Phase 1 high engagers (n = 12, 30%), medium engagers (n = 16, 40%), and low engagers (n = 12, 30%) among the study log participants (N = 40) indicate that overall averages mask a great deal of individual variation. High engagers reported being engaged in an average of 34.2 activities per week (approximately 3.2 hours per day), while low engagers reported being engaged in 13.8 activities (approximately 1.1 hours per day). This represents a 2.5 fold difference in behavioural engagement, and therefore time spent with English greatly varies across the cohort.

However, this variation in behaviour did not translate into a proportional difference in learning-oriented engagement. The gradient ratio for language focus was only 1.3:1 (2.3 vs. 1.8), far lower than the ratios for behavioural engagement (2.9:1) or gaming activity (2.5:1). In other words, even students who engage with English far more frequently do not show a correspondingly higher degree of attention to linguistic form. Their practices remain primarily consumption driven, reflecting the broader pattern observed across the full sample.

Theoretically, this defies simple assumptions that "more exposure leads to more acquisition." As Lai (2017) and Reinders and White (2016) emphasise, effective digital learning relies on metacognitive awareness learners need to know how to use digital affordances strategically. High behavioural engagement but not parallel cognitive or linguistic engagement describes what DiMaggio and Hargittai (2001) have described as the "second-level digital divide"; that is, learners have access and frequent use, but not the strategic digital literacy that will turn that use into learning. Despite their differences in time and frequency, both groups converge on a similar issue.

Those 30% of students that show the lowest engagement in IDLE (1.1 hours daily) do not have enough input quantity to be able to support the development of incident vocabulary. On the other hand, the 30% of students that engage in IDLE very intensively (3.2 hours daily) are not necessarily exposed to more language, as

the findings suggest that they are just a lot more content consumers. . Both ends of the spectrum point to the same need: explicit instruction in metacognitive and form focused strategies that can help students convert high levels of consumption into meaningful language development.

7.4.1 Quality-Adjusted Engagement Metrics

Overall, the findings imply that there is a need for a more refined framework to assess IDLE engagement. Time on task simply cannot explain the linguistic value of various forms of input. Ten hours of short form, algorithmically curated clips characterised by fragmented contexts and limited noticing cannot be compared to series of five hours with subtitling and coherent narratives, with repetitive constructions.

The engagement profile observed here illustrates this clearly. High behavioural and affective engagement coexist with lower cognitive and linguistic engagement, reflecting structural constraints embedded in platform design rather than a lack of motivation on the part of the learners.

Research in the future would benefit from distinguishing between:

- long form and short form exposure
- algorithmically curated and self-selected content
- passive reception and interactive practices
- entertainment-only and learning integrated activities

Such distinctions would allow us to make more accurate predictions of which forms of informal engagement are most likely to support meaningful linguistic development.

RQ1 reveals a nuanced picture: Algerian technical students engage extensively with English through digital media, driven by enjoyment and autonomy. But the overwhelming focus on content over form constrains linguistic development. Incidental learning supports receptive fluency and vocabulary growth, but without noticing or productive practice, deeper acquisition may plateau. These findings set the stage for understanding how IDLE shapes formal language attitudes (RQ2) and motivational orientations (RQ3)

7.5. IDLE-EST relationship

The second research question examines the relationship between IDLE engagement and students' attitudes toward EST. The findings reveal a pattern with clear theoretical significance.

7.5.1 Affective Engagement and EST Attitudes: Evidence for the Conflict Hypothesis

The second research question is how informal digital English practices of students relate to their attitudes towards English for Science and Technology (EST). While there has been no general correlation between IDLE engagement and EST attitudes, a more detailed examination suggests a more clear-cut and nuanced pattern. The affective dimension of IDLE students' enjoyment, excitement, and emotional connection to informal English was strongly and negatively related to their affective attitudes toward EST ($r = -.697$, $p < .001$). Affective engagement alone accounted for 48.6% of the variance in affective EST attitudes ($R^2 = .486$). Students who found English fun, stimulating, and rewarding in digital environments tended also to report boredom, frustration, and low enjoyment in their formal EST classes.

Self Determination Theory provides a convincing explanation for this difference. IDLE environments satisfy the three essential psychological needs of autonomy (self chosen content), competence (instant understanding support, images and interaction), and relatedness (online communities, fandoms, shared interests). This pattern is a direct instantiation of the contrast effect observed by Deci and colleagues (1999), who showed that being in autonomy supportive conditions causes aversive ratings of subsequent controlling conditions ($d = -0.36$ to -0.68). The present negative correlation ($r = -0.697$) reflects a much larger effect, probably because the difference in autonomy between IDLE and EST is larger than in conventional experimental manipulations. Students are not comparing two conditions within a classroom but contrasting totally self-directed leisure activity with institutionally mandated instruction; a comparison which intensifies the psychological costs of the controlled setting.

On the other hand, EST is felt as a regulated environment mostly due to the fact that the curriculum is predetermined, there is little flexibility, the texts are of a technical nature, and the tasks are exam oriented. Ryan and Deci's (2017) organismic integration theory predicts that when learners routinely experience high autonomy and enjoyment in one context, controlled contexts may feel particularly unsatisfying. Teachers observed the same pattern. As one explained, students "enjoy English in general, but EST vocabulary scares them. The terminology is intimidating, and the topics don't connect to their lives... media feels accessible; EST feels like work."

The correlation between affective IDLE engagement and cognitive EST attitudes provides an even more precise picture. While students who enjoy English informally report lower affective and behavioural engagement in EST ($r = -.697$ and $r = -.550$, $p < .001$), they still acknowledge EST's importance (cognitive attitudes $M = 3.40$). The relationship between affective IDLE engagement and cognitive EST attitudes was in fact moderately positive ($r \approx +.32$). Students who are fond of English acknowledge the career worth of technical English, however, they continue to be indifferent to the class, as the learning experience is not in harmony with the fun they relate to English in other places. This mirrors the SDT distinction between identified regulation (valuing an activity for future goals) and intrinsic motivation (valuing the activity itself). Students value EST for what it represents but not for how it feels.

The structural equation model reinforces the centrality of affect. Affective IDLE engagement remained the only significant predictor of EST attitudes ($\beta = -.68$, $p < .001$) once all dimensions were accounted for. Time spent, strategy use, and linguistic attention did not predict EST attitudes. This difference is consistent with SDT: emotional involvement is an example of the fulfilment of psychological needs, while behavioural and cognitive aspects may not inherently represent autonomy, competence, or relatedness. To a large extent, emotional involvement is the reason for the motivational asymmetry noticed here: IDLE feels like freedom, connection, and joy; EST feels like an obligation. Students compare these contexts and respond accordingly.

7.5.2 Understanding the Null Relationships: Evidence for an Independence Framework

Beyond the strong affective contrast discussed above, the results show that the remaining IDLE dimensions behavioural, cognitive, and linguistic have no significant relationship with students' EST attitudes (all $r < .12$). This pattern aligns with observations in the field that informal and formal English learning frequently operate as psychologically distinct domains (Benson, 2011; Sundqvist & Sylvén, 2016; Lee & Dressman, 2018), rather than functioning in a complementary manner.

Several layers of evidence show how this division is operationalised. First, the two domains are divided temporally and contextually. IDLE occurs during leisure time, in personally chosen digital environments, and revolves around student selected topics, genres, and communities. EST, by contrast, takes place during scheduled academic hours, uses institutionally mandated texts, and follows a teacher directed syllabus. EST takes place in classroom settings, using materials that are mandated by the institution, and tasks that are directed by the teacher. There is also significant difference in terms of language between the two: IDLE aims at raising learners' awareness of conversational registers, familiar vocabulary, humour, gaming discourse, and pop-culture references, whereas EST requires learners to be proficient in technical terminology and academic genres.

This interpretation aligns with year-level comparisons, which showed no meaningful differences in EST attitudes between second- and fourth-year students ($t = 1.17$, $p = .244$). If IDLE and EST affected each other, attitudes could be changed for the better in an accumulative exposure or on the negative due to greater dissatisfaction. Their consistency over the course of years rather indicates that learners maintain a conceptual distinction between informal and formal English.

This view is reinforced with teacher interviews. T1 explained that students select content online according to "what matters to them personally" but EST does not allow such autonomy. T4 noted that students "enjoy English in general, but EST vocabulary scares them," emphasizing the idea that students have two separate evaluative frames: English as enjoyable and self directed, and EST as obligatory and institutionally imposed.

A further insight comes from comparing these results with studies conducted in general EFL contexts. Previous research (Sundqvist & Sylvén, 2016; Lee & Dressman, 2018; Sockett, 2014) has often reported a complementarity effect, where out-of-class English use enhances classroom motivation. The present findings diverge from this pattern, and the decisive difference appears to be contextual. In previous research, the formal instruction was in general or communicative English, which is in more natural parallel to what people do informally. In the present context, EST represents a highly specialised domain centred on technical vocabulary, scientific reading, and engineering-related genres. Students can easily follow gaming streams, films or social media creators, but have trouble following thermodynamics texts or engineering summaries. As one focus group participant put it: “The vocabulary is too technical. We don’t use it in real life.”

Pedagogical practices further widen this gap. Where complementarity did appear, teachers frequently included the use of media, student selected materials or more up-to-date topics within teaching. In contrast, students in the present study described EST as “too much reading, no videos... very boring”, indicating that the curriculum makes little attempt to capitalize on learners’ rich informal exposure. Under such conditions, any potential motivational transfer is unlikely to occur. Instead, the two domains remain isolated.

Consequently, behavioural, cognitive, and linguistic IDLE dimensions show near-zero correlations with EST attitudes, not because informal learning lacks value, but because students do not perceive the two experiences as connected. They can be extremely active and motivated in IDLE even though they might find EST tedious or intimidating simply because the contexts are different in terms of purpose, mode and competencies required.

7.5.3 Why Affective Engagement Predicts EST Attitudes While Other Dimensions Do Not

The pattern observed in RQ2 is better understood within a Self Determination Theory (SDT) framework. Among all IDLE dimensions, affective engagement is the one that directly reflects the psychological needs fulfilled in informal learning environments namely autonomy, competence, and relatedness. These are the same

needs that EST instruction satisfies only partially, if at all. Consequently, students who experience high emotional satisfaction in IDLE experience the contrast with EST more intensively, which results in more negative attitudes towards the formal context.

By contrast, the other engagement dimensions do not index these psychological needs. Behavioural engagement is capture of time on task as opposed to motivation quality. A learner may spend many hours with English without necessarily experiencing autonomy or competence, particularly in algorithm driven environments. Indeed, 87.5% of students described their IDLE habits in passive terms such as “it gives me,” “the app decided for me,” or “I just scroll,” indicating that high behavioural engagement does not necessarily involve self-directed choice. Similarly, cognitive and linguistic engagement are measures of strategic processing and attention to form, and not of subjective satisfaction. Students can use context clues or can follow main ideas without the perception of being skilled and autonomous. These forms of engagement reflect what learners do, not how they feel while doing it.

This distinction is crucial. SDT states that attitudes toward environment of learning are not involved in the quantity of activity but rather in the extent to which the contexts meet psychological needs. Behavioural, cognitive and linguistic engagement are therefore unrelated to EST attitudes as the former are measures of engagement that can actually be observable, whereas the latter reflects internal motivational meaning that students attach to their experiences. Affective engagement, by contrast, contains enjoyment, immersion and preference, which are the exact same factors that signify need satisfaction. When students receive great pleasure and freedom under IDLE, and are challenged by a control-oriented and less engaging environment under EST, the difference in motivation becomes salient. As a result, affective IDLE engagement emerges as the sole dimension that predicts EST attitudes, while the others remain neutral.

Therefore, only affective engagement carries the psychological weight necessary to influence how students evaluate their formal learning experiences.

The correlation between the affective IDLE engagement and affective EST attitudes ($r = -.697$) warrants beyond statistical significance. By Cohen's (1988) conventions, this is a large effect and accounts for about 49% of variance in EST attitudes. This magnitude surpasses correlations reported in the literature on motivation in L2, in which correlations between motivational variables and outcomes tend to fall between $r = .20$ and $.45$ (Masgoret & Gardner, 2003). The effect size indicated that the IDLE-EST affective contrast is not only statistically detectable but also very meaningful: almost half of the students' emotional reaction to EST instruction can be attributed to their affective experiences in informal digital learning. From a more pragmatic perspective, an effect of this magnitude is worthy of pedagogical attention.

However, there are really a variety of other explanations, which must be considered before causal conclusions can be drawn. First, the relationship might be bidirectional and not unidirectional. Students who already have a negative attitude toward EST may have been compensating for this by looking for enjoyment in IDLE activities, rather than IDLE enjoyment leading to EST dissatisfaction. The cross-sectional design can't create temporal precedence; longitudinal research that tracks attitude change over time would need to be done to examine the directionality.

Second, there may be unmeasured third variables achieving some of this relationship. Students with generally negative academic orientations might simultaneously report greater enjoyments of leisure activities and lower appreciations of formal aspects of instruction and therefore correlation between IDLE affect and EST attitude may indicate dispositional effects rather than a direct IDLE-to-EST specific influence. The inclusion of general academic motivation or conscientiousness as control variables in future research would help to get at the unique contribution of IDLE affective engagement.

Third, while the contrast effect interpretation based on SDT is theoretically based, another alternative possibility could be that IDL and EST attitude develop independently from each other, but correlate in a negative way because IDL and EST reflect different motivational orientation (hedonic versus achievement-oriented). Students who were high in hedonic orientation would have a natural tendency to

achieve high scores of IDL enjoyment and low levels of EST appreciation regardless of any active comparison process. Nevertheless, there is support for the contrast interpretation in the qualitative data: Students explicitly compared the two contexts ('media feels accessible; EST feels like work'), and teachers directly observed them doing so ('they enjoy English in general, but EST vocabulary scares them'). This convergence among sources of data enhances the interpretation of the contrast effect without claiming that any unequivocal causal claims have been identified to date, which is again subject to confirmation via experiments or longitudinal studies.

7.5.4 Reconciling the Null Findings with Expectations from Transfer Literature

This study's negative findings contrast sharply with findings of positive relationships reported in the literature review, pointing out context as a vital moderator. Sundqvist and Sylvén (2012) found positive correlations ($r=.23-.38$) between Swedish students' extramural English and classroom proficiency. Lee and Dressman (2018) reported informal digital literacy predicted formal classroom achievement ($\beta=.34$) among Korean learners. Sockett (2014) found French students viewed informal and formal learning as complementary.

Three contextual differences may explain divergent findings:

- **Pedagogical approach:** Swedish as well as Korean contexts involved communicative pedagogy, pedagogy of autonomy, that recognized and made use of extra-mural experiences of students. Teachers in the study by Sundqvist and Sylvén claimed they used gaming discussions and popular media within the teaching. In contrast, the EST courses in the present study incorporated traditional methods with emphasis on technical reading and terminology with little digital media integration. As students noted: "Too much reading, no videos. It feels very boring."
- **Content alignment:** Previous research has focused on general English or communicative EFL, which is largely akin to informal entertainment English. There is direct transfer of students' pop culture vocabulary and conversational fluency. EST, on the other hand, requires specialist register and technical

lexicon with little or no overlap with informal practices. As FG1-P2 stated: "The vocabulary is too technical." We don't use it in real life." The distance between what students do informally (watch Marvel movies, follow social media, play MMORPGs) and what EST is asking them to do (read about thermodynamics, write engineering reports) is very great.

- **Institutional culture:** Contexts in which complementarity is observed may have educational systems with institutionalized dispositions toward appreciating and acting on out-of-class learning. The institutional constraints of the present study, overloaded curricula and the focus on assessment by examination and rigid syllabi provide conditions in which the use of informal learning feels like "going off track" rather than enhancing basic objectives. As T5 explained: "If I am using the class for the things that are not going to be tested, then it becomes difficult to handle the syllabus."

These comparisons suggest the "Independence Hypothesis" that informal and formal learning operate separately may be context-dependent. In autonomy supportive, flexible educational contexts with content alignment, IDLE and formal learning can complement. In controlling, rigid contexts with content misalignment, they remain independent or even conflicting domains. The negative relationship observed here is not inevitable but rather symptomatic of how EST is currently experienced in this particular institutional context.

7.5.5 The Cognitive-Affective-Behavioral Dissociation

A better understanding of student attitudes to EST is revealed when viewed in terms of Gardner's (1985, 2010) three-component attitude model. The data reveal a strong dissociation between student thinking about EST, feeling about EST, and behavior in the course.

Cognitively, the students appreciate the instrumental value of EST. They scored well above the neutral midpoint ($M=3.4/5$ or so) on such items as "EST is important for my academic/career goals"; even those who don't like the class intellectually accept its utility. This was echoed in the focus groups, where one participant said, "For career, maybe yes, we need technical English . . . But in class it is very boring"

(FG3-P6). In other words, students do not question EST's relevance, they question the experience of learning it.

Affectively, their evaluations were much more negative. Students mean affective attitude score was well below neutral ($M \approx 2.4/5$) and statement "EST is useful but very boring" was unanimously agreed in all groups. This is not indifference and is genuine negative feelings against EST. This is not indifference and is genuine negative feelings against EST. The boredom, lack of enjoyment, and emotional detachment that was cited so often in the focus group discussions fits this quantitative pattern well.

Behaviourally, these beliefs were reflected in the students making very little effort and showing low participation. Students claimed to have had little behavioural engagement ($M \approx 2.4/5$). Such a mixture of low affect and low behavioural engagement, even though the students clearly recognized the importance cognitively, is equivalent to amotivation or external regulation as per Ryan and Deci (2017) in their terms. Students are involved in the activities because it is a compulsory course, not because they want to or because they have recognized its value. They realize that EST is important, however, they only do the minimum necessary very typical extrinsic motivation signs which are unable to sustain learning behaviour over time.

This pattern is in line with what Vansteenkiste et al. (2004) consider as the difference between identified regulation intellectual recognition of value and intrinsic motivation real, heartfelt, emotional engagement. Students show identified regulation toward EST (recognizing instrumental importance, $M = 3.40$ cognitive attitudes) while having very low intrinsic motivation ($M = 2.34$ affective attitudes). A moderate positive correlation between affective IDLE engagement and cognitive EST attitudes ($r = +.32$) indicates that both could be, in fact, two sides of the same Ideal L2 Self coin: students with a strong future oriented L2 identity engage in English learning out of their own will and through self directed learning (IDLE) whereas at the same time, they recognize EST's role in achieving professional competence.

Nevertheless, this recognition is not accompanied by affective engagement as EST instruction being mainly associated with curricular rigidity, high stakes

assessment, and perceived lack of connection to personal interests frustrates the autonomy, competence, and relatedness needs that IDLE contexts satisfy in a systematic way.

This is not inconsistent rather, it is a theoretically expected result of the situation when formal instruction is not in line with the autonomy supportive, personally relevant conditions that are typical of successful informal learning.

In summary, RQ2 showed a misalignment: high informal engagement is associated with negative affective attitudes toward formal EST, consistent with an SDT based interpretation of an autonomy/control clash. Students value the value of EST but generally do not enjoy it or put effort into it, particularly if they have rich and fulfilling experiences in English in other places. The relation of IDLE to EST in this context appears to be one of parallel tracks or even competing experiences, rather than mutually reinforcing avenues of learning. This highlights a need for pedagogical approaches that can include informal learning and the formal curriculum a theme that will be revisited when discussing teacher perspectives (RQ4). Before that, RQ3 offers additional insight into the learner side by looking at how the motivational patterns of students drive their IDLE engagement patterns, which in turn set the stage for the attitudes observed here.

7.6 Interpreting motivational predictors (RQ3)

Research Question 3 examined whether motivational constructs predict IDLE engagement. The findings revealed a systematic pattern: strong prediction for consumption-oriented engagement (52.0% variance explained) but null prediction for learning-oriented engagement (1.0% variance) a divergence requiring careful theoretical interpretation.

7.6.1 Prediction of Consumption-Oriented Engagement

The results of the regression analysis indicate the presence of a strong and consistent motivational basis for students' informal English use. Ideal L2 Self and International Posture together explained 52.0% of variance in consumption-oriented IDLE engagement (combined behavioral and affective dimensions), $R^2 = .520$,

$F(2,250) = 135.67, p < .001$, with both variables found to be significant independent predictors (Ideal L2 Self $\beta = .477, p < .001$; International Posture $\beta = .419, p < .001$). This represents a large effect size and is larger than is normally reported in L2 motivation studies.

This pattern fits squarely within the L2 Motivational Self System (Dornyei, 2005, 2009). The Ideal L2 Self reflects the students' vision of themselves as competent future English-using professionals - an image that is particularly salient for technical students who expect to work with international partners or read specialist literature or participate in global engineering environments. International Posture, in turn, reflects their receptiveness to global content and cross-cultural communication. Both orientations predispose learners to seek out English voluntarily.

The types of IDLE activities reported by students :YouTube watching, gaming with international players, browsing global social media are very much in line with these motivations. A student who envisions themselves as an internationally mobile engineer may view TED talks, technology channels, or online multiplayer environments as steps towards that professional identity Similarly, students with a significant degree of global perspective view English media as their access to the trends and communities of the world. The effect size of this motivational prediction ($r = .520$) is higher than the values typically reported in L2 motivation research and much higher than Al-Hoorie's (2018) meta-analytic effect size of Ideal L2 Self ($r = .61$). This amplification is likely to reflect IDLE's unique position as totally voluntary behaviour: classroom effort is variance from the institutional requirements, but IDLE engagement is entirely motivation driven. The current results therefore constitute a purer test of the influence of motivation than classroom-based studies, in which external pressures confound the relationship between motivation and behavior. The findings of Mills (2018) and Alnajashi (2024), which both found that IP and Ideal L2 Self were jointly predictive of informal engagement, are confirmed and extended here with the present study showing these effects in a context that has never been studied before (i.e., Algerian technical students), while disaggregating the effects of prediction by engagement dimension.

Thus, the high affective engagement scores (enjoyment $M = 4.40$, excitement $M = 4.30$, preference $M = 4.37$) reflect not only the fun factor but also the involvement that corresponds to the students' identity.

The dimension specific regressions suggest complementary roles for the two motivational constructs. For behavioral engagement, the model was significant ($F(2,250) = 44.72$, $p < .001$; $R^2 = .264$), with the Ideal L2 Self being a better predictor ($b = .398$, $p < .001$) than International Posture ($b = .199$, $p < .01$). This suggests that the amount of time and effort that students put into English is driven by future oriented identity.

For affective engagement, the model was significant again ($F(2,250) = 60.43$, $p < .001$; $R^2 = .326$), but International Posture was a stronger predictor ($\beta = .401$, $p < .001$), with Ideal L2 Self playing a secondary role ($\beta = .259$, $p < .001$). Thus, positive feelings of joy, excitement, and emotional attachment to English use seem to be determined more by learners' global orientations than by their long term professional goals.

Motivational results seem to depict a profile in which the Ideal L2 Self is the source of the change in the quantity of informal engagement, while International Posture contributes to the quality of emotional involvement. Such a mixing mechanism makes it possible to account for the extent as well as the enthusiasm of students in consumption based IDLE activities.

7.6.2 Null Prediction of Learning-Oriented Engagement

In contrast to strong motivational effects found for consumption-oriented engagement, the analysis found no meaningful relationship between motivation and learning-oriented engagement. Neither the Ideal L2 Self nor International Posture predicted students' cognitive or linguistic engagement during IDLE. The regression models were non-significant for both cognitive engagement ($R^2 = .011$, $F(2,250) = 1.39$, $p = .251$; Ideal L2 Self $b = [?].003$, $p > .05$; International Posture $b = .104$, $p > .05$) and linguistic engagement ($R^2 = .009$, $F(2,250) = 1.15$, $p = .318$; Ideal L2 Self $b = .095$, $p > .05$; In practical terms, even the most motivated learners - those with

strong future self visions or high international orientation - were no more likely than others to monitor their comprehension, analyze linguistic forms, or deliberately study the language while engaging with English media.

Several factors help to explain this dissociation.

First, consumption and learning are two different psychological modes. The activities that dominate the IDLE of students, watching videos, gaming, browsing social media, are inherently hedonic and immersive. They are a good match with the Ideal L2 Self and International Posture, both of which make English-language media personally meaningful and enjoyable. In contrast, learning-oriented behaviors, such as attention to form or monitoring comprehension, would interrupt this immersion. Based on flow theory (Csikszentmihalyi, 1990), metacognitive monitoring interrupts the flow of experience that makes these activities pleasurable. Thus, even highly motivated learners prefer to stay in the consumption mode, where the use of English is natural and rewarding.

Second, motivation seems to be conducive to implicit rather than explicit learning. Usage-based accounts of acquisition (Ellis, 2002, 2017) suggest that learners extract linguistic patterns from repeated exposure without conscious analysis. Highly motivated students may therefore have faith in the idea that "learning will happen" through massive input rather than intentional study. Their motivation makes them seek English often and enjoy it intensely, providing favourable conditions for implicit learning, but not conscious strategy use.

Third, the IDLE environment is not conducive to incentives for deliberate engagement. Unlike the formal instruction, informal digital spaces offer no grades, feedback, or expectations that encourage strategic processing. Entertainment value alone keeps participation going. Because strategic attention does not provide an immediate reward - and may even diminish enjoyment - there is little contextual reason for students to switch from entertainment to study mode, regardless of motivational strength.

Finally, strategic engagement requires explicit metacognitive training, which is largely lacking in students in this context. Research on learning strategies (Oxford, 2017) indicates that learners rarely use metacognitive techniques without being taught, modelled and given feedback. Teacher interviews supported this gap: only two of seven teachers (T3 and T5) referred to giving any guidance on how to use informal media strategically, and even these efforts were limited and unsystematic. Without pedagogical support, the motivation of students leads to more exposure, not more strategic engagement.

These null results have important theoretical weight. They suggest that the self-regulation capacities that Zimmerman (2000) and Dornyei and Ushioda (2021) have found to be accompanying strong motivation may be context-dependent as opposed to automatically deployed. In formal learning environments motivated learners do appear to engage with strategic processing-but formal environments involve teachers, tasks and the assessments and scaffold and reward strategic processing. IDLE environments don't offer any one of these supports. The results thus support incidental learning theory (Schmidt, 1990; VanPatten, 2004) over self-regulation theory in terms of which informational context (English-rich environment) learners choose to engage in or not, but not in terms of which informational context they decide to process strategically once in an English-rich environment. This provides an important boundary condition for motivational theory in the digital learning context.

7.6.3 Year-Level Differences in Motivation: Identity Development

The comparison of the Year 2 and Year 4 students showed a clear pattern of development in identity based motivation. Ideal L2 Self increased significantly from Year 2 ($M = 4.03$, $SD = 0.59$) to Year 4 ($M = 4.24$, $SD = 0.57$), $t(251) = -2.95$, $p = .004$, $d = 0.37$, while International Posture did not significantly change - from Year 2 ($M = 3.93$, $SD = 0.52$) to Year 4 ($M = 4.05$, $SD = 0.5$). This increase in Ideal L2 Self was not associated with more positive attitudes toward EST; all comparisons of EST attitudes across year levels were non-significant (all $p > .19$).

The strengthening of Ideal L2 Self seems to be the result of the natural process of professional identity formation rather than the influence of the EST curriculum. As students are about to graduate, the awareness of the expectations of the job market in terms of language becomes more concrete. They see their peers preparing for international mobility, they see job advertisements that emphasize English language skills, and they see career limitations that are linked to a lack of English. These accumulated experiences make the imagined future self as a competent English using engineer more vivid and more urgent. In this sense, Ideal L2 Self develops independent of the affective experience of EST classes.

In contrast, it is the stability of International Posture that leads one to believe that it is more of a dispositional rather than a developmental orientation. Students openness to global culture and international communication is likely to be formed before university through exposure to international media, family influence or pre-existing cosmopolitan interests and is relatively constant during their studies. Unlike the Ideal L2 Self, which can be seen to become more distinct as one's career goals become more clear, the International Posture appears to be less dependent on academic progression and more reflective of individual's stable personal tendencies.

The difference here is consistent with Yashima's (2009) model, according to which International Posture is a general attitudinal orientation towards the international community, whereas the Ideal L2 Self is a context sensitive motivational guide that becomes more prominent when learners encounter their professional paths in the world. The different developmental patterns at play here increasing the Ideal L2 Self alongside a stable International Posture thus, support the idea that these constructs work through different psychological mechanisms despite their being jointly implicated in IDLE engagement.

To sum up, RQ3 demonstrated that students' motivation ,namely their Ideal L2 Self and International Posture , was a significant predictor of the amount of engagement in IDLE and the amount of enjoyment of IDLE (52% variance explained), but the impact of these motivational factors was virtually nil in terms of engagement for learning (which was close to zero). In practical terms, highly

motivated students watched more English content and felt more positive while doing so, but did not pay more attention to linguistic forms or use more cognitive strategies than their less motivated peers.. These results help to explain that motivation is a driver of quantity and enjoyment, rather than strategic learning, and understand why extensive IDLE does not always result in proportional linguistic gains. In line with previous research (Lai & Gu, 2011; Lee, 2019) and Henry's (2013) concept of motivational dualism, learners' strong Ideal L2 Selves energise their informal, pleasure-based English use, while their formal learning is externally regulated leaving their IDLE practices rich in exposure but limited in deliberate, form-focused engagement.

7.7 Teacher Perspectives on IDLE and EST (RQ4)

RQ4 explores the other side of the learning ecology: the instructors who teach EST. After establishing in earlier chapters how students engage with informal digital English and how this influences their attitudes towards formal instruction, RQ4 investigates how teachers perceive these same informal practices and whether they respond to them pedagogically. In accordance with the guiding questions in the research design, this section delves into the awareness of teachers on the IDL habits among students, their beliefs on the educational value of IDL habits, the extent to which they integrate digital practices into EST teaching and the constraints that influence their decision in the classroom.

7.7.1 Teacher Awareness and the Recognition Gap

Research Question 4 investigated how EST teachers can identify and use informal learning practices of students in English. The results demonstrate that there is a basic awareness gap that differs significantly among teachers. Although the seven participants all admitted that students access English-language digital media beyond the classroom, the level of awareness of this activity was based on loose impressions to specific platform-based information. The educators who frequently engaged students informally in discussions of their media use showed significantly more complex knowledge of which platforms students used, which were Instagram, Tik

Tok, YouTube, Netflix, video games, and music and what types of content students were exposed to and what linguistic style they were exposed to. On the contrary, educators who forced students to follow a set of prescribed textbooks and structured materials had a general awareness of students using the internet, but no particular knowledge of how they engage with it.

This variability is theoretically important when considered with the quantitative results from Phase 1. Students spend an average of 14.3 hours per week in informal digital English activities, 9.5 times the exposure of 1.5 hours of formal EST instruction they receive. Yet many teachers are unaware of this scale of engagement or the specific linguistic environments that students are in digitally. Arndt (2019) found this to be a critical blind spot in formal language education, where institutional curricula run in parallel with learners' authentic language practices. The present findings suggest that teacher awareness is a prerequisite to any pedagogical integration of IDLE, but that teacher awareness is neither universal nor systematic among EST instructors.

7.7.2 Perceived Benefits and Concerns: The Register Dilemma

Teachers consistently identified certain linguistic benefits among students who had regular IDL engagement, especially in pronunciation accuracy, listening comprehension, oral fluency, spelling, and speaking confidence. These observations are consistent with Input Hypothesis predictions that comprehensible, meaningful exposure facilitates acquisition (Krashen, 1982). Teachers credited pronunciation gains to students' repeated exposure to the authentic models of native speakers via YouTube content and streaming services, while gaming was specifically associated with increased tolerance for fast speech and real-time comprehension. The fact that the teachers were able to observe these benefits through classroom performance - rather than making assumptions based on theory - gives empirical strength to claims about IDL's linguistic value documented in international contexts (Sundqvist & Sylvén, 2016; Lee, 2022).

However, in addition to these perceived benefits, teachers voiced strong concerns about inappropriateness of register and informality of language. Students were reported to bring slang, internet jargon, meme language and vocabulary relating to the specific context of entertainment into formal academic contexts in which technical or professional registers were required. Examples included using the language of Harry Potter ("squib") in technical discussions, viral expressions ("slay," "no cap") in formal speaking tasks, and hyperbolic constructions ("I literally died") with no pragmatic understanding. Critically, teachers emphasized that these were not mistakes in linguistic correctness but failures in contextual appropriateness - students lacked metacognitive awareness of the variety of language by register and situation.

This register dilemma helps to highlight a significant limitation that is demonstrated in the quantitative data: the consistently low level of linguistic engagement by students during IDLE activities ($M = 1.95\text{-}2.72$, well below the scale midpoint of 3.0). When students use digital media for entertainment purposes and to understand meaning rather than to consciously focus on the linguistic form, they learn conversational and informal registers without building parallel awareness of formal, academic, and/or discipline-specific language. Bouhania's (2016) finding that only 22% of Algerian student gamers transferred acquired expressions to academic discourse is in direct parallel to what teachers are now observing in EST classrooms. The lack of explicit form focused attention during IDLE, along with the lack of metacognitive scaffolding in formal instruction, results in learners with significant receptive English competence who struggle to effectively adapt register.

This register confusion is the instantiation of what Han (2004) and Long (2003) warned about concerning fossilization from non-target input. Without correctional feedback - absent in the IDL contexts - students internalize, not just correct informal forms, but also register-inappropriate usages patterned as successful communication which becomes stabilized through repeated successful communication. The theoretical concern, raised in section 1.2.2.2, that exposure to IDLE might solidify errors rather than correcting them, finds tangible empirical form in teachers' accounts of the learners who confidently produce pragmatically inappropriate

language. The problem is not linguistic error per se but what Oxford (2017) calls weak metacognitive strategy use: the students lacked the awareness to recognise when it was necessary to change register, having developed their English competence in contexts in which this was not necessary.

7.7.3 Limited Integration and Structural Constraints

Despite their awareness of the linguistic benefits of IDL, teachers reported little and unsystematic incorporation of students' informal practices into EST instruction. Three different approaches emerged: engagement driven integration, in which teachers strategically employed youth-oriented language to minimize anxiety in speaking tasks; topic-driven integration, in which media content was selectively integrated when related to technical subject matter; minimal or absent integration, in which curriculum density and time constraints prevented any systematic use of digital media. Critically, only five out of seven teachers reported any bridging strategies and none described systematic, long term approaches for developing students metacognitive awareness of register differences or processes of transfer.

Teachers openly noted structural barriers as the main limitation to integration of IDLE. The EST curriculum was described as incredibly dense, with little instructional time compared to content volume, exam oriented assessment structures, and standardized materials that had little flexibility. This tension of time pedagogy is especially striking in light of the quantitative context: while students spend almost ten times more hours in IDLE than EST, teachers frame the formal integration of IDLE as a trade off to "core content" coverage. This is what educational research calls curricular washback - high-stakes assessments measuring vocabulary, grammar, and comprehension are more powerful drivers of instructional choices than learner needs or pedagogical research (Fullan, 2001).

Activity Theory provides a helpful lens for interpreting such constraints. Teachers are working in an activity system where the object is assessment preparation and not authentic communication development, the rules are standardized curricula and fixed syllabi, and the tools are prescribed textbooks (Engeström, 1987). Individual teacher beliefs about the value of IDLE cannot overcome these systemic forces. Even

teachers who knew of the important linguistic gains from informal practices by their students often did not have institutional permission, curricular space or time to benefit from this engagement in a systematic way. This exposes a basic misalignment: the formal education system is designed in ways that actively block teachers from building on such a vast amount of self-directed learning that students do on their own.

7.7.4 Motivational Asymmetry and the Affect-Autonomy Connection

All seven teachers noted a dramatic motivational contrast between student engagement with digital media and student engagement with EST course work. Students were said to be highly self-driven, enthusiastic, and persistent in IDLE contexts and relatively task-oriented and less emotionally engaged in formal EST activities. Teachers attributed this asymmetry to content relevance and learner choice: students choose digital media based on their personal interests: it can be gaming tutorials, beauty content, sports analysis, etc. EST content is predetermined and often disconnected to students lives outside engineering studies. Teachers further observed that students had a positive attitude towards English in general, but EST specific terminology was intimidating and far removed from everyday experience

This observation directly relates to the quantitative findings and provides a mechanism explaining these findings. Phase 1 data showed that the levels of student behavioral and affective engagement with IDLE were uniformly high ($M = 3.51 - 4.30$ for behavioral activities; $M = 3.92 - 4.40$ for affective responses), but that affective engagement with IDLE was highly correlated and negatively associated with EST attitudes ($r = -.697$ for affective EST attitudes). Teachers account and suggest that this negative correlation represents not contradiction but contrast effects: students who experience highly satisfying, autonomous, interest driven English interaction through IDLE subsequently see formally mandated, controlled, content-driven EST as comparably less engaging.

Self-Determination Theory (Ryan & Deci, 2000) predicts just this pattern. IDLE meets the three psychological needs that contribute to intrinsic motivation: autonomy (students select content), competence (content is self-selected at an appropriate level

of difficulty), and relatedness (participation in communities based on shared media interests). EST instruction, as it is usually structured, offers little autonomy, variable support for competence based on curriculum-learner alignment, and little relatedness to students' authentic identities and communities. The motivational asymmetry that teachers observe is therefore not incidental, but structural-there are fundamental differences in the way that informal and formal learning environments address psychological needs. The implication is important: Efforts to improve EST attitudes may involve not just better content delivery but fundamental restructuring of how EST offers learner choice, relevance and connection to students' existing linguistic practices and identities.

To sum up, Research Question 4 investigated the role EST teachers play in recognizing and capitalizing on students' informal English learning practices. The results show that although all seven teachers accepted that students interact with digital English media and there are linguistic advantages in pronunciation, fluency and confidence, their involvement is limited and unsystematic. Teachers' awareness ranged quite a bit depending upon their active inquiry about students' digital practices, and there were structural constraints such as curriculum density, time limitations, and assessment pressures that precluded systematic integration even among teachers who valued IDLE. Most critically, no teachers used strategies to foster students' metacognitive awareness of differences between registers or to scaffold transfer between informal and formal contexts so that students were not able to appropriately shift between conversational and academic English. Teachers therefore play a largely passive role as passive observers instead of active mediators of the informal learning of students, failing to take advantage of the opportunity to bridge the motivational gap between students' high IDLE engagement (14.3 hours weekly) and low EST satisfaction.

7.7.5 Mixed-Methods Integration and Framework Evaluation

The explanatory sequential design used in this study permits examination of how quantitative and qualitative findings are related. Three patterns of integration emerged: convergence, complementarity and discordance. Convergence was the strongest for consumption learning asymmetry. Questionnaire data indicating high

levels of behavioural engagement ($M = 3.51-4.30$) and low linguistic engagement ($M = 1.95-2.72$) was consistent with study log language focus ratings ($M = 1.5-2.2$), teacher-reported observations that students 'consume a lot but don't study,' and student descriptions in focus groups of passive scrolling behavior ('it gives me,' 'I just scroll'). This four source triangulation questionnaire, study logs, teacher interviews, student focus groups provides strength to belief that the consumption-learning gap is robust rather than a methodological artefact.

Complementarity was displayed where qualitative data explained mechanisms that were behind quantitative patterns. The high negative relationship between affective IDLE engagement and EST attitudes ($r = -.697$) received explanatory depth via teacher narratives of 'motivational asymmetry' and student descriptions that provided contrast between digital media enjoyment and EST tedium. The qualitative strand therefore delivered the 'why' of the quantitative 'what,' which fulfilled the central role of explanatory sequential design.

One area of apparent discord needs to be acknowledged. Teachers reported seeing obvious linguistic benefits for their students who were digitally active, improved pronunciation, fluency, and confidence - however, quantitative analyses revealed that there were near zero correlations between non-affective dimensions of IDLE and EST attitudes. This discordance probably means that it is a reflection of different phenomena: while teachers were identifying the outcome in terms of performance, especially in receptive skills, the quantitative instruments were measuring attitudes toward instruction. Students may well benefit linguistically from IDLE exposure while finding EST emotionally unsatisfying these are not mutually exclusive. This discordance thus strengthens, rather than compromises, the main result that IDLE does promote some competencies, but it does not transfer to positive attitude to formal technical English instruction.

In relation to the conceptual framework used in the study, the four-dimensional engagement model developed by Arndt (2019) was proven to be essential. The behavioural-affective-cognitive-linguistic distinction indicated the consumption-learning asymmetry that would have been rendered invisible by unidimensional engagement measurement. Had engagement been operationalised only in terms of

time-on-task the critical finding, i.e. that extensive exposure is co-experienced with minimal linguistic attention, would have been masked. Self determination theory successfully predicted the affective contrast between autonomy-supportive IDL and controlling EST instruction and L2MSS constructs explained variance in engagement quantity. The one limitation of the framework was that it implicitly expected motivation to be a predictor of quality of engagement as well as quantity; the null results for cognitive and linguistic engagement suggest that motivational constructs are more focused on approach behaviour rather than depth of processing in informal leisure contexts; a boundary condition not accounted for in the original framework.

7.8 Conclusion

The results offered in this chapter indicate that the high level of involvement of students in using digital English functions mostly beyond the pedagogical and motivational frameworks of formal training in EST. Although IDLE provides a high level of exposure, control, and fun, which are stimulating good behavioural and affective interest, it is still mostly consumption-oriented and less strategic or linguistic. This asymmetry validates the theoretical issues that stated that comprehensible input, without form-focused attention, results in constrained morphosyntactic development (VanPatten, 2004; Ellis, 2017), and that exposure repetition is an insufficient substitute of the load of involvement that is involved in deeper vocabulary learning (Laufer & Hulstijn, 2001). 2001). This asymmetry assists in explaining why IDLE is related to receptive gains but is associated with negative affect towards EST, which students appreciate cognitively but experience as inflexible, textual, and unrelated to their daily use of English.

Motivation also supports this dichotomy: Ideal L2 Selves and International Posture are the motivator of the amount and enjoyability of IDLE activity, but not more profound learning plans, establishing that the L2MSS constructs, act more on approach behavior than processing depth (Dornyei, 2009), and that need satisfaction as predicted by the Self-Determination Theory is a better predictor of amount of engagement than the quality of engagement in informal settings. The perspectives of teachers confirm the linguistic benefits and the limits of unmediated IDLE, echoing

Lai's (2017) finding that only successful learning managers are strategic in their use of digital resources while others are passive consumers.

Chapter VIII : Implications

8.1 Introduction

This chapter considers the wider implications of the findings at different levels conceptual, pedagogical, sociocultural, institutional and methodological. What emerges is a persistent disconnect in the way informal digital language engagement is recognised within formal structures. Addressing this is not a matter of encouraging more out-of-class activity. Rather, it requires rethinking the way in which formal education recognises and builds on the significant informal efforts already made by learners, with teaching practice moving towards greater alignment between content, purpose and the lived experiences of students.

8.2 Theoretical implications

The findings of the present study have implications in a number of theoretical frameworks that are central to the research on IDLE and language learning motivation. This part discusses how the patterns recorded, namely the asymmetry of consumption-learning, the affective difference between informal and formal settings, and the motivation-engagement disconnection, challenge, extend, or refine the available theoretical frameworks. There are four areas to be discussed, which include: the role of teacher cognition as a mediating variable with little to no presence in existing IDLE frameworks (9.2.1), the generalization of Self-Determination Theory to cross-context motivational influences (9.2.2), the reconceptualization of formal-informal learning relationships beyond mere complementarity (9.2.3), and the implications of modern platform evolution to IDLE theory (9.2.4).

8.2.1 Teacher Cognition as Mediating Variable

The findings indicate that teacher cognition, here understood as beliefs, awareness and pedagogical choices, plays a central role in whether IDLE remains separate from formal learning or becomes meaningfully connected to it. Teachers varied in their awareness of students' digital practices, whether they considered informal learning as part of their job, and how they dealt with it in the classroom. These differences were evident even among colleagues working in the same institution, with students and

constraints similar, suggesting that teacher cognition is a unique mediating factor in the way that informal learning is recognised, valued and incorporated into formal teaching.

Current IDLE research focuses mainly on informal learning as a learner side phenomenon and analyzes individual differences in engagement patterns, motivational orientations, and learning outcomes. The current study shows that the teacher-side variables are equally consequential. Even when students interact a lot with IDLE and build up a lot of informal competencies, these competencies are disconnected from formal learning if teachers are unaware, have beliefs that formal and informal learning are separate, or have structural constraints that prevent them from integrating. Future IDLE research should systematically examine teacher cognition, such as awareness of informal practices of students; beliefs about the educational value of informal learning; pedagogical content knowledge for bridging informal and formal contexts; and self-efficacy for implementing integration strategies as variables affecting IDLE's educational impact. Research designs might need investigate teacher-learner interactions as units of analysis instead of only learner behaviors.

8.2.2 Extending Self-Determination Theory: Cross-Context Motivational Effects

The finding that affective engagement with IDLE was significantly and negatively correlated with EST attitudes ($r = -.475$ to $-.697$) extends Self-Determination Theory in important ways. SDT normally looks at how autonomy, competence, and relatedness affect motivation within one context, the current research illustrates cross context effects. The data would suggest that a student who has their autonomy well catered for in the IDLE condition might feel the lack of autonomy in the EST condition more acutely. Students who through IDLE regularly engage in self selected, interest driven, intrinsically motivated English activities are likely to view curriculum controlled, formally assessed EST instruction as more controlling and less satisfying.

This is an indication of adaptation level reading of SDT: students set up their expectations for autonomy, competence, and relatedness on the basis of their most engaging experiences. When a different context fails to meet those expectations, it gets more restrictive by comparison. The consequences, however, are not only limited to language learning. In any educational system where learners have access to highly autonomous informal learning, contrast effects may take place. Formal instruction may be negatively evaluated not in absolute terms, but in the context of more enriching informal experiences.

If formal settings do not provide similar autonomy support with real choice, clear rationale or relevance for student interests students may disengage from formal learning and lean more heavily into informal spaces. Systems promoting autonomous learning outside of class have to ensure that classroom environments do not get left behind or risk losing student motivation altogether.

8.2.3. Reconceptualizing the Formal-Informal Learning Relationship

The literature review presented three different theoretical perspectives which anticipated distinct relationships between IDLE engagement and EST attitudes: the Complementarity Hypothesis (positive relationship), the Conflict Hypothesis (negative relationship), and the Independence Hypothesis (null relationship). The present results provide significant empirical evidence in support of the Conflict Hypothesis, and the Self Determination Theory origin in particular. A strong emotional involvement in autonomy supportive informal learning was a good predictor of more negative attitudes toward controlling formal instruction, as measured across all components of the EST attitude.

This contradicts a large number of assumptions that are still held within language pedagogy, that any English exposure is beneficial and that informal learning naturally complements formal instruction. The results indicate that formal informal relationships are not necessarily complementary but rather depend on pedagogical mediation. If there is no explicit bridging activities helping students recognize connections, develop metalinguistic awareness, and practice strategic transfer informal and formal learning may be seen as two different activity systems with

different rules, tools, communities, and objects. In each system, students gain skills, but they experience these systems as separate domains.

The theoretical implication is that IDLE's educational value is not just dependent on the amount or quality of engagement but also on whether formal instruction is actively using informal learning through systematic scaffolding.

future research should investigate the factors that make IDLE and formal learning complementary or conflicting, with a focus on pedagogical practices, curricular design, and assessment alignment as mediating factors.

8.2.4 Platform Evolution and Contemporary Affordances

This research demonstrates the impact of modern platform affordances on informal learning that is beyond what previous IDLE studies have been able to capture. While the foundational studies have looked at gaming, television, and films, extended YouTube content, and general online activities, the current study uncovers the move to algorithm driven, short form platforms TikTok, Instagram Reels, YouTube Shorts that are increasingly taking over students digital practices. These platforms, according to the study, endorse fundamentally different engagement experiences characterised by short, fast succession content exposure, algorithm curated personalization and passive scrolling, rather than active selection.

The first theoretical implication is quite important. It states that if platform affordances are the main factors that determine the quality of engagement, then IDLE research should not consider "informal digital learning" as one single phenomenon. In this case, platform features are potential determinants that can have a significant impact on learning outcomes. Short form video platforms may broaden vocabulary through a wide range of content but at the same time they can restrict the users from focusing deeply, requiring deep processing skills or coming across linguistic forms repeatedly processes that are credited as acquisition mechanisms. On the other hand, long form content may enable a learner to acquire more language input from one coherent source but it also requires more attention on the part of the learner.

IDLE research at the crossroads should carefully consider that different platforms may have different affordances, algorithms, content characteristics, and user interaction patterns, which in turn will have theoretical and methodological implications for the linguistic gains achieved, thus digital media should not be treated as an undifferentiated category.

8.3 Pedagogical Implications

The results of this research have a direct implication on the EST classroom practice. The patterns recorded, including high consumption and low linguistic engagement, affective difference between IDLE and EST, motivation predicting quantity and not quality, and teacher awareness with no systematic integration, all tend to indicate certain pedagogical responses. This part of the study will take these empirical results and convert them into practical guidelines and interventions that can be applied to EST teachers. It starts with a clear explanation of what is not needed in the effective integration of IDLE (8.3.1), proceeds to list the core pedagogical principles based on the motivational affordances of IDLE (8.3.2), and ends with the curriculum-level bridging practices (8.3.3). All along, it focuses on capitalizing on the vast informal exposure of the students without trying to imitate the entertainment value of the digital platforms.

8.3.1 Principles Over Performance: Effective IDLE Integration Without Entertainment Mimicry

A fundamental clarification of the conceptual framework for all pedagogical recommendations is: the effective integration of IDLE (informal digital learning environments) does not demand that teachers imitate informal digital environments or present themselves as entertainers. The teacher interview data pointed to a teacher who deliberately used the language of the youth during speaking sessions in order to lower students' anxiety and establish a good relationship. Although it was done with a good intention, this method mimics superficially, thereby misunderstanding the instructional value of IDLE, which the teachers' interview data suggests.

Teachers are not required to become "cool", get GenZ slang, use viral memes, or perform relatability to be able to leverage informal learning effectively. Such methods might only work for a short time to raise engagement due to the novelty effect but they do not solve the fundamental pedagogical problems which this research has pointed out, namely low linguistic engagement, register confusion, lack of metacognitive awareness, and motivational asymmetry.

Students don't need educators to keep them amused they can entertain themselves through IDLE, where they spend 14.3 hours a week on self chosen, intrinsically motivating English media. What students require from formal instruction is something that informal learning cannot provide: systematic support for register awareness, explicit metacognitive development, guided transfer from informal to formal contexts, and strategic literacy instruction. These teaching functions call for teacher expertise, not the teacher's entertainment value.

Therefore, teachers should be expert pedagogues when effectively integrating IDLE. They should be planning activities that not only engage students but also reflect the underlying pedagogical principles that make informal learning effective. Thereby, teachers are not required to compete with digital platforms for students' attention. This difference keeps teachers' professional expertise and authority intact while recognizing what makes informal learning motivationally powerful.

The aim is to have formal and informal learning work together (synergy) with each learning domain contributing what it is best at, instead of formal instruction trying to imitate the surface features of informal environments while at the same time giving up its distinctive pedagogical contributions.

8.3.2. Four Core Pedagogical Principles Derived from IDLE Affordances

Effective IDLE integration means applying the core pedagogical principles behind informal learning to formal instruction without imitating the surface features of digital platforms.

- **Autonomy Provision**

Autonomy provision represents one of IDLE's motivational elements. Students are thus fully engaged with technology and media as they are the ones who choose the content that is most relevant to them, they dictate the pace as well as the time of the session and follow up their own goals which are for them the most meaningful. The huge difference in motivation that teachers noticed students being highly engaged in IDLE and less so in EST should not be interpreted as students losing interest in the English language. Instead, it draws attention to the fact that the needs of students for autonomy, competence, and relatedness are satisfied differently in the informal and formal learning contexts because of the psychological nature of these needs. There is no need for teachers to embed YouTube videos, gaming references or social media content into lessons in order for EST instruction to be able to support autonomy.

How one provides meaningful choice within the constraints of structured frameworks is a way of accepting that not every aspect of the curriculum can be student directed in discipline specific programs but at the same time there are real opportunities for decision making. Teachers could give students a choice of how to demonstrate their understanding of writing a report, making an oral presentation, making a video to present the idea or making a poster. Students could also be allowed to choose from a variety of supplementary material each of which is a documentary, an article, a podcast or a YouTube channel, all of which are adapted to different interests and language levels. Small steps towards autonomy greatly contribute to the acknowledgment of students' independence and hence raise their intrinsic motivation, however, teachers are not required to change their roles into informal ones or use entertainment content.

Explaining the rationale for tasks rather than just assigning them also addresses student need for purpose. When teachers explain the relevance of particular vocabulary or grammatical forms or genres for carrying out professional communication, students are more likely to recognize the relevance of the tasks. For example, making direct connections between report writing and the expectations of

the workplace, between technical vocabulary and reading engineering literature, or between presentation skills and international conferences enables pupils to see the relevance in practice. This is particularly important considering the findings currently available: despite the fact that students recognize the cognitive value of EST ($M = 3.40$), their affective and behavioral engagement is low ($M = 2.34$ and 2.47). They know that it is important but do not find it engaging. The importance of providing rationale is so that students can internalize requirements and facilitate autonomous motivation.

- **Multimodality**

Multimodality is a concept that is used to define digital platforms using a combination of visual, auditory, text, and interactive elements in order to convey a message. Nonetheless, teachers do not need to use TikTok videos or Instagram posts to illustrate multimodal learning principles. EST instruction can provide diversification of modes for well founded pedagogical practices: students representing technical concepts via diagrams, infographics or flowcharts and written explanations; oral presentations with visual help in place of written reports; the use of authentic technical documents that contain text, tables, figures and photographs; or designing tasks that require students to move from one mode to another, e.g., turning a data table into a graph with interpretation, or a written procedure into a labeled diagram.

Such activities develop technical communication skills which are fundamental in the engineering and at the same time are on the same line as the multimodal literacy that the students get through IDLE. The most important feature is that the teachers are not obliged to copy the style and structure of the social media platforms. The emphasis is still on the enhancement of the disciplinary competencies through the use of different, intentional and functional forms of representation.

- **Socialization and Collaborative Learning**

Socialization and collaborative learning are reflected in the ways that digital platforms serve to enable peer interaction, community building, and group problem resolution especially in the form of online gaming, social media discussions and

comment sections. Teachers are free to create similar social structures through work that is project-based collaborative without needing digital tools or involvement in the online communities of students. Group projects in which students work together to research technical issues, peer review sessions in which students peer-review each other's writing, classroom discussions in which students build on each other's ideas, and structured debates on technical controversies are the types of social engagement that make IDLE motivating. The key is converting the model of transmission from individuals, through teachers, to co-construction of knowledge, with the students serving as resource for one another - reflecting the social affordances of digital learning environments without teachers having to adopt the informal norms of communication and play in students' digital areas.

- **Digital Literacy Development**

The results of this study indicate a basic problem that goes beyond language learning: students do not have the critical digital literacies to turn media consumption into a learning activity with purpose. Being digitally literate requires "the individual and social skills needed to effectively interpret, manage, share and create meaning in the growing range of digital communication channels" (Dudeney, Hockly & Pegrum, 2013, p.2), and this has made digital literacies an essential competency in the 21st Century education. Importantly, the term is plural - digital literacies - and is indicative of the multi-faceted nature of skills that are needed to be effective in the digital environment.

Dudeney, Hockly and Pegrum's (2013) framework identifies four dimensions of connectivity that are all considered to be of particular relevance to the IDLE-EST relationship, observed within this current study. First, language literacy involves being able to interpret and generate texts in different registers - precisely the type of competence in which students are lacking when it comes to adapting informal digital English to academic contexts. Second, information literacy is about being able to evaluate sources, to be able to be credible with the information and to be able to synthesise information - which is not the case when students passively consume algorithm-curated information. Third, connections literacy is the ability to engage in

digital networks and communities in meaningful ways, and it goes beyond simply being a passive participant in a web of networks. Fourth, (re)design literacy is about analyzing critically and creatively transforming digital content as opposed to consuming it.

This framework helps to reveal the consumption learning asymmetry identified in this study. Students showed high levels of behavioural engagement ($M= 3.51-4.30$) and low levels of linguistic engagement ($M=1.95-2.72$) not necessarily because they are not motivated or because they do not employ metacognitive strategies, but because they lack the digital literacies that would transfer them from passive reception to active learning. When 87.5% of the students are describing their habit of IDLE in passive terms ('it gives me,' 'the algorithm shows,' 'I just scroll') communicate the absence of critical information literacy and connections literacy. The register confusion displayed by teachers reflects underdeveloped language literacy - students cannot move between informal and formal registers as they have not developed the skills needed to analyse language, recognising register as a variable.

The pedagogical implication is important: EST instruction should not simply provide training in English for technical purposes but should be based on the development of digital literacies that allow students to make fruitful use of their extensive (yet informal) exposure in addition to their formal EST instruction. This changes this IDLE-EST relationship from competition (informal vs. formal) to integration (digital literacies being the bridge).

The development of digital literacy involves critical work with digital information, such as: assessing the credibility of the source, the ability to identify bias, synthetic work across sources and the knowledge of how algorithms shape content exposure. Rather than just showing YouTube videos during the class session, which is a gimmicky use of the media, through structuring teaching, teachers can develop these competences. Activities could involve comparing the way the same technical topic is described in various sources (e.g. Wikipedia, manufacturer websites, explainers on Youtube, academic articles) and involving explicit talk about

rhetorical purpose, intended audience and markers of reliability. Students can be taught to have claims to primary sources rather than taking secondary information at face value or how engineering misinformation is spread on social media and how it can be spotted.

These practices achieve the high degree of digital activity of students (average 14.3 hours per week) and simultaneously, equip them to be resourceful, strategic consumers and producers of technical information. This has more worth than media inclusion at the surface level, or teacher attempts to reference trends.

The main difference between all four principles is a difference between the pedagogical substance and surface Bohemia. Each principle can be applied through the wholesale and deliberate design of instruction that borrows from IDLE's motivational strengths without requiring teachers to mimic the formats used on platforms, to use the language of youth, or to be relatable. What teachers do offer pedagogical expertise, structured scaffolding, assessment literacy, and metacognitive support complements rather than competes with, the engagement and relevance that IDL offers informally.

- **Deep Engagement Strategies**

A striking finding through this research is the prevalence of the use of short forms, algorithmically driven platforms (TikTok, Instagram Reels, YouTube Shorts) in the IDLE practices of the students. This movement away from the long form content documented in previous research on IDLE (Sundqvist, 2009; Sockett, 2014) has pedagogical implications that require direct intervention. Students reported high rates of mind-wandering (62% "often" or "always"), low sustained concentration ($M = 3.10$) and a "good enough" comprehension strategy that focuses more on the continuity of entertainment than on understanding. These patterns are an expression of what Carr (2010) called the "shallows" - cognitive habits that come from digital environment that encourage the way we rapidly switch rather than focus and pay attention over time.

EST teaching can be used as a response to disrupted digital use by intentionally developing profound engagement abilities. This does not involve getting rid of digital media but rather bringing in a systematic practice that restores stamina of attention. Long reading assignments of real technical texts journal articles, technical manuals, long reports, etc. give exposure to the sustained linear attention not required in the short-form platforms. In contrast to the 15-60 seconds clips that prevail in student IDLE, such texts demand that readers hold ideas between paragraphs, follow arguments between sections and synthesise information between pages. These activities must be graded in stages: shorter texts and explicit monitoring of comprehension should be used at the beginning, and length and support should be decreased as the students gain stamina.

Deep listening practices provide an equivalent intervention of auditory attention. Instead of the discontinuous audio experience of scrolling (students said they continued to listen even when they had problems with understanding, $M = 3.89$), organized listening to longer technical information lectures, conference talks, 20+ minutes long podcasts train continuous auditory processing. The most important pedagogical aspect is the accountability: the necessity to produce something out of what they have listened to (summaries, response papers, discussion contributions) which is impossible to create in case of superficial listening.

Importantly, the practices do not contradict IDLE but complement it. The informal interaction of students offers breadth - exposure to different vocabulary, accents, registers and topics in 14.3 hours per week. Formal training gives content-the long term, responsible interaction that changes exposure into competency. Teachers can also make EST an addition to the informal use of digital media and not a rival to the attention of the students by explicitly positioning deep engagement tasks as the development of capacities that complement and do not displace the informal use of digital media.

- **Metacognitive Awareness Interventions for EST Teachers**

One of the most important pedagogical issues revealed by this study concerns the lack of systematic strategies to help students develop register awareness and capacity

for transfer between informal and formal situations. This gap can be addressed by specific classroom practices that can focus on promoting metacognitive awareness, form-consciousness, strategic attention on language. Two complementary strands support this goal: (1) explicit instruction of register awareness, and (2) training students to be aware of and think about linguistic features during IDLE.

- **Registers Awareness & Strategic Transfer**

Helping students see and experience how language changes in different contexts establishes a foundation for metalinguistic awareness. Contrastive tasks between parallel texts, such as a YouTube transcript, Reddit thread, Wikipedia article and journal abstract, can show differences in vocabulary, syntax and discourse. These tasks make appropriateness, rather than correctness, the guiding principle of good language use and transform digital content into the subject of analytical reflection.

Bridge-building tasks can help students take informational input from IDLE (gaming tutorials, tech reviews or social media posts etc.) and turn them into a formal output, such as reports, presentations or work professional emails. Scaffolding should progress from predetermined structures to independent applications, with learner autonomy and reinforcement of the control of the register. Reflective tasks then take this development a step further by asking students to identify informal vocabulary or strategies, evaluate their use, and transfer them to a formal context - to develop flexibility and context-sensitivity in their competence.

- **Developing Form-Focused Attention During IDLE**

In their informal engagement, most students attend to content rather than language form, as their low attention to vocabulary and structure ($M = 1.5-2.2$) combined with high content attention ($M = 4.5-4.8$) reveals. To change this pattern without compromising motivation, teachers can introduce light touch strategies that boost noticing without disrupting the enjoyment and autonomy like the followings:

1. **Consciousness-raising:** Replay short extracts in the media, with meaning as primary at first, elements of language (ie pronunciation, register, grammar) as focus too.

2. Strategic pausing: Encourage students to pause for a while to record unfamiliar words, make notes about expressions or replay interesting parts.
3. Selective focus: Task-specific work by either paying attention to the tracking task (how your characters are giving commands) or to notice three technical words in a video.
4. Micro-journaling: Same idea as above, but have students write quick observations after each IDL; that is, 2-3 sentences describing new vocabulary or register patterns.
5. Subtitles as scaffolds: Use subtitles not only for comprehension, but actually to examine the appearance of language in spoken vs. written form.
6. Gamification: Make noticing a game - i.e. vocabulary hunts, register detective work, pronunciation quests.
7. Peer sharing: Set aside some time in class for students to share out "language finds" from their experience in IDLE.

These strategies are optional and can empower students to interact more deeply with language when they choose. The goal is not to formalize IDLE but to provide learners with tools to maximize its value - when, how, and if they choose to use them.

8.3.3 Curriculum Design: Explicit Bridging Practices

Evidence from this study indicates that transfer between informal and formal English occurs inconsistently in the absence of targeted instructional support. EST curricula can include explicit bridging modules that systematically connect informal and formal English. These practices address the metacognitive awareness gap while making the four pedagogical principles **autonomy**, **multimodality**, **digital literacy**, and **socialization** actionable. Two types of activities, in particular, show strong potential based on this study's findings.

- **Content: Technical Popular Science**

Popular science media presents a natural way of bridging entertainment and academic English, if used analytically. TED Talks, educational documentaries, and YouTube channels such as Veritasium, SciShow, or Kurzgesagt use language somewhere between the conversational and academic tone and present material that

is pertinent to the discipline. Incorporating this content into the curriculum facilitates vocabulary development, listening comprehension and discussion-which anchors instruction in formats students are already engaged in informally through IDLE.

Teachers can help students examine how such sources balance accessibility and technical accuracy. This helps students to appreciate register as a continuum, rather than a binary and develops metacognitive awareness of language variation. The approach taps into the digital habits of students and promotes digital literacy

- **Project-Based Learning (PBL)**

PBL provides students with autonomy with the choice of topic, but also guides them to create formal academic work. A semester-long project could challenge students to research a technical topic of interest to them electric vehicles, sustainable architecture, AI, or renewable energy from both informal sources (e.g., YouTube, podcasts, Wikipedia, academic journals) and formal sources (e.g., academic journals, textbooks, platforms, etc.). Final outputs can be a written report, a poster, or an oral presentation.

Structured scaffolding throughout the project helps promote the digital literacy (source evaluation), multimodality (use of different sources and different formats), and socialization (works with and for peers, peer presentations). Allowing students some choice in topics they examine also reinforces the concept of autonomy, solving the motivational triangle away from IDLE and toward EST in these teacher interviews.

Through both activities, teachers remain expert facilitators in their support of inquiry, modeling of analysis and the guidance of formal production. These practices do not try to recreate informal digital environments but rather try to construct structured bridges to informal digital environments. In the process, they weave the existing engagement that students have with English into meaningful academic development and systematically apply the four main pedagogical principles that drive effective IDLE integration.

8.3.4 Assessment Diversification and Skills Recognition

Findings from this study show that current practices to assess learning contribute to the separation between informal and formal learning domains. High-stakes

assessments that only focus on technical skills in reading and vocabulary recall do not afford much recognition for competencies built through informal digital engagement. These include oral fluency, pronunciation, listening comprehension, colloquial vocabulary and pragmatic awareness. The lack of such competencies from the assessment frameworks may contribute to the student's perceptions of the lack of academic relevance for informal learning.

- Diversified evaluation formats enable greater scope of measurement of English proficiency. Incorporating oral tasks (presentations, group discussions, recorded technical explanations), listening comprehension components (following technical lectures, processing spoken instructions, extracting information from multimedia) - and different genres in writing (formal report, informal summaries, technical emails, proposals) - expand the concept of academic English. Portfolio-based approaches can also provide a means of documenting over time language development. These methods are in line with the multimodality principle, and recognise the various kinds of skills that students acquire through IDLE, without introducing forms of assessment that are entertainment driven.
- Assessment of transfer competence affords a way of measuring sociolinguistic awareness, linguistic knowledge and form-focused attention. Task types may involve reformulation of technical content from one register to another (such as informal to formal), or identification and correction of language inappropriate to a given register or selection among linguistic alternatives based on given communicative contexts. Additional assignments might involve analysis of grammatical choices, a lexical precision, or a structural variation from register to register, which would draw student attention to the way form encodes appropriateness. These approaches measure metacognitive control over the use of language, for the gap of transfer as well as limited form-focused engagement seen during IDLE. Importantly, such assessments look at integration of informal and formal learning without duplicating the features or aesthetics of digital media.

8.4 Institutional and Policy Implications

The structural barriers as identified in this research such as curriculum density, examination-based assessment, lack of instructional time, and standardised materials show that pedagogical change is not adequate. When institutional structures limit the practice of individual teachers, they are not able to conduct effective EST instruction. The findings result in three levels of institutional response. To begin with, the design of EST curriculum needs to be redesigned. The existing 1.5 hours of weekly training is not enough to build the technical English skills that the engineering graduates need. Curriculum models must focus on the fundamental EST goals of register control, technical writing, discipline-specific communication, and must positionally capitalize on the 14.3 hours of self-directed English study that students already complete out of class. This does not imply any adjustment of EST to informal learning but instead it implies that EST teaching must be about what only formal teaching can teach: systematic register awareness, transfer skills, and academic literacy building. The students come with a lot of receptive exposure; EST has to develop the productive and analytical competencies that informal exposure cannot create. EST syllabi could be reviewed by curriculum committees in institutions such as ENP to make sure that instructional time is focused on these high-value competencies instead of replicating input students already have access to informally.

Second, there is a need to reform assessment. In this study, teachers cited that the pressure of examinations limited their teaching decisions, which had washback effects and favored discrete grammar and vocabulary knowledge over communicative competence or transfer skills. A more diversified approach to assessment, incorporating oral performance, listening comprehension, register-appropriate writing, and project-based assessment, would acknowledge competencies that have been acquired in an IDLE and still remain academically rigorous.

Third, professional development of teachers requires institutional assistance. The difference in the teacher awareness and integration practices that were observed in this study implies that individual initiative is what now dictates whether IDLE is being pedagogically leveraged or not. Systematic professional development--

workshops on digital literacies, training in bridging pedagogy, communities of practice for sharing integration strategies would distribute effective practices across the teaching staff rather than leaving them to chance.

8.5 Implications for Future Research

Although this research contributes to the knowledge on the IDLE-EST relationship, it also indicates some gaps that need to be filled. The findings raise questions that the current design was not able to answer: can the consumption-learning asymmetry be reversed by intervention, how the dynamics of IDLE-EST are affected by time, and are the patterns observed at ENP generalised to contexts. This section establishes priority directions of future research, which is organised around four themes: the development of form-focused attention in the context of informal engagement (9.5.1), methodological innovations in studying IDLE (9.5.2), variables that have not been thoroughly studied and require research (9.5.3), and comparative research across contexts and platforms (9.5.4). Each direction builds directly on limitations or unexpected findings from the present study, offering a research agenda that extends rather than merely replicates this work.

8.5.1 Prioritizing Form-Focused Attention

This study suggests the importance of investigating how form focused attention in IDLE affects language outcomes. Experimental designs may offer a comparison between students who receive training on noticing strategies and a control group in order to measure the impact on linguistic development, transfer, awareness, and register in formal contexts. The key questions would be whether the training in forming focus results in increases in linguistic engagement decreases in confusion of registers or even an effect on motivation. Research can also identify the optimal combination of content enjoyment and

The fact that different people have different noticing ability could also be analyzed more. Cognitive and metacognitive traits might be responsible for the differences between individuals who develop habits focused on the form on their

own and others who don't benefit from their training. Understanding these profiles of learners would support differentiated pedagogical recommendations.

- Methodological Innovation

This research study's mixed-methods approach related the quantitative engagement patterns to the teacher perceptions. Future research could expand on this with longitudinal studies showing changes in attitude over time, experience sampling methods (ESM) showing real-time engagement with IDL, and classroom observations showing actual use of bridging practices. Controlled intervention studies that compare integrated and traditional instruction would provide causal evidence of the effect of IDLE-based pedagogy.

- Underexplored Variables

Several variables that have resulted from this study deserve further study. One key area is IDLE's effect on formal English proficiency and in particular how this relationship may be influenced by the quality of engagement. Teacher related factors including digital literacy, pedagogical knowledge for integration and confidence in adapting instruction could also be quantitatively explored in order to understand their role in enabling or limiting classroom implementation. Sociocultural factors such as parental and community perspectives on informal learning might have an impact on how students approach and value IDLE. In addition, the extent to which specific platforms expose learners to different registers and the extent to which students transfer these stylistic norms is open for investigation.

The fact that IDLE engagement and EST attitudes were negatively correlated creates a crisis of sorts because can that relationship be shifted? Future research could investigate whether instruction that explicitly validates and makes informal learning relevant and meaningful leads to perceptions of formal English education as more complementary, rather than conflicting, to informal learning.

- Context and Platform Comparisons

Future studies could investigate how IDLE-formal learning dynamics differ across disciplines, different proficiency levels, and institutional contexts to identify general patterns and moderating factors. Cross-linguistic and international comparisons may reveal whether these dynamics are language specific or represent more general learning mechanisms.

There are also platform-specific studies that are needed. Comparing the effect of different features of a given platform, e.g. video length, modality, way of curation, interactivity, etc., on linguistic engagement could help understand what affordances are most effective for language development. Experimental designs that manipulate factors such as captions or transcripts would help isolate which conditions are most conducive to learning.

- Metacognitive Intervention Studies

Studies could investigate interventions which help learners reflect on their language use, identify register variation and transfer the learning that has taken place in informal contexts to a formal context. This involves training in noticing strategies, guided transfer tasks and the measurement of the effect of these interventions on formal performance.

At the classroom level research can focus on developing and validating instructional materials aimed at developing register awareness. At the teacher level, professional development studies can focus on how metacognitive training affects instructional beliefs and practices. To achieve deeper understanding, mechanism-focused research is also required that can contribute to understanding more clearly how metacognitive skills can support transfer, and the context in which they are best developed.

8.5 Conclusion

This chapter explored the implication of the findings of the study on theoretical, pedagogical, and institutional levels. On the theoretical level, the results apply Self-

Determination Theory to cross-context motivational impacts and revise IDLE literature to modern platform realities that are driven by algorithms. At the pedagogical level, the chapter defined that successful EST teaching does not presuppose imitating digital entertainment but instead requires what informal learning is unable to offer, namely, systematic register development, transfer skills, and analytical competencies that turn passive exposure into productive command. At institutional level, the chapter contended that the conditions that should be in place to bridge informal and formal learning are curriculum reform, diversification of assessment and professional development support, which cannot be achieved through the individual teacher effort. Form-oriented attention interventions, longitudinal monitoring of the dynamics of IDLE-EST, and cross-platform and cross-context comparisons are the priority of the research agenda

Ultimately, the challenge facing EST instruction is not competition with digital media but integration, leveraging what students bring from extensive informal engagement while delivering what only systematic instruction can provide.

General Conclusion

The study examined the relationship between Informal Digital Learning of English (IDLE) and formal English teaching of Science and Technology (EST) among technical students in the National Polytechnic School in Algeria. IT investigated the way students interacted with English using digital media outside of the classroom, the relationship between such interaction and EST attitudes, the predictors of engagement patterns, and the ways EST teachers viewed and reacted to informal practices of students. This chapter is a summary of the main findings, the contribution of the study, limitations and future work directions.

In the context of the first research question, which involved patterns of IDLE engagement, technical students at ENP spent a lot of time using English digital media, much more than official EST contact hours. Their exposure was dominated by social media, YouTube, music streaming, and gaming, which is in line with global studies (Lee, 2019; Sundqvist and Sylven, 2016). Nevertheless, there was a conspicuous trend: students were attracted to short-form, algorithmically recommended content Tik Tok, Instagram Reels, YouTube Shorts, instead of the long-form media that was recorded in previous IDLE research (Sundqvist, 2009; Sockett, 2014). This change is a fragmented input and platform-based consumption as opposed to learner-based selection. Students spoke of their interaction as passive scrolling through the available information instead of active searching.

The interaction on the four dimensions of engagement as presented by Arndt (2019) was asymmetrical. The levels of behavioral and affective engagement were high: students spent a lot of time watching English media on various platforms and reported they enjoyed and preferred English content. However, the level of cognitive and linguistic activity was also low. Learners rarely stopped to check understanding, gave little consideration to language structure and considered content as more important than language. Even high engagers, who spend much time on English media, demonstrated little linguistic attention. It is a consumption pattern and not a learning one, an immersion pattern and not an analysis one.

In relation to the second research question about the relationships between IDLE and EST, the relationship between IDLE engagement and EST attitudes was

found to be more intricate than simple complementarity or independence would imply. The analysis was based on three competing hypotheses: informal engagement could strengthen formal attitudes (complementarity), weaken them (conflict), or be independent dimensions (independence). Findings showed that there was a differentiated pattern in favor of conflict and independence, depending on the type of engagement. The pleasure and emotional gratification of informal use of English, Affective IDLE engagement, had a significant negative correlation with EST attitudes in all three elements of the tripartite model developed by Gardner. Students who found informal English to be the most rewarding had the least positive attitude towards formal EST teaching. Affective engagement was the only significant predictor when all dimensions were tested at the same time using structural equation modeling.

This finding can be explained by Self-Determination Theory (Ryan and Deci, 2000). IDLE meets three fundamental psychological needs: students have a choice of what to watch and when (autonomy), choose content they understand (competence), and relate to interest-based communities (relatedness). EST classes are different, they have pre-determined syllabus, abstract vocabulary and limited options. The controlled quality of EST becomes more noticeable in comparison to autonomy-supportive situations after exposure to English in autonomy-supportive situations. The remaining dimensions of engagement behavioral, cognitive, linguistic, did not have any correlation with EST attitudes, which confirms the hypothesis of independence of these dimensions. EST attitudes were not predicted by time spent with English media, strategic processing and attention to form. In addition to the affective contrast effects, informal and formal learning seem to be independent domain

Regarding the third research question that dealt with motivation predictors of IDLE engagement, Ideal L2 Self and International Posture were predictors of consumption-oriented engagement. Students who pictured themselves as future users of the English language spent more time on English media and preferred it more. These motivational constructs explained significant differences in behavioral and

affective engagement. Nevertheless, the same factors failed to predict learning-oriented engagement. There was no difference in the attention to language form, comprehension monitoring or deep processing between students high in Ideal L2 Self or International Posture. Motivation encourages students to find English material and like it, but not to approach language strategically. This trend defies expectations that language is naturally acquired by learners through informal activities.

However, comparison between years showed that Ideal L2 Self rose to a significant level between second and fourth year, which could be because professional identities were becoming clearer as students neared graduation. International Posture was constant, indicating an existing orientation. In fact, the increase in Ideal L2 Self did not enhance EST attitudes—students formed more positive professional English identities but they equally formed negative views of EST classes.

Comparison of the motivational profiles showed significant differences at the year level. Ideal L2 Self—students' vision of themselves as future users of the English language—was also much higher in fourth-year students compared to second-year students, probably due to the professional identities becoming more tangible with the coming of graduation. International Posture, by contrast, was consistent across year levels, which indicates that it is an existing orientation to global culture which students carry with them to university and not something that is acquired in the course of their studies. Importantly, though, this increase in Ideal L2 Self was not accompanied by better attitudes towards EST instruction. Although they have formed stronger professional identities that are related to English, fourth-year students rated EST classes equally negatively as their second-year counterparts. This result suggests that the mental imagery of becoming a future engineer who will speak English in the workplace does not result in more favorable attitudes toward formal EST coursework.

Regarding the fourth research question on teacher attitudes, all seven EST teachers acknowledged that students accessed English digital media, but their level of knowledge differed. There were those who systematically asked questions

regarding media habits; others had only a vague knowledge. This difference is important since, according to Arndt (2019), teachers should be well informed of informal practices before they can build upon them in the instructional process. The teachers saw real advantages in IDLE. The students with high informal exposure demonstrated superior pronunciation, listening fluency, spelling, and willingness to communicate, which are in line with the input-based acquisition theory (Krashen, 1982) and prove that extensive exposure, despite the absence of focused attention to the form, builds receptive competence and oral confidence.

Nevertheless, educators were still concerned with register suitability. Students brought slang and entertainment-related phrases into the context of formal academic work without metacognitive awareness of the registers. This register confusion is a direct result of the quantitative observation of low linguistic involvement in the case of IDLE where students watch media to have fun and not to pay attention to the form, they learn conversational registers without the parallel knowledge of formal, discipline-specific language. Although these patterns were acknowledged, the use of IDLE in instruction was insignificant and not systematic. Three strategies were identified: engagement-based integration (speaking anxiety reduction through the use of youth-oriented language), topic-based integration (media integration when relevant to the content), and minimal integration (because of curriculum limitations). None of the teachers reported systematic training of register awareness or support of transfer between informal and formal contexts.

Structural barriers constituted the main constraint. Teachers reported thick curricula, exam-based evaluation, and standardized resources with minimal flexibility. This is an example of curricular washback (Fullan, 2001): high-stakes tests of discrete knowledge influence instructional decisions more than needs and pedagogical research. Even the teachers who saw the importance of informal learning did not see the opportunity to incorporate it into the existing institutional structures.

In terms of theoretical contributions, this study advances IDLE scholarship in several ways. Theoretically, this research contributes to the IDLE literature in a

number of aspects. It offers systematic testing of rival hypotheses regarding informal-formal relationships in technical English settings, which demonstrates that various dimensions of engagement are connected to formal instruction differently, with affective engagement exhibiting contrast effects and other dimensions indicating independence. The study generalizes the Self-Determination Theory to cross-contextual interactions, showing how satisfaction of needs in one context influences perceptions of another. It places teacher cognition as a significant mediating variable that is mostly missing in the prior IDLE studies. Lastly, it records the changing patterns of engagement with the long-form content that dominated previous research to the passive and algorithm-driven consumption of short-form media, and the consequences of these changes to the quality of linguistic exposure.

Several limitations warrant acknowledgment. There are a number of constraints that should be mentioned. The use of one elite engineering institution restricts the ability to generalize the findings to other Algerian universities, disciplines, or countries. Cross-sectional design only measures relationships at a single point but cannot determine causality- the negative affective engagement-EST attitude relationship can be due to contrast effects or prior student dispositions. In addition, measurement of engagement was based on self-report, which is susceptible to social desirability bias and recall bias; objective behavioral measures would enhance results. The research also investigated the EST attitudes but not the actual performance of proficiency. Lastly but not the least, the sample of teachers was small though it was extensive in the institution; bigger multi-institutional surveys would give stronger evidence of patterns of teacher cognition.

Based on these findings, some practice recommendations arise. The negative affective engagement-EST attitude correlation indicates that teachers are not supposed to strive to compete with entertainment platforms by making EST fun in a manner that is similar to digital media. Rather, teaching must target what cannot be achieved in informal learning: explicit support of register awareness, metacognitive means of detecting form and systematic assistance in transferring informal competence to academic situations. The desired metalinguistic awareness can be

built through bridging activities, i.e. contrastive register analysis, reformulation tasks, explicit discussion of language variation. Educators are encouraged to ask informal practices systematically and use this information to model teaching based on the experiences of digital English rather than disregard them. Teachers could be given integration strategies through professional development without compromising on content coverage. Chapter 9 contains detailed pedagogical suggestions.

Several directions for future research are suggested by the present study.

The current study proposes several guidelines to be followed in future research. The experimental research should investigate whether explicit metacognitive training can be used to orient learners towards more learning-oriented engagement without compromising fun that supports informal practices. Longitudinal designs that follow students over the course of university would help to explain the dynamics of the IDLE-EST relationships over time and whether the L2 identity developments ultimately affect formal attitudes. Since the dominance of algorithm-driven platforms, comparative studies of platforms could determine which environments are truly conducive to language development. A further investigation beyond the field of technical education would show whether these trends are EST-specific or represent informal-formal relations in higher education, in general. Studies of teacher professional development may help to fill the gap between understanding the potential of informal learning and having the means of integrating it into the curriculum systematically.

In conclusion, this study records a more complex relationship between informal and formal English learning than one of simple complementarity or independence. Indeed, ENP students are highly exposed to English via digital media much more than a formal education but their exposure is consumption-based and not learning-based. As a result, the informal rewards of informal English form contrast effects that render formal teaching relatively restrictive. Moreover, motivation produces exposure but not strategic attention to language. Furthermore, the teachers are aware of the advantages and issues but are structurally constrained to integrate. Consequently, the EST pedagogy challenge is not the rivalry with the digital

platforms but the bridging, the creation of pedagogical practices to assist students to transform informal exposure into academic competence, the development of metacognitive awareness of register variation, and the establishment of formal instruction as a complement to but not a substitute of student independent engagement. Ultimately, the solution does not lie in opposing contexts or in the idea that one can substitute the other, but in establishing a situation where informal and formal learning of English can really complement each other.

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Appendices

Appendix A

English Learning Survey for Technical Students

Dear Student,

Thank you for taking the time to participate in this research study. This questionnaire is part of a doctoral research project at École Nationale Polytechnique (ENP) investigating how technical students learn English informally through digital media and how this relates to their attitudes toward formal English for Science and Technology (EST) instruction.

Your participation is completely voluntary and anonymous. Your responses will be kept strictly confidential and will be used only for academic research purposes. No personal identifying information will be collected or shared.

The questionnaire should take approximately **15-20 minutes** to complete. Please answer all questions honestly based on your own experiences and opinions. There are no right or wrong answers.

Instructions:

- Please read each question carefully before responding.
- Mark your responses by checking (✓) the appropriate box or filling in the blanks.
- Try to answer all questions, but you may skip any that make you uncomfortable.
- Please do not discuss your answers with others while completing the questionnaire.

Thank you very much for your participation

Section 1: Background Information

Please indicate your:

Age	
Gender	☐ Male ☐ Female
Study Year	☐ Second-year ☐ Fourth-year
Technical Field	

Prior English Exposure

Please indicate your level of agreement:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Before starting English classes at University, I was already exposed to English through digital media (TV, internet, music, games, etc.).	☐	☐	☐	☐	☐

English Media Usage

On average, how much time do you spend per day using the following types of English media outside of class?

Media Type	Never	Less than 30 min/day	30 min to 1 hour	1 to 2 hours	2 to 3 hours	More than 3 hours
Movies/Series (Netflix, streaming platforms)	☐	☐	☐	☐	☐	☐
YouTube videos	☐	☐	☐	☐	☐	☐
Music (Spotify, Apple Music, streaming)	☐	☐	☐	☐	☐	☐
Video games	☐	☐	☐	☐	☐	☐
Social media (Instagram, TikTok, Twitter/X, Facebook)	☐	☐	☐	☐	☐	☐
Websites/online articles	☐	☐	☐	☐	☐	☐
News sites/apps	☐	☐	☐	☐	☐	☐
Podcasts/audiobooks	☐	☐	☐	☐	☐	☐

SECTION 2: ENGAGEMENT

Affective engagement

Please indicate your level of agreement with each statement:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I enjoy consuming entertainment content in English.	☐	☐	☐	☐	☐
2. I feel excited when I find interesting English content online.	☐	☐	☐	☐	☐
3. English entertainment usually bores me.	☐	☐	☐	☐	☐
4. I feel nervous when the entertainment is in	☐	☐	☐	☐	☐

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
English.					
5. I get frustrated when I try to use English outside of class.	☐	☐	☐	☐	☐
6. I often feel fully focused and absorbed when I use English for entertainment.	☐	☐	☐	☐	☐
7. I prefer to use English for entertainment when I can.	☐	☐	☐	☐	☐

Behavioral Engagement

Please indicate how often you engage in each activity:

Activity	Never	Rarely	Sometimes	Often	Always
1. I watch movies or series in English.	☐	☐	☐	☐	☐
2. I listen to English-language music.	☐	☐	☐	☐	☐
3. I play video games in English.	☐	☐	☐	☐	☐
4. I use social media platforms (Instagram, TikTok, Facebook) in English.	☐	☐	☐	☐	☐
5. I browse websites in English.	☐	☐	☐	☐	☐
6. I spend considerable time each week learning English through media.	☐	☐	☐	☐	☐
7. I consistently use English media even when content is available in Arabic/French.	☐	☐	☐	☐	☐

Cognitive Engagement

Please indicate how often you use each strategy when consuming English content:

Strategy	Never	Rarely	Sometimes	Often	Always
1. I keep my focus on the content and ignore distractions.	☐	☐	☐	☐	☐
2. I focus on the main idea, not every word.	☐	☐	☐	☐	☐
3. When I don't understand, I use context clues (images, sounds, earlier parts, or captions) to guess the meaning.	☐	☐	☐	☐	☐
4. I pause or go back to check my understanding.	☐	☐	☐	☐	☐
5. I follow the main ideas and connect parts so the content is clear.	☐	☐	☐	☐	☐
6. My mind wanders, and I stop paying attention.	☐	☐	☐	☐	☐
7. I keep watching/listening even when I don't understand, without trying to fix it.	☐	☐	☐	☐	☐

SECTION 3: ATTITUDES TOWARDS EST

Please indicate your level of agreement with each statement:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Cognitive Attitudes					
1. Learning EST is important for my future career.	☐	☐	☐	☐	☐
2. EST skills will help me access technical information in my field.	☐	☐	☐	☐	☐
3. EST is essential for succeeding in my technical studies.	☐	☐	☐	☐	☐
4. EST teaches English I need for my field.	☐	☐	☐	☐	☐
5. EST doesn't connect to my technical field.	☐	☐	☐	☐	☐

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6. EST courses are not useful.	☐	☐	☐	☐	☐
Affective Attitudes					
7. I enjoy attending EST classes.	☐	☐	☐	☐	☐
8. EST lessons are interesting to me.	☐	☐	☐	☐	☐
9. I look forward to my EST classes each week.	☐	☐	☐	☐	☐
10. Studying EST makes me feel anxious.	☐	☐	☐	☐	☐
11. I find EST lessons boring.	☐	☐	☐	☐	☐
12. I don't like going to EST classes.	☐	☐	☐	☐	☐
Behavioral Attitudes					
13. I work hard in my EST classes.	☐	☐	☐	☐	☐
14. I participate in EST class activities.	☐	☐	☐	☐	☐
15. I will keep studying technical English after this course.	☐	☐	☐	☐	☐
16. I only do the minimum work in EST.	☐	☐	☐	☐	☐
17. I avoid EST homework when possible.	☐	☐	☐	☐	☐
18. I pay little attention in EST classes.	☐	☐	☐	☐	☐

SECTION 4 :MOTIVATIONAL ORIENTATION

Please indicate your level of agreement with each statement:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Ideal L2 Self					
1. I can picture myself using English in real life.	☐	☐	☐	☐	☐
2. Being good at English is part of who I want to be.	☐	☐	☐	☐	☐
3. My future plans (study or work) need English.	☐	☐	☐	☐	☐
4. My idea of my future English self helps me plan my learning.	☐	☐	☐	☐	☐
5. Reaching a high level in English is important to me.	☐	☐	☐	☐	☐
International Posture					
6. I am interested in news and ideas from many countries.	☐	☐	☐	☐	☐
7. I want friends from other cultures.	☐	☐	☐	☐	☐
8. I like chances to talk in English with people from other countries.	☐	☐	☐	☐	☐
9. I want study or work that connects me to the international community.	☐	☐	☐	☐	☐
10. I enjoy English content from different countries (videos, articles, podcasts).	☐	☐	☐	☐	☐
11. I feel positive about joining online groups with people from many countries.	☐	☐	☐	☐	☐

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
12. I feel part of a world community.	☐	☐	☐	☐	☐
13. If I have the chance, I would study, work, or live abroad.	☐	☐	☐	☐	☐

Optional: Study Log/interview Participation

Thank you for completing this questionnaire! If you are willing to participate in the next phase of this research by keeping a **study log and be interviewed**, please provide your contact information below. Your participation is entirely **voluntary** and will remain **confidential**.

Field	Your Information
Full Name	
Email Address	
Phone Number (WhatsApp/Mobile)	
Preferred Contact Method	☐ Email ☐ WhatsApp ☐ Phone
Best Time to Contact	

☐ I agree to be contacted for participation in the study log /interview phase of this research

Note: Your contact information will be used solely for research purposes and will be kept separate from your questionnaire responses to ensure anonymity. You may withdraw from the study log phase at any time without penalty.

Appendix B

IDLE Study Log

Instructions for Students:

This questionnaire helps track your English language activities outside of university. Please follow these steps:

- 1 Mark whether you used English today and fill in the date and device used
- 2 Select which English language activity you engaged in (section 2)
- 3 Complete the follow-up questions for your specific activity (section 3)
- 4 Note how much time you spent on the activity (section 4)
- 5 Rate your experience for up to three different activities (sections 5-)

1. Did you use English outside university today? ☐ Yes ☐ No | Day: _____ | Device:

☐ Phone ☐ PC ☐ Tablet ☐ TV

2. English Activities

Select your English language activity:

Activity	Activity
☐ Look at English on Social Media	☐ Read a text in English
☐ Listen to music in English	☐ Write a text in English
☐ Play a video game in English	☐ Listen to spoken English
☐ Watch film/TV in English	☐ Have a conversation in English
☐ Did not use English outside school	★ Other: _____

3. Follow-up Questions

3.1 Social Media: *If you selected social media, which platform?*

Platform	☐	Activity Options
☐ Instagram (IG)	☐	☐ Read captions ☐ Watch videos ☐ Read comments ☐ Write comments ☐ Other: _____
☐ YouTube (YT)	☐	☐ Watch videos ☐ Read subtitles ☐ Read comments ☐ Write comments ☐ Other: _____
☐ Snapchat (SC)	☐	☐ Read captions ☐ Watch videos ☐ Read articles ☐ Read comments ☐ Write ☐ Other: _____
☐ Facebook (FB)	☐	☐ Watch videos ☐ Read posts ☐ Read texts ☐ Write posts ☐ Text msg ☐ Voice msg ☐ Other
☐ TikTok (TT)	☐	☐ Watch videos ☐ Read comments ☐ Post videos ☐ Comment on videos ☐ Other: _____
★ Other	☐	☐ Watch videos ☐ Read texts ☐ Write texts ☐ Written conversation ☐ Spoken conversation

3.2 🎵 Music: *If you selected music:*

Listening Style	☐	Additional Actions
☐ Background listening	☐	☐ Read lyrics ☐ Sing along ☐ Do nothing
☐ Attentive listening	☐	☐ Read lyrics ☐ Sing along ☐ Do nothing

3.3 🎬 Video Content: *If you watched video content:*

Content Type	☐	Viewing Method	Subtitles
☐ Film	☐	☐ Internet ☐ TV ☐ Download	☐ English ☐ Arabic ☐ French ☐ None
☐ TV programme	☐	☐ Internet ☐ TV ☐ Download	☐ English ☐ Arabic ☐ French ☐ None
☐ Online video	☐	(Links to YouTube)	
★ Other: _____	☐	☐ Internet ☐ TV ☐ Download	☐ English ☐ Arabic ☐ French ☐ None

If you played video games:

Game Type	☐	Language Activities
☐ Single-player	☐	☐ Listen to English ☐ Read English ☐ Write English (commands)
☐ Multi-player	☐	☐ Listen ☐ Read ☐ Write ☐ Written conversation ☐ Spoken conversation

3.5 📖 Reading: *If you read in English:*

Reading Material	☐
☐ English-language book	☐
☐ Article (print or online)	☐

☐ Other online texts	☐
★ Other: _____	☐

3.6 🖋 Writing: *If you wrote in English:*

Writing Type	☐
☐ Short text/message	☐
☐ Longer text	☐
★ Other: _____	☐

3.7 🎧 Listening: *If you listened to spoken English:*

Listening Context	☐
☐ English-language audiobook	☐
☐ English-language radio	☐
☐ English-language podcast	☐
☐ Conversation others were having	☐
★ Other: _____	☐

3.8 Conversation: *If you had a conversation in English:*

Medium	☐	Conversation Partner
---------------	--------------------------	-----------------------------

☐ In person	☐	☐ Someone known personally ☐ Online friend ☐ Stranger
☐ Phone/Skype	☐	☐ Someone known personally ☐ Online friend ☐ Stranger

☐ 4. Time Spent

_____ hours	_____ minutes
-------------	---------------

★ 5 . Experience Ratings

Instructions:

For each activity, circle one number (1-5) on each line that best represents your experience.

- A rating of 1 means the left-side description (e.g., "Entertaining")
- A rating of 5 means the right-side description (e.g., "Boring")
- Ratings 2, 3, and 4 represent points between these extremes
- For question 10, select which type of new learning occurred (if any)

Activity 1: _____					
Question	1	2	3	4	5

5. This activity was...	☐ Entertaining				☐ Boring
6. During this activity, I...	☐ Concentrated hard				☐ Did not concentrate
7. I was focused on language...	✗ Not at all				✓ Completely
8. It was interesting to me...	★ Very				☐ Not at all
9. I focused on every word...	✗ Not at all				✓ Completely
11. I liked this activity...	♥ Liked				☐ Did not like
12. I focused on content...	✗ Not at all				✓ Completely
10. I learnt something new...	☐ Grammar	☐ Pronunciation	☐ Vocabulary	☐ Expression	☐ Nothing

Activity 2: _____					
Question	1	2	3	4	5
5. This activity was...	☐ Entertaining				☐ Boring
6. During this activity, I...	☐ Concentrated hard				☐ Did not concentrate
7. I was focused on language...	✗ Not at all				✓ Completely
8. It was interesting to me...	★ Very				☐ Not at all
9. I focused on every word...	✗ Not at all				✓ Completely
11. I liked this activity...	♥ Liked				☐ Did not like
12. I focused on content...	✗ Not at all				✓ Completely
10. I learnt something new...	☐ Grammar	☐ Pronunciation	☐ Vocabulary	☐ Expression	☐ Nothing

Activity 3: _____					
Question	1	2	3	4	5
5. This activity was...	☐ Entertaining				☐ Boring
6. During this activity, I...	☐ Concentrated hard				☐ Did not concentrate
7. I was focused on language...	✗ Not at all				✓ Completely
8. It was interesting to me...	★ Very				☐ Not at all
9. I focused on every word...	✗ Not at all				✓ Completely
11. I liked this activity...	♥ Liked				☐ Did not like
12. I focused on content...	✗ Not at all				✓ Completely
10. I learnt something new...	☐ Grammar	Pronunciation	☐ Vocabulary	☐ Expression	☐ Nothing

Appendix C

Focus group discussion Protocol

Participants per Session	6 students
Total Sessions	4 focus groups
Total Participants	24 students
Recording	Audio-recorded with participant consent
Language	Participants could respond in English, French, or Arabic; Arabic/French responses translated
Moderator	Principal researcher

Introduction Script (5 minutes)

"Thank you all for agreeing to participate in this discussion. My name is Safia Boufares and I am conducting this study as part of my doctoral research at Ecole Nationale Polytechnique."

"Today, I would like to hear about your experiences using English outside of class—particularly through digital media like social media, YouTube, Netflix, music, and video games. There are no right or wrong answers. I am interested in your honest experiences and opinions."

"This discussion will be audio-recorded for research purposes only. Your responses will be anonymized, and no identifying information will be shared. You may choose not to answer any question, and you may withdraw at any time."

"Please feel free to respond in English, French, or Arabic—whichever is most comfortable for you. Do you have any questions before we begin?"

Focus Group Questions

Section A: Platform and Content Usage

1. What apps or platforms do you use most often when you're not studying? [Probe: TikTok, Instagram, YouTube, Netflix, Spotify, games?]

2. When you use these platforms, how much of the content is in English versus Arabic or French?
3. How do you decide what to watch or listen to? Do you search for specific things, or do you follow what the app suggests?
4. Do you prefer short videos (like TikTok/Reels) or longer content (like full YouTube videos or Netflix episodes)? Why?
5. Why do you choose to watch/listen to content in English rather than Arabic or French?

Section B: Language Engagement and Learning

6. When you watch or listen to English content, do you pay attention to the language—like new words, expressions, or how things are pronounced?
7. If you hear a word or expression you don't know, what do you do? [Probe: Look it up? Ignore it? Replay?]
8. Do you feel like you learn English from the media you consume? Can you give examples?
9. Do you ever try to speak or write in English outside of class? What stops you or encourages you?

Section C: EST Attitudes and Connections

10. How would you describe your English for Science and Technology (EST) classes?
11. Is the English you use online similar to or different from the English in EST class? How?
12. Do you think EST classes are useful for your future career? Why or why not?
13. What would make EST classes more interesting or relevant to you?

Section D: Closing

14. Do you see yourself using English in your future career as an engineer? In what ways?
15. Is there anything else you would like to share about your experiences with English—either online or in class?

Probing Techniques Used

Elaboration probes: 'Can you tell me more about that?' 'What do you mean by...?'

Clarification probes: 'Could you give me an example?' 'How often does that happen?'

Contrast probes: 'How is that different from...?' 'Does everyone feel the same way?'

Consensus probes: 'Does anyone have a different experience?' 'Do others agree?'

Appendix D

Complete FCD Codebook

Theme 1: Algorithm-Driven, Passive Consumption

Code	Definition	Inclusion Criteria	Example Quote
ALG-PASSIVE	Acceptance of algorithmic content curation without active selection	References to 'For You page,' 'algorithm shows,' following suggestions without searching	'The For You page knows what I like. It gives me exactly what I want.' (FG2-P1)
ALG-COMFORT	Positive framing of algorithmic control as convenient or easy	Terms like 'comfortable,' 'easy,' 'convenient' describing platform curation	'It's comfortable because I don't have to search.' (FG2-P3)
SHORT-PREF	Stated preference for content under one minute in duration	Explicit mention of video length preferences, scrolling past long content	'If it's more than one minute, I scroll.' (FG1-P1)
FATIGUE-AVOID	Choosing short content due to mental fatigue from academic demands	Links between tiredness/studies and preference for brief content	'When I'm tired from studies, long content feels heavy.' (FG2-P4)
ENG-QUALITY	Perception that best/quality content is available primarily in English	Comparisons of English vs Arabic/French content quality	'The best series, the funniest videos... they're all in English.' (FG3-P2)
ENG-DEFAULT	English as default language choice driven by content availability, not learning intent	Statements that language choice follows content, not vice versa	'If the same content existed in Arabic, maybe I would watch in Arabic.' (FG3-P1)

C.4 Theme 2: Surface-Level Language Engagement

Code	Definition	Inclusion Criteria	Example Quote
NOTICE-EMOTION	Language noticing triggered by emotional response rather than intentional focus	Noticing tied to humor, surprise, emotional engagement	'When something is funny or emotional, I remember words.' (FG2-P1)
NOTICE-ACCIDENTAL	Incidental attention to language features without deliberate focus	'Sometimes,' 'occasionally' noticing; no systematic attention	'Only sometimes. Like if I hear a nice expression, I repeat it in my head.' (FG1-P6)
GRAMMAR-AVOID	Explicit avoidance of grammatical analysis	Statements rejecting grammar focus; grammar as 'complicated'	'I don't focus on grammar. I just watch.' (FG3-P4)

Code	Definition	Inclusion Criteria	Example Quote
	during consumption		
NO-FOLLOWUP	Failure to consolidate or review noticed language features	Saving but not reviewing; replaying without checking meaning	'I save some TikToks because I want to learn later, but I never go back.' (FG1-P6)
EXPOSURE-BELIEF	Belief that passive exposure alone leads to language acquisition	'Natural' learning beliefs; exposure = improvement assumptions	'I just watch, you know? Natural.' (FG3-P2)
REPLAY-SHALLOW	Using platform replay features without deeper engagement	Replaying for curiosity but skipping if still unclear	'I replay if I'm curious. But if I still don't understand, I skip.' (FG3-P2)

C.5 Theme 3: Confidence Barriers to Production

Code	Definition	Inclusion Criteria	Example Quote
PROD-GAP	Perceived disparity between comprehension ability and production ability	Explicit contrasts between understanding and speaking/writing	'When I watch, I understand maybe 80%. But when I try to speak, maybe 20% comes out.' (FG3-P6)
VOCAB-PASSIVE	Recognition that vocabulary is available for recognition but not production	Distinctions between words 'known' vs words 'usable'	'I have maybe 1000 words I understand. But to speak, maybe 200 words only.' (FG2-P5)
ACC-ANXIETY	Fear of making grammatical or pronunciation errors inhibiting speech	Overthinking correctness; blocking during speech attempts	'When I try to speak, I think too much grammar, pronunciation... and I block.' (FG4-P6)
EVAL-FEAR	Concern about negative judgment from others when speaking English	Fear of looking 'stupid'; concern about others noticing errors	'I'm afraid of looking stupid. Even if I know the word, I worry I will say it wrong.' (FG3-P2)
NO-INTERLOCUTOR	Lack of available conversation partners for English practice	No English speakers in environment; strangeness of using English with peers	'We don't have people to speak English with. It feels strange to speak English with my Algerian friends.' (FG1-P3)
GAMING-EXCEPTION	Online gaming as unique context enabling comfortable English production	Gaming environments described as non-judgmental speaking spaces	'During video games, we practice speaking every week. It's comfortable because no one judges mistakes.' (FG3-P3)

C.6 Theme 4: EST Disconnect

Code	Definition	Inclusion Criteria	Example Quote
EST-VALUE	Recognition of EST's instrumental value for career/academic success	Statements linking EST to jobs, documents, professional needs	'For career, maybe yes, we need technical English.' (FG3-P6)
EST-BORING	Negative affective response to EST instruction (boredom, disengagement)	Terms: 'boring,' 'heavy,' wanting class to 'finish'	'EST is useful but very boring.' (FG2-P1)
VOCAB-TECHNICAL	Perception that EST vocabulary is overly specialized and decontextualized	Technical terms seen as isolated from real use; 'scary' terminology	'The vocabulary is too technical. We don't use it in real life.' (FG1-P2)
PRACTICE-LACK	Insufficient opportunities for practical application of EST content	Desire for reports, presentations, emails vs. just reading	'We don't really get to use them in situations like reports, emails, presentations.' (FG3-P4)
TEXT-HEAVY	Overreliance on written texts with minimal multimedia variety	'Always text'; no videos, audio, or interactive elements	'Every class, same thing. Read the text, answer questions, translate technical terms.' (FG1-P6)
MEDIA-REQUEST	Expressed desire for multimedia integration in EST instruction	Requests for videos, TikTok-style content, engineering videos	'Show us engineering videos in English. Real engineers explaining projects.' (FG2-P4)

Appendix E

Focus Group Code Frequency Summary

The following table presents the frequency of each code across the four focus group sessions (N=24 participants), indicating how many participants endorsed each pattern and the total number of coded quotations.

Code	Participants	Percentage	Quotes	Pattern Description
THEME 1: Algorithm-Driven, Passive Consumption	24/24	100%	63	
ALG-PASSIVE	24/24	100%	33	Accept algorithmic curation
ALG-COMFORT	21/24	87.5%	12	Positive framing of algorithms
SHORT-PREF	18/24	75.0%	14	Sub-minute content preference
FATIGUE-AVOID	6/24	25.0%	6	Academic fatigue drives brevity
ENG-QUALITY	19/24	79.2%	16	Best content in English
ENG-DEFAULT	19/24	79.2%	11	Content over language choice
THEME 2: Surface-Level Language Engagement	22/24	91.7%	39	
NOTICE-EMOTION	22/24	91.7%	16	Emotion-driven noticing
NOTICE-ACCIDENTAL	22/24	91.7%	8	Incidental attention only
GRAMMAR-AVOID	17/24	70.8%	9	Explicit grammar avoidance
NO-FOLLOWUP	19/24	79.2%	12	Abandoned consolidation
EXPOSURE-BELIEF	16/24	66.7%	11	'Natural' learning belief
REPLAY-SHALLOW	12/24	50.0%	5	Replay without deep processing
THEME 3: Confidence Barriers to Production	20/24	83.3%	31	
PROD-GAP	20/24	83.3%	13	Comprehension ≠ production
VOCAB-PASSIVE	14/24	58.3%	6	Recognition vs. active use
ACC-ANXIETY	18/24	75.0%	10	Overthinking correctness
EVAL-FEAR	15/24	62.5%	7	Fear of judgment

Code	Participants	Percentage	Quotes	Pattern Description
NO-INTERLOCUTOR	12/24	50.0%	8	No practice partners
GAMING-EXCEPTION	4/24	16.7%	4	Gaming as safe speaking space
THEME 4: EST Disconnect	24/24	100%	40	
EST-VALUE	24/24	100%	14	Career value recognized
EST-BORING	24/24	100%	12	'Useful but boring'
VOCAB-TECHNICAL	22/24	91.7%	11	Technical terms decontextualized
PRACTICE-LACK	18/24	75.0%	8	No practical application
TEXT-HEAVY	21/24	87.5%	15	Overreliance on written texts
MEDIA-REQUEST	21/24	87.5%	12	Desire for multimedia
TOTAL (24 codes)	24/24	100%	173	All participants contributed

Code Distribution Summary

Statistic	Value
Total codes	24
Total themes	4
Total coded quotations	173
Mean quotations per code	7.2
Range of participant endorsement	16.7% - 100%
Codes endorsed by >75% participants	14 (58.3%)
Codes endorsed by >50% participants	20 (83.3%)
Most frequent code	ALG-PASSIVE (33 quotes)
Least frequent code	GAMING-EXCEPTION (4 quotes)

High-Frequency Codes (≥80% Participant Endorsement)

Rank	Code	Endorsement	Interpretation
1	ALG-PASSIVE	100%	Universal reliance on algorithmic content selection
1	EST-VALUE	100%	Universal recognition of EST career relevance
1	EST-BORING	100%	Universal affective disengagement from EST
4	NOTICE-EMOTION	91.7%	Near-universal emotion-driven language noticing

Rank	Code	Endorsement	Interpretation
4	NOTICE-ACCIDENTAL	91.7%	Near-universal incidental (not intentional) attention
4	VOCAB-TECHNICAL	91.7%	Near-universal concern about decontextualized vocabulary
7	ALG-COMFORT	87.5%	Strong positive framing of algorithmic control
7	TEXT-HEAVY	87.5%	Strong criticism of text-dominated EST pedagogy
7	MEDIA-REQUEST	87.5%	Strong desire for multimedia in EST instruction
10	PROD-GAP	83.3%	Widespread comprehension-production disconnect

Appendix F

EST Teacher Interview Protocol

Format	Semi-structured individual interviews
Total Participants	7 EST teachers
Recording	Audio-recorded with participant consent
Location	Teacher's office or designated quiet space at ENP
Language	English (with option for French/Arabic clarification if needed)
Interviewer	Principal researcher
Question Structure	19 main questions with integrated probes across 8 sections

Introduction Script

"Thank you for agreeing to participate in this interview. As part of my doctoral research at École Nationale Polytechnique, I am investigating how EST teachers perceive and respond to students' informal English learning through digital media—activities like watching YouTube, playing games, using social media, or browsing websites in English outside of class."

"This interview will take approximately 30 minutes. With your permission, I will audio-record our conversation to ensure accuracy. Your responses will remain confidential, and your name will not appear in any reports. You may skip any question or stop at any time."

"There are no right or wrong answers—I am interested in your genuine experiences and perspectives."

"Do you have any questions before we begin?"

Interview Questions

Section A: Background

1. Can you briefly tell me about your teaching background: how long you have been teaching EST, your typical class sizes, and the main curriculum or syllabus you follow?

Integrated probe: How much flexibility do you have to adapt this curriculum?

Section B: Awareness of Students' Informal Digital English

2. Outside of formal classroom instruction, do you think your students encounter or use English in their daily lives? Through what platforms or activities?

Integrated probes: YouTube? Video games? Social media? Streaming platforms?

How frequently or intensively?

3. Have students ever mentioned their informal English activities to you, and how did you become aware of these practices?

Integrated probe: Through classroom conversations? Student reports? Observation?

Section C: Beliefs About Educational Value

4. In your view, do these informal digital activities contribute to students' English language development, and if so, in what ways?

Integrated probe: Do you see this as "exposure" or "learning"—is there a difference?

5. Do you think informal digital English activities are relevant to EST instruction specifically?

Integrated probe: How might they relate to the technical English your students need?

6. What do you see as the main benefits and limitations or concerns about students' informal digital English practices?

Integrated probes: Benefits—motivation, exposure, authenticity? Concerns—accuracy, distraction, appropriateness?

Section D: Current Integration Practices

7. Have you ever incorporated students' informal English activities into your EST teaching? If yes, describe what you did. If no, what prevents you from doing so?

Integrated probes: Asked students about informal use? Assigned related tasks? Used digital tools? Recommended resources?

Section E: Formal-Informal Differences and Motivational Architecture

8. In your experience, how motivated are students in formal EST classes compared to when they engage with English on their own terms?

Integrated probe: What differences do you observe in engagement, participation, or enthusiasm?

9. How much choice or autonomy do students have in your EST courses—for example, in choosing topics, materials, or assignment formats?

Integrated probes: Would you like to offer more? What prevents you?

10. In your view, what are the main structural or environmental differences between formal EST instruction and informal digital English activities?

Integrated probe: Consider time, choice, assessment, social context, content, motivation sources.

Section F: Strategic Guidance and Metacognitive Support

11. Do you teach students how to learn strategically from informal English encounters—for example, how to notice language patterns, remember vocabulary, or reflect on their learning?

Integrated probes: If yes—what strategies? If no—have you considered it? Do you think students already know how to do this?

12. In your EST courses, do you teach any metacognitive or self-regulated learning strategies, such as goal-setting, self-monitoring, or planning?

Integrated probe: If students wanted to improve independently, what advice would you give?

Section G: Institutional Constraints and Barriers

13. What are the main challenges or constraints you face in EST instruction?

Integrated probes: Time? Curriculum mandates? Class size? Assessment requirements? Resources? Student levels?

14. If you wanted to connect students' informal English practices to your EST teaching, what would be the main obstacles?

15. How much flexibility do you have in choosing materials, designing assessments, and allocating class time? Are there institutional expectations that influence how you teach?

Integrated probe: Standardized exams? Department requirements? Pass rate pressures?

16. Do you receive professional development related to digital technology in language teaching or integrating informal learning? Would such training be useful?

Section H: Future Possibilities

17. If you had more time, smaller classes, and curricular flexibility, would you incorporate students' informal digital practices? What would you need to do this meaningfully?

Integrated probe: Is this theoretically valuable but practically impossible, or feasible with adjustments?

18. Some educators argue that teachers should explicitly teach students how to learn from their informal digital activities. What do you think of this idea?

Integrated probe: Realistic in your context? Valuable? Already happening?

19. Is there anything else about your teaching context, your students' informal English use, or the challenges you face that you think is important for understanding this issue?

E.4 Closing Statement

"Thank you so much for sharing your insights. Your perspective is invaluable to this research. If you have any questions or would like to add anything after our conversation, please feel free to contact me."

Probing Techniques Used

Elaboration probes: 'Can you tell me more about that?' 'What do you mean by...?' 'Could you explain further?'

Clarification probes: 'Could you give me a specific example?' 'How often does that happen?' 'In what situations?'

Contrast probes: 'How does that compare to...?' 'Is that different from...?' 'What about the opposite situation?'

Reflection probes: 'Why do you think that is?' 'What's your interpretation of that?' 'How do you feel about that?'

Silent probes: Allowing pauses to encourage further reflection and elaboration

Appendix G

Complete Codebook for Teacher Interview Analysis

#	Theme	Definition	Teachers	RQ4
1	Teacher Awareness of Students' Digital Media Use	Teacher knowledge of platforms students use for English exposure outside class	7/7 (100%)	RQ4.1
2	Perceived Linguistic Benefits	Observed improvements in language skills attributed to media exposure	7/7 (100%)	RQ4.2
3	Concerns About Informal Language	Issues with slang, register confusion in academic contexts	6/7 (85.7%)	RQ4.2
4	Current Integration Practices	Whether and how teachers incorporate media into EST teaching	7/7 (100%)	RQ4.3
5	Professional Role Perception	Teacher beliefs about obligation to address students' informal learning	7/7 (100%)	RQ4.2/3
6	Structural Teaching Constraints	Curriculum, time, and institutional limitations affecting integration	7/7 (100%)	RQ4.3/4
7	Motivational Asymmetry	Observed differences in engagement with media versus EST instruction	6/7 (85.7%)	RQ4.4
8	Bridging Strategies	Specific techniques teachers use to connect informal and formal learning	5/7 (71.4%)	RQ4.3/5

Theme 1: Teacher Awareness of Students' Digital Media Use

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
AWR-HIGH	High awareness: Teacher actively inquires about and demonstrates detailed knowledge of student digital practices	Regular questioning about media habits; specific platform knowledge; awareness of content types	General assumptions without verification; vague references to 'internet use'	'I ask them regularly about what they're watching, what games they play.' (T3)
AWR-MOD	Moderate awareness: Teacher has general knowledge based on occasional conversations or observations	Occasional inquiry during warm-ups; knowledge from student mentions; partial platform awareness	Systematic data collection; comprehensive understanding of habits	'I asked them a few times what they watch, especially during warm-up activities.' (T1)
AWR-LOW	Low awareness: Teacher acknowledges student internet use but lacks	General acknowledgment only; no specific inquiry; reliance on assumptions	Any active investigation of student practices	'I know they use the internet, but I don't ask specifically what

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
	specific knowledge			they watch.' (T6)

Theme 2: Perceived Linguistic Benefits

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
BEN-PRON	Pronunciation benefits: Improved accent, intonation, or phonological accuracy from media exposure	References to accent acquisition; natural intonation; mimicking native speakers	General speaking improvement without phonological specifics	'He could mimic the American accent almost perfectly... from YouTube creators.' (T7)
BEN-LIST	Listening benefits: Enhanced comprehension, especially for fast or authentic speech	Processing speed; tolerance for rapid speech; understanding authentic audio	General comprehension without reference to speed/authenticity	'The gamers don't struggle... They're used to processing English at speed.' (T4)
BEN-FLUEN	Fluency benefits: More natural, less mechanical speech patterns	Use of contractions; natural rhythm; less scripted speech	Accuracy improvements; vocabulary gains	'They speak more naturally, less mechanically... they use contractions, they have rhythm.' (T1)
BEN-CONF	Confidence benefits: Increased willingness to participate in oral activities	Volunteering to speak; reduced anxiety; active participation	Proficiency improvements without affective dimension	'They're more willing to participate in oral activities because they've heard the language used naturally.' (T2)
BEN-SPELL	Spelling benefits: Improved written accuracy from subtitle exposure	Fewer spelling errors; correct word forms; subtitle-watching habits	General writing improvement; grammar gains	'Students who watch series with subtitles make fewer spelling mistakes.' (T2)

Theme 3: Concerns About Informal Language

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
CON-SLANG	Slang intrusion: Use of internet slang, memes, or viral expressions in	TikTok/social media language; meme references; internet	Colloquial but non-internet informal language	'They use slang constantly—"slay," "periodt," "no

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
	academic contexts	abbreviations in class		cap"... even memes when speaking.' (T3)
CON-REGIST	Register mismatch: Inability to distinguish between informal and academic/technical register	Informal language in assignments; casual tone in formal tasks; confusion about appropriateness	Vocabulary errors unrelated to register	'This language is fine with friends but not appropriate for professional communication.' (T3)
CON-FANTASY	Fantasy/entertainment vocabulary: Use of fiction-derived terms in technical contexts	Movie/game vocabulary; fictional terminology in academic work	Technical vocabulary errors; general lexical gaps	'They used "squib" from Harry Potter... I had to explain we need "defective unit" instead.' (T1)
CON-PRAGM	Pragmatic confusion: Misuse of expressions without understanding literal or contextual meaning	Hyperbole misuse; idiom confusion; copying without comprehension	Grammatical errors; pronunciation issues	'They say "I literally died" without understanding what "literally" means.' (T6)

Theme 4: Current Integration Practice

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
INT-ENGAGE	Engagement-driven integration: Systematic use of media to increase student motivation and participation	Regular media use; pedagogical rationale; student interest as driver	Occasional or topic-limited use	'I regularly use short video clips... students are more engaged when they see content they recognize.' (T2)
INT-TOPIC	Topic-driven integration: Selective use of media when directly relevant to lesson content	Content-matched media; occasional integration; topic relevance as criterion	Regular use regardless of topic; no media use	'If the topic allows it, yes. For example, a TED talk if we're discussing renewable energy.' (T5)
INT-MINIM	Minimal/no integration: Rare or absent use of informal	Once per semester or less; preference for traditional materials; no systematic	Any regular or planned media integration	'Not often. Maybe once per semester if there's a relevant

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
	media in EST instruction	approach		news article.' (T4)

Theme 5: Professional Role Perception

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
ROLE-BRIDGE	Bridging responsibility: Belief that acknowledging IDLE is part of professional practice	Clear affirmation; pedagogical rationale; student-centered framing	Conditional or uncertain views	'Absolutely. Students are bringing knowledge... Our job is to help them refine it.' (T7)
ROLE-CONDIT	Conditional responsibility: Belief that IDLE acknowledgment depends on lesson context	'It depends'; context-specific relevance; neither affirmation nor rejection	Clear positions (for or against)	'It depends on the lesson... Sometimes students' informal knowledge is helpful; other times irrelevant.' (T3)
ROLE-CURRIC	Curriculum-focused: Belief that responsibility is limited to formal curriculum delivery	Exam focus; syllabus priority; IDLE as external to professional role	Any acknowledgment of IDLE as part of teaching role	'My responsibility is to teach the curriculum... I don't see it as my job to integrate their hobbies.' (T6)

Theme 6: Structural Teaching Constraints

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
CONST-TIME	Time constraints: Insufficient instructional time for activities beyond core curriculum	Time pressure; pacing demands; competing priorities for class time	Curriculum content issues; resource limitations	'Time is the biggest challenge. I barely have enough time to teach the core material.' (T4)
CONST-CURRIC	Curriculum density: Heavy, inflexible syllabus leaving no room for additions	Content overload; fixed syllabus; lack of flexibility for deviation	Time management issues; personal choice to exclude	'The curriculum is very heavy... a huge amount of technical terminology, grammar, genres.' (T1)
CONST-EXAM	Assessment pressure: Exam-focused	Test alignment; exam content priority; difficulty	Curriculum issues without assessment	'If I use class time for things that won't

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
	teaching limiting non-assessed activities	justifying non-assessed work	reference	appear on the test, it becomes hard to manage.' (T5)

Theme 7: Motivational Asymmetry

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
MOT-CHOICE	Choice-driven engagement: Student motivation linked to personal content selection	Interest-based selection; autonomy in media; personalization of content	General motivation differences without choice reference	'Students are very motivated by media because they choose what to watch based on their interests.' (T1)
MOT-ACCESS	Accessibility contrast: Media perceived as accessible vs. EST as intimidating	Media as 'easy'; EST as 'scary' or 'work'; accessibility framing	Interest differences without accessibility dimension	'Media feels accessible; EST feels like work.' (T4)
MOT-VOCAB	Vocabulary intimidation: Technical terminology creating affective barriers	Fear of technical terms; terminology as obstacle; vocabulary-specific anxiety	General difficulty with EST content	'EST vocabulary scares them. The terminology is intimidating.' (T4)

Theme 8: Bridging Strategies

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
STRAT-VIDEO	Video integration: Use of YouTube, TED talks, or clips in lessons	Specific video sources mentioned; pedagogical video use; authentic video materials	General media reference without video specifics	'I use short video clips from YouTube... technical demonstrations or TED talks.' (T2)
STRAT-DISCUSS	Discussion of media: Using student media experiences as discussion topics	Warm-up discussions; relating lessons to student viewing; media as topic	Media as teaching material rather than discussion topic	'I ask what they're watching and try to connect it to our lesson themes.' (T3)
STRAT-REGISTER	Register teaching: Explicit instruction on formal vs. informal language	Explaining register; contrasting styles; correcting informality with explanation	Simple correction without register explanation	'I remind them that this language is fine with friends but not appropriate for

Code	Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
	differences			professional contexts.' (T3)

Appendix H

Teachers' interviews Code Frequency Summary

The following table presents the frequency of each code across the seven teacher interviews, indicating how many teachers endorsed each pattern.

Code	Teachers Endorsing	Percentage	Quote Count
AWR-HIGH	3/7	42.9%	5
AWR-MOD	2/7	28.6%	3
AWR-LOW	2/7	28.6%	2
BEN-PRON	5/7	71.4%	7
BEN-LIST	4/7	57.1%	5
BEN-FLUEN	5/7	71.4%	6
BEN-CONF	6/7	85.7%	8
BEN-SPELL	3/7	42.9%	3
CON-SLANG	6/7	85.7%	9
CON-REGIST	5/7	71.4%	6
CON-FANTASY	2/7	28.6%	2
CON-PRAGM	3/7	42.9%	4
INT-ENGAGE	2/7	28.6%	4
INT-TOPIC	3/7	42.9%	5
INT-MINIM	2/7	28.6%	3
ROLE-BRIDGE	3/7	42.9%	5
ROLE-CONDIT	2/7	28.6%	3
ROLE-CURRIC	2/7	28.6%	2
CONST-TIME	7/7	100%	11
CONST-CURRIC	6/7	85.7%	8
CONST-EXAM	5/7	71.4%	6
MOT-CHOICE	5/7	71.4%	6
MOT-ACCESS	4/7	57.1%	5
MOT-VOCAB	4/7	57.1%	4

Note. Quote count represents the number of distinct quotations coded to each code across all interviews.

X.13 Coding Decision Rules

The following decision rules were applied during the coding process:

1. Multiple codes per segment: A single data segment could receive multiple codes if it reflected distinct patterns (e.g., both BEN-PRON and BEN-CONF).

2. Primary code assignment: When codes overlapped, the code most central to the participant's point was assigned as primary.
3. Context consideration: Surrounding context was considered when assigning codes to ambiguous segments.
4. Exclusion precedence: If a segment met exclusion criteria for a code, it was not assigned that code regardless of partial inclusion fit.
5. Teacher-level counting: For frequency analysis, each teacher was counted once per code regardless of how many times they expressed that pattern.

ملخص

أحدث استخدام الوسائط الرقمية تغييرًا جوهريًا في طريقة تفاعل المتعلمين مع اللغة الإنجليزية خارج الفصول الدراسية، غير أن تأثيرات هذه الوسائط على التعلم اللغوي غير الرسمي والتعليم الرسمي لم تحظَ بالدراسة الكافية. تستكشف هذه الدراسة العلاقة بين التعلم الرقمي غير الرسمي للغة الإنجليزية (IDLE) وتعليم وتعلم الإنجليزية للعلوم والتكنولوجيا (EST) لدى طلاب الهندسة الجزائريين في المدرسة الوطنية المتعددة التقنيات، مع التركيز على أنماط الانخراط والاتجاهات والدافعية نحو التعليم والتعلم الرسمي.

اعتمدت الدراسة النموذج البراغماتي بتصميم منهجي مختلط تفسيري متسلسل شمل الاستبيانات (253 مشاركًا)، وسجلات الدراسة (40 طالبًا)، ومجموعات التركيز الطلابية، ومقابلات الأساتذة (7 أساتذة).

كشفت النتائج عن تباين في أبعاد الانخراط، حيث سُجِّل مستوى مرتفع من الانخراط السلوكي والوجداني، في حين ظل الانخراط المعرفي واللغوي منخفضًا، مما يشير إلى أنماط قائمة على الاستهلاك وليس على التعلم المقصود. كما لوحظ انفصال في الاتجاهات، إذ تبيّن وجود ارتباط سلبي قوي بين الانخراط الوجداني في التعلم الرقمي غير الرسمي واتجاهات الطلاب نحو الإنجليزية للعلوم والتكنولوجيا ($r = 475$ إلى -697). وهو ما يتسق مع فرضية الصراع المستندة إلى نظرية تقرير المصير، التي ترى أن التجارب غير الرسمية المستقلة قد تؤدي إلى إدراك التجارب التعليمية الرسمية باعتبارها خاضعة للتحكم الخارجي. وبالمثل، تنبأت البنى الدافعية) الذات المثالية للغة الثانية والتوجه الدولي (باستهلاك المحتوى الترفيهي، لكنها لم تتنبأ بسلوكيات التعلم المقصود.

من جهتهم، أشار الأساتذة إلى أن التعلم الرقمي غير الرسمي يعزز النطق والطلاقة، لكنهم حددوا أيضًا الخلط في السجل اللغوي والقيود المؤسسية كعوائق أمام الدمج البيداغوجي.

على المستوى النظري، تطرح النتائج تساؤلات حول مدى انطباق أطر التعلم الرقمي غير الرسمي الحالية على البيئات المعاصرة المحكومة بالخوارزميات والمحتوى القصير، كما توسّع نظرية تقرير المصير لتشمل السياقات التعليمية المتنوعة. من الناحية البيداغوجية، تتحدى الدراسة الافتراض القائل بأن التعرض الرقمي العرضي يُترجم إلى تطور في اللغة الأكاديمية، وتدعو بدلًا من ذلك إلى التعليم الصريح للوعي بالسجلات اللغوية واستراتيجيات ما وراء المعرفة.