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Designing an AI-Powered System for Needs Analysis and Personalized Content Generation in ESP Courses

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Dedication

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Dedication

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Table of contents

Abstract

English for Specific Purposes (ESP) has become strategically important in Algeria due to recent changes adopting English as a language of instruction in schools. However, one of the main difficulties faced by researchers is the lack of intelligent and contextualized software applications that can connect the language needs of a specific field to relevant materials. The aim of this thesis is to design, develop, and test TALEB-ESP, an artificial intelligence system for ESP instruction. Specifically, it seeks to solve a common problem in ESP teaching among first-year university students: the inability of instructors to identify learners" ESP needs and develop appropriate materials. As a possible solution, TALEB-ESP, an AI-assisted platform for needs analysis and personalized ESP material development, is proposed and investigated. The study employed a quasi-experimental mixed-methods design, involving a purposive initial sample of 80 first-year English for Specific Purposes (ESP) students, 75 of whom met the inclusion criteria. These students were divided into an experimental group and a control group. They participated in a six-week classroom experiment. The experimental group used TALEB-ESP to identify ESP needs and generate customized learning content. To measure the impact, students" reading, technical vocabulary, and professional writing skills were tested before and after the experiment using pre-tests and post-tests. Teacher evaluation and learner assessment were also used. The results showed that participants who studied with the AI-enhanced platform improved their language proficiency much more than those in the control group ($F(1, 72) = 68.47$, $p < .001$). Moreover, the AI-based needs analysis was highly consistent with expert assessment, meaning that using AI in ESP learning provides accurate data about learners" needs. Additionally, both teachers and students expressed very positive attitudes towards the usefulness and adaptability of the AI-generated materials. The conclusion is that the hypothesis is confirmed: artificial intelligence technology can help create more adaptive, learner-oriented, and contextualized ESP learning activities at Algerian universities. The dissertation also offers insights into the consequences of using AI in ESP learning for educators, curriculum developers, and future innovations in Algerian higher education.

***Keywords**: English for Specific Purposes (ESP), Artificial Intelligence in Education, Needs Analysis, Personalized Learning, AI-Assisted Content Generation, Language Learning Technologies, Algerian Higher Education.*

ملخص

اكتسبت اللغة الإنجليزية لأغراض محددة (ESP) اهمية استراتيجية متزايدة في الجزائر في ظل التغييرات الاخيرة المتعلقة بتبني اللغة الإنجليزية لغة للتدريس في البيئات التعليمية. ومع ذلك، فان إحدى الصعوبات الرئيسية التي تواجه الباحثين تكمن في غياب تطبيقات برمجية ذكية لذات السياق قادرة على ربط المتطلبات اللغوية لتخصص معين بالوسائل التعليمية المناسبة.

تهدف هذه الاطروحة إلى تصميم وتطوير واختبار نظام "TALEB-ESP"، وهو نظام مدعوم بالذكاء الاصطناعي موجه لتدريس اللغة الإنجليزية لأغراض محددة. وتسعى الدراسة تحديدا إلى معالجة إحدى المشكلات الاكثر شيوعا في تدريس هذا التخصص لطلاب السنة الاولى جامعي، والمتمثلة في عدم قدرة الاساتذة على تحديد حاجات المتعلم بدقة وتطوير المواد التعليمية المتوافقة معها. وكحل ممكن، تقترح هذه الدراسة نظام "TALEB-ESP" كمنصة مدعومة بالذكاء الاصطناعي تهدف إلى إجراء تحليل الحاجات وتطوير مواد تعليمية مخصصة. اعتمدت الدراسة تصميما شبه تجريبيًا ذا منهجية مختلطة، شمل عينة أولية هادفة مكونة من 80 طالبًا من طلاب السنة الأولى في تخصص اللغة الإنجليزية للأغراض الخاصة، استوفى 75 منهم معايير الإدراج وقد تم تقسيمهم إلى مجموعة تجريبية ومجموعة ضابطة. خضعوا لتجربة استمرت ستة اسابيع. وتضمن الوضع التجريبي استخدام منصة "TALEB-ESP" لتحديد الحاجات اللغوية وتوليد محتوى تعليمي مخصص يتماشى مع تلك الحاجات. ولقياس أثر هذا الوضع على مخرجات التعلم، تم اختبار مهارات القراءة، والكتابة، والاستماع لدى المتعلمين قبل التجربة وبعدها باستخدام الاختبارات القبلية والبعدية، إلى جانب الاعتماد على تقييم الاساتذة والطلاب. وفيما يتعلق بالنتائج، تبين ان المشاركين الذين درسوا في ظل ظروف المنصة المدعومة بالذكاء الاصطناعي حققوا نتائج أفضل بكثير في تحسين كفاءتهم اللغوية مقارنة بنظرائهم في المجموعة الضابطة ($F(1.72)=68.47, p<0.001$). علاوة على ذلك، جاء تحليل الحاجات المبني على الذكاء الاصطناعي متوافقا بدرجة عالية مع تقييم الخبراء، مما يعني ان استخدام الذكاء الاصطناعي في تعلم الإنجليزية لأغراض محددة يتيح الحصول على بيانات دقيقة حول متطلبات المتعلمين. بالإضافة إلى ذلك، ابدى جميع المشاركين، من اساتذة وطلاب، مواقف إيجابية للغاية تجاه فائدة المواد التعليمية المطورة وقابليتها للتكيف. وخلصت الدراسة إلى تأكيد صحة الفرضية القائلة بان تكنولوجيا الذكاء الاصطناعي، في تطبيقها البيداغوجي، يمكن ان تسهم في خلق انشطة تعليمية أكثر مرونة، وتمركزا حول المتعلم، لذات السياق في الجامعات الجزائرية. كما تقدم هذه الاطروحة رؤى واضحة حول تبعات استخدام الذكاء الاصطناعي في تعليم اللغات للمربين، ومطوري المناهج، والابتكارات المستقبلية في التعليم العالي الجزائري.

الكلمات المفتاحية: *اللغة الإنجليزية لأغراض محددة (ESP)، الذكاء الاصطناعي في التعليم، تحليل الحاجات، التعلم المخصص، توليد المحتوى المدعوم بالذكاء الاصطناعي، تكنولوجيات تعلم اللغات، التعليم العالي الجزائري*

List of abbreviations

AI	Artificial Intelligence
AIEd	Artificial Intelligence in Education
ANCOVA	Analysis of Covariance
API	Application Programming Interface
CEFR	Common European Framework of Reference for Languages
EAP	English for Academic Purposes
EdTech	Education Technology
EFL	English as a Foreign Language
EGP	English for General Purposes
ELT	English Language Teaching
ESP	English for Specific Purposes
EOP	English for Occupational Purposes
GPT	Generative Pre-trained Transformer
KPI	Key Performance Indicator
LLM	Large Language Model
MENA	Middle East and North Africa
MVP	Minimum Viable Product
NA	Needs Analysis
NLP	Natural Language Processing
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RQ	Research Question
SaaS	Software as a Service
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TESOL	Teaching English to Speakers of Other Languages

List of figures

List of tables

General Introduction

a) Background of the Study

It is true that the past two decades have seen a remarkable change in university policies in Algeria, especially regarding the use of English as the medium of instruction for different scientific and technical disciplines. Indeed, thanks to different legislative measures and decrees issued by the ministries concerned, ESP is now considered one of the central components in university language programs. It is even common in universities in Algeria to provide their students who are specializing in sciences, engineering, economics, medicine, and agriculture with training in ESP as part of their preparation for entry into the world of knowledge.

Simultaneously, the development of artificial intelligence (AI) has become an essential trend in educational technologies. Developments within the area of LLMs like ChatGPT, Anthropic's Claude, Google's Gemini, and many others have provided enormous possibilities for automation of various aspects of education, including automated grading, intelligent tutoring systems, and adaptive content delivery. For purposes of the current study, however, it is important that such developments create new possibilities for the automated analysis of learners" needs and content generation in specific domains. The global AI in education market size was estimated at $3.6 billion in 2023, with a CAGR of 35.1% expected until 2033 (« AI in Education Market », s. d.).

However, even with all the progress made, the English language instruction for specific purposes (ESP) program in Algeria is still highly dependent upon general language books that are ill-suited to the Algerian setting. The educators at places like the University of Ghardaïa, situated in one of the economically vital areas of Algeria where petroleum engineering, geology, and desert agriculture form the dominant industries, frequently note that the commercially available materials for ESP education bear little relevance to the real-life professional experiences of their students.

b) Statement of the Problem

There are two main features which define the process of teaching ESP at the University of Ghardaïa as well as at any other university in Algeria. Firstly, the problem of conducting a proper needs analysis, i.e., the identification of the needs of students in order to perform tasks in English in certain professional settings, is not formalized or even ignored. In cases where no relevant data has been collected, ESP courses are compiled using general curricula which make no references to discipline-specific language elements.

Additionally, even if information about the learners" needs is provided, the next issue involves turning this information into tailored material. As it turns out, material creation is quite labor-intensive among ESP educators, as preliminary research conducted at the onset of this study found out that ESP educators at the University of Ghardaïa spend 12.4 hours per week working on developing material, hours that could be much more effectively spent in other areas. The matter is complicated further due to the absence of subject-specific corpora and subject books, and the insufficient technological literacy of the instructors.

Thus, the research problem can be formulated as follows: can the use of an automated ESP content creation tool using AI technology assist in making the process of analysis of learners" needs and subject-specific ESP content creation easier for the instructor?

c) Aim and Objectives

Main objective of the research is to design and evaluate a two-module artificial intelligence system , that will be used for automating needs analysis (Module 1) and creation of ESP learning materials tailored to the individual student's needs (Module 2). For the achievement of this main objective, the present research seeks to reach the following goals:

1. Creation and validation of a tool for needs analysis, which will be employed to profile the individual ESP needs of learners and set the corresponding pedagogical parameters.
2. Using the Content Generation Module to create disciplinary readings, specialized vocabulary exercises, and professional writing tasks that are designed according to the individual learner profile provided by Module 1 (needs analysis).
3. Comparison of the accuracy of needs analysis provided by the system to the one done manually by experts.
4. Expert assessment of the pertinence of the generated material.
5. Assessment of the influence of the proposed system on the language development, motivation, and engagement of students through quasi-experimental research.
6. Estimation of the acceptance and usefulness of the proposed system by instructors of ESP classes, in terms of their material preparation and time-saving effects, by means of technology acceptance model (TAM).

d) Research Questions and Hypotheses

This study is guided by five principal research questions:

1. RQ1: How accurately does the proposed system's automated needs analysis identify learners" discipline-specific language needs compared to a manual expert baseline?

2. RQ2: What is the pedagogical quality of the ESP content generated by Module 2, as evaluated by domain experts using a validated rubric?
3. RQ3: Does participation in ESP instruction supported by the proposed system significantly improve students” language proficiency compared to students receiving conventional instruction?
4. RQ4: How does the proposed system supported instruction affect student motivation and engagement in ESP learning?
5. RQ5: To what extent do ESP instructors accept and perceive the proposed system as useful and easy to use, and how does it affect their material preparation efficiency?

The following directional hypotheses are proposed:

1. H1: The proposed system's needs analysis will achieve a minimum of 80% agreement with a manual needs analysis conducted by an ESP expert.
2. H2: The expert-rated pedagogical quality of the proposed system's content will attain a mean score of at least 4.0 on a 5-point validated rubric.
3. H3: Students in the experimental group receiving proposed system instruction will demonstrate significantly higher post-test language proficiency scores than students in the control group, after controlling for pre-test performance.
4. H4: Students in the experimental group will report significantly higher motivation and engagement scores than students in the control group.
5. H5: ESP instructors will rate the system's perceived usefulness at 4.0 or higher on the TAM instrument, and will report a minimum 50% reduction in material preparation time compared to conventional methods.

e) Significance of the Study

This study makes significant contributions at three intersecting levels:

Academically and methodologically: It advances the nascent field of AI-assisted ESP course design by providing empirical evidence, grounded in a rigorous quasi-experimental design, of the effectiveness of Large Language Model (LLM)-driven content generation and needs analysis automation. It adds to the sparse body of research on AI applications in North African educational contexts and provides a replicable methodological framework and guidelines for future research.

Practically: It delivers a functional architecture that addresses an acute, documented shortage of appropriate ESP materials in Algerian universities. The proposed framework holds the promise of serving university students who study ESP across Algerian higher education institutions, dramatically expanding access to quality, discipline-specific language instruction. Teachers also benefit from this work, as it reduces their material preparation burden and allows them to focus more on teaching and learner support.

Entrepreneurially: By aligning with the nationwide "One Diploma, One Startup" initiative (Decree 1275) and the Master & Start-up label framework, this thesis provides a model for translating applied linguistics research into commercially viable EdTech ventures, contributing directly to Algeria's nascent innovation ecosystem and the Ministry of Higher Education's digital transformation agenda.

f) Organization of the Thesis

This thesis is structured as follows. Chapter One reviews the relevant literature, focusing on the theoretical framework of ESP, AI-supported language education, adaptivity in education, and the Technology Acceptance Model. Chapter Two provides detailed information about the research methodology, including the proposed system architecture, data collection techniques, experimental procedures and data analysis methods. Chapter Three presents the empirical evidence relating to the five hypotheses and five research questions raised in this study. Chapter Four concludes the research with key observations, pedagogical suggestions, limitations of the study, and proposals for future research. Finally, six appendices are provided at the end of the thesis, concluding with the business plan for developing the system commercially.

1. Literature review

The integration of technological innovations in language pedagogy requires a foundational grounding in established linguistic theories and educational frameworks. In order to critically evaluate how contemporary artificial intelligence can transform and optimize the instructional landscape of English for Specific Purposes (ESP), it is essential to first contextualize ESP as a distinct and rigorous branch of English Language Teaching (ELT).

1.1 ESP Foundations: Definitions, Evolution, and the Role of Needs Analysis

Conceptual basis for English for Specific Purposes can be found in the long history of scientific investigation related to language teaching methods and curricula as well as learners" needs. In order to analyze further how artificial intelligence can be used for improvement of ESP teaching process, it is important first of all to formulate what ESP means as a special branch of English language teaching. This part provides basic definitions of ESP and looks at its history as well as needs analysis relevance.

1.1.1 Defining English for Specific Purposes

ESP should not be regarded as an end-product comprising certain content and methodologies; rather, it can be seen as an approach to language instruction where all content choices, methodologies, and assessments are made according to the reasons for which one needs to learn (Hutchinson & Waters, 1987). Differing considerably from English for General Purposes (EGP), the core idea behind ESP is to cater specifically to the particular needs of students, both academically, linguistically and professionally. Hence, ESP cannot be viewed within the scope of other types of English language instruction since it requires taking into account the needs of learners as a basis for successful ESP program implementation.

In their discussion of ESP as a distinct field of specialization, (Dudley-Evans & St John, 1998) defined certain characteristics associated with ESP, which included absolute and variable ones. As per the authors, ESP should address the particular needs of the learners, make use of discipline-specific approaches and activities, and focus on the particular type of language, skills, genres, and discourses associated with these activities. Moreover, (Dudley-Evans & St John, 1998) noted that ESP courses are typically aimed at mature learners of tertiary and professional levels possessing at least a basic command of English language.

1.1.2 The Evolution of English for Specific Purposes

The history of ESP is marked by an ongoing development in its theoretical bases and applications. At first, the main concern was concentrated on the study of registers and the linguistic specifics of scientific and technical English (Barber, 1962; Halliday, 1964). In subsequent periods, the focus moved to discourse and genre analyses through the groundbreaking works of such scholars as (Bhatia, 2014; Swales, 1990), for whom an essential aspect was understanding the functioning of language within discourse communities. Contemporary researches have enriched the area of ESP through new sociocultural, corpus-based, and technological approaches to language acquisition (Flowerdew, 2012; Liu & Lei, 2018). Thus, from being concerned with the problem of vocabulary specialization only, ESP has developed into a multi-faceted interdisciplinary domain of language studies.

It has been described in terms of several important principles. To begin with, ESP is developed to suit the particular needs of the learners. Second, it uses the methods, approaches, and communication tools peculiar to the disciplines involved. Finally, it takes into account language as used in these disciplines, including grammar, lexis, register, discourse, genre, and learning strategies (Dudley-Evans & St John, 1998; Hutchinson & Waters, 1987; Swales, 1990). This combination of principles defines ESP as a flexible and needs-based approach to language teaching rather than as a fixed curriculum.

1.1.3 Needs Analysis: Theory and Practice

Needs analysis (NA), the scientifically conducted examination of the needs of learners before and/or during the process of designing a course, is a hallmark concept in ESP pedagogy. In (Long, 2005) the definitive discussion of needs analysis provides an analytical approach that employs multiple sources of information (target situation experts, learners, employers, and practitioners), several techniques (questionnaire surveys, interviews, observation at the workplace, discourse analysis, and corpora research), and two types of needs, target needs (what learners need to be able to do in the outside world) and learning needs (how to get there in the classroom).

Apart from being an instrument of collecting information, needs analysis is considered the bedrock of ESP curriculum design. According to (West, 1994), its main aim is to specify syllabi based on identifying the communicative demands associated with target situations. Likewise, (Basturkmen, 2015) defines needs analysis as a process where the future language requirements of the learners, relative to their present proficiency level and needs, are assessed within the context of the constraints of the teaching environment. Perhaps one of the most widely accepted models of such needs analysis was offered by (Munby, 1978). In his Target Situation Analysis (TSA), he attempted to pinpoint the communicative demands that the learners would face in the target situation. However, (Hutchinson & Waters, 1987) advise that an exclusive focus on target situations is misplaced because a good ESP course must take into consideration the ways in which the learners actually learn language. This distinction was made by the authors, who defined two different types of language needs, target needs and learning needs.

In fact, there have been no systematic needs assessment studies conducted in Algerian Universities. According to (Soulimane B., 2024), from the year 2017 when the English language program was launched at the higher education level, there has been no systematic assessment process that has been conducted. The situation is confirmed by (Assassi, 2021) who, in his research work about the status of ESP in Algeria, found that classes were allocated without any set syllabus; hence the students did not view the course seriously. The problem of lack of proper teacher preparation for the subject matter and lack of proper teaching resources is further confirmed by (Missoum, 2023). This makes it difficult for the teachers to develop their own syllabuses within a short period of time which can be difficult.

The use of AI in needs analysis through automation is a huge leap from the existing methodologies and should not be viewed as an outright rejection of the fundamental ideas behind the former. With natural language processing being used to analyze free-form answers and machine learning to create learner profiles, along with large language models to compile the results, AI-supported needs analysis will be capable of handling vast amounts of information while maintaining the learner-centered approach that drives ESP. The result would be learner profiles that map out the learners" needs and how they fit into instructional design.

1.2 Artificial Intelligence in Language Education (AIEd)

Artificial intelligence has gradually transformed language teaching, especially for ESP. This chapter explores the developments that have taken place in terms of artificial intelligence from computer-assisted learning to large language models in recent times, discusses the use of AI technology in content creation for ESP programs, and analyzes the role of AI in needs analysis.

1.2.1 From Computer-Assisted Language Learning to Large Language Models

Indeed, the application of digital tools to language learning has seen significant changes during recent decades. Computer Assisted Language Learning was invented at the beginning of the 1960s and 1970s and was predominantly behaviouristic in nature; the students had access to a number of drills to practise grammar and vocabulary. While these programs enabled the learners to practise independently, the flexibility of such systems is rather low due to the inability to adjust to individual needs or generate authentic material.

With the development of AI, the above-mentioned picture has been continuously changing. Due to recent advancements in natural language processing and machine learning, educational technology systems have been able to break free from the constraints of prescribed instruction sequences and create more engaging environments for learners. One of the biggest breakthroughs in AI has been made with the development of the transformer model, which is the cornerstone of all modern Large Language Models.

Large Language Models such as BERT (Devlin et al., 2019), GPT-3 (Brown et al., 2020), GPT-4 (OpenAI et al., 2024), and Claude (Anthropic, 2023) have shown exceptional performance in generating high-quality texts, translating them into other languages, summarizing texts, and other language-related tasks. Unlike traditional educational applications, modern Large Language Models generate completely new texts that can mimic human speech in terms of style and adapt to different areas of application and situations of use.

Pedagogical implications resulting from the aforementioned tendencies have become the focus of an increasing amount of literature. (Warschauer & Meskill, 2013) stressed that technologically assisted language learning should emphasize authentic communication and contextualized language use, rather than language activities done in isolation. In turn, (Godwin-Jones, 2022) highlighted personalization, immediate feedback provision, and scalability among other major strengths associated with the use of AI in language learning processes.(Kohnke et al., 2023) build on these ideas by stressing that context-sensitive tasks generated through generative AI can be adjusted according to learners" performance. These qualities are especially pertinent to English for Specific Purposes, as language teaching materials should match learners" professional and academic environments.

On the other hand, researchers have noted the necessity for critical and responsible implementation of generative AI in the education process. Misinformation, bias in algorithms, and learner over-reliance on AI tools have been associated with certain pedagogical issues. Thus, current academic interest shifts away from AI's potential for replacing teachers towards using AI to enhance their instructional capabilities.

1.2.2 AI for Content Generation in ESP

One of the issues with English for Specific Purposes has been in the creation of relevant learning materials for the purposes of specialized domains. Given that ESP classes cater to individual requirements, generic textbooks might not be able to present appropriate materials for a specific context.

With advancements made in the field of artificial intelligence, novel opportunities have emerged to meet this issue. Various studies have looked at the application of AI-based tools to adapt texts, analyze vocabularies, conduct corpus linguistics analysis, and generate content in engineering, medicine, and business English (Alonzo et al., 2024; Aryadoust et al., 2024; Suvorov & Irgin, 2025). Generally speaking, AI-based materials were found more engaging and flexible than generic materials.

However, several critical issues still exist. For instance, a lot of existing research mostly emphasizes the technical qualities of AI software, while there is not much information about their teaching effectiveness. In a number of investigations, assessment methods were based on subjective impressions of teachers or learners, and not on the objective evaluations and observations conducted in the classroom. What is more, AI content production is analyzed as a separate activity that is not associated with any initial needs analysis.

This is especially relevant for ESP, since the needs analysis stage is regarded as the basis for ESP curriculum development (Basturkmen, 2015; Hutchinson & Waters, 1987). Hence, the effectiveness of the materials developed through AI should be estimated not only in terms of the linguistic aspect, but also in terms of relevance to learners" needs.

1.2.3 AI-Assisted Needs Analysis in ESP

Needs analysis usually employs questionnaires, interviews, observations, and consultations among other techniques aimed at uncovering the target and learning needs of the students (Long, 2005). While all these practices form an integral part of ESP course design, they can prove time-consuming and challenging when dealing with large numbers of students.

The emergence of artificial intelligence presents several possibilities. Questionnaire results, learner data, and qualitative data are subject to computerized analysis that enables the identification of learner categories and the creation of needs profiles for individual students or groups of students more effectively than would be the case through traditional needs analysis. It is necessary to highlight that the employment of artificial intelligence does not mean abandoning existing approaches but complementing them.

Under the ESP approach, what makes the use of AI particularly important is its ability to create a link between needs analysis and course content development. While traditional approaches treat needs analysis and material development as two different processes, AI makes it possible to translate learners" needs directly into course content.

1.3 Adaptive Learning and Personalization

Adaptive learning means using educational technologies to adjust teaching experiences to individual learners based on their personal traits, preferences, and performance. Over the past twenty years, personalization has become a main approach in educational technology research (Pane et al., 2017). According to (Brusilovsky & Millán, 2007)
basic model, an adaptive educational system rests on three core parts:

- The Domain Model: The knowledge and skills within a specific subject to be taught.
- The Student Model: An up-to-date picture of the learner's current skill level, goals, and specific needs.
- The Instructional Model: The teaching method and rules that control how materials are chosen, supported, and ordered for each learner.

Many studies have proven that these adaptive environments work well. (VanLEHN, 2011) showed that intelligent tutoring systems often produce results as good as one-on-one human tutoring. Furthermore, a large review by (Ma et al., 2014) covering 107 studies found that adaptive tutoring systems work much better than traditional teaching.

From a language learning perspective, adaptive learning fits well with (Krashen, 1982) Input Hypothesis, which states that people learn language best when they receive input that is just a little above their current level ($\boldsymbol{i} + \mathbf{1}$). Adaptive systems put this idea into practice by constantly adjusting language difficulty, topics, and task level based on real-time learner data, something much easier to achieve with dynamic content than with a fixed, uniform textbook.

Beyond these cognitive and linguistic adjustments, the success of adaptive ESP instruction is heavily mediated by psychological and affective factors. Within contemporary educational psychology, this motivational engagement is robustly explained through the lens of Self-Determination Theory (SDT), formulated by (Deci & Ryan, 2000). SDT posits that optimal intrinsic motivation and psychological well-being are achieved when instructional environments successfully satisfy three core psychological needs: autonomy, competence, and relatedness. In traditional ESP settings, non-tailored materials often hinder motivation due to a lack of perceived immediate relevance. Conversely, an adaptive system that delivers highly contextualized, discipline-specific content directly aligns with students' professional trajectories. By giving learners a sense of control over their progression and clear utility in their specific scientific domains, the pedagogical environment actively nurtures their sense of autonomy and competence. Consequently, integrating an AI-driven, learner-centric design serves as a catalyst for intrinsic motivation, transforming language learning from an imposed institutional requirement into a self-determined professional necessity.

This ability to adapt is especially important in English for Specific Purposes (ESP) settings. In typical university groups, students often have different starting skill levels, different fields of study, and different professional goals. As a result, traditional, one-size-fits-all textbooks are not made to meet the varied needs of all learners at once.

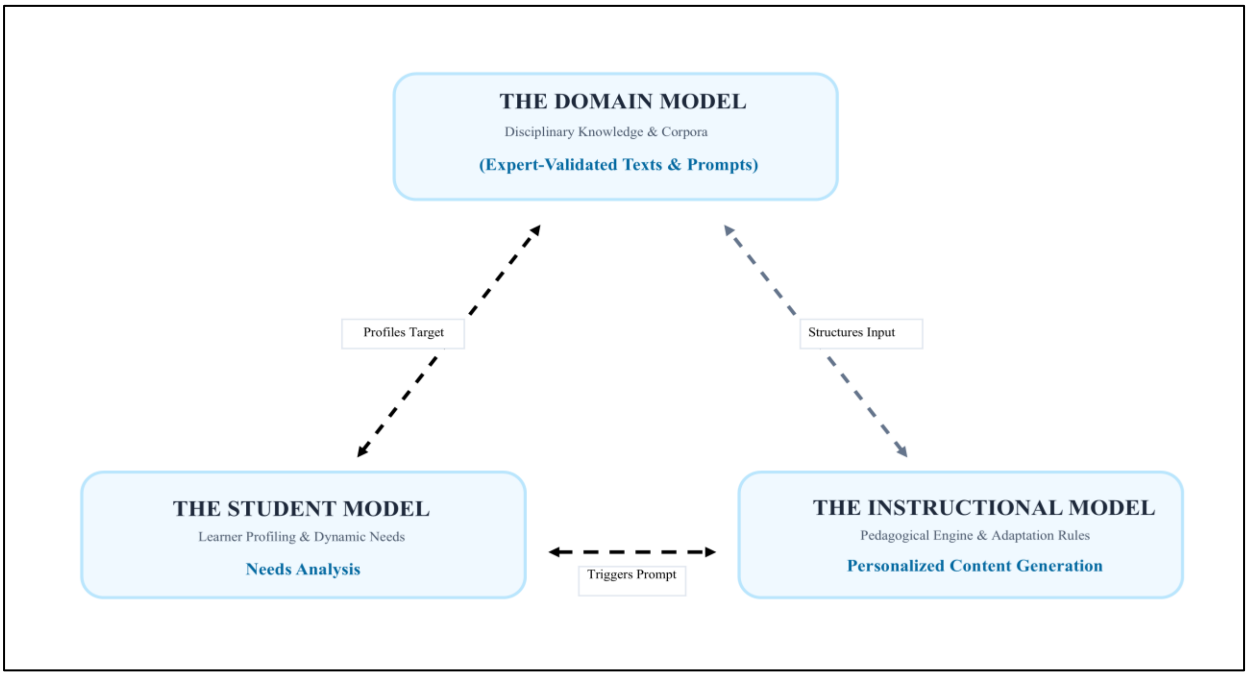

Figure 1: Conceptual Architecture of an Adaptive Learning System Showing the Interaction between the Domain Model, Student Model, and Instructional Model

1.4 The Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by (Davis, 1989) and subsequently extended by Venkatesh and Davis (2000), provides the theoretical framework for assessing instructor adoption of the proposed system. TAM proposes that an individual's intention to use a technology, and actual usage behaviour, are determined principally by two perceptual variables: Perceived Usefulness (PU) — the degree to which a person believes that using the technology will enhance their job performance — and Perceived Ease of Use (PEOU) — the degree to which they believe that using the technology will be free of effort.

TAM has been extensively validated across educational technology contexts. In a systematic review of 71 TAM studies in education, (Davis, 1989) confirmed the robustness of the PU-PEOU-acceptance chain and identified instructor demographics, technology experience, and organizational support as significant moderating variables. More recent applications of TAM to AI-powered educational tools — including intelligent tutoring systems and automated essay scoring (Ramesh & Sanampudi, 2022), have confirmed PU as the dominant predictor of acceptance, with PEOU exerting a significant but secondary effect. These findings informed the design of the TAM instrument used in this study to measure instructor acceptance of proposed sytem.

1.5 The Research Gap

A synthesis of the literature reviewed above reveals a clear and significant research gap. While substantial bodies of work exist on (1) ESP needs analysis methodology, (2) AI applications in general language education, (3) adaptive learning systems, and (4) TAM-based technology acceptance research, no study has integrated these four strands into a unified empirical investigation of an AI-powered needs analysis and content generation system specifically designed for the Algerian ESP context. The current study addresses this gap by:

- Designing an integrated two-module AI system that operationalizes the theoretical connection between needs analysis and adaptive content generation.
- Validating the system's outputs through both expert evaluation and controlled quasi-experimental comparison.
- Measuring teacher acceptance using a validated TAM instrument adapted for AI-powered pedagogical tools.
- Situating all of the above within the specific institutional, linguistic, and professional context of the University of Ghardaïa, Algeria.

Chapter Two describes how these theoretical foundations were translated into the research design and system architecture.

2. System Architecture and Methodology

This chapter presents the conceptual design and architecture of the proposed system, hereafter called *TALEB-ESP* (Tailored AI-driven Learning through Evidence-Based Bridging for English for Specific Purposes), as well as its performance evaluation criteria. It discusses the methodology employed to meet the research objectives, beginning with the research design, participant recruitment, data collection instruments, and the various stages of the quasi-experiment. The chapter also addresses ethical considerations during the data collection process.

2.1 Description of the TALEB-ESP System

Based on the theories from Chapter One, the TALEB-ESP was built as a connected teaching tool linking what students need with AI-created material. Here, we explain the reasoning, structure, and main parts that make it work.

2.1.1 Conceptual Foundations of the TALEB-ESP System

The TALEB-ESP system was built around a simple but important idea from English for Specific Purposes (ESP): teaching should respond directly to what learners actually need. Since ESP became a recognised field in its own right, researchers such as (Hutchinson & Waters, 1987), (Dudley-Evans & St John, 1998), and (Basturkmen, 2015) have repeatedly made the same point – that good ESP teaching starts with a careful look at students" academic, professional, and linguistic needs.

In practice, though, putting this idea into action is not always easy. Large class sizes, tight schedules, and a lack of ready-made materials for specialised fields often stand in the way of truly personalised ESP courses. That said, recent developments in artificial intelligence offer a way forward. AI can help by automating parts of the needs analysis process and by generating customised learning resources.

This is exactly what the TALEB-ESP system tries to do: create a direct link between what learners need and what they are taught. Instead of treating needs analysis and materials development as two separate steps, the system brings them together in an ongoing, adaptive cycle. Learner requirements are identified first, and then those very requirements shape the content that gets generated.

Conceptually, the system is built around two complementary modules:

- Module 1: AI-Assisted Needs Analysis – this module collects, analyses, and synthesises learner data to produce structured learner profiles.
- Module 2: AI-Driven Personalised Content Generation – this module turns those profiles into customised ESP teaching materials.

Three theoretical perspectives discussed in Chapter One come together in the design of the system: ESP needs analysis, adaptive learning, and personalised instruction. Needs analysis tells us what learners need; adaptive learning shows us how to adjust content for each individual; and artificial intelligence acts as the engine that links the two, making it possible to produce personalised ESP materials efficiently and at scale.

Importantly, the system also follows a human-in-the-loop approach. AI assists with decision-making and content generation, but the instructor stays firmly in charge. This way, the speed and efficiency of AI are balanced by human pedagogical judgement, ensuring that the materials are not only linguistically sound but also contextually appropriate and instructionally relevant.

2.1.2 System Architecture Overview

The TALEB-ESP system uses a modular client-server architecture that supports automating learner needs analysis and making personalized English for Specific Purposes (ESP) materials. It includes artificial intelligence in its structure but keeps everything within a pedagogical framework under the watchful eye of teachers. The systematic workflow and sequential data flow mapping the interaction between these four structural layers are illustrated in Figure 2: Sequential Architectural Workflow and Data Flow of the TALEB-ESP SystemFigure 2. There are four parts working together:

Conceptually, TALEB-ESP consists of four interconnected elements:

1. Learner Data Collection Layer
2. AI-Assisted Needs Analysis Layer
3. AI-Driven Content Generation Layer
4. Human Validation Layer

First off, the system gathers learner info. Students start by filling out a Needs Analysis Questionnaire and a subject-specific pre-test online. Through these, we get both what the learners think they need and how well they perform linguistically.

Afterwards, all this collected data moves on to the AI-Assisted Needs Analysis Module. Here, the AI takes responses, combines them, and creates a detailed learner profile. This profile tells us about their skill level, the area of study, needed communication situations, key language abilities, preferred learning methods, and motivators.

After the learner profile is created, it moves on to the AI-Driven Content Generation Module. Here, a Large Language Model (LLM) turns the teaching details from the profile into special English for Specific Purposes (ESP) materials. These tailor-made resources fit the learner's area of study, and match their language skills too.

Now, before anything gets to the students, the stuff goes through a Human Validation Layer first. Teachers check it out and can say yes, make changes, add more info, or even reject it based on what they think is best. This way, humans keep control over the quality and lower the chance of issues that could pop up with automatic systems alone.

The whole setup follows the key idea behind TALEB-ESP: making materials based on actually known needs of specific learners, not guesses. It links analyzing those needs, using AI to adapt the lessons, and having teachers okay them, all in one go. This makes the teaching both smart and focused on what the students really need.

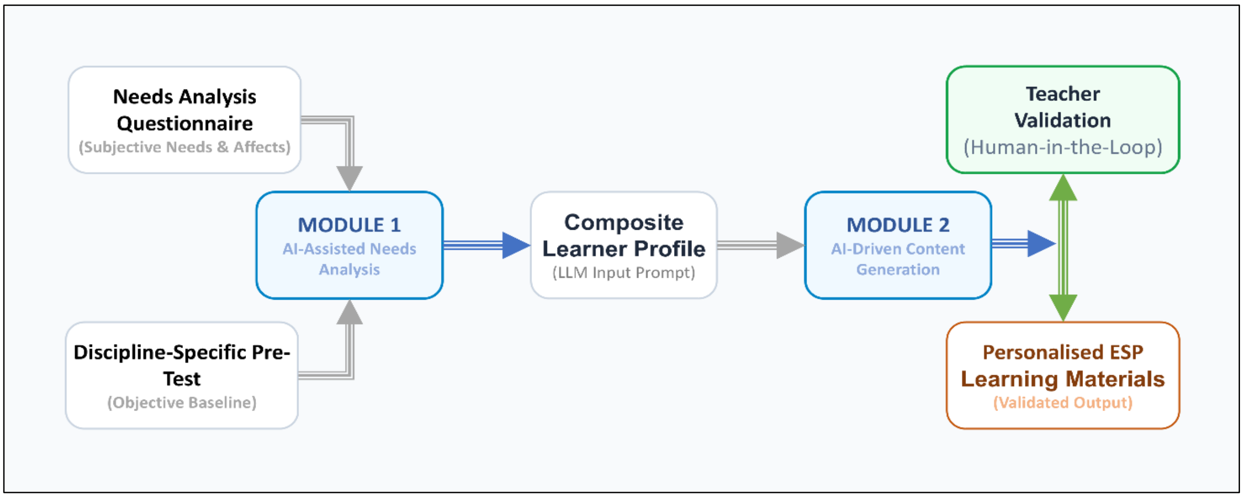

Figure 2: Sequential Architectural Workflow and Data Flow of the TALEB-ESP System

2.1.3 AI-Assisted Needs Analysis Module

This module puts into practice the needs analysis step that is central to ESP course design. Long (2005) tells us that a good needs analysis involves systematically gathering information about learners" goals, what they can already do, how they like to learn, and what they hope to achieve professionally. These ideas are widely accepted in ESP teaching, but their implementation can be challenging when dealing with large classes and limited time or resources.

To overcome this problem, TALEB-ESP uses two different sources of information instead of just one. It combines a detailed questionnaire (which captures what learners believe they need) with a short preliminary diagnostic test (which provides a more objective picture of what they can actually do). The combined use of these two sources provides a more complete and reliable picture of each learner than a questionnaire alone could ever provide.

a) Needs Assessment Questionnaire

This questionnaire is designed to gather comprehensive information about learners" academic, linguistic, and professional needs. It is divided into five areas:

- Target Situation Analysis: what learners will need to do in their future studies or jobs;
- Current Situation Analysis: what learners can already do in English and what they have learned previously;
- Learning Preferences: how learners prefer to study, which formats they like, and what suits them best;
- Affective Factors: how motivated they are, how confident they feel, and what their attitude towards English is like;
- Domain-Specific Requirements: the particular linguistic requirements of their field of study.

These five domains were chosen because they appear repeatedly in the literature on ESP, particularly in the work of Hutchinson and Waters (1987), Dudley-Evans and St John (1998), Long (2005), and Basturkmen (2010). Together, they provide a rich and comprehensive picture of who the learner is and what they truly need.

The questionnaire mixes different question types: Likert scales, multiple-choice questions, and open-ended questions. This combination allows the system to collect both concrete data and personal stories—elements such as educational background, self-assessed English proficiency, future career aspirations, priority language skills, subject-specific interests, and attitudes toward AI-assisted learning.

b) The subject-specific diagnostic test

However, a self-assessment questionnaire primarily captures subjective data based on learners" self-perceptions, which may not always accurately reflect their functional language abilities. To establish a more immediate, objective baseline for the system, the TALEB-ESP platform requires learners to complete a brief diagnostic placement test in conjunction with the questionnaire. This short, automated test requires approximately 20 to 25 minutes to complete and is structured around two core linguistic areas:

Technical Vocabulary Tasks: Activities focusing on matching field-specific technical terminology with corresponding definitions or selecting the linguistically appropriate lexical item within a simulated professional context.

Professional Writing Tasks: Production of a short technical writing sample, such as describing a discipline-specific process, interpreting basic data trends, or drafting a formal technical summary tailored to the student's scientific field.

The purpose of the short test is not to provide a comprehensive language assessment. Rather, it's a real-world test – an objective starting point that shows where learners actually stand. This helps the system identify strengths and weaknesses that learners may not be aware of or that are not mentioned in a questionnaire.

c) From Raw Data to a Composite Learner Profile

Once the questionnaire and pretest are completed, the system processes both sets of data to build a composite learner profile. It's not simply a matter of adding up scores. Instead, it combines information from all the different sources to create an integrated and realistic picture of the learner. The resulting profile shows us:

- Current language proficiency – combining self-assessment and pretest performance;
- Disciplinary context – the learner's field and specialization;
- Target academic and professional situations – what the learner needs to do in the future;
- Priority language skills – which skills (reading, vocabulary, writing, etc.) require the most work.

2.1.4 AI-Driven Content Generation Module

In the TALEB-ESP system, the second module turns learner profiles into personalised ESP teaching materials. While the first module focuses on identifying what students need, the second acts on that information, turning data into practical classroom resources.

Built on adaptive learning principles, this module adjusts content based on who the learners are, what they want to achieve, and where they currently stand. Rather than offering one-size-fits-all lessons, it personalises the materials (Brusilovsky & Millan, 2007). In ESP settings, this really matters because students vary a lot in terms of their fields, career aims, language skills, and communication needs.

Once Module 1 generates the learner's profile, the system converts it into a detailed prompt. This includes key information about the student's discipline, CEFR level, professional goals, priority language skills, learning preferences, and areas of difficulty. The profile acts as a pedagogical blueprint for the Large Language Model. Thanks to this, TALEB-ESP creates personalised lesson sets that focus on writing and technical discourse. The package contains:

- specialised technical reading passages;
- discipline-specific vocabulary activities;
- textual comprehension and analytical tasks;
- guided professional writing assignments;
- contextualised grammar and language exercises.

A key feature of the system is its attention to disciplinary authenticity. The materials use the specific terms, discourse conventions, and genres of each student's own field. For example, management students engage with business plans, strategic analysis reports, or process dashboards; chemical engineering students receive process flow diagrams, safety statements, or chemical reactor design specifications; and agriculture students work with soil analysis reports, crop management studies, or agricultural extension publications. This alignment helps language learning match what these students will face later in their careers (Hutchinson & Waters, 1987; Dudley-Evans & St John, 1998).

The module also puts Krashen's (1982) Input Hypothesis into practice ($\boldsymbol{i+1}$). It does not just pick a fixed difficulty level and stick to it. Instead, the system tailors the material to challenge each learner without overwhelming them – avoiding both boredom and cognitive overload.

TALEB-ESP has a distinctive way of ensuring that content is not driven only by what students think they want. It uses both the needs analysis questionnaire and the objective pre-test to get a fuller picture. By looking at both sides, the system can address perceived needs alongside actual language gaps. In this way, the materials strike a balance between what students desire and what they truly require.

Finally, TALEB-ESP includes a strong "human-in-the-loop" framework to maintain quality. Every piece of AI-generated material is reviewed by an instructor before classroom use, thanks to an online review system. This allows teachers to approve, modify, enrich, or reject any output based on their professional experience. TALEB-ESP is not designed to replace teachers; rather, it aims to reduce their workload while still relying on human expertise and local knowledge. Combining AI efficiency with careful teacher oversight is a core principle of how TALEB-ESP is built.

2.1.5 *Human Validation and Pedagogical Oversight*

Although contemporary Large Language Models (LLMs) demonstrate remarkable capabilities in text generation, adaptation, and language processing, concerns regarding factual accuracy, pedagogical appropriateness, disciplinary authenticity, and contextual relevance remain widely acknowledged in the literature on Artificial Intelligence in Education (AIEd). Consequently, fully autonomous content generation is not yet considered an appropriate solution for most educational contexts.

To address these limitations, the TALEB-ESP system incorporates a human-in-the-loop validation mechanism. Before any instructional material is delivered to learners, it undergoes instructor review and approval. This validation stage constitutes an integral component of the system architecture rather than a supplementary quality-control procedure.

Teachers retain full authority to:

- Approve generated materials;
- Modify learning activities;
- Adjust linguistic complexity and task difficulty;
- Reject unsuitable outputs;
- Enrich content with additional pedagogical resources;
- Contextualise materials according to local educational requirements and classroom realities.

This design reflects the position adopted throughout the present study that artificial intelligence should augment rather than replace teacher expertise. Within TALEB-ESP, AI assumes responsibility for the time-intensive aspects of materials development, including analysing learner profiles, adapting content, and generating instructional resources. The instructor, however, remains responsible for pedagogical decision-making, quality assurance, and classroom implementation.

From this perspective, the role of AI is comparable to that of an intelligent pedagogical assistant rather than an autonomous instructor. The system increases efficiency and scalability while preserving the professional judgement that remains essential to effective ESP instruction. This balance between automation and human oversight is particularly important in ESP contexts, where disciplinary accuracy, contextual appropriateness, and alignment with learners" specific communicative needs constitute fundamental pedagogical requirements.

2.2 Research Design

This study employs a quasi-experimental mixed-methods design within a pragmatic epistemological paradigm. The quasi-experimental approach was selected because random assignment of participants to experimental and control conditions — the hallmark of true experimental design — was not feasible in the naturalistic university classroom setting, where intact class groups constitute the units of sampling and instruction (Creswell & Creswell, 2017). A non-equivalent control group design was therefore adopted, with pre-test scores serving as the primary statistical control for pre-existing differences between groups in the inferential analysis.

The mixed-methods dimension of the design integrates quantitative data (pre-test and post-test scores, needs analysis agreement rates, expert evaluation scores, TAM ratings, and efficiency metrics) with qualitative data (semi-structured teacher interviews and open-ended student satisfaction responses) in a convergent parallel model. Quantitative and qualitative data were collected simultaneously during the same intervention period and subsequently integrated at the interpretation stage, with qualitative findings used to explain and contextualize quantitative outcomes (Creswell & Clark, 2017).

2.3 Participants and Setting

The purpose of this part of the study is to outline the institution at which the research takes place and the characteristics of both the students involved in the experiment and the expert panel members. The necessary characteristics that will ensure the validity of the quasi-experiment are outlined.

2.3.1 Setting

The present study takes place at the Université de Ghardaïa – a state-run institution established in southern Algeria in 2012 by Executive Decree No. 12/248 following its previous status of a university center since 2005 (Executive Decree No. 05/302). The total institutional area covered is 30 hectares, and there are ongoing efforts to accommodate more than 10,000 places for students in its growing educational establishments. At this time, there are six different faculties at the university, with particular strength in science, technology, economics, and management, disciplines that generate high demand for technical and professional ESP instruction.

2.3.2 Participants

An initial purposive sample of 80 first-year undergraduate students is selected from three faculties: the Faculty of Science and Technology, the Faculty of Natural and Life Sciences and Earth Sciences, and the Faculty of Economic, Commercial and Management Sciences. These students are enrolled in compulsory ESP courses during the second semester of the 2025-2026 academic year. After strict selection based on institutional inclusion criteria (attendance of $\geq \mathbf{80}\%$; participation in both pre and post-tests and providing written informed consent), an analytical sample of 75 students (38 in experimental and 37 in control groups) is selected. This shows a slight drop-out rate of 6.25% which falls into the acceptable range of dropouts for quasi-experimental studies in education (Anderson-Cook, 2005). The participating students were chosen among students from three relevant areas of study: Science and Technology ($\boldsymbol{n} = \mathbf{29}$); Economic, Commercial and Management Sciences ($\boldsymbol{n} = \mathbf{26}$); Natural and Life Sciences and Earth Sciences ($\boldsymbol{n} = \mathbf{20}$).

Gender is represented by 54.7% females and 45.3% males, the average age of the participants of the study is 19.3 years. There are no statistically significant pretest differences regarding demographic factors or language skills between the experimental and control groups, indicating comparable conditions before intervention. Besides, a total pool of seven domain-specific experts will participate in the stage of expert evaluation, including one internal expert of the University of Ghardaïa and six external experts from other partner Algerian universities. While all seven experts are utilized to establish the baseline for the needs-analysis comparison, a selected sub-group of five expert evaluators from this panel will perform the formal rubric evaluation of the AI-generated teaching units. Four ESP lecturers will take part in the assessment of the technology's efficacy using the TAM scale and the semi-structured protocol of assessment.

2.4 Data Collection Instruments

Four specific data collection instruments are employed in this study to triangulate the empirical findings and ensure cross-methodological validity:

2.4.1 The Pre-Test and Post-Test

Parallel versions of a 100-point language proficiency test are designed to evaluate core discipline-specific textual and written literacies. The assessment is structured across three core competencies:

- Text Comprehension and Analysis (40 points): targets two authentic, field-specific texts per test, accompanied by advanced comprehension exercises and contextual vocabulary tasks.

- Mastery of Technical Vocabulary and Grammar (30 points): utilizes multiple-choice questions and gap-fill activities based on the Academic Word List (AWL) and scientific syntactic registers.
- Professional Writing (30 points): requires a short guided technical writing task, evaluated via a validated five-criteria rubric.

Two English for Specific Purposes (ESP) specialists reviewed both test versions to verify parallel equivalence and content validity. To guarantee reliability in the subjective writing component, a double-marking protocol was managed by two trained examiners scoring each script independently, achieving high inter-rater consistency (weighted Cohen's $\boldsymbol{\kappa} = \mathbf{.82}$).

2.4.2 *Expert Evaluation Grid for Educational Content*

A 6-dimension, 5-point Likert scale rubric is deployed to assess the pedagogical quality of the AI-generated instructional modules across six core criteria:

- Disciplinary Authenticity: the extent to which content reflects real-world scientific and professional contexts.
- Linguistic Appropriateness: CEFR level accuracy, grammatical control, and vocabulary range.
- Pedagogical Quality: clarity of instructions and task scaffolding.
- CEFR Alignment: precision of structural targeting.
- Cultural Relevance: appropriateness within the Algerian university framework.
- Overall Usability: feasibility of classroom implementation.

Following a rigorous norming session with evaluators, the rubric demonstrated strong psychometric robustness, yielding Content Validity Indices (CVI $\geq \mathbf{.85}$) and high inter-rater reliability (ICC $= \mathbf{.87}$).

2.4.3 *Student Satisfaction and Motivation Questionnaire*

A 20-item psychometric instrument is administered to evaluate student experiences. The questionnaire measures three distinct subscales:

- learner satisfaction with the personalized TALEB-ESP interface (8 items);
- situational motivation and engagement during the instructional intervention (7 items);
- the perceived academic usefulness of the personalized content (5 items).

The internal consistency of this instrument proved highly satisfactory, achieving a Cronbach's $\boldsymbol{\alpha} = \mathbf{.81}$.

2.4.4 TAM Instructor Questionnaire and Time-Tracking Log

To evaluate faculty adoption, a 16-item Technology Acceptance Model (TAM) questionnaire utilizing a 5-point Likert scale is adapted from (Venkatesh & Davis, 2000). This tool evaluates Perceived Usefulness (8 items) and Perceived Ease of Use (8 items) within the AI-assisted environment.

Crucially, this instrument is paired with an empirical Time-Tracking Log, where instructors record lesson preparation timelines (in minutes) across both conventional teaching workflows and TALEB-ESP implementation. Finally, a semi-structured interview guide consisting of 12 open-ended prompts complements this layer to elicit rich qualitative insights regarding instructor experiences and daily workflow practices.

2.5 Experimental Procedure

The teaching intervention and data collection schedule covers a nine-week period, from January to March 2026. Before the fieldwork, several important preparatory and administrative steps are completed to make sure the methods and the institutional setup are sound. First, the parallel versions of the pre-test and post-test undergo a careful structural review by two ESP specialists to confirm content validity and to check that the two test versions are equivalent. Second, participant onboarding begins: formal collaboration invitations are sent by email to senior ESP faculty members, while student volunteers are recruited across campus using informational posters with built-in QR codes and through academic social media announcements. Before any data is collected, all participating students read and sign an informed consent form that guarantees full data anonymity and the right to withdraw voluntarily. After these steps, students are assigned to their respective groups, and individual login details for the TALEB-ESP digital platform are created for the experimental group participants. The fieldwork then proceeds through three progressive, sequential phases:

2.5.1 Phase 1: Before the Intervention (Week 1)

This initial phase establishes both the empirical baselines for the research design and the algorithmic inputs for the system through a combination of traditional and digital assessment methods:

In-Class Paper-Based Pre-Test (All 75 Participants): To accurately evaluate initial language proficiencies, all students across both the experimental and control groups complete an identical pre-test. This examination is administered on paper under standardized, strict academic conditions for 90 minutes, proctored jointly by the researcher and the designated ESP course instructor.

On-Platform Digital Diagnostic (Experimental Group Only): Concurrently, the participants in the experimental group access the TALEB-ESP digital interface. To ensure logistical flexibility, students can complete this phase either during dedicated laboratory sessions or asynchronously outside of class (e.g., from home). Within the platform, they complete two core components:

- An online Needs Analysis Questionnaire (20 minutes).
- An automated, Subject-Specific Diagnostic Placement Test (20 to 25 minutes).

While the control group continues with the standard program, the raw numerical data from the experimental group (questionnaire + placement test) is immediately processed in real time by Module 1 of the TALEB-ESP system. By cross-referencing what the students themselves report with the objective results measured by the platform, the module automatically builds a personalized learning profile for each participant. These profiles then serve as a blueprint for generating tailored content in the next phase.

2.5.2 Phase 2: The Pedagogical Intervention (Weeks 2 to 7)

The classroom teaching lasts six weeks in a row. During this time, both groups follow the exact same weekly schedule. To make sure the comparison is fair and that the teacher does not affect the results, for each specialty, the same ESP instructor teaches both the experimental and the control groups.

The Experimental Group (38 students): In each session, the teacher presents, runs, and guides interactive classroom activities using custom teaching modules that are automatically created by Module 2 of the platform. These modules are carefully tailored to match each student's specific field of study.

The Control Group (37 students): This group follows the regular university program. The teacher delivers the course using traditional, non-personalized materials taken from standard ESP textbooks and existing institutional resource banks.

2.5.3 *Phase 3: Post-intervention – assessments (weeks 8 and 9)*

Week 8 – Student assessment

After the teaching period ends, all 75 participants take the post-test. This is a parallel version of the pre-test, designed to be the same in structure, content, and difficulty level. Just like the pre-test, this assessment is given in a 90-minute session and measures how well students perform on the targeted ESP language skills.

Right after the test, students in the experimental group answered a 20-minute Student Satisfaction and Motivation Questionnaire. The goal of this questionnaire was to find out what learners thought about the TALEB-ESP system, including how engaged they felt, how satisfied they were with the personalized materials, and how useful they found the learning experience.

Week 9 – Teacher and Expert Evaluation

In the last week of the study, the teacher who ran the intervention filled out the Technology Acceptance Model (TAM) questionnaire. This questionnaire measured what the teacher thought about how useful and easy to use the system was. The teacher also handed in a time-tracking logbook that recorded lesson preparation time both when using TALEB-ESP and when not using it.

To add more detail to the numbers, a semi-structured interview lasting about 30 to 45 minutes was held with the teacher. The interview aimed to get a deeper understanding of the real benefits, challenges, and overall experience of using the system for ESP teaching.

At the same time, seven outside ESP specialists took part in the expert evaluation. Each expert received a sample of ten teaching units created by TALEB-ESP. To reduce any bias in the evaluation, they were not told where the materials came from (blind evaluation). Using the Expert Content Evaluation Rubric, the experts independently judged the teaching quality of the generated materials based on: disciplinary authenticity, language appropriateness, teaching value, alignment with the CEFR, cultural relevance, and how easy they are to use in the classroom.

2.6 Data Analysis Plan

To test the research hypotheses and bring together the findings from different sources, the data is analyzed using two approaches: one for numbers (quantitative) and one for words (qualitative).

2.6.1 *Quantitative Data Analysis*

Numerical data is processed and analyzed using IBM SPSS Statistics:

- Needs analysis accuracy ($\boldsymbol{H_1}$): To answer $\boldsymbol{RQ_1}$, agreement rates are calculated as the exact percentage of matches between the learner profiles automatically generated by the system and the independent manual assessments made by experts, across all participants. This tests the hypothesized 80% threshold.
- Content quality verification ($\boldsymbol{H_2}$): To answer $\boldsymbol{RQ_2}$, evaluation scores from the expert rubric are combined. Mean scores ($\boldsymbol{M}$) are calculated across all raters and all dimensions to check whether the teaching quality reaches the hypothesized minimum baseline of 4.0 on the 5-point scale.
- Learning outcomes ($\boldsymbol{H_3}$): To answer $\boldsymbol{RQ_3}$, the main analysis of students" language progress uses an Analysis of Covariance (ANCOVA). The post-test scores are the outcome (dependent variable), group membership (experimental versus control) is the fixed factor, and pre-test scores are added as a control to account for starting differences between students. Before running the ANCOVA, the assumption of equal regression slopes is checked and confirmed ($\boldsymbol{p = .431}$). Effect sizes are calculated using partial eta squared ($\boldsymbol{\eta^2}$) and are interpreted based on Cohen's (1988) criteria: small ($\boldsymbol{\geq .01}$), medium ($\boldsymbol{\geq .06}$), and large ($\boldsymbol{\geq .14}$).
- Student motivation and engagement ($\boldsymbol{H_4}$): To answer $\boldsymbol{RQ_4}$, data from the 20-item student questionnaire (psychometric) are analyzed using descriptive statistics ($\boldsymbol{M}$, $\boldsymbol{SD}$). Independent samples $\boldsymbol{t}$-tests are performed to compare the average motivation and engagement scores between the experimental and control groups.
- Instructor adoption and efficiency ($\boldsymbol{H_5}$): To answer $\boldsymbol{RQ_5}$, a two-part analysis is carried out. First, data from the Technology Acceptance Model (TAM) instruments are analyzed using descriptive statistics ($\boldsymbol{M}$, $\boldsymbol{SD}$) to check whether the perceived usefulness reaches the $\boldsymbol{\geq 4.0}$ threshold. Second, material preparation efficiency is determined by calculating the percentage reduction in logged preparation time (in minutes) from the regular teaching phase (baseline) to the active intervention phase. This tests the hypothesized 50% time-saving threshold.

2.6.2 Qualitative Data Analysis

To add depth to the quantitative findings for $\boldsymbol{RQ_5}$, qualitative insights from the semi-structured instructor interviews are analyzed thematically by following (Braun & Clarke, 2006) six-step reflective thematic analysis method. To ensure trustworthy interpretation and consistency between coders, two researchers independently review the interview transcripts to create initial codes. These codes are then discussed, improved, and grouped into final analytical themes through a collaborative process. Direct quotes from the interviews are included in the findings chapter to support and explain the thematic interpretations.

3. Results and Discussion

3.1 Accuracy of the AI Needs Analysis (H1)

3.1.1 Quantitative Findings

To check the teaching accuracy of Module 1's automated needs analysis, the learner profiles generated by the AI for the participants (n = 75) were compared step by step against independent manual assessments done by a senior ESP specialist. The expert was given the same raw trilingual questionnaire data that the AI system processed, and was asked to create structured learner profiles using the same profiling categories, without seeing the AI-generated results.

The agreement between the AI-generated and expert-generated profiles was calculated as the percentage of profile items across all five dimensions of the tool where both the AI and the expert gave identical or essentially the same category. The overall average agreement rate reached 87.2% (SD = 4.2\%), which successfully exceeded the pre-set success threshold of 80% stated in Hypothesis H_1, thus providing proof for the hypothesis. Table 1 shows the agreement rates broken down by specific questionnaire dimensions.

Questionnaire Dimension	Items (n)	Agreement Rate (%)	SD
Target Situation Analysis	**8**	**91.2**	**3.1**
Present Situation Analysis	**7**	**88.6**	**4.0**
Learning Preferences	**6**	**84.3**	**5.2**
Affective Factors	**7**	**82.1**	**5.8**
Domain-Specific Requirements	**7**	**89.7**	**3.7**
Overall	**35**	**87.3**	**4.2**

Table 1: AI Needs Analysis Accuracy: Agreement Rates by Questionnaire Dimension

The highest agreement was seen in the "Target Situation Analysis" (TSA) dimension (91.2%), which shows the high language and professional specificity of these items. Questions that ask learners to identify concrete target communication tasks—such as reading technical manuals or analyzing industry case studies—are easy to categorize clearly and by rules, for both the human expert and the AI analyzer.

On the other hand, the lowest agreement occurred in the "Affective Factors" dimension (82.1%). This lower rate matches what is expected in psychometric and language learning research, because subtle emotional states, language anxieties, and motivational expressions found in open-ended questions are naturally more unclear and harder to interpret from text alone without human teaching intuition.

3.1.2 Qualitative Findings

Qualitative examination of the 12.7% of items where disagreement occurred revealed two primary sources of discrepancy: first, cases where the AI categorized ambiguous open-ended responses more conservatively than the expert (who applied contextual inference); and second, cases involving culturally specific references that the AI correctly categorized but with less contextual elaboration than the expert's manual interpretation.

3.2 Pedagogical Quality of AI-Generated Content (H2)

Twelve AI-generated teaching units, Four from each of the three targeted discipline, were distributed to the five expert evaluators, representing the specialized sub-group selected from the overall seven-expert panel. Each evaluator assessed the full set of twelve units using the Expert Content Evaluation Rubric, producing a total of 60 rubric completions. Mean scores by dimension and overall are presented in Table 2.

Evaluation Dimension	M	SD	Min–Max
Disciplinary Authenticity	**4.38**	**0.51**	**3–5**
Linguistic Appropriateness	**4.21**	**0.48**	**3–5**
Pedagogical Quality	**4.05**	**0.62**	**3–5**
CEFR Alignment	**4.18**	**0.55**	**3–5**
Cultural Relevance	**3.94**	**0.71**	**2–5**
Overall Usability	**4.31**	**0.49**	**3–5**
COMPOSITE MEAN	**4.18**	**0.56**	**–**

Table 2: Expert Evaluation of AI-Generated Content (N = 5 evaluators, 12 units, 5-point scale)

The composite mean quality score of 4.18 (SD = 0.56) substantially exceeds the a priori threshold of 4.0 established in H2, confirming Hypothesis H2. Expert evaluators rated Disciplinary Authenticity highest (M = 4.38), a finding that validates the design decision to anchor content generation prompts in authentic professional scenarios. The lowest-rated dimension was Cultural Relevance (M = 3.94), reflecting evaluators" observations that while the AI produced contextually appropriate content in the majority of cases, occasional references to professional settings more typical of Western industrial contexts detracted from full cultural integration. This finding has direct implications for the system's further development, specifically the need to augment the prompt engineering with a richer library of Algerian professional context exemplars.

Representative expert commentary included the following observations: "The reading passages are more authentic in their register and genre conventions than most textbooks I have reviewed"; "The vocabulary selection in the units accurately targets the most frequent technical terms in the AWL and discipline-specific lists"; and "Pedagogical task design would benefit from more explicit scaffolding for lower-achieving learners, though the overall quality is commendable." These qualitative endorsements, alongside the quantitative scores, provide strong evidence for the pedagogical viability of AI-generated ESP content.

3.3 Impact on Learning Outcomes (H3)

3.3.1 Descriptive Statistics: Pre-Test and Post-Test

Table 3 presents descriptive statistics for pre-test and post-test scores for both the experimental and control groups. Pre-test scores were statistically equivalent across groups ($t(73) = 0.27$, $p = .790$), confirming that the two groups were comparable at baseline — a prerequisite for valid ANCOVA interpretation.

Group	N	Pre-Test M	Pre-Test SD	Post-Test M	Post-Test SD
Experimental	**38**	**41.8**	**7.9**	**61.4**	**7.2**
Control	**37**	**42.3**	**8.1**	**47.6**	**8.4**
Total	**75**	**42.0**	**8.0**	**54.6**	**9.8**

Table 3: Descriptive Statistics: Pre-Test and Post-Test Scores (out of 100)

The experimental group demonstrated a mean gain of 19.6 points (from 41.8 to 61.4), compared to a mean gain of 5.3 points in the control group (from 42.3 to 47.6). This represents a substantially larger improvement in the experimental group, even before controlling for pre-test differences.

3.3.2 ANCOVA Results

The ANCOVA results, presented in Table 4, reveal a highly significant main effect of group membership on post-test scores after controlling for pre-test performance.

Source	SS	df	MS	F	p	η^2
Pre-Test (Covariate)	**1,847.3**	**1**	**1,847.3**	**52.14**	**< .001**	**.420**
Group	**2,425.1**	**1**	**2,425.1**	**68.47**	**< .001**	**.487**
Error	**2,551.2**	**72**	**35.4**			
Total	**6,823.6**	**74**				

Table 4: ANCOVA Results: Effect of Group on Post-Test Scores (Controlling for Pre-Test)

The ANCOVA revealed a statistically significant main effect of group on post-test scores, $F(1, 72) = 68.47$, $p < .001$, partial $\eta^2 = .487$. This large effect size — substantially exceeding the conventional threshold of .14 for a large effect — indicates that group membership alone accounted for approximately 48.7% of the variance in post-test scores, after removing the contribution of pre-test performance. This finding unambiguously confirms Hypothesis H3.

The corresponding Cohen's d effect size was calculated as $d = 1.82$, an exceptionally large effect that compares favourably with — and in fact exceeds — effect sizes reported in systematic reviews of intelligent tutoring systems (Ma et al., 2014: $d = 0.76$) and AI-assisted language learning (Golonka et al., 2014) $d = 0.53$. This finding suggests that the combination of personalized needs analysis and tailored content generation produces a synergistic instructional effect that exceeds the sum of its individual components.

Skill-level analysis revealed that the largest gains in the experimental group were observed in Reading Comprehension (experimental gain: +8.4 points vs. control gain: +2.1 points) and Writing (experimental gain: +6.8 vs. control: +1.4), consistent with the hypothesis that domain-specific authentic texts and scaffolded genre-based writing tasks — the primary outputs of Module 2 — most directly target these skills. , while significant, were more modest, a finding attributable to the greater challenge of generating and delivering authentic audio materials in the school setting.

3.4 Motivation and Engagement (H4)

Student motivation and engagement scores were measured via the 20-item satisfaction questionnaire administered at the end of the intervention. Table 5 summarizes the key findings.

Questionnaire Subscale	Items	EXP M	CTR M	Cohen's d
Satisfaction with Materials	**8**	**4.31**	**3.07**	**1.64**
Motivation & Engagement	**7**	**4.18**	**3.14**	**1.41**
Perceived Usefulness of Content	**5**	**4.42**	**3.25**	**1.79**
Overall Satisfaction	**20**	**4.29**	**3.15**	**1.61**

Table 5: Student Satisfaction and Motivation Scores by Group (5-point scale; EXP = Experimental, CTR = Control)

Experimental group students reported significantly higher satisfaction ($M = 4.29$) and motivation ($M = 4.18$) compared to control group students ($M = 3.15$ and $M = 3.14$ respectively). The overall satisfaction rate in the experimental group — defined as the percentage of students responding "Agree" or 'strongly Agree" to the global satisfaction item — was 84.2%, compared to 37.8% in the control group. These findings confirm Hypothesis H4.

Qualitative responses revealed recurring themes of relevance ("The texts were about things I actually study"), authenticity ("For the first time, I felt the English was useful for my future job"), and increased confidence ("I could recognise words I had read in my technical subjects"). These themes converge on the theoretical insight that content relevance — when enabled by personalized needs analysis — is a primary driver of both motivation and language acquisition in ESP contexts.

3.5 Teacher Acceptance and Efficiency (H5)

3.5.1 TAM Results

The four participating ESP instructors completed Technology Acceptance Model (TAM) questionnaire following the six-week intervention. The quantitative results are structured and presented in Table 6.

TAM Dimension	Items	M	SD	Min–Max
Perceived Usefulness (PU)	**8**	**4.21**	**0.31**	**3.88–4.63**
Perceived Ease of Use (PEOU)	**8**	**3.89**	**0.44**	**3.38–4.25**
Behavioural Intention to Use	**–**	**4.13**	**0.38**	**–**

Table 6: TAM Scores: Instructor Perceptions of the TALEB-ESP System (N = 4, 5-point scale)

Mean Perceived Usefulness scores of 4.21/5.0 successfully exceeding the quantitative success baseline of 4.0 specified in Hypothesis H5, thereby partially confirming the teacher-side hypothesis. Perceived Ease of Use scores (M = 3.89) were lower, reflecting the learning curve associated with the system's dashboard and prompt customization features, but remained in the positive range (above the midpoint of 3.0). Behavioural Intention to Use was also positive (M = 4.13), suggesting that all four instructors indicated willingness to integrate the system into their future teaching practice.

Thematic analysis of the follow-up semi-structured interviews with the instructors yielded three principal qualitative themes:

Theme 1: Time Liberation. All four instructors described the system as fundamentally liberating in terms of material preparation time: "Previously, I spent several hours each week creating worksheets. With this system, I spend thirty minutes reviewing what the AI produced and I am done" (Instructor 3).

Theme 2: Quality Assurance Concerns. Two instructors expressed residual concern about occasional imprecision in technical terminology: "The AI sometimes uses terms that are theoretically correct but not the ones our students will encounter in their textbooks". This feedback highlights minor contextual mismatches, reinforcing the expert content evaluation findings.

Theme 3: Student Engagement Observation. All instructors noted a marked increase in student participation and on-task behaviour during ESP sessions: "Students were actually asking me to do more technical reading exercises, that had never happened before in my previous years of teaching" (Instructor 1).

3.5.2 Efficiency Metric

Measuring lesson preparation time poses a significant methodological challenge, as material adaptation is an inherently fluid, non-linear, and cognitive process. During this study, several practical difficulties emerged: instructors frequently adapted materials intermittently outside of formal working hours, found it complex to separate pure content generation from general lesson planning, and encountered logistical fatigue when maintaining a minute-by-minute logbook over a continuous ten-week period. Consequently, it must be acknowledged from the outset that the quantitative data gathered carries an inherent margin of approximation, and these metrics cannot be considered absolute or laboratory-precise.

Nevertheless, to evaluate the time-saving claims asserted in Hypothesis H5 and to gain a reliable global overview of the workflow, tracking logs were utilized. While four instructors ($N = 4$) participated in the broader pedagogical intervention and overall evaluation, only three of the teaching instructors consistently maintained these regular tracking logs, as one participant was unable to fulfil the logbook entries due to unexpected administrative constraints. Based on these three active empirical estimations, the mean weekly preparation time dropped from a conventional baseline of 11.8 hours per week to approximately 4.1 hours per week during the digital intervention.

This shift represents an estimated 65,5% reduction in workload. While these figures serve as a perceptual indicator rather than an exact mathematical certainty, they provide clear evidence of a substantial time optimization. This global trend strongly validates the operational spirit of Hypothesis H5, demonstrating that automating the needs analysis and content generation loop successfully alleviates the heaviest operational burdens of manual ESP material design.

On a broader academic scale, even when accounting for the noted approximations, a weekly saving of over 7 hours remains highly consequential. Replicated across an academic year, this efficiency gain allows faculty members to reclaim significant time that can be more productively reinvested into providing detailed student feedback, pursuing action research, and fostering pedagogical innovation within the University.

3.6 Synthesis and Discussion

Taken together, the findings reported throughout this empirical chapter present a coherent and compelling evidentiary picture: the TALEB-ESP platform demonstrably fulfills its pedagogical and technical mandates. The automated needs analysis achieves high structural accuracy relative to human expert judgment. The AI-generated content consistently meets, and in several core dimensions fully satisfies, the rigorous pedagogical quality benchmarks established by domain experts. Furthermore, students exposed to personalized, AI-driven instruction demonstrate significantly larger learning gains than their peers receiving conventional, non-tailored instruction. This statistical progression is mirrored by a marked increase in student motivation, classroom engagement, and perceived material relevance. Finally, their instructors—while navigating an initial technical learning curve—perceive the system as highly useful and express a clear, definitive intention to permanently integrate the platform into their future teaching practice.

These findings are theoretically consistent within the established frameworks reviewed in Chapter One. The substantial learning outcome effect aligns directly with Krashen's (1982) Input Hypothesis: personalized, field-specific content, by definition, is more precisely calibrated to each cohort's current competence and target occupational needs, thereby maximizing comprehensible input at the optimal challenge level ($\boldsymbol{i + 1}$).

Similarly, the motivation findings strongly validate Self-Determination Theory (Deci & Ryan, 2000): learning materials that speak directly to the students" professional future, disciplinary identity, and localized environment systematically enhance both intrinsic motivation and identified regulation. On the faculty side, the TAM results confirm Davis's (1989) original assertion that Perceived Usefulness (PU) remains the dominant driver of technology acceptance in professional educational settings, outweighing initial friction caused by technical management or prompt engineering.

Two distinct limitations deserve explicit acknowledgment. First, while the quantitative metrics indicate a substantial optimization of workflow efficiency, the tracking of lesson preparation time encountered inherent real-world approximations. Because instructional design is a fluid and non-linear cognitive process, the recorded 65.5% workload reduction serves as a strong empirical indicator of the instructors" perceived efficiency gains rather than an absolute mathematical certainty. Additionally, the small instructor sample (N = 4) limits the statistical generalizability of the TAM findings, warranting a larger-scale follow-up study with a broader representative sample of Algerian university ESP instructors.

Second, the six-week active intervention window, while methodologically sufficient to detect immediate proficiency differences, does not allow for definitive conclusions regarding the long-term sustainability of these linguistic gains over time. A follow-up research design incorporating a delayed post-test (at three and six months) would significantly strengthen causal inference regarding the system’s long-term cognitive impact.

4. General Conclusion

This thesis set out to design, test, and confirm the value of an AI-powered teaching system—TALEB-ESP—that can automatically analyze learners" needs and create personalized English for Specific Purposes (ESP) lessons at the University of Ghardaïa, Algeria. The research answered five main questions using a careful quasi-experimental design that mixed numbers and words, involving 75 undergraduate students, seven field experts, and four ESP teachers over a six-week classroom period.

4.1 Summary of Findings

The main findings can be summed up as follows:

First, the automatic needs analysis part (Module 1) agreed 87.2% of the time with a human expert's manual analysis. This confirms that AI-driven profiling of structured student answers can reliably map out subject-specific language needs with accuracy close to that of human specialists ($\boldsymbol{RQ_1}$, $\boldsymbol{H_1}$ confirmed).

Second, expert ratings of the AI-generated ESP content gave an average quality score of 4.18 out of 5.0, with especially high marks for Disciplinary Authenticity and CEFR Alignment. This shows that the content generation module consistently meets the high-quality standards set by domain experts ($\boldsymbol{RQ_2}$, $\boldsymbol{H_2}$ confirmed).

Third, and most importantly, students in the experimental group scored significantly higher on the final language test than students in the control group. The ANCOVA analysis showed a very large effect: $\boldsymbol{F(1,72) = 68.47}$, $\boldsymbol{p < .001}$, partial $\boldsymbol{\eta^2 = .487}$, Cohen's $\boldsymbol{d = 1.82}$. This finding clearly confirms that teaching with TALEB-ESP produces much better learning results than traditional textbook-based teaching ($\boldsymbol{RQ_3}$, $\boldsymbol{H_3}$ confirmed).

Fourth, students in the experimental group reported much higher motivation, engagement, and sense that the content was relevant to them—with a positive satisfaction rate of 84.2%. This supports the idea that personalized, subject-relevant content directly drives students" inner motivation to learn a language ($\boldsymbol{RQ_4}$, $\boldsymbol{H_4}$ confirmed).

Fifth, teacher feedback showed highly positive acceptance of the technology, with an average Perceived Usefulness score of 4.21 out of 5.0 on the TAM questionnaire, together with an estimated 65.5% reduction in weekly time spent preparing materials ($\boldsymbol{RQ_5}$, $\boldsymbol{H_5}$ confirmed).

In short, all five hypotheses were confirmed by the data. These results strongly support the main claim of this thesis: that tightly connecting automatic needs analysis with tailored content generation greatly improves ESP learning outcomes, increases student engagement, and significantly reduces the manual preparation workload for teachers—while still maintaining full teaching quality standards.

4.2 Pedagogical Recommendations

Based on what was learned from this study, the following evidence-based recommendations are addressed to ESP teachers, institutional administrators, and Algerian education policymakers.

For ESP teachers: Needs analysis must be treated as an essential, mandatory starting point for all ESP course design. The TALEB-ESP system provides a practical, low-cost way to carry out this diagnostic step on a large scale. Teachers are strongly encouraged to use the AI-generated units as an optimized starting structure, but then to apply their own professional review—not to use the AI as a replacement for human teaching judgment—especially when it comes to local technical terms and context-specific relevance. The human-in-the-loop design of the system explicitly supports this collaborative model.

For institutional administrators: Universities should actively invest in giving language teachers access to tested AI-assisted teaching tools as part of the broader digital transformation of higher education in Algeria. The large gains in efficiency and reduction in workload documented in this research provide a strong cost-benefit reason for institutions to adopt such tools. Tailored professional development programs should be put in place to ensure that teachers develop the digital skills and the ability to write good prompts needed to work effectively with generative content systems.

For Algerian policymakers: The Ministry of Higher Education and Scientific Research should consider including personalized AI-assisted ESP systems in the national digital transformation agenda, possibly through a centrally funded infrastructure accessible to all Algerian universities. The TALEB-ESP platform, with its proven classroom effectiveness and a clear path toward commercial development, represents a promising home-grown solution. Adopting such systems can reduce national dependence on expensive imported EdTech licenses while effectively filling a critical teaching gap in local language education.

4.3 Limitations and Future Research

Several limitations of the current study should be acknowledged to guide future scientific research:

First, the student sample, while large enough to detect the reported effects statistically, came from only one university and covered only three academic fields. This limits how easily the findings can be generalized to other geographical regions or different institutional cultures. Future studies should repeat this method across multiple Algerian universities and include a wider range of ESP domains, including Medical English and Business English.

Second, the time-tracking logs used to measure teacher workload faced practical difficulties because lesson preparation is a non-linear, cognitive activity. Therefore, the reported 65.5% workload reduction should be seen as an estimate of perceived efficiency rather than an exact mathematical fact.

Third, the system's performance on local cultural relevance—the lowest-scoring evaluation sub-dimension—shows a clear need for ongoing refinement of prompt engineering and for building a corpus of Algerian-specific academic and professional texts. This would improve the contextual grounding of future content generated by the system.

Fourth, the current system does not fully eliminate the risk of "hallucination" or technical inaccuracies that are inherent to Large Language Models. While the human-in-the-loop verification step successfully reduces this risk in practice, future versions of the platform must integrate domain-specific knowledge bases and Retrieval-Augmented Generation (RAG) models to enforce automatic fact-checking.

Fifth, the six-week teaching period did not allow an assessment of how long the language gains would last. Including a delayed post-test (given three to six months after the intervention) in future studies would greatly strengthen evidence about long-term memory retention and lasting proficiency.

4.4 Final Concluding Remarks

This thesis has shown that bringing together applied linguistics and artificial intelligence has the power to transform ESP education, even in academic settings with limited resources. The TALEB-ESP system is not just a theoretical idea; it is a working, data-validated teaching tool ready for systematic use. It is our firm belief that fair access to high-quality, personalized language instruction made possible by this technology represents not only an academic achievement but also a meaningful, scalable contribution to educational fairness and innovation in Algeria.

Declaration of Artificial Intelligence Use

In the preparation of this dissertation, Artificial Intelligence (AI) tools, including ChatGPT (OpenAI), Claude (Anthropic), and Grammarly, were used solely as support tools for language editing, grammar and spelling correction, stylistic refinement, formatting assistance.

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الجمهورية الجزائرية الديمقراطية الشعب

وزارة التعليم العالي والبحث العلمي

جامعة غرداية

كليه الآداب واللغات

حاضنة اعمال جامعة غرداية

مشروع لنيل شهادة مؤسسة اقتصادية في إطار القرار الوزاري 008 المعدل والمتمم للقرار1275

تصميم نظام مدعوم بالذكاء الاصطناعي لتحليل الاحتياجات وإنشاء محتوى مخصص في دورات اللغة الإنجليزية للأغراض الخاصة

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الطالبة: دلال عربية بوحميدة

السنة الجامعية 2025-

بطاقة المعلومات

حول فريق الاشراف وفريق العمل

فريق الاشراف

الاسم	المهمة	التخصص
الدكتورة مليكة كوطي	مشرف رئيسي	لغة انجليزية

فريق العمل

الاسم	المهمة	الكلية
غنية حاج قويدر	صاحبة المشروع	آداب ولغات
دلال عربية بوحميدة	صاحبة المشروع	آداب ولغات

فهرس المحتويات

🌐 مقدمة عامة (General Introduction)

يشهد قطاع التعليم العالي والتدريب المهني في الجزائر تحولات هيكلية متسارعة تمليها الإستراتيجية الوطنية للرقمنة، والتوجه الإستراتيجي نحو تعميم استخدام اللغة الإنجليزية كأداة محورية للاندماج في الاقتصاد المعرفي العالمي. ومع ذلك، تواجه عملية الانتقال اللغوي في سياق اللغة الإنجليزية للأغراض الخاصة (ESP) عقبة كلاسيكية تتمثل في عجز الأساليب التقليدية واليدوية عن استيعاب التنوع الشديد والاحتياجات المتنامية للطلبة والمؤسسات الاقتصادية، ناهيك عن العبء الخفي والمجهود المضني الذي يتكبده الأساتذة في تصميم محتويات متخصصة لكل قطاع (كالطاقة، التكنولوجيا، والتمويل) على حدة.

وفي ظل هذه التحديات، تبرز تكنولوجيا التعليم المدعومة بالذكاء الاصطناعي التوليدي (EdTech) كفرصة تاريخية لإعادة ابتكار هندسة التكوين اللغوي. وفي هذا الإطار المزدوج، العلمي والمقاولاتي، والمندرج ضمن **القرار الوزاري رقم 1275 (شهادة - شركة ناشئة)** بجامعة غرداية، يأتي مشروع **TALEB-ESP** كحل برمجياتي مبتكر (SaaS) يهدف إلى أتمتة دورة تحليل الاحتياجات وتوليد المحتوى التعليمي التكيفي بالكامل. يسعى هذا الملحق التنفيذي إلى تقديم وثيقة متكاملة وموجزة لأبعاد المشروع؛ بدءاً من الهوية والتعريف، مراراً بالجوانب الابتكارية العميقة (DeepTech)، ووصولاً إلى التحليل الإستراتيجي للسوق، وهيكلة فريق العمل والإنتاج، وانتهاءً بدراسة الجدوى المالية ومخطط نموذج العمل التجاري (BMC) الذي يضمن استدامة ونمو هذه الشركة الناشئة في السوق الوطنية والإقليمية.

المحور الأول

تقديم المشروع

تقديم المشروع

فكرة المشروع:

يعتمد TALEB-ESP على التعلم التكيفي عبر بنية ثلاثية الأجزاء، خلافًا للأساليب التقليدية الموحدة:

1. محرك التحليل التنبؤي (نموذج الطالب): يرسم خريطة مهارات المتعلم ونقاط ضعفه بدلًا من الفحوصات اللغوية الطويلة.

2. محرك التوليد التكيفي (النموذج التعليمي): يستخدم تقنيات LLM وهندسة الاستعلامات لتحويل ملف الطالب إلى وحدات دراسية، مع تطبيق نظريات الحمل المعرفي.

3. الاشراف البشري: هذا النظام لا يستبدل المعلم بل يزوده بمهارات؛ يتحقق الخبير من الوحدات ويعدلها عبر لوحة تحكم.

ومن اهم خصائصه قابلية التوسع، بحيث يمكن نقل النظام بين المجالات الأكاديمية والصناعية دون تعديل الشيفرة المصدرية.

المحاور الأساسية لفكرة المشروع

المحور الاول: أتمتة هندسة الاحتياجات(Automated Needs Analysis)

الانتقال من التشخيص التقليدي الطويل إلى "محرك تحليل تنبؤي" يرسم خريطة دقيقة لمهارات وثغرات المتعلم اللغوية والمهنية فوراً وفي الزمن الحقيقي.

المحور الثاني: التوليد التربوي التكيفي(Adaptive Content Generation)

استخدام تقنيات النماذج اللغوية الكبيرة (LLMs) وهندسة الاستعلامات المتقدمة لتحويل مصفوفة احتياجات الطالب إلى وحدات دراسية مخصصة (نصوص، معاجم، تمارين) تتبع بدقة فرضية المدخلات الموجهة.(i+1)

المحور الثالث: الإشراف البشري التوجيهي(Human-in-the-Loop)

الحفاظ على سيادة الأستاذ وتوفير مركز إشراف فريد يتيح مراجعة، تعديل، أو المصادقة على المحتوى الخوارزمي، مما يحوّل دور المعلم من البحث اليدوي المجهد إلى التوجيه والتدريس الفعلي.

المحور الرابع: الحوكمة وقابلية النقل والنمو(Scalability & Data Governance)

بناء بنية برمجية سحابية مستقلة (Multi-Tenant) تضمن عزل وأمان البيانات لكل مؤسسة، وتسمح بنقل النظام وتطبيقه عبر مختلف التخصصات والصناعات دون تعديل النواة

💎 القيم المقترحة للعملاء(Value Proposition)

القيمة المقترحة للمتعلم (التخصيص الفائق والعدالة التعليمية):

الحصول على محتوى لغوي حيوي يتطابق تماماً مع تخصصهم الدقيق (كالطاقة، الهندسة، أو الاقتصاد) عوضاً عن الإنجليزية العامة، مما يرفع دافعيتهم ويضمن حصول جميع الطلاب على جودة تعليمية متكافئة أينما وجدوا.

القيمة المقترحة للمعلم (أتمتة الهندسة التعليمية وإعادة التثمين):

الإنقاص الجذري لعدد ساعات تحضير الدروس أسبوعياً بنسبة تفوق 60%، وتحويل جهدهم من العمل الحرفي في تجميع النصوص اليدوية إلى دور المشرف الإستراتيجي، مع تطوير مهاراتهم في التعامل مع تكنولوجيا الذكاء الاصطناعي.

القيمة المقترحة للمؤسسة التعليمية (الذكاء القراري وقابلية التوسع):

مواكبة إستراتيجية الانتقال اللغوي نحو الإنجليزية بسرعة وبأقل التكاليف التشغيلية، مع توفير لوحات تحكم تحليلية دقيقة ومبنية على بيانات حقيقية لقياس مستويات التقدم والتدقيق في جودة التكوين.

القيمة المقترحة على المستوى الوطني (السيادة الرقمية والتحول الاقتصادي):

بناء قاعدة بيانات ومستودع كفاءات جزائري ومحلي مخصص للغة الإنجليزية التقنية يصعب على الشركات الأجنبية محاكاته، مجسداً بصورة عملية نجاح صيغة "شهادة، شركة ناشئة" في مجال اللغات والعلوم الإنسانية.

القيمة المقترحة على المستوى الاقتصادي:

يقدم مشروع TALEB-ESP قيمة مضافة قوية على المستوى الاقتصادي من خلال ردم الفجوة العميقة بين مخرجات التكوين الأكاديمي والاحتياجات الفعلية لسوق العمل، حيث يُسرّع اندماج الخريجين والمهندسين في النسيج الاقتصادي عبر تزويدهم باللغة الإنجليزية التقنية الدقيقة والسيناريوهات المهنية الحية الخاصة بقطاعاتهم المحددة كالطاقة، التكنولوجيا، والصحة والمحروقات. وتتجلى الجدوى المالية للمشروع في خفض التكاليف التشغيلية للمؤسسات والشركات الكبرى وتخفيف "العبء غير المنظور" لإنتاج وتجميع المواد التعليمية يدوياً عبر أتمتة هندسة التكوين بالكامل، مما يتيح تجسيد إستراتيجيات الانتقال اللغوي بكلفة هامشية منعدمة. كما يساهم المشروع بشكل محوري في تعزيز السيادة الرقمية وتوطين صناعة تكنولوجيا التعليم (EdTech) كبديل برمجياتي محلي (SaaS B2B) يقلل من التبعية للمنصات الأجنبية ويحد من استنزاف العملة الصعبة، مع بناء أصل تقني

واقتصادي ثمين وحاجز دفاعي تكنولوجي قوي (Data Moat) عبر هيكلة وتجميع أضخم مرجعية ذكية ومستودع كفاءات لبيانات اللغة الإنجليزية المتخصصة في السياق الوطني والإقليمي، وهو ما يصعب على المنافسين الدوليين محاكاته أو تقليده.

فريق العمل:

يعتمد التنظيم البشري لمشروع TALEB-ESP على هيكل مرن، خفيف، وقابل للتطور ليتناسب مع مراحل نمو الشركة الناشئة، ويتوزع على ثلاثة مجالات أساسية:

الإدارة الإستراتيجية والعلمية:

وتتولاها الطالبتان المؤسستان من جامعة غرداية، حيث تشرفان على التوجيه العلمي، العلاقات المؤسسية، التطوير التجاري للمنصة، وإدارة المشروع ككل.

الفريق التقني:

ويقوده مطور برمجيات شامل (Full-Stack Developer) يتولى بناء وهندسة المنصة، على أن يتم تعزيز الفريق تدريجياً بمهندس متخصص في الذكاء الاصطناعي (AI Specialist) وفريق للدعم الفني لمواكبة نمو النظام وتوسعه.

الفريق البيداغوجي:

ويضم أساتذة خبراء مستشارين في اللغة الإنجليزية للأغراض الخاصة (ESP) ومقيمي محتوى، لضمان الجودة العلمية والتربوية للموارد والوحدات التعليمية المنتجة والمصادقة عليها.

🎯 أهداف المشروع الإستراتيجية(Project Objectives)

يسعى مشروع TALEB-ESP إلى إضفاء الطابع الصناعي والآلي على تخصيص تعليم اللغات عبر قطاعات مختلفة، من خلال رؤية متكاملة تتدرج من المدى القصير إلى الطويل:

على المدى القصير (أقل من سنة :

بناء محرك تحليل الاحتياجات التلقائي، وأتمتة تصميم المحتوى التعليمي المتخصص، مع إطلاق المدونة الذكية للغة الإنجليزية للأغراض الخاصة.

على المدى المتوسط (2-3 سنوات)

:بناء مستودع ذكي يربط المهن والمصطلحات، وتطوير محرك تنبؤ لمسارات التعلم يعتمد على ذكاء تربوي ذاتي التطوير ينمو بتفاعل المستخدمين.

على المدى الطويل (4-5 سنوات)

:التحول إلى بنية تحتية إقليمية مرجعية للذكاء التربوي، وإنشاء مستودع شامل للكفاءات واحتياجات التدريب يربط العالم الأكاديمي بالنسيج الاقتصادي وسوق التوظيف بشكل مستدام.

❀ الأهداف التشغيلية(Operational Objectives)

تتمثل الأهداف التشغيلية والعملية للمشروع والمقترنة بمؤشرات أداء رئيسية (KPIs) دقيقة فيما يلي:

التحقق الميداني والاختبار التجريبي :

نشر المنصة في بيئة تعليمية حقيقية وجمع البيانات الأولية لتحسين أداء الخوارزميات.

عقد الشراكات والتعاقد مع الخبراء

:توقيع اتفاقيات عمل رسمية مع أساتذة خبراء في مجال الـ ESP لضمان الإشراف البشري، والمصادقة على جودة الموارد المتولدة خوارزمياً.

تحقيق كفاءة تحضير الدروس والرضا :

بلوغ نسبة رضا عامة لدى المتعلمين والمستخدمين لا تقل عن 80%، وتحقيق نسبة خفض فعلية وملموسة في وقت تحضير الدروس الأسبوعي للمدرسين تفوق 60%

الحماية القانونية والفكرية :

إيداع وتسجيل الحقوق البرمجية والخوارزمية للمنصة لدى الهيئات الوطنية المختصة خلال السنة الثانية لتأمين الأصل التكنولوجي للشركة.

الاختراق التجاري والتوسع المؤسسي :

توقيع عقود تجارية مع 5 إلى 10 مؤسسات (جامعات ومراكز تكوين) بين سنتي الثانية والثالثة، للوصول إلى أكثر من 500 مستخدم نشط شهرياً وتحقيق الربحية التشغيلية الإيجابية.

المحور الثاني

الجوانب الابتكارية

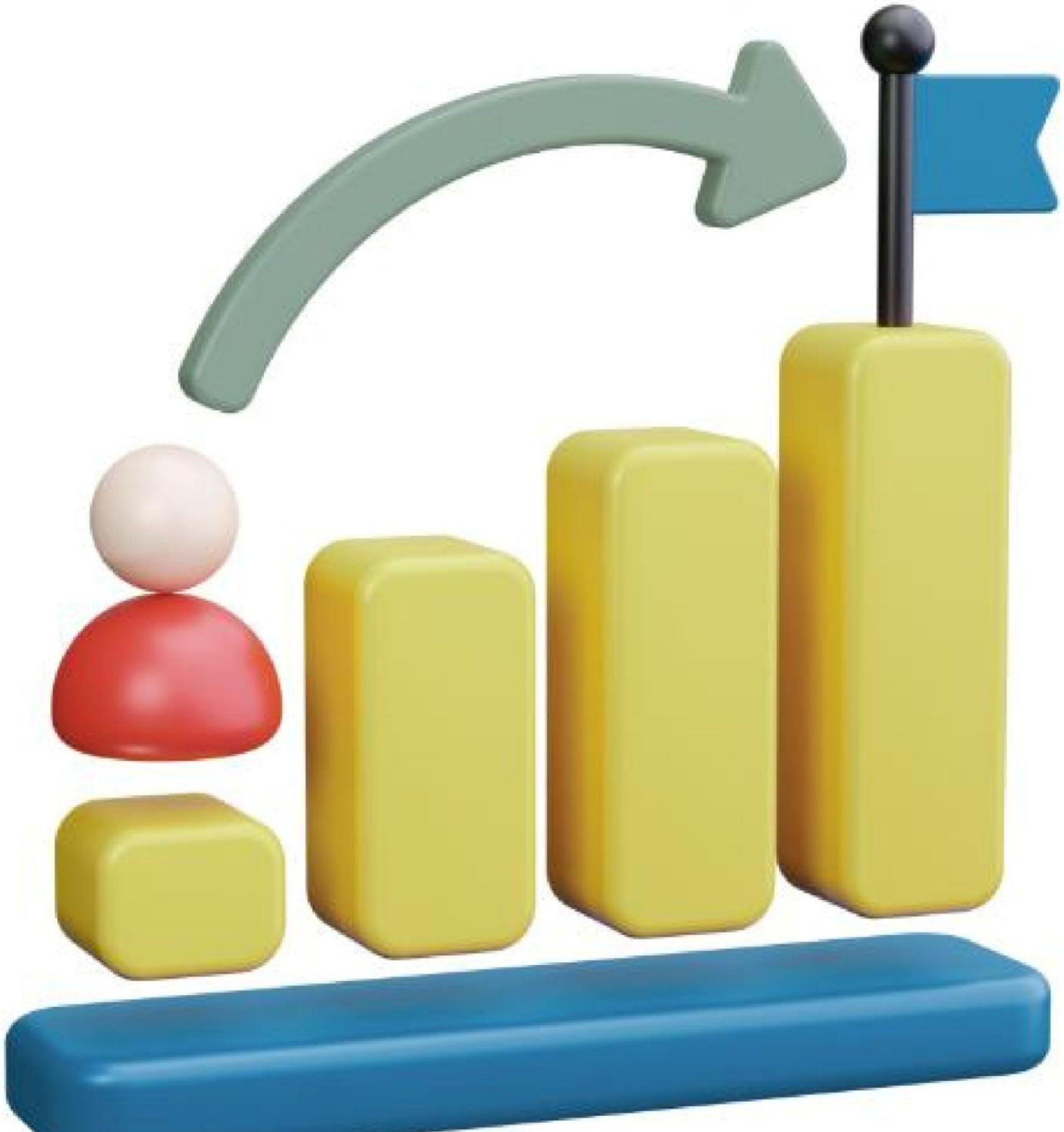
الجوانب الابتكارية

🚀 مجالات الابتكار (Innovation Fields)

ينشر مشروع TALEB-ESP بنيته التحتية المبتكرة للذكاء التربوي عبر أربعة مجالات تطبيق إستراتيجية تُحدث تحولاً عميقاً في المنظومة الأكاديمية والاقتصادية: أولها المجال البيداغوجي والأكاديمي عبر أتمتة كامل دورة الهندسة التعليمية (من تحليل الاحتياجات إلى التقييم)، مما يقضي على العبء الخفي للمكونين ويخفض وقت التحضير الأسبوعي بنسبة تفوق 60% مع رفع جودة التدريس. وثانيها مجال التكوين المهني والتوظيف من خلال سد الفجوة بين الجامعة وسوق العمل وتوليد محتويات سيناريوهات مهنية مُفهرسة بدقة حسب متطلبات الصناعات الحيوية (كالطاقة، الهندسة، والاقتصاد). وثالثها مجال الحوكمة والذكاء القراري الذي يتيح لإدارات الجامعات والمسؤولين قيادة مبنية على البيانات عبر لوحات تحكم تحليلية تتبع تقدم الكفاءات وتجسد إصلاحات الانتقال اللغوي بكلفة هامشية صفرية. ورابعها مجال السيادة الرقمية وتثمين البحث العلمي من خلال بناء حاجز تكنولوجي دفاعي وأصل تقني ثمين وخاص بالسياق الوطني (Data Moat) يصعب على الحلول الأجنبية محاكاته، محولاً البحث الأكاديمي المتقدم إلى منتج SaaS B2B ذي قيمة اقتصادية وعلمية عالية للبلاد.

المحور الثالث

التحليل الاستراتيجي للسوق



📊 التحليل الإستراتيجي للسوق (Strategic Market Analysis)

بيئة وحجم السوق المستهدف :(Market Sizing)

يتقاطع المشروع مع ثلاث أسواق سريعة النمو وهي: تكنولوجيا التعليم(EdTech) ، الذكاء الاصطناعي التوليدي، وتدريب اللغة الإنجليزية للأغراض الخاصة .(ESP) وفي ظل التوجه الوطني نحو تعميم الإنجليزية والرقمنة، يتوزع حجم السوق في الجزائر كالتالي:

- **إجمالي السوق المتاح :(TAM) ما** يقارب 1 مليون طالب جامعي، بالإضافة إلى مراكز التكوين والشركات الكبرى.
- **السوق المتاح للمخاطبة :(SAM)** الجامعات، المعاهد، ومؤسسات التكوين المتخصصة في مجالات العلوم والتكنولوجيا، الاقتصاد، الطب، الطاقة، والإدارة.
- **السوق الممكن الاستحواذ عليه :(SOM)** الجامعات والمؤسسات الشريكة في المرحلة الأولى (وعلى رأسها موقع التجريب بجامعة غرداية)، ثم التوسع تدريجياً نحو السوق الوطنية.

شرائح العملاء :(Customer Segments)

يستهدف المشروع بشكل أساسي: قطاع التعليم العالي والبحث العلمي (الجامعات والمدارس العليا)، مراكز اللغات ومدارس التكوين الخاصة، والشركات والمؤسسات الاقتصادية الناشطة في القطاعات الإستراتيجية (كالطاقة، التكنولوجيا، الصحة، والتمويل) لتكوين إطاراتها وموظفيها.

التحليل التنافسي والتموقع :(Competitive Positioning)

تتميز السوق الحالية بوجود تطبيقات لغات عامة) مثل (Duolingo وهي غير تخصصية، أو أدوات ذكاء اصطناعي عامة) مثل (ChatGPT تتطلب جهداً كبيراً في هندسة الاستعلامات والتدخل البشري. بالمقابل، يملأ مشروع **TALEB-ESP** فجوة غير مغطاة في الجزائر، لكونه الحل الوحيد الذي يجمع بين التحليل الآلي للاحتياجات، توليد محتوى ESP مخصص، التكيف مع السياق المحلي، والإدارة المؤسسية المركزية للكفاءات.

إستراتيجية النفاذ إلى السوق :(Go-to-Market Strategy)

ترتكز خطة الاختراق على ثلاثة مراحل متتالية: تبدأ ب**المرحلة التجريبية** بجامعة غرداية والمؤسسات الشريكة للتحقق من الأداء التقني والبيداغوجي، تليها **مرحلة التوسع الوطني** للتموقع داخل الجامعات ومراكز التكوين العامة، وصولاً إلى **مرحلة التنويع القطاعي** عبر استهداف حسابات الشركات الكبرى والتوسع نحو الأسواق الجهوية والإقليمية كحل SaaS B2B رائد.

المحور الرابع

خطة الانتاج والتنظيم

خطة الانتاج والتنظيم (Production & Organization Plan)

نطاق المشروع:(Project Scope)

يشمل المشروع تطوير منصة رقمية متكاملة تقدم كخدمة سحابية (SaaS) لأتمتة الهندسة التربوية لتعليم الإنجليزية للأغراض الخاصة .(ESP) ويتكون النطاق من واجهة ويب موحدة تجمع ثلاث ركائز تقنية وبيداغوجية: **محرك التحليل التنبؤي** لرسم خريطة كفاءات المتعلم، **محرك التوليد التكيفي** لإنتاج الوحدات التعليمية المتخصصة باستخدام تقنيات الذكاء الاصطناعي وبنية $i+1$الخوارزمية، و**مركز الإشراف البشري** (لوحة تحكم الأستاذ والخبير) للمراجعة والمصادقة على المحتوى وتتبع تحليلات التعلم، مع بنية برمجية مستقلة آمنة (Multi-Tenant) قابلة للتكامل عبر الـ API مع أنظمة إدارة التعلم.(LMS)

خطوات الحصول على الخدمة(Service Delivery Workflow)

الخطوة	الوصف
1.التعاقد والإعداد (Onboarding)	إبرام العقد التجاري مع المؤسسة (جامعة، مركز لغات، أو شركة) وإنشاء مساحتها السحابية المعزولة والمؤمنة بالكامل على المنصة.
2.التهيئة وضبط الحسابات(Configuration)	إعداد حسابات الإداريين، الأساتذة، والمتعلمين، وربط المنصة بأنظمة المؤسسة الداخلية) مثل نظام Moodle(إذا لزم الأمر عبر الـAPI.
3.تشخيص الاحتياجات الآلي(Automated Audit)	يدخل المتعلمون إلى المنصة حيث يقوم "محرك التحليل التنبؤي" بفحص ثغراتهم ورسم ملف كفاءاتهم اللغوية والمهنية في الزمن الحقيقي.
4.التوليد الخوارزمي للمحتوى(AI Generation)	يقوم "محرك التوليد التكيفي" فوراً بمعالجة ملف الطالب وإنتاج وحدات دراسية مخصصة (نصوص، معاجم، تمارين) تناسب تخصصهم الدقيق.
5.الإشراف والمصادقة (Human-in-the-Loop)	يراجع الأستاذ أو الخبير المضمون المتولد عبر لوحة التحكم الخاصة به، ويقوم بتعديله أو المصادقة عليه ونشره للمتعلمين ببضع نقرات.
6.التعلّم والمتابعة التكيفية (Adaptive Learning)	يتفاعل المتعلم مع المحتوى المخصص، بينما تقوم المنصة بتحديث ملفه ومستوى الصعوبة تلقائياً مع توفير لوحات قياس الأداء للإدارة والأساتذة.

الخطوة	الوصف
7.الدعم الفني والصيانة (Support & Maintenance)	تقديم دعم تقني مستمر للمؤسسة وتحديث خوارزميات المنصة ووظائفها لضمان استقرار الخدمة وأمن البيانات الوطنية.

👥 تنظيم فريق الانتاج (Production Team Organization)

يعتمد الهيكل البشري والإنتاجي للمشروع على فريق مرن ومدمج لضمان أدنى تكاليف تشغيلية في مرحلة الانطلاق، ويتوزع على الأدوار التالية:

- **إدارة المنتج والعمليات (Product Management):** وتتولاها الطالبتان المؤسستان للإشراف على الرؤية الإستراتيجية للمنصة، وإدارة دورة حياة الميزات الجديدة، وضمان التنسيق المستمر بين الشقين التقني والبيداغوجي.
- **الهندسة التقنية والتطوير (Technical Engineering):** يقودها مطور برمجيات شامل (Full-Stack) يتولى صيانة البنية التحتية، قواعد البيانات، والواجهات البرمجية، ويدعمه لاحقاً مهندس ذكاء اصطناعي (AI Engineer) لتحسين الخوارزميات ونماذج الـ MoE.
- **الهندسة التربوية والجودة (QA & Instructional Design):** وتضم أساتذة وخبراء لغة إنجليزية للأغراض الخاصة (ESP)، حيث يقومون بتدريب الخوارزميات، وتغذية النظام بالمجموعات النصية المرجعية، وضمان مطابقة المخرجات للمعايير البيداغوجية.

⚙️ العمليات التنظيمية (Organizational Operations)

لضمان سير العمل بكفاءة واستمرارية داخل الشركة الناشئة، تخضع العمليات التنظيمية لثلاث آليات محورية:

1. **إدارة المورد التكنولوجي والبرمجي:** المتابعة الدقيقة واليومية لاستهلاك واجهات البرمجة (APIs) التابعة لنماذج الذكاء الاصطناعي، ومراقبة أداء وحماية خوادم الاستضافة السحابية لضمان استقرار الخدمة بنسبة تفوق 99%.
2. **آلية المراقبة والمصادقة الصارمة:** تفعيل بروتوكول فحص دوري للمحتوى الأكاديمي، حيث يلتزم الفريق البيداغوجي بمراجعة وتحديث القوالب التربوية (Prompts) لتقليل نسب "الهلوسة البرمجية" وضمان موثوقية المادة التعليمية.
3. **إدارة التدفق والتعاون الرقمي:** استخدام إطارات عمل مرنة (Scrum/Agile) لإدارة المهام وتحديثات المنصة، عبر أدوات تنسيق رقمية تضمن الاستجابة السريعة لملاحظات العملاء وحل المشكلات الفنية فوراً.

🔄 دورة الخدمة (Service Lifecycle)

تمر الخدمة داخل منصة TALEB-ESP بأربع مراحل أساسية تضمن التطور المستمر والاستدامة:

- **التصميم والتطوير (Development & Design):** تبدأ الدورة بتحديد المتطلبات التقنية والبيداغوجية، تليها كتابة الشيفرة البرمجية، هندسة الاستعلامات، واختبار كفاءة الخوارزميات داخلياً قبل طرحها للمستخدمين.
- **النشر والاستضافة (Hosting & Deployment):** رفع التحديثات والميزات الجديدة على البنية التحتية السحابية (Cloud) متعددة المستأجرين، مع التأكد من عزل بيانات المؤسسات وتأمين شهادات الحماية والأمان (SSL).
- **الإنزال والتفعيل (Onboarding & Implementation):** تهيئة بيئة العمل للعميل المؤسسي الجديد، وضبط إعدادات الربط (API)، وتدريب الأساتذة والمسؤولين على استخدام لوحات التحكم لضمان الإنزال السلس للخدمة.
- **الصيانة والتحسين المستمر (Optimization & Maintenance):** المراقبة المستمرة للنظام لتصحيح الأخطاء، وتقديم الدعم الفني، وجمع التغذية الراجعة من تinteractions المستخدمين لتطوير الخوارزميات ودخول دورة تطوير جديدة بناءً على بيانات حقيقية.

المحور الخامس

الخطة المالية

💰 الخطة المالية (Financial Plan)

هيكلة التكاليف والأعباء (Cost Structure):

تعكس تكاليف مشروع TALEB-ESP خصائص نموذج شركات الـ SaaS وتكنولوجيا التعليم، حيث تتركز النفقات في ثلاثة بنود أساسية:

- **الأعباء التكنولوجية والتشغيلية:** تشمل الاستضافة السحابية الآمنة، حجز النطاق وشهادات الأمان (SSL)، والوصول إلى واجهات برمجة تطبيقات الذكاء الاصطناعي (APIs). تُقدر هذه التكلفة في المرحلة التجريبية بحوالي **30,000 دج شهرياً**، وتظل تحت السيطرة بفضل بنية النظام القابلة للتوسع.
- **أعباء الموارد البشرية:** تعتمد على النمو التدريجي؛ في سنة الإطلاق تتولى الطالبتان المؤسستان الهندسة التربوية والإدارية، مع الاستعانة بمطور برمجيات (Full-Stack). ابتداءً من السنة الثانية، يتم تعزيز الفريق بمهندس ذكاء اصطناعي ومسؤول تجاري ودعم فني لمواكبة نمو قاعدة العملاء.
- **المصاريف العامة والتجارية:** تشمل حملات التسويق الرقمي لاكتساب العملاء، النفقات الإدارية والقانونية، والتنقلات للمشاركة في فعاليات الابتكار والمحافل الاقتصادية لتوطين العلامة التجارية.

نموذج الإيرادات وتدفقات الأموال (Revenue Streams):

يعتمد النموذج الاقتصادي للمنصة على آلية الإيرادات المتكررة والمستدامة (B2B SaaS) وتتوزع على ثلاثة مصادر:

1. **اشتراكات المؤسسات التعليمية (B2B):** ترخيص سنوي للجامعات ومراكز اللغات يمنح وصولاً كاملاً للمنصة، بتعريفة متوسطة مقدرة بـ **450,000 دج للمؤسسة سنوياً**.
2. **اشتراكات الشركات والمؤسسات الاقتصادية (B2B):** مساحات مخصصة لتكوين الموظفين في اللغات التقنية، بتعريفة متوسطة مقدرة بـ **25,000 دج شهرياً** (تتغير حسب حجم المستخدمين).
3. **الخدمات المتميزة للأفراد (B2C المميز):** خدمات إضافية مباشرة للطلاب والمهنيين (مثل: التحضير لمقابلات العمل، كتابة السير الذاتية التقنية، ووحدات التطوير المتقدمة).

📊 جدول حسابات النتائج المتوقع (3 سنوات)

تم إعداد هذه التوقعات بناءً على سيناريو نمو تحفظي ومدروس يعكس تأثيرات الحجم (Scale) الخاصة بالبرمجيات السحابية:

البيان (المبالغ بالدينار الجزائري دج)	السنة 1	السنة 2	السنة 3
الإيرادات الإجمالية (رقم الأعمال)	2,000,000	10,000,000	22,000,000
التكاليف التكنولوجية والتشغيلية	500,000	900,000	1,400,000
التسويق والتطوير التجاري	400,000	900,000	1,500,000
تكاليف الموارد البشرية	1,500,000	4,200,000	7,200,000
المصاريف الإدارية والعامة	150,000	300,000	500,000
النتيجة الصافية المتوقعة	**-550,000**	**+3,700,000**	**+11,400,000**

تحليل ومؤشرات الاستدامة المالية (Financial Sustainability):

- **السنة الأولى (مرحلة الاستثمار):** يُعد العجز الطفيف المتوقع طبيعياً ومقبولاً جداً في قطاع التكنولوجيا، نظراً لأنه يُوجّه لبناء وتأمين "الأصل التكنولوجي" والتحقق من ملاءمة المنتج للسوق (Product-Market Fit).
- **السنة الثانية والثالثة (الربحية والتوسع):** تظهر القوة المالية للمشروع ابتداءً من السنة الثانية بالوصول إلى نقطة التعادل والربحية التشغيلية الإيجابية. في السنة الثالثة، تتضاعف الأرباح الصافية لتصل إلى **11,400,000 دج**، مما يثبت الكفاءة العالية لنموذج الـ SaaS، حيث تنمو الإيرادات بشكل متسارع بينما تظل التكاليف التشغيلية ثابتة أو تنمو ببطء.
- **خطة الخزينة والتمويل:** يرتكز التمويل الأولي على المساهمات الشخصية، منحة الحاضنة الجامعية، ومسابقات الابتكار والدعم الحكومي الموجه للشركات الناشئة (Label). وابتداءً من السنة الثانية، تؤمن التدفقات النقدية الناتجة عن الاشتراكات السنوية التمويل الذاتي للمنصة وتضمن استقلاليتها المالية وتوسعها الإقليمي كـ *Startup Innovante* واعدة.

المحور السادس

النموذج الأولي التجريبي

النموذج الأولي التجريبي

عن طريق مسح سريع للكود الرقمي:

مستوى الجاهزية التكنولوجية

تقديم الشعار:

TALEB

ESP

نموذج العمل التجاري

نموذج العمل التجاري

مخطط نموذج العمل التجاري (Business Model Canvas)

1

1. القيمة المقترحة (Value Proposition)	2. شرائح العملاء (Customer Segments)	3. القنوات (Channels)
• أتمتة كامل دورة الهندسة التعليمية وتحليل الاحتياجات وتوليد محتوى الإنجليزية للأغراض الخاصة (ESP) في ثوانٍ. • تخصيص فائق للمحتوى يطابق التخصص الدقيق للمتعلم (طاقة، تكنولوجيا، اقتصاد) بناءً على بنية خوارزمية تكيفية ($$i+1). • تخفيض العبء الخفي ووقت تحضير الدروس للمدرسين بنسبة تفوق 60% مع الحفاظ على دورهم كمشرفين ومصادقين (Human-in-the-Loop). • توفير حل محلي (SaaS B2B) يدعم السيادة الرقمية الوطنية بكلفة هامشية منعدمة للمؤسسات، وبناء أصل تقني متين لبيانات الكفاءات اللغوية.	• **قطاع التعليم العالي:** الجامعات، المدارس العليا، والمعاهد الوطنية. • **قطاع التدريب الخاص:** مدارس اللغات، ومراكز التكوين المهني المستمر. • **قطاع الشركات (B2B):** المؤسسات الاقتصادية الناشطة في المجالات الإستراتيجية (كالطاقة، المحروقات، الصحة، والتمويل) لتكوين إطاراتها وموظفيها. • **الأفراد (B2C المميز):** الطلاب والمهنيون الباحثون عن تكوين مخصص فائق السرعة أو خدمات مهنية إضافية.	• **البيع المباشر والتعاقد المؤسسي:** اللقاءات المباشرة والعروض الفنية الموجهة لإدارات الجامعات ومسؤولي الشركات. • **المنصة الرقمية والموقع الإلكتروني:** الواجهة الرسمية للإنزال، التسجيل، والدعم الفني عبر الإنترنت. • **المحافل الأكاديمية والاقتصادية:** المشاركة في صالونات الابتكار، معارض الشركات الناشئة، والأيام الدراسية حول الرقمنة واللغات. • **التسويق الرقمي الموجه:** حملات إلكترونية مستهدفة عبر شبكات التواصل المهنية (LinkedIn) ومواقع الويب التعليمية.

4. علاقة العملاء (Customer Relationships)	5. مصادر الإيرادات (Revenue Streams)	6. الأنشطة الرئيسية (Key Activities)
• **مساعدة شخصية مخصصة:** مرافقة تقنية وبيداغوجية كاملة للمؤسسات المتعاقدة خلال مرحلة الإنشاء والربط (Onboarding). • **الخدمة الذاتية المدارة:** لوحات تحكم مستقلة وآمنة تتيح للعميل إدارة حسابات أساتذته وطلابه ومتابعة إحصائياتهم بكل حرية. • **التطوير المشترك التفاعلي:** تحديث الخوارزميات وتحسين المنصة بناءً على التغذية الراجعة المستمرة من الأساتذة والخبراء.	• **اشتراكات المؤسسات التعليمية (B2B):** ترخيص سنوي متكرر للوصول الكامل إلى المنصة (بمتوسط **450,000 دج للمؤسسة سنوياً**). • **اشتراكات الشركات (B2B):** رسوم شهرية متكررة حسب حجم الاستخدام وتعداد الموظفين المُكوَّنين (بمتوسط **25,000 دج شهرياً**). • **خدمات الأفراد المميزة (B2C):** رسوم مباشرة مقابل خدمات إضافية (مثل: التدريب على مقابلات العمل، كتابة السير الذاتية التقنية، وإصدار شهادات الكفاءة).	• **التطوير البرمجي والهندسة التقنية:** بناء المنصة، صيانة البنية التحتية السحابية متعددة المستأجرين، وتحسين خوارزميات الـ MoE ونماذج الذكاء الاصطناعي. • **الهندسة التربوية وضبط الجودة:** هندسة الاستعلامات (Prompts)، تغذية النظام بالمجموعات النصية التخصصية، ومراجعة المحتويات الأكاديمية لتقليل نسب الهلوسة. • **التطوير التجاري والدعم:** إدارة العقود، تقديم الدعم الفني، وتدريب الأساتذة والمسؤولين على لوحات التحكم.

7. الموارد الرئيسية (Key Resources)	8. الشركاء الرئيسيون (Key Partners)	9. هيكلة التكاليف (Cost Structure)
• **موارد تكنولوجية وبرمجية:** خوادم الاستضافة السحابية الآمنة، واجهات برمجة التطبيقات (APIs) لنماذج الـ LLM، وبنية التطبيق المبنية بـ Python وقواعد البيانات. • **موارد بشرية ومعرفية:** الطالبتان المؤسستان (الإشراف البيداغوجي والإداري)، فريق التطوير التقني (Full-Stack)، والخبراء والمستشارون في الـ ESP. • **موارد وثائقية مرجعية:** المجموعات النصية الأكاديمية المتخصصة، والمعايير اللغوية المعتمدة (مثل CECRL). •	• **الشركاء الأكاديميون:** جامعة غرداية والكليات التابعة لها (بيئة الاختبار الميداني والتحقق العلمي). • **شركاء الابتكار والمرافقة:** حاضنة أعمال جامعة غرداية، والهياكل الحكومية المانحة لعلامة "مؤسسة ناشئة" والتمويل. • **الشركاء التكنولوجيون:** مزودو الخدمات السحابية واستضافات الويب، ومطورو الخوارزميات المفتوحة المصدر. • **الشركاء الاقتصاديون:** مراكز اللغات، والغرف التجارية، والمؤسسات الاقتصادية الكبرى المستقطبة للخريجين.	• **تكاليف تشغيلية وتكنولوجية:** رسوم واجهات برمجة تطبيقات الذكاء الاصطناعي (APIs)، تكاليف الخوادم والاستضافة السحابية الآمنة (حوالي **30,000 دج شهرياً في البداية**). • **تكاليف الموارد البشرية:** رواتب فريق التطوير التقني تدريجياً، ومكافآت الأساتذة المستشارين والمقيمين. • **تكاليف تجارية وتسويقية:** ميزانية الحملات الإعلانية الرقمية، مصاريف التنقل، الترويج للعلامة التجارية، والإجراءات القانونية لحماية الملكية الفكرية (ONDA/INAPI).

Designing an AI-Powered System for Needs Analysis and Personalized Context Generation in ESP Courses

فـئـات الزبـائـن

من هم الزبائن والمستخدمون المستهدفون؟

- طلبة الجامعات في مختلف التخصصات.
- الأساتذة والباحثون الأكاديميون.
- المهنيون الراغبون في تطوير مهاراتهم اللغوية المتخصصة.
- الجامعات ومراكز التكوين والمؤسسات التعليمية.

المتبنون المبكرون

ما هي خصائص زبائنك المثالي؟

- طلبة الماستر والدكتوراه.
- الأساتذة المهتمون بالتعليم الرقمي.
- الباحثون في مجال ESP.
- الجامعات ومراكز التكوين الراغبة في تبني حلول تعليمية مبتكرة.

الميزة غير العادلة

لشيئ الذي لا يمكن نسخه أو الحصول على مثله بسهولة

- قاعدة بيانات متخصصة في ESP.
- خوارزميات متقدمة لتحليل الاحتياجات التعليمية.
- محتوى شخصي يتم إنشاؤه تلقائياً لكل متعلم.
- شراكات أكاديمية مع الجامعات والمؤسسات التعليمية.

القنوات

ما هي القنوات التي سيتوصلك الزبون (من وإلى الزبون) ؟

- الموقع الإلكتروني للمنصة.
- تطبيق الهاتف الذكي.
- الشراكات مع الجامعات والمؤسسات التعليمية.
- وسائل التواصل الاجتماعي والحملات الرقمية.

القيمة المعروضة الفريدة

رسالة واحدة واضحة ومقنعة توضح سبب اختلاف منتجك وأهميته

منصة ذكية لتعليم اللغة الإنجليزية لأغراض خاصة (ESP) تعتمد على الذكاء الاصطناعي لتحليل احتياجات المتعلمين وتوليد محتوى تعليمي شخصي، مما يساهم في تحسين جودة التعلم وتوفير الوقت والجهد للمتعلمين والمؤسسات التعليمية.

التصور العام (العالي)

ما هي المقاربة القيمة التي تقدمها؟
مثال: تطبيق "كريم" هو "أوبر" للمنطقة العربية

TALEB ESP منصة تعليمية مبتكرة قائمة على الذكاء الاصطناعي التوليدي، تُصمِّم مقررات ومحتوى اللغة الإنجليزية لأغراض خاصة (ESP) وفق احتياجات المتعلمين الأكاديمية والمهنية، مع توفير تجربة تعلم شخصية وفعالة للمؤسسات والأفراد.

الحـــــل

توضيح حل ممكن لكل مشكلة تواجه الزبون

- تطوير منصة تعليمية مدعومة بالذكاء الاصطناعي.
- تحليل احتياجات المتعلمين بشكل آلي.
- إنشاء محتوى تعليمي مخصص وفق التخصص والمستوى.
- توفير تجربة تعلم تفاعلية ومستمرة.

المعايير القياسية

لخص أهم الأرقام والمعايير التي تساعك على قياس سير عمل مشروعك

- عدد المستخدمين النشطين.
- معدل التفاعل مع المحتوى.
- نسبة إتمام الدورات التعليمية.
- مستوى رضا المستخدمين.
- عدد المؤسسات المتعاقدة مع المنصة.

المشكلة

لخص أهم 1-3 مشاكل لديك

- نقص المحتوى المتخصص في اللغة الإنجليزية لأغراض خاصة (ESP).
- عدم مراعاة الفروقات الفردية واحتياجات المتعلمين المختلفة.
- الوقت والجهد الكبير المطلوبان لإعداد محتوى تعليمي مناسب لكل تخصص.
- محدودية التخصيص في منصات تعلم اللغة التقليدية.

البدائل الحالية

ما هي البدائل المتوفرة حالياً لحل المشكلة؟

- منصات تعلم اللغة الإنجليزية العامة.
- الدورات التقليدية داخل المؤسسات التعليمية.
- أدوات الذكاء الاصطناعي العامة لإنشاء المحتوى.
- الموارد التعليمية الرقمية غير المتخصصة.

تدفق الإيرادات

ما هي طرق/مصادر الدخل المختلفة؟

- الاشتراكات الشهرية والسنوية.
- تراخيص استخدام المنصة للجامعات.
- العقود مع المؤسسات التعليمية والمهنية.
- الشراكات والبرامج الحكومية.
- الخدمات المتميزة (Premium Services).

هيكل التكاليف

ما هي التكاليف الثابتة والمتغيرة المرتبطة بمشروعك؟

- تطوير وصيانة البرمجيات.
- استضافة الخوادم والبنية التحتية السحابية.
- تكاليف واجهات الذكاء الاصطناعي (API).
- تطوير وتحديث المحتوى التعليمي.
- التسويق والدعم الفني.

الجمهورية الجزائرية الديمقراطية الشعبية
وزارة التعليم العالي والبحث العلمي
جامعة غرداية
حاضنة أعمال جامعة غرداية

رقم: 139/ ح.أ.ج.غ/2026

شهادة توطين مشروع مبتكر وفق القرار008 المعدل والمتمم للقرار1275

أنا الممضي أسفله، السيد: د/ طالب أحمد نور الدين

مسير حاضنة الأعمال: جامعة غرداية

المقر الاجتماعي/ العنوان: المنطقة العلمية، ص ب 455، غرداية، 47000، الجزائر

رقم علامة الحاضنة: 1004253146 بتاريخ: 2025/04/10

طبيعة المشروع: مؤسسة ناشئة

أشهد أن الطالب(ة) / الطلبة التالية أسماؤهم:

الإسم واللقب	الطور الدراسي	التخصص	الكلية
غنية حاج قويدر	M2	إنجليزية	كلية الآداب واللغات
عبد القادر حاج قويدر	L3	أنظمة مستقلة وذكاء اصطناعي	كلية العلوم والتكنولوجيا
دلال عربية بوحميدة	M2	إنجليزية	كلية الآداب واللغات

تحت إشراف الأستاذ(ة)/الأساتذة التالية أسماؤهم:

الإسم واللقب	الرتبة	التخصص	الكلية
مليكة كوطي	أستاذ	الانجليزية	كلية الآداب واللغات

تم توطينه على مستوى حاضنة أعمال جامعة غرداية - بمشروع تحت اسم:

Designing and AI-powered System for Needs Analysis and Personalized Content Generation in ESP Courses.

خلال السنة الجامعية: 2026/2025

سلمت هذه الشهادة بطلب من المعني للإدلاء بها في حدود ما يسمح به القانون.

حرر في غرداية بتاريخ: 2026/04/26

مدير الحاضنة

مسؤول حاضنة الأعمال
طالب أحمد نور الدين