People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
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Faculty of Letters and Foreign Languages
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Integrating English-Medium Instruction for First-Year Biology Students Through Tailored Course Design: A Case Study of Fundamental Chemistry Units

A Dissertation Submitted to the Department of Letters and English Language in Partial Fulfillment of the Requirements for the Degree of Master in Language Sciences

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2023/2024

Acknowledgements

"All praise and gratitude for the fulfillment of this effort should mainly go to Allah, the All-Powerful."

Our deepest gratitude goes to our esteemed teacher and supervisor, Mrs. BOUREZG Zahra. Her support and guidance were valuable throughout our dissertation journey. From the initial stages of selecting a compelling topic to offering precious advice and assistance at every step .Her contributions have been truly remarkable.

We extend our sincere gratitude to the examination board, " Dr. Tayaa karima " and" Dr. Nasri Chadia " , for dedicating their valuable time to meticulously reviewing and evaluating our dissertation. We are also thankful to "Ms. Douaibia Asma ".

Our appreciation extends to the faculty and students of the Biology Department whose cooperation in responding to our questionnaire proved invaluable. We want to sincerely thank the Chemistry's teachers " Kaheld Aggoun " and " Dr. Sellami .S " for providing us with the essential Caneva " the educational document of the case unit of study" . A special debt of gratitude goes to "Dr. Tayaa Karima " for her unwavering support throughout our journey of making this modest work .

We would like to express our thanks to the professors and staff members of the Faculty of Letters and Languages, specifically the Department of Letters and English Language. Their expertise, support, and guidance were crucial throughout this research. Thank you all for creating an academic setting which has truly enhanced our educational journey among them" Mr. Yahia " who contributed in SPSS results and" Mr. Hamza" who helped in providing such important documents besides the teacher ’email . For the valuable contributions made by numerous authors and researchers, whose works have informed and shaped our understanding of this subject, we gratefully acknowledge their valuable feedbacks.

Dedication

To my incredible parents, Dearest father " El Elmi " and my beloved mother " Malika " , your endless support has been the fuel that propelled me through this dissertation journey.

With deep appreciation, I dedicate this work to my sweet sisters " Raounek " the smily lady, " Aya " the funny girl , " Mona " the little sister and my dear aunt " Nadia ", whose encouragement from the very beginning of my university journey proved invaluable.

To all my friends who cheered me on, especially " Nourhane ", my partner in this endeavor. Without your shared effort, this work would not have come to fruition because if it were not for your support, I would not have made it so far . My dear " Radia ", the lovely friend with a pure soul, who always used to give me words of encouragement. "Rania", your unwavering support was a constant source of strength which is a great gratitude to overcome the obstacles of fatigue .

With a deep affection, " Fatima Zahra ", you were the most beautiful coincidence of my life, a gift from God that continues to enrich my days. This work is dedicated to you, and I promise to never let go of your hand, no matter what life throws our way.

To my secret friend " Stitch "I may say : " In times of darkness, you were my guiding star, and through every challenge, you were never far. Your unwavering support, a comforting embrace, With you by my side, I find strength and grace."

Finally, with love and gratitude, I dedicate this work to " Ikram" ," Marouita " and " Hadjer " the kind cheerful and pretty girls who tirelessly worked alongside " Nourhane "and me on our research. Your insightful advices proved invaluable.

"If there is no pain, so there is no gain because success is not the result of spontaneous combustion , you must set yourself on fire. "

Marwa

Dedication

To my dearest parents, words cannot express the depth of my gratitude for your love and support throughout this journey. Your sacrifices and endless encouragement fueled my determination every step of the way.

To my beloved sisters and brothers, Thank you for being my cheerleaders and confidantes . Thank you for reminding me of my strength and for being a source of inspiration . To my brother's wife "Donia" , your support was a key in my journey towards this achievement. I am grateful to you with all my heart."

To my amazing cousins "Soulef" and "Nardjess " , your constant encouragement was a beacon of light throughout this dissertation journey. Your belief in me pushed me forward even when doubts crept in.

To my little nephew boys, Aouab, Gaith, Oubai and Adem ,though you may not understand the words right now, I hope it inspires you to dream big and always strive to reach your goals.

To my hopeful partner in this endeavor "Marwa", you have been my rock, my confidante, and my biggest cheerleader throughout this entire dissertation process. Your unwavering support, countless revisions, and late-night coffee breaks fueled my motivation and kept me going.

To my kind friend "Radia ", your friendship brightens my days. Thank you for always being there with your caring soul and supportive presence. Your friendship is valuable for me .I cherish our bond deeply.

To my dearest cute light of inspiration "Karouma " ,"Marouita" and " Hadjer" , your support and friendship have been pillars of strength throughout this journey. I will never forget your kindness, and I cherish the memories we made along the way .To my cherished friend " Linda " , I am forever grateful for your presence in my life.

Nourhane

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List of Acronyms and Abbreviations

CBI : Content-Based Instruction .

CLIL : Content and Language-Integrated Learning.

EMI : English as a Medium of Instruction.

ESP : English for Specific Purposes.

MHESR : Ministry of Higher Education and Scientific Research.

MOI: Medium of Instruction .

Abstract

With the growing trend of integrating English as a Medium of Instruction (EMI) in science classrooms, concerns raised about student success. This study explores the challenges faced by First Year license biology students at Tebessa University and how a desired tailored course design can support EMI integration in a fundamental chemistry unit to meet student's needs. Furthermore, the current research intends to gain general analysis of how a potential EMI courses in chemistry unit would look like. Therefore, the data conducted through a mixed approach. Thus , a sample of 150 first license biology students at Tebessa University , have responded to a mixed quantitative questionnaire about the identification of students' challenges and preferred learning materials. Additionally, a qualitative content analysis examines existing courses, exercises, and practical work, while a structured teacher interview provide insights into more data gathered for the document analysis framework to identify components of an EMI course design in terms of lectures content and teaching- learning materials. The findings reveal significant student challenges associated with EMI in chemistry. However, the study emphasizes the impact of tailored course design components on overcoming these challenges. This research sheds light on the importance of engaging EMI-integrated materials for chemistry learning. These findings provide a preliminary standing ground for future initiatives to design an EMI course for first year biology students specially for their fundamental chemistry unit. It is recommended to highlight the need to consider language use in scientific fields when developing educational materials.

Keywords: Integrating EMI, Tailored Course Design, Components of EMI course design , Fundamental Chemistry module , Student Challenges, Student's needs, Content Analysis, Mixed Methods Research , First-Year Biology Students.

General Introduction

1. Background of the Study:

English has become the dominant global language due to factors like America's political power, technological progress, and globalization. This widespread use of English extends to scientific research, economics, and publications, prompting learners to acquire English skills tailored to specific fields, because not any English language is suitable for meeting the learners 'needs specialized in scientific disciplines, but there are certain aspects show the most appropriate language needed in such contexts to improve their performance in academic settings and also in the future professional career, as Hutchinson and Waters (1978, p .8) states :"Tell me what you need English for and I will tell you the English that you need". This need has given rise to English-medium of instruction , defined by Macaro (2018) as the use of English to teach academic subjects other than English itself in educational settings where English is not the primary language. This approach is particularly relevant in scientific fields, where most resources are available in English. A number of studies worldwide, including those conducted in Algeria, have investigated the implementation of EMI in educational settings. In Algeria, the scientific field faces significant challenges in incorporating English as the instructional language, especially in university courses like biology. Despite the availability of resources in English, the transition to EMI in Algerian universities, particularly in the biology discipline, is fraught with difficulties. This study focuses on integrating EMI into the first-year biology curriculum through tailored course design, using the fundamental chemistry unit as a case study.

2. Statement of the Problem:

English, the universal language of science, is crucial for biology students at Larbi Tebessi University to access research findings and understand scientific literature. However, the shift from French to English as the medium of instruction (EMI) poses significant challenges for first-year students. These challenges include linguistic barriers, limited English

proficiency, and adapting to new teaching methods, leading to difficulties in understanding course materials and engaging in class participation. While prior research, such as Macaro (2018), has highlighted general difficulties with EMI, there is limited focus on how these issues specifically affect the fundamental chemistry unit. Additionally, existing studies often overlook the potential of tailored course design in addressing these challenges.

3. Aims and Objectives of the Study:

The primary aim of this study is to examine if with the integration of English-medium instruction in first-year biology students , Teachers implemented the components of tailored course design effectively , focusing on fundamental chemistry units . This study seeks to explore the challenges faced by first-year biology students encountering a fundamental chemistry unit taught entirely in English for the first time . In order to achieve this aim, we will pursue the following objectives:

1. Firstly, identify the language proficiency challenges faced by first-year biology students, particularly in understanding scientific chemical concepts within English-medium instruction.

2. Subsequently, Examine the current course design of the chemistry unit for its suitability for EMI implementation. This involves analyzing the course materials (lectures, exercises, practical work) to see if they incorporate strategies for scaffolding student understanding in English, such as clear learning objectives, use of visuals, and activities that promote active learning.

3. Provide recommendations for improving English-medium instruction in scientific disciplines based on the findings of the study suggesting specific strategies that instructors can adopt to create more engaging and supportive learning materials for students encountering science subjects in English for the first time.

4. The Significance of the study:

This study addresses the urgent need for effective English-Medium Instruction (EMI) strategies in Algerian higher education, specifically focusing on first-year biology students at Larbi Tébessi University. By developing tailored course design strategies and instructional materials, this research aims to overcome language proficiency challenges that hinder students' understanding and performance in the fundamental chemistry unit. While existing research explores general EMI challenges, this study provides specific insights into the unique difficulties faced by these students. It offers practical solutions to improve their academic outcomes, bridging the gap between theory and practice in EMI implementation. The findings will contribute significantly to EMI literature by enhancing the overall success of EMI in fundamental science courses in Algeria, thereby supporting educational advancement and improving student learning experiences.

5. Research Questions :

In the light of the problem statement, the present research study seeks to answer the following questions:

1. What are the predominant challenges faced by first-year biology students when integrating English as a medium of instruction, particularly in the case of Chemistry fundamental unit?
2. How are the key components of tailored course design currently being implemented in chemistry courses taught through English as a medium of instruction (EMI) for first-year biology programs?
3.To what extent does the current course design of the chemistry unit cater to the needs of students learning through EMI?

This study which takes an exploratory approach, utilizing research questions which they do not capture predetermined hypotheses .Because hypotheses which typically predict specific outcomes, are not utilized in this context.

6. Methodology:

6.1. Tools of Investigation:

The contemporary study, conducted in the faculty of Biology , adopts a mixed-method approach that combines qualitative and quantitative methods for data collection. This approach is chosen to provide a comprehensive understanding about English language instruction in biology courses and to address the research questions effectively. For data collection, the study utilizes a combination of questionnaire and content analysis, conducting an interview with teachers of chemistry module used as a document to gather more data about the elements which are not mentioned clearly in the courses are analyzed. The questionnaire, translated into Arabic, is distributed to students and comprises three sections. Section One gathers background information like age, gender, and English proficiency, then dives into their experiences with English in biology courses. In section two, The survey gauges their confidence, explores difficulties they face, and asks about their preferred language of instruction for biology classes. Finally, section three focuses on their ideal learning materials and support for an English language course designed to strengthen their academic progress . Content analysis is employed to collect data related to English language instruction in biology courses. This method involves analyzing components of tailored course design, such as materials, activities, evaluation and needs assessment and it is applied to analyze the chosen courses and exercises of Chemistry module supporting the statistical data ,using a structured interview to fill the gaps which are not mentioned clearly in the previous selected documents in content analysis .

6.2. Population and Sampling:

The study focuses on First year students enrolled in the Biology department at Larbi Tébessi University. A stage sampling is chosen as the sample technique, aligning with specific criteria relevant to the research objectives. Participants are 150 students from around 400 total as the whole population.

7. Structure of the Dissertation:

This master dissertation contains two chapters. The first chapter is devoted to reviewing the literature about the theoretical background about the research variables. It is divided into two sections. The first section explores the knowledge about(EMI) English as a medium of instruction, however the second section elaborate the elements are related to tailored course design. The second chapter is devoted to the practical field work via collecting data, analyzing and discussing the results. This chapter includes three sections starting with a brief introduction then dealing with the students' questionnaire. After that , the next section deals with a detailed content analysis for the existing selected materials of chemistry module. Each part has its own discussion of results then synthesis of the overall findings of the study. The coming part provides mainly hints about what the study does contribute for the pedagogy and the educational applications.

Chapter One : Theoretical Framework

Introduction :

The English language holds undeniable dominance in the globalized world, permeating various domains like education and scientific research. Its influence shapes curricula and scholarly communication in classrooms worldwide. This pivotal rise has fueled a growing interest in English-Medium Instruction (EMI) within higher education institutions.

This chapter provides a comprehensive theoretical framework for exploring EMI implementation in Algerian higher education, with a specific focus on science and technology education. We begin by examining the broader significance of EMI, including its definition and its importance in higher education.

The chapter delves into the trends of implementing EMI in diverse educational settings, as well as the challenges faced by both teachers and students in the Algerian context, including its impact on student learning outcomes and academic success. Furthermore, the chapter examines the theoretical frameworks for curriculum development in Algeria, focusing on prominent theories and curriculum development models. This section explores how these frameworks can be applied to design curricula for EMI settings in science education, analyzing the implications of various theories for enhancing EMI in science subjects .

Section two shifts the focus to tailored course design in science education. Starting by define tailored course design, outlining its key components and theoretical underpinnings. This section emphasizes the importance of understanding student backgrounds and learning styles in designing courses that cater to diverse student needs. It sheds light on the value of flexibility and adaptability in curriculum development, highlighting the role of student feedback and assessment data in informing effective course design. Finally, the chapter explores strategies for implementing tailored course design in science education, including differentiated instruction techniques and the incorporation of real-world applications and examples.

Section One : English-Medium Instruction in Higher Education

1. Overview of the Significance of EMI in Higher Education

English is considered the most widely spoken and significant language which is utilized globally across diverse sectors such as education, business, politics, and culture. It serves as a vital mean of communication in the contemporary world. In higher education, English is employed as the primary language of scientific research because numerous academic books and journals are published in English across various fields of study.

1.1. Definition of EMI

1.1.1.What is EMI ?

The definition of English-Medium Instruction (EMI) has emerged as a central theme in scholarly discourse and educational debates and it has been a contentious point within the field of education, sparking ongoing discussions and debates among scholars and educators.

Dearden (2015) defined EMI as:" The use of the English language to teach academic subjects in countries or jurisdictions where the first language (L1) of the majority of the population is not English "(p.2).

As an attempt to make the definition of EMI clear enough, Ouarniki (2023) claimed that EMI (English-Medium Instruction) has been interpreted differently by multiple scholars in education . She defined the concept of EMI by presenting various scholarly definitions (p.177-178) . These definitions encompass a range of perspectives as the following :

According to Cummins & Davison (2007) EMI is :"A situation where students are taught academic content in a language that is not their first language, and that language is used as the primary medium of instruction. "To elaborate , students receive instruction in an academic subject using a language that is not their primary language. In this context, the non-native language becomes the predominant medium of teaching. This approach is designed to help students engage with academic content effectively, even if it is presented in a language

they are not fluent in. We can notice that both Dearden (2015) , Cummins & Davison (2007) emphasize the "primary" role of English . Also, Tsui (2013) defined EMI as "A situation where English is used as the primary language of instruction in an educational institution where it is not the mother tongue of the majority of students and teachers." This definition provides a strong foundation for understanding EMI as the primary use of English for instruction in non-native language educational settings.

Galloway &Rose (2021) proclaimed that : " Other definitions of EMI have attempted to broaden its purview to include Anglophone contexts, recognizing the established multilingual educational environments due to the rise of English as a second language (L2) speakers in these universities". This is one of the alternative conceptualizations of EMI which have endeavored to expand its scope by encompassing Anglophone contexts .

1.1.2.Other Terminology Related to EMI

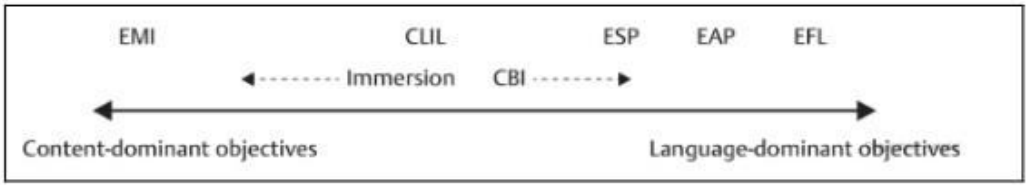
The multifaceted concept of English-medium instruction (EMI) subsumed related terms such as Content and Language Integrated Learning (CLIL) , Content-Based Instruction (CBI) and English for Specific Purposes (ESP) to underscore the diverse pedagogical approaches within this educational domain. Further strengthening this point, The definition given by Dearden (2015,p.4) clarified the distinction between English as a Medium of Instruction (EMI) and Content and Language Integrated Learning (CLIL). Unlike CLIL, which has its roots in the European ideal of multilingualism, EMI has no specific contextual origin. Additionally, CLIL doesn't specify the second language used for instruction, while EMI focuses solely on English, with its inherent geopolitical and sociocultural implications. Finally, CLIL explicitly aims to develop both content knowledge and language skills through integrated learning. EMI, on the other hand, prioritizes content delivery in English, not necessarily language acquisition itself .

According to Carpini & Alonso (2013) , CBL refers to :" The integration of some content within the goals of the language program. The content can be selected based on teacher interests, student interests, or program needs and often is selected based on a combination of these factors." From this perspective, CBL prioritizes language acquisition through engaging content, while EMI prioritizes content delivery using English as the primary language of instruction.

In addition to the previous associated terms, English for Specific Purposes (ESP) falls under the broader umbrella of English-Medium Instruction (EMI). According to a definition is established by Laurence Anthony (2018) , English for Specific Purposes (ESP) is : " An approach to language teaching that targets the current and/or future academic or occupational needs of learners, focuses on the necessary language, genres, and skills to address these needs, and assists learners in meeting these needs through the use of general and/or discipline-specific teaching materials and methods" (p.10-11).

Figure 1

Language-content continuum



Note. English Medium Instruction: Content and language in policy and practice . by E. Macaro, 2018. Oxford: Oxford University Press.

1.2. Importance of EMI

As Crystal (2004) highlighted the growing prevalence of English-medium instruction (EMI) in higher education worldwide although debates regarding the impact of EMI persist . Universities are increasingly adopting EMI due to perceived benefits, such as fostering greater internationalization, facilitating access to a wider range of resources, and reflecting

the growing prominence of English as the language of academia (as cited in Khenioui & Boulkroun, 2023). Many experts and educators viewed that English-medium instruction (EMI) fosters student communication skills and advancement, while simultaneously promoting university internationalization, educational quality and finding opportunities (p. 51). This claim is supported by Messeded (2023), who highlighted the growing trend of universities adopting EMI as a strategy to attract international faculty and students, facilitate academic exchange, and prepare graduates with the competitive advantage of English fluency in a globalized job market(p. 37). In addition ,Wilkinson & Zegers (2019), as cited in Ouarniki (2023), further emphasized the multifaceted advantages of EMI. For students, EMI fosters language proficiency, strengthens employability by equipping them with sought-after skills, and broadens their exposure to diverse cultures and knowledge domains (p. 179). Additionally, EMI presented universities with the opportunity to internationalize their curriculum and attract a more diverse student population . The potential benefits of EMI, as previously discussed, have contributed to its growing popularity in higher education institutions worldwide.

1.3.Trends in Implementing EMI in Diverse Educational Setting

Universities in non-English speaking countries have seen a dramatic expansion of English-Medium Instruction (EMI) programs in the last two decades. A collaborative study conducted by the British Council and Oxford University's EMI research center surveyed 55 countries. Their findings, reported by Dearden (2014), revealed that 62% of respondents adopted EMI policies within the past ten years (as cited in Messeded , 2023,p.37) .

Khenioui & Boulkroun (2023,p.53) viewed that both Dearden (2015) & Knight (2013) agreed upon the spread of EMI as a new trend. Dearden viewed that Fueled by a globalized world, English-Medium Instruction (EMI) is experiencing a surge in popularity across all educational levels and settings. Similarly, knight (2013) acknowledged the

increasing adoption of EMI across educational settings. Both Dearden &Knight highlighted the perspective of universities that view EMI as a tool to increase their prestige and international appeal. The driving forces behind this trend vary based on specific contexts, but some common motivations include universities' desire to internationalize and boost their prestige (Knight, 2013). Additionally, declining national student enrollment due to demographics and funding cuts has made EMI an attractive strategy for institutions to attract international students. Furthermore, EMI can be a tool for universities to compete more effectively within the higher education landscape, both nationally and internationally. Finally, the prominent role of English in academic research publications further strengthens the case for adopting EMI (as cited in Khenioui & Boulkroun , 2023,p.53). So, Dearden & Knight provided a valuable starting point for understanding the rise of EMI. Their focus on university motivations complements future research that explores the broader landscape of stakeholders involved in EMI .

1.4. Challenges in Implementing EMI in Diverse Educational Settings

According to Messeded (2023) EMI is rapidly growing in numerous universities worldwide. This growth can be attributed to various factors, such as the emphasis on globalizing higher education to appeal to international scholars and learners, as well as the aim to equip students with the necessary abilities to excel in a competitive employment land scape. However, this expansion presented several difficulties, particularly concerning English language proficiency and the provision of English instruction for both educators and students (p .37).

Boulkroun & Khenioui claimed that the dominance of English in higher education forced many instructors to teach outside their native language. This creates difficulties for both teachers and students. Teachers may struggle to adapt their teaching style, and students may not fully grasp concepts explained in a non-native tongue. Unfortunately, the assumption

that English proficiency equals content mastery in English often leads to minimal support for instructors and students transitioning to English-as-a-medium-of-instruction (EMI) environments (2023,p.56). Richards & Pun (2022) as cited in Boulkroun & khenioui, (2023) pointed out that true comprehension requires strong listening and reading skills specific to the subject matter, including specialized vocabulary and registers. Similarly, effective communication demands the ability to interact with peers and instructors, along with writing skills that conform to subject-specific conventions. Students in EMI settings face a double burden: learning new concepts and acquiring the English skills necessary to understand and communicate with them (p.56) . In this view, they cited from Mohan (1986) who argued that a purely language-focused approach which neglects subject matter is inadequate for EMI learners. Instead, an integrated approach that combines language and content acquisition is needed. This approach recognizes language as a tool for learning and acknowledges the importance of context in communication. Moreover, Boulkroun & khenioui argued mainly that implementing English as a Medium of Instruction (EMI) effectively requires careful planning and execution. Failure to do so can lead to a number of hurdles for all stakeholders involved, including teachers, students, course designers, and university administrators. Teacher quality is a major challenge in adopting EMI in higher education because the current training programs often fall short in equipping teachers with the necessary skills to effectively deliver courses in English or integrate EMI practices into their classrooms and also the traditional professional development courses may not yield the desired results for successful EMI implementation .

1.5. Implications of EMI for Student Learning Outcomes and Academic Success

Researchers in Global countries using English as a foreign language (EFL) have explored the impact of EMI on student achievement.

A Spanish context study's findings done by Dafouz & CamachoMiñano (2016) indicated the adoption of English as a Medium of Instruction (EMI) does not detrimentally impact students' academic achievements. Through a comparison of final grades between EMI participants and those not exposed to EMI, the researchers observed no significant variance. Similarly, research conducted in China by Hu & Lei (2014) corroborated the efficacy of EMI in achieving dual benefits—increasing students' motivation and utilization of the target language, thereby enhancing their knowledge acquisition. To address these potential challenges and ensure effective knowledge transfer, various coping mechanisms are implemented in educational settings. These strategies include simplifying course materials, integrating visual aids like PowerPoint presentations, developing instructional guides, reemphasizing key concepts for comprehension, and encouraging students to engage with course readings to grasp fundamental definitions and vocabulary (as cited in Saidani and Afkir 2023, p. 299).

In contrast to the previously discussed research on existing EMI programs, Medfouni's (2020) work explored potential future implementation. Through a survey of students at three Algerian public universities, the study revealed positive attitudes towards adopting English, an instrumental language associated with global aspirations, as the Medium of Instruction (MOI) instead of French, the current MOI linked to the country's colonial past. Medfouni's findings highlighted the importance of language ideologies and classroom practices within monolingual MOI policies. However, her study focused solely on potential implementation and student attitudes based on theoretical expectations, not on actual classroom experiences with EMI. This research aims to bridge this gap by investigating a university setting where EMI is already established, focusing on the lived experiences of students and educators within this implemented program.

2.Theoretical Frameworks for Curriculum Development in Algeria

Posner discussed the various interpretations of the term "curriculum." He claimed that some believe it refers to the content and objectives that schools expect students to learn, while others see it as the instructional methods teachers intend to use. This disagreement extracted from differing views on whether curriculum pertains to the goals of education or the ways in which those goals are achieved. Some argued that planned curriculum is less important than the actual learning experiences and methods employed by students. In essence, curriculum can be viewed as either a planned guide for education or a reflection of the actual educational experiences and outcomes of students (2004,p.5). So, Posner identified two main views of "curriculum" which are content or goals methods vs teaching methods. This reflects a debate on curriculum as either educational goals or methods to achieve them.

Shading the light into curriculum development, Paudel (2022 ,p. 148) emphasized curriculum development as an inherently practical process . Its purpose is to enhance the quality of language teaching and learning by implementing well-structured practices across all aspects of language instruction, encompassing planning, development, implementation and review. To sum up, Paudel (2022) views curriculum development as a practical process that improves language teaching and learning .

2.1.Overview of Prominent Theories and Models in Curriculum Development

According to Ornstein & Hunkins, There are two main approaches for curriculum development which are named : Technical-Scientific Approach (Modernist Perspective) and Nontechnical-Nonscientific Approach (Postmodernist, Post constructivist Perspective).

2.1.1.Technical-Scientific Approach (Modernist Perspective): The technical-scientific approach in education emphasizes acquiring specific knowledge through a meticulously planned curriculum. This curriculum, designed with scientific principles and efficiency in mind, acts like a blueprint for structuring the learning environment with resources and personnel as stated by Ornstein & Hunkins :" Curriculum development is a plan for

structuring the learning environment and coordinating personnel, materials, and equipment ". The approach applies scientific principles and involves detailed monitoring of the components of curriculum design." (p, 210). While it prioritizes systematic evaluation to achieve desired outcomes, the precision of such evaluation is debated. This approach, reflecting the influence of scientific advancements and business practices, emerged around 1900.

2.1.1.1. The Models of Bobbitt and Charters

In the early 1900s, Franklin Bobbitt & Werrett Charters revolutionized curriculum development by advocating for a scientific approach. They compared it to building a railroad – with a clear destination (student goals) and a planned route (activities) to get them there. Here is a breakdown of their key ideas:

• Scientific planning: They believed pre-existing educational practices lacked careful planning. A scientific approach could determine the specific activities students need to learn for success in study . This is supported by the following saying :"A general plan for the educational program can then be formulated, followed by "determining content and experiences necessary for the [learner] "(p. 211).

• Activity analysis: Bobbitt emphasized identifying the activities people perform in real-life situations (occupations, family life, etc.) These activities would then be translated into learning objectives for the curriculum.

• Connecting aims to activities: Charters stressed that educational goals (ideals) should directly influence the chosen content and experiences. He proposed a four-step process to achieve this, including selecting objectives and breaking them down into activities.

• Emphasis on outcomes: Both Bobbitt and Charters believed curriculum development should lead to a meaningful educational program that prepares students for real-world application.

Their ideas, including activity analysis and a focus on clear goals and activities, continue to influence curriculum development today, even if the specific methods have evolved.

2.1.1.2.The Tyler Model:

Ralph Tyler's model (1949) emphasizes clear objectives in curriculum development. It involves four steps:

• Identifying School Goals: Define the overall purpose of education.

• Selecting Learning Experiences: Choose activities that help achieve those goals. Ornstien and Hunkis claimed in this point that :" By purposes. Tyler meant general objectives. He indicated that curriculum planners should identify these objectives by gathering data from the subject matter, the learners, and the society (p.212).

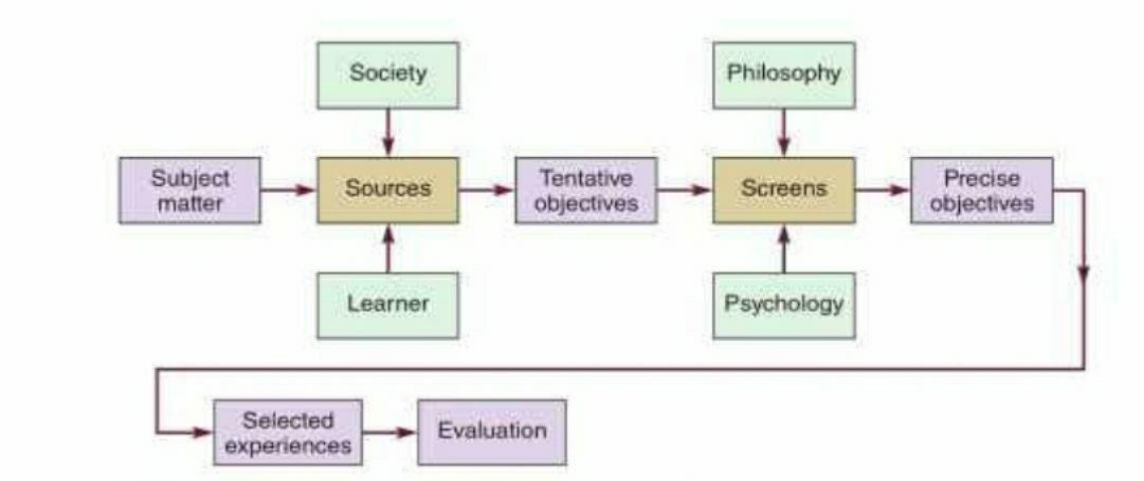
• Organizing Learning: Sequence experiences for maximum impact.

• Evaluation: Assess the program's effectiveness in meeting the goals.

While he criticized for being too linear, Tyler's approach remains popular for its practicality and ability to adapt to different contexts.

Figure 2

Tyler's Curriculum Development Model



2.1.1.3 The Taba Model (Grassroots Rationale) :

Hilda Taba, a colleague of Ralph Tyler, believed teachers should be involved in curriculum development (grassroots approach). Unlike Tyler's top-down model, Taba's inductive approach starts with teachers creating specific learning units for students and then builds to a general curriculum design .Taba's model involves seven key steps:

- Diagnose student needs: Identify what students need to learn.
- Formulate objectives: Set clear learning goals.
- Select content: Choose relevant content that matches the objectives.
- Organize content: Sequence the content appropriately for students.
- Select learning experiences: Choose engaging activities for students.
- Organize learning activities: Plan how activities will unfold.
- Evaluate: Assess student learning and program effectiveness , this is mentioned mainly as a way of illustration :"The curriculum planner determines which objectives have been accomplished. Students and teachers must consider evaluation procedures." (p. 213).

• The curriculum tips for conducting a Needs Analysis:

1. Set aside time and designate people who will conduct the needs analysis.
2. Create or obtain data gathering instruments and schedule time to gather data (for example, through

surveys, town meetings, questionnaires, tests, and interviews).

3. List the curriculum’s aims and goals.
4. Match the aims and goals.
5. Identify gaps between desired and actual results.
6. Decide which gaps require immediate curricular attention.
7. Suggest ways to address the identified gaps.

Taba's model focused on teacher involvement and practical steps continues to influence curriculum development today.

2.1.1.4.The Backward-Design Model:

The "backward design" model by Wiggins and McTighe focuses on starting with desired results and here is the breakdown stages :

- Stage 1: Desired Results

Define clear learning goals (knowledge, skills, values) considering standards and expectations.

Narrow down content to focus on "enduring understandings" key ideas students retain.

- Stage 2: " the backward-design model involves determining how the curriculum will be evaluated once it is in place." Assessment

Plan how to evaluate if students achieved the set goals.

Consider various assessment methods like observations, quizzes, projects, etc.

- Stage 3: Instructional Activities

Design learning activities that help students master the desired knowledge and skills. Choose materials and ensure the overall design aligns with good curriculum principles. This approach encourages educators to think about assessment and desired outcomes before developing lessons and activities.

2.1.1.5.Task-Analysis Model:

It Focuses on identifying essential knowledge and skills for school learning or real-world tasks. There are Two main types:

• Subject-matter analysis: They claim :" Subject matter, or content, is the starting point in subject-matter analysis." (p. 215).It Starts with content, breaking it down into key parts (concepts, facts) using methods like "master design charts."

• Learning analysis: Starts with learning processes, figuring out activities students need to master content and skills. Considers research in cognitive psychology and brain science.

Developing a Master Curriculum Plan:

- Combines subject-matter and learning analysis to create a comprehensive plan.

Involves steps like: Setting learning objectives (cognitive, affective, psychomotor).

- Determining sequence of content and activities.

- Identifying educational materials and evaluation methods.

2.1.2. Nontechnical-Nonscientific Approach (Postmodernist, Post constructivist Perspective):

Curriculum development is a battleground between certainty and complexity, with the technical-scientific approach wielding logic and objectivity, while the nontechnical approach champions the subjective and ever-evolving nature of knowledge and learning.(p.217).

2.1.2.1. The deliberation Model :

The deliberation model in curriculum development offers a dynamic alternative to traditional, rigid approaches . Ornstein and Hunkins argued that :"The deliberation approach draws on systems thinking and on feedback and adjustments but also takes into account that reality is somewhat subjective." (p. 218)

These is s a breakdown of its key features:

- Open Communication and Diverse Perspectives: educators from various backgrounds share their visions for education. This "public sharing" stage sparks lively discussions about goals, content, and teaching methods.

- Potential conflicts arise due to differing viewpoints, highlighting the richness of diverse educational perspectives.

- Building Consensus Through Understanding: after sharing ideas, the group identifies areas of agreement and disagreement. Respectful discussions ensure everyone's voice is heard.

Each participant explains their rationale, presenting data supporting their views, specific student needs they're addressing, and proposed solutions. This fosters empathy and understanding.

- Adaptability and Collaborative Refinement: as arguments and data are presented, educators might adjust their initial positions based on new information. This "highlighting changes in position" reflects the open-mindedness that's crucial in the deliberation model.
- Through negotiation and persuasion, the group seeks common ground on key aspects like curriculum content, teaching approaches, and educational goals. This collaborative effort is where the curriculum truly takes shape.
- Reaching Consensus and Embracing Uncertainty: the deliberation process culminates in a shared vision for the curriculum, encompassing topics, pedagogy, materials, and assessment methods.
- While some uncertainty remains, the curriculum reflects the group's social, political, and philosophical values, acknowledging the ever-changing nature of knowledge and education.
- Beyond Fixed Plans: A Postmodernist Twist: the deliberation model draws on a postmodernist, post constructivist perspective. Unlike the technical-scientific approach with its rigid plans, it acknowledges that knowledge and learning are constantly evolving.
- Educators here are comfortable with doubt and ongoing questioning. They understand that situations can change, and new information can lead to adjustments in the curriculum.
- Learning as a Shared Exploration: instead of following a pre-defined script, the deliberation model positions curriculum as a starting point for exploration. Students and teachers become co-investigators, delving into various intellectual areas together.
- Learning is a shared journey where students build relationships, challenge ideas, and discover the joy of exploration. This "improvisational theater" approach allows for unexpected discoveries and diverse forms of understanding.

- By fostering open communication, collaboration, and a willingness to adapt, the deliberation model allows educators to create a curriculum that is both dynamic and responsive to the ever-changing world of education. It celebrates the messy yet enriching process of learning together.

2.1.2.2. Slattery's Approach to Curriculum Development:

Patrick Slattery's guiding principles for postmodern curriculum development:

- Embrace Complexity: They argued that :" educators need to accept that education is capable of reconceptualizing that very concept of schooling globally and locally." (p. 220).

Reject Modernism: Move away from rigid, pre-defined curriculum models.

Global Citizenship: Prepare students to address social and educational issues on a global scale.

- Currere: Curriculum development is an ongoing process of self-study and reflection for educators.

- Scholarship: Curriculum developers should be scholars who delve into interpretation (hermeneutics) to inform their work.

2.1.2.3.Doll's Model of Curriculum Development:

William Doll offers four criteria for judging curriculum design, especially for postmodern approaches:

- Richness: Curriculum content should be deep and complex, allowing for multiple interpretations and ongoing learning. They indicated that : " Doll's suggested four R's are : Richness, Recursion, Relations, and Rigor." (p. 220).

- Recursion: Concepts and information should be revisited and explored in more depth over time, building understanding in a spiral.

- Relations: The curriculum should consider connections between content areas, pedagogical approaches, and cultural contexts.

- Rigor: Instead of absolute certainty, a postmodern curriculum embraces interpretation, uncertainty, and the ever-evolving nature of knowledge .

2.2.Application of Theoretical Frameworks to Curriculum Design for EMI Settings in Algeria

Benkhettou (2023) asserted that Algeria's higher education system is undergoing a significant overhaul, with the government prioritizing upgrades and a strong emphasis on scientific research. A key driver of this push is the growing recognition of foreign languages, particularly English. As the lingua franca of science and academia, Algerian universities implementing English as a Medium of Instruction (EMI) marks a bold step forward. This shift aims to propel Algeria's educational and scientific pursuits to new heights by fostering global collaboration, knowledge sharing, and research innovation. The Algerian higher education system has witnessed a period of significant transformation under the guidance of the Ministry of Higher Education and Scientific Research (MHESR). In addition, scientific research in Algeria is a priority for the government, with the MHESR implementing various policies and funding programs to support research activities and infrastructure development. These efforts have created an impressive network of 6 agencies, 19 centers, 12 units and 1472 research laboratories (MHESR, 2022). This comprehensive research ecosystem covered a wide range of disciplines, from the natural sciences to the social sciences and humanities, and contributes to the country's scientific progress (p.25) .

The push to implement English as a Medium of Instruction (EMI) in Algerian universities has sparked lively debate. Former Minister Tayeb Bouzid was crucial in this movement. In an announcement on July 4th, 2019, via Facebook, he declared the Ministry's commitment exploring ways to increase English usage in higher education (Appendix 1). Demonstrating remarkable inclusivity, a poll was launched the following day through university websites and social media. This unprecedented initiative sought public input on

promoting English, reflecting the Ministry's desire to involve the Algerian community in the decision-making process. Even before the online poll closed, the MHESR demonstrated its commitment to promoting English by issuing a directive on July 21st, 2019. This directive required universities to include English alongside Arabic in official document headings. The subsequent poll results, announced by the former minister, were overwhelmingly positive, with a remarkable 94.3% of the 94,741 respondents (Appendix 2) favoring increased English usage. Capitalizing on this strong support, a national forum was held on August 1st, 2019, bringing together educators and specialists to discuss practicalities of integrating English into academic settings.

The MHESR continued fostering collaboration to ensure successful EMI implementation. On August 18th, 2019, universities were invited to recommend qualified linguists and researchers to contribute to the project (Appendix 3). This underscored the Ministry's commitment to harnessing expertise from the field. Further expanding the dialogue, an online survey launched on October 18th, 2019, sought valuable suggestions from the education community for the gradual integration of English (Appendix 3). The survey results, along with the appointment of a committee tasked with developing a procedural roadmap for the project, were made public on November 7th, 2019. These collaborative efforts culminated in a landmark achievement on December 17th, 2019. The Ministry published a final report outlining a comprehensive roadmap for enhancing English usage in Algerian universities (Appendix 4). This document detailed short, medium, and long-term plans and activities, reflecting the Ministry's strategic vision and unwavering commitment to successfully integrating English into higher education. This plan proposes an increase in both the coefficient (weighting) and teaching hours of the English module to three hours per week. Additionally, students now require a B2 level English language certificate for graduation and a minimum score of 11/20 (passing grade is 10/20) in the English module to qualify for a

master's program. Similarly, the plan proposes a 12/20 minimum score in English for baccalaureate (high school diploma) students. Further initiatives included establishing doctoral schools of English across Algeria and long-term plans to modernize English language teaching. These plans involve teacher training workshops, collaboration with English-speaking countries, and the ultimate goal of offering English to all undergraduate students. While still in their initial stages, the implementation of these plans remains uncertain. This research project presents an opportunity to address these uncertainties surrounding the status of English and its potential use as a Medium of Instruction (EMI) in Algeria.

Minister Kamel Beddari is building on the groundwork laid by his predecessor to further promote English in Algerian universities. A letter sent to universities outlined the Ministry's ambitious plan to train a large majority of professors (80% in science and technology, 100% in humanities, social sciences, and medical sciences) (Appendix 5). Universities with existing language learning centers or English departments are encouraged to leverage those resources for faculty training. The Ministry recognizes the need for broader support and has partnered with the National Commission for Distance Education to launch a digital platform accessible from February 2nd, 2023. This platform will provide English language training and support faculty in integrating English into their curriculum. Additionally, the plan emphasizes establishing training programs to equip teachers with the necessary English language skills, aiming for a B2 or C1 proficiency level. Minister Beddari is taking a bold step towards EMI in Algerian universities. On May 18th, 2023, he urged university chancellors to introduce English-taught subjects in Science, Technology, Engineering, and Math (STEM) disciplines starting next year. These courses will be led by instructors with a minimum B2 level of English proficiency (Appendix 6).

Recognizing the importance of ongoing development, Beddari also emphasized the need for continuous teacher training programs to ensure faculty remain skilled and effective in delivering high-quality education through English. Furthermore, two newly established National Higher Schools of Artificial Intelligence and Mathematics (launched in 2021) will offer entire programs through EMI. These institutions will provide students with a six-week intensive language training program before commencing their studies. This dual approach aims to enhance both the quality of learning and scientific research in Algeria (U.S. Embassy Algiers, 2021).

2.3.Implications of Various Theories for Enhancing EMI in Science Education

Algeria is shifting English from a specific foreign language in some scientific disciplines into the primary language of instruction across all university modules. A closer look at the status of English at the University of Annaba is presented in Table 01 (see below). This table summarizes information gathered from timetables available on the university website for the 2018-2019 academic year (Appendices 7-8). These resources offer a glimpse into how English language instruction is integrated within the university. Table 01 reveals that English is primarily offered as an additional module. The specific titles of these modules vary, ranging from "Scientific English" and "Terminology" to "Analysis of English Articles" and "General English." The ambitious plan to integrate English as a medium of instruction (EMI) in Algeria's higher education system is not without its challenges.

Table 1

English Module in Scientific Courses in Annaba Algerian University

University/ Faculty	Departments	Year	English module	Appendix
University of Annaba, Faculty of Sciences	Department of Biochemistry	3rd year bachelor	**Scientific English** Hours: 1:30 hours per week. Credits: 01 Coefficient: 01 Semester: 2	9 and 10
University of Annaba, Faculty of Sciences	Department of Biochemistry	1st year master	**Research Methodology and Scientific Writing and English** Hours: 1:30 hours per week. Credits: NA Coefficient: NA Semester: 1	11 and 12
			English Hours: 1:30 hours per week. Credits: NA Coefficient: NA Semester: 2	

El Chourouk newspaper reported on October 6, 2023 that the linguistic shift towards English in the higher education and scientific research sector, both in the pedagogical and research aspects, has imposed several challenges that are beginning to manifest themselves. This included the need for specialized experts who are proficient in English to ensure proper monitoring and follow-up of scientific production, as well as good arbitration of research. The Ministry of Higher Education and Scientific Research officially adopted English as the language of instruction beginning in the current academic year in several scientific and technological disciplines, as well as in humanities and social sciences. This followed training

in English for professors and doctoral students since the end of 2022, with 30,000 professors benefiting from the training in various ranks. Experts and academics believed that the biggest challenge lies not in teaching a third or second language, but in using English in scientific writing and academic publications. Researchers have been accustomed to conducting research and publishing in Arabic and French only, with English being used by a small number of students studying abroad at English-speaking universities. According to them, the challenge lies in the current linguistic shift in the higher education sector, specifically in scientific research, which requires precision and specificity compared to teaching. This necessitates experts and editors-in-chief of scientific journals who are proficient in English to handle research and arbitration effectively, and to motivate researchers to publish in this language. The Algerian researchers have strived to write their articles and research in English, sometimes resorting to translators or using smart applications or the famous search engine "Google" for translation. However, the lack of expertise among experts and reviewers in these journals has led to various issues, such as incorrect literal translations or even academic plagiarism from foreign websites and international journals. One Algerian researcher, for example, was found to have plagiarized nine articles written in English belonging to an Iraqi researcher, before being discovered in early September. The Scientific Research and Technology Directorate announced the withdrawal of the stolen articles from its platform, raising questions about the awareness of journal administrators regarding this linguistic challenge. In this context, El Chourouk opened this file with specialized professors. One professor at the University of El Oued, Redouane Chafo, believes that the issue of an Algerian researcher stealing articles in English warrants the activation of the penalties outlined in Decision No. 1082 dated December 27, 2020, which defines the rules related to preventing and combating scientific theft, with the researcher himself being responsible for it.

Section two : Tailored Course Design in Science Education

1. Conceptual Framework of Tailored Course Design

1.1. Definition :

According to Kumar & Refaei (2013) course design is defined as : "An ongoing process that demands continuous examination of its impact on participants' learning " (as cited in Alkathiri, 2021). This ongoing process is based on a thorough needs assessment. Similarly, Hutchinson & Waters (1987, p.21) define the term 'course design' as the creation of a course involving posing inquiries to establish a logical foundation for developing the syllabus, crafting materials, conducting classroom instruction, and assessing outcomes. This definition offers a comprehensive understanding of the concept of course design compared to other definitions.

Accordingly , course design and tailored course design are closely related yet with different aims, the latter, however, is crafted and designated to meet learners needs as cited by Hauge (2011) in Larsen's (2015) work , " Tailored courses are largely flexible and customized in relation to learning activities and individual experiences" (p. 9). Drawing attention both to its primary aim and nature, where the main role of instructors is to design or adopt a content, materials or activities corresponds to students needs including their abilities , styles preferences and interests .

1.2. Key components :

Tailored course design has become more relayed on in the last few years in the academic setting exclusively , compared to the traditional way since it targets immediately the lacks and the learning gaps of students. Its designing process, however, requires a set of components refers to different elements that must be taken into consideration when designing a course. Morrison et al (2004, p.9)claimed that :"The key components of tailored course design include learner analysis, content analysis, instructional strategies, and evaluation methods." Making it a systematic process, Certainly, Graves (2000) shed light on these

components in a form of a figure. Based on the figure in her study research , the tailored course design components can be summarized in terms of assessing needs, formulating goals and objectives, analyzing content, organizing the course, developing materials, designing an assessment plan, defining the context, and ultimately articulating beliefs, hence, the first component was called needs assessment, accompanied with questions were what are my student's needs? How can I assess them so that I can address them? Where the teachers mainly assess the points of strength and weakness of the individuals to formulate their goals and objectives and what competencies that learners should acquire by the end of the course. To elaborate , according to Graves , those components could be appear in order mainly as following :

A- Assessing needs : it involves systematically collecting and analyzing information about students' requirements and preferences, which informs decision-making for course design to effectively address those needs .When needs assessment is integrated into teaching practices on an ongoing basis, it allows students to evaluate their own learning progress, identify areas where they require support, and feel more responsible for their learning outcomes. This approach transforms learning into a collaborative process, encouraging communication and interaction between teachers and students as well as among students themselves (p.98).

When should one do needs assessment ? Needs assessment should be conducted at different stages of course development and implementation, including pre-course, initial, and ongoing phases. Each stage serves a specific purpose and provides valuable insights into learners' needs and preferences:

1. Pre-course Needs Assessment: Before the course begins, assess students' strengths, weaknesses, target needs, and learning preferences to inform decisions about course content, goals, objectives, activities, and materials.

2. Initial Needs Assessment: At the start of the course, gather similar information within the course context to understand students' needs and preferences as they begin their learning journey.

3. Ongoing Needs Assessment: Throughout the course, continuously monitor students' progress and the effectiveness of teaching methods and materials to make adjustments as needed in course content, materials, objectives, and teaching strategies.

Each type of needs assessment offers advantages and may involve direct, indirect, or informal assessment methods. By conducting needs assessments at various stages, teachers can ensure that their courses are responsive to learners' needs and promote effective teaching and learning experiences (p,110-111).

B- Formulating goals and objectives: goals serve as a method for articulating the primary aims and anticipated results of a course. Analogous to a journey, the goal represents the ultimate destination, while the course embodies the journey itself. The objectives act as the various checkpoints the designer encounters on the journey towards the destination (p.75). In addition, these objectives break down the overarching goal into manageable and instructive segments. Attaining these objectives is essential for reaching the ultimate goal; therefore, objectives should directly align with the goal. For instance, when initially defining goals for a course, a teacher set a goal stating, "Students will confidently engage in English conversations." One of the corresponding objectives included teaching students how to narrate stories effectively (p.76). She listed key principles for formulating effective goals and objectives in course design (p.75-76) which are :

• Goal Characteristics:

- Specificity with Clarity: Goals should be clear and focused, avoiding vagueness and jargon.

- Attainable Success: Goals should represent realistic achievements within the course timeframe and student capabilities. Break down overly ambitious goals if needed.

- Relevance to Course Content: Goals should directly connect to the material and activities included in the course.

- Measurable Progress: Goals should be phrased in a way that allows you to assess if the course successfully achieved them.

• Objective Characteristics:

- Detailed Steps: Objectives should be more specific than goals, detailing the steps students will take to reach the overall goals.

- Aligned with Goals: Each objective should directly contribute to achieving a specific goal. Imagine objectives as building blocks leading to the overall goal.

-Learning Focus: Objectives should emphasize what students will learn (e.g., writing a term paper) or the skills involved (e.g., outlining) rather than just the activity itself.

-Shorter-Term Focus: Objectives are more short-term milestones compared to the long-term vision of the goals.

- Quantity and Connection: this is about having more objectives than goals. One objective may contribute to achieving multiple goals.

- Focused Practice: Each objective should aim to develop a specific skill or knowledge area, avoiding overloading a single objective.

• Benefits and Considerations:

- Syllabus Framework: Goals and objectives provide a clear structure for your course syllabus. Objectives act as the building blocks for the entire syllabus.

- Evaluation and Assessment: Well-defined goals and objectives create a foundation for evaluating the course's success (goals) and measuring student learning (objectives).

- Learner-Centric Approach: Both goals and objectives should be phrased in terms of what the students will achieve, though you may have separate goals as an instructor.

- Multi-Layered Approach: Depending on your course length and complexity, you may utilize a layered structure for goals and objectives, with each layer progressively more specific.
- Purposeful Learning Journey: Formulating clear goals and objectives allows you to create a focused and purposeful learning experience for your students.

C- Conceptualizing content :it involves several aspects which are :

1.Assessing students' needs, identities, and course objectives to determine learning goals.

2.Making choices about what to include, prioritize, and exclude from the course material.

3.Structuring the content in a manner that facilitates understanding the connections between different components, aiding in setting objectives, selecting materials, determining the sequence, and evaluating progress (p,37-38).

Graves discussed the process of conceptualizing content in language teaching, emphasizing the importance of making deliberate choices about what to teach and how to organize it. According to her there are various categories for conceptualizing content in language teaching, such as linguistic skills, situations, topics/themes, genre, the four language skills : speaking , listening , reading , and writing :

- linguistic Skills: these encompass grammar, pronunciation, and vocabulary. This includes understanding how sounds are produced, grammatical structures, and the lexicon of the language.
- Topics/Themes: refers to the subjects or themes around which language is used. It could include personal topics like family or hobbies, professional topics related to one's profession, or sociocultural topics like education or politics.
- Situations: describes the contexts in which language is used, such as transacting business at a supermarket or socializing at a party.
- Four Skills (Speaking, Listening, Reading, Writing): These are the channels for using and understanding language. Each skill involves various subskills, such as turn-taking in

speaking, listening for gist in listening, predicting content in reading, and using appropriate rhetorical structure in writing.

- Genre: describes different types of texts or communicative events that serve specific purposes within a social context.

These categories explore how language elements are implemented into the course design, assessing if they are appropriately balanced to promote language learning effectively, and investigating the types of text to assess whether they align with the course objectives (p.44-48).

D- Organizing the course: organizing the course involves determining the underlying systems that harmonize the content and materials in alignment with the goals and objectives to provide the course with structure and coherence. This organization occurs at different levels: the overall course level, subsets of the course such as units, modules, or strands, and individual lessons. There are five intertwined processes involved in organizing a course are : establishing the guiding principles that steer the course, defining the units or modules based on these principles, arranging the sequence of units, determining the language and skills content within units, and structuring the content within each unit (p. 125).

E- Developing materials : course material development for teachers involves crafting, selecting, or modifying resources and activities. The aim is to equip students with the tools they need to accomplish the objectives, which ultimately lead them to achieving the course goals. (p. 150). Those are considerations needed in the process of choosing the materials explained by Graves :

1. Utilize students' prior knowledge to make activities relevant and engaging.
2. Encourage problem-solving and critical thinking skills in activities to keep students engaged.
3. Help students develop transferable skills and strategies for future learning.

4. Focus on language and skills necessary for real-life communication.

5. Integrate speaking, listening, reading, and writing skills to reinforce each other.

6. Provide authentic language use experiences for students.

7. Mix up roles and groupings within the classroom to offer diverse learning opportunities.

8. Use a variety of materials (visuals, print, audio, video, realia) to cater to different learning styles (p. 152-155).

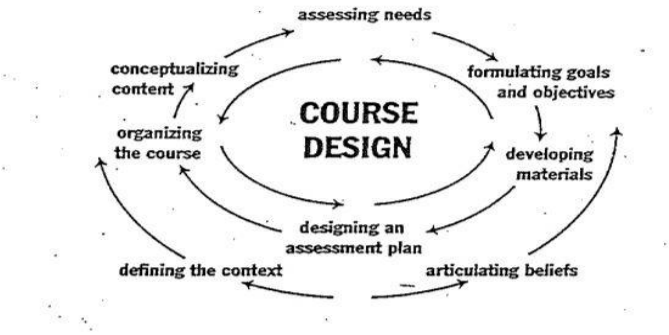
F- Evaluation : this involves evaluating different aspects of the course design, including goals, content, organization, materials, methods, and assessment plan. It can be done through systematic observation, feedback . Evaluation in course design is essential, encompassing both formative and summative approaches. Formative evaluation involves ongoing assessment by teachers and students to identify strengths and areas needing improvement. It empowers students, giving them a voice in their learning journey, and provides insights for refinement. Summative evaluation offers a comprehensive assessment of the course's achievements and informs decisions about its continuation and improvement. Every component of course design is subject to evaluation, ensuring alignment with objectives and meeting students' needs. Methods vary and include observation, feedback, questionnaires, and dialogue journals. Evaluation occurs at various intervals, guiding ongoing improvements and ensuring the course evolves to meet changing needs, promoting continuous improvement and student success. (p.207-215).

Dick et al . (2015) stated that :"Learner analysis is the process of identifying the characteristics, needs, and preferences of the target audience, which is essential for tailoring the course content and instructional strategies." (P. 72). Additionally, the content analysis and selection of the course materials is the next essential steps that may vary depending on the subject area, level of education, and the unique requirements of the target learner population e.g., quizzes, assignments, projects, presentations. In the same line of thought Gustafson and

Branch (2002) stated that "Content analysis involves breaking down the subject matter into manageable units, identifying the prerequisite knowledge and skills, and determining the appropriate scope and sequence of instruction." (P. 98). This serial manner, made them overlapped in a way or another. Thereafter, the Graves ’2000 figure presented these components in an interrelated processes that can be approached in a non-linear fashion according to the specific context and beliefs of the course designer.

Figure 3

A framework of Course development process



Note. Designing language courses: A guide for teachers. By Graves, K. (2000).

1.3. Theoretical Underpinnings and Approaches:

1.3.1.Theoritcal underpinnings :

When teachers need to tailor a course design or any instructional design, they rely on some foundational underpinnings such as behaviorism, cognitivism, and constructivism. These underpinnings guide the adaptation of teaching practices to meet the diverse needs of learners, accommodating their learning styles and preferences. Recognizing these variations informs how materials are selected and presented.

Behaviorism, championed by B. F. Skinner, focuses on using rewards and positive reinforcement to shape desired behaviors in learners. In contrast, cognitivism, with David Ausubel and Rob Forshay as key figures, emphasized the mental processes of learning, where learners actively use strategies to understand and remember new information. Finally,

constructivism, with Jean Piaget and Lev Vygotsky as leading theorists, highlighted how learners actively construct meaning from their experiences. In this view, learning is tailored to the individual and their environment, ensuring knowledge is connected to real-world contexts (Colborn, 2011). Understanding these diverse learning theories allows teachers to effectively meet the needs of all learners.

1.3.2.The Approaches:

Tailored course design incorporates various approaches aimed at customizing learning environment based on students' abilities and preferences to meet their needs. These approaches include:

1.3.2.1.Learner Centered Approach (LCA):

The traditional course design approach, teacher-centered, starts with determining the course content. Teachers decide what to teach, plan how to teach it, and then assess students' understanding of the material. This method relies on the teacher's direction and evaluates students based on how well they learn and recall the content (Schreurs & Dumbraveanu, 2014). However , there is now a shift from teacher-centered to learner-centered approaches. According to Graves (2000), course design is the process of creating or revising the syllabus and planning the course as a whole, highlighting the importance of a comprehensive approach to designing learning experiences (p. 4). A learner-centered approach, as emphasized by Grave, involves having students participate in formulating goals, choosing content, and selecting types of learning activities, which promotes active engagement and ownership of the learning process (p. 28).

LCA prioritize the creation of learning opportunities aimed at enhancing students' learning outcomes (Abdelmalak & Trespalacios, 2013). It entails shifting the focus to students, giving them more control in the classroom. They actively participate in discussions and activities, while teachers take on a guiding role. Instead of just listening and imitating,

students are encouraged to be active learners. This approach enhances the learning process, leading to improved student achievement and academic success. Though learner-centered approaches display diversity, they typically share certain characteristics depending on Kindervatter' perspective (1977) which are

l. Content and objectives are aligned with learners' needs and perspectives.

2. Methods encourage active participation and interaction of learners instead of passive information gathering.

3. Materials provoke and pose problems rather than providing straightforward answers.

4. Teachers assume the role of facilitators rather than traditional instructors.

5. Learning leads to new awarenesses and behaviors in learners' lives, not just cognitive development (p.3-4).

These characteristics emphasize the importance of adapting educational experiences to meet student's needs. Additionally, Brown (1995) discussed a skills-based approach, which addresses the four skills of listening, speaking, reading, and writing as the organizing principle for designing instructional activities (P. 69).Brown explains that the four skills serves as foundation for designing activities that facilitating language acquisition proficiency.

In addition Schreurs & Dumbraveanu (2014) stated that LCA focus on the expected student capabilities upon completing the course, commonly known as an outcome-based approach.

1.3.2.2.Outcome-Based Education Approach (OBEA):

Outcome-Based Education (OBE) is a framework that centers on achieving specific educational outcomes. It starts by defining the knowledge, competencies, and qualities students should have upon completing their education. Practitioners of OBE then design curricula and instructional systems to ensure all students can demonstrate these desired

outcomes. Unlike traditional programs, OBE is a systematic approach focused on achieving intended educational goals and outcomes (Spady, 1988). It is about establishing precise objectives for what students are expected to learn and achieve by the end of their education , then based on the outcomes , instructors design a courses and curriculum and teaching methods to make sure that this goals happen . So, this approach focuses on outcomes rather than just covering content . Spady (1994a) introduced four key principles of Outcome-Based Education (OBE) as cited in Abdul Karim & Khoo (2013):

1- Clarity of Focus about Outcomes: Teachers must clearly define what they want students to achieve. They should plan instruction to help students develop the necessary knowledge, skills, and attitudes to reach these outcomes. Teachers need to communicate their learning intentions to students and assess them based on these defined outcomes.

2- Designing Backwards: Curriculum design should start with a clear understanding of the desired learning outcomes students should achieve by the end of their education. Instructional decisions should then be made by working backward from these long-term goals, identifying the foundational learning components necessary for students to achieve these outcomes.

3- Consistent and High Expectations of Success: Teachers should set high standards for student performance to encourage deep engagement with the learning material. Success in learning reinforces further learning, builds confidence, and motivates students to tackle more challenging task .

4- Expanded Opportunity: Intellectual quality should be expected from all students, not just select few. While students may learn at different paces and in different ways, most can achieve high standards given appropriate opportunities. Students learn best when they are engaged in meaningful learning experiences that are relevant and important to them. Overall , these principles guiding instructors in tailoring a course design that encourage student success and achievement .

1.3.2.3. Problem-based Learning Approach (PBLA):

Problem-based learning (PBL) is an educational method where learning begins with a problem. The selection of the problem depends on the particular context, often focusing on real-life issues that have been adapted to meet educational goals and criteria (De Graaff & Kolmos, 2003). In this passage, the scholars define (PBL) as an approach or method that starts by presenting students with a real-world problem . Learners actively work to solve these problem by aligning them with their content.

Furthermore, Akcay (2009) referred to PBL as a notable example of a constructivist learning environment. It serves as a powerful method for inquiry-based learning, where students delve into authentic problems to explore what they need to know in-depth.

Akcay (2009) proposed three main characteristics (PBL) as :

- Involving students as active participants in addressing a problem scenario.
- Structuring the curriculum around a comprehensive problem, fostering students' learning in contextually meaningful and interconnected ways.
- Establishing a learning atmosphere where teachers mentor students' critical thinking and steer their investigative process, promoting deeper comprehension levels. Through these features, (PBL) engages students to solve problems,organizes curriculum around these problems and guides students to deeper understanding. The importance of this approach in tailored course design lies in the integration of real-world problems and aligning them with course content , thus helping students in understanding .

1.3.2.4. A Genre-Based Approach (GBA):

Swales (1990) defines genre as "a class of communicative events, the members of which share some set of communicative purposes" (as cited in Thompson, 1994). That means that genre refers to a type of communicative events that share similar purposes . Swales (1990) as cited in Thompson (1994) , further emphasizes that : "exemplars of a particular

genre share similarities in structure, style, content, and intended audience" . Thompson expands on Swales' definition by highlighting that each genre exhibits consistent patterns in structure, style, and content, which are tailored to their intended audience.

Genre analysis is a developing interdisciplinary method for examining verbal and written texts, integrating insights from Linguistics, Anthropology, Sociology, and Psychology. Researchers in this field seek out recurring patterns in grammar usage, essential vocabulary, and text organization across various text genres (Bradford-Watts, 2003, as cited in Abbaszadeh, 2013).

From these approaches, students first should be active participants in their learning process rather than passive to achieve specific educational outcomes. Then, they engage with the material and deepen their understanding by incorporating real-world problems into the classroom. When applying genre analysis, instructors need to understand the specific needs of students, particularly in scientific fields like biology. By analyzing course content from various perspectives, including grammar, structure, and vocabulary, instructors can identify students' biology-related needs. With this analysis, instructors can design appropriate materials and set specific objectives tailored to meet those needs.

To sum up, by understanding the theoretical underpinnings and the approaches help the teachers to make the decision about their courses which materials and methods are appropriate thus enhancing students success.

2 . Principles for Designing Courses to Meet Student Needs

2.1.Understanding student diversity and learning styles :

Diversity exists in every society and manifests in various aspects of our lives, including diversity in education. Therefore, diversity in education extends beyond exceptional needs, ethnicity, or language differences to include various aspects such as personalities, family backgrounds, and learning preferences. It is essential to acknowledge

that even students from seemingly homogeneous backgrounds have diverse learning styles. Embracing diversity involves creating an inclusive classroom environment where all students feel respected and valued for their contributions (Katz, 2012, p. 03). Because according to Grosser & de Waal (2006), inclusion entails recognizing the fundamental right of every child to receive education, acknowledging their capacity to learn, and understanding their individual needs for support. It involves valuing the uniqueness of each learner, which prompts educators to adapt their attitudes, teaching methods, assessment approaches, curricula, and surroundings accordingly. Moreover, educators must accommodate various learning styles to meet the diverse needs of learners. Just as students exhibit diverse personalities, they also demonstrate varying learning styles. For instance, consider how you memorize the names of new acquaintances. Do you find it easier to remember a name when it is written down? If so, you might be inclined towards visual learning, which involves better retention through seeing or reading. Conversely, if you remember names more effectively by hearing them, you may lean towards auditory learning. While everyone utilizes multiple learning methods, certain students excel more in specific approaches than others (Swisher & Schoorman, 2001, as cited in Slavin, 2018, p. 91) . People may have different preferences when it comes to learning styles, such as visual or auditory learning. However, when students use a combination of methods, they excel in certain approaches. After that , it is crucial to define the concept of learning style .According to Dunn & Dunn (1992; 1993; 1999) learning style refers to the way in which each learner begins to concentrate on, process, absorb, and retain new and difficult information (as cited in Dunn & Burke 2005, p. 2) . In addition, Dunn (1996) presented a similar perspective, defining learning style as a term used to describe how individuals prefer to engage with and absorb information, often influenced by factors such as class, grade, age, nationality, race, culture, or religion (p.01).

These definitions collectively outline learning style as the individualized approach through which people engage with and retain new information, taking into account various factors and involving complex cognitive processes. If there is diversity among students, it naturally entails variations in learning styles. As a result, educational psychologists have extensively researched and analyzed these differences, like the model proposed by David Kolb (1984), an American psychologist. Kolb categorizes learners into four main types:

1- Converges/Sensors prefer learning through intuition and sensitivity to feelings and atmosphere. They rely on experience and intuition and prefer to see, hear, and feel in order to learn.

2- Diverges/Watchers prefer learning through perception and observation. They enjoy activities such as lectures and demonstrations where they can observe.

3- Assimilators/Thinkers prefer logical analysis and creating understanding for themselves. Th$ey prefer reading theory and studying independently.

4- Accommodators/Doers prefer learning by trying things out and are willing to take risks. They favor practice over theory and enjoy activities such as projects, tasks, and discussions.

Teachers should expose learners to all styles to achieve successful learning outcomes, ensuring learners see, feel, think, and do to grasp knowledge effectively (as cited in Mary Grosser & Elda de Waal, 2006).

Another model to consider is the Dunn and Dunn Model, which encompasses 20 elements. These elements, once classified, illuminate how students are influenced by various factors such as:

1 - Environment (sound, light, temperature, seating design).

2 - Emotionality (motivation, task persistence, responsibility/conformity, structure).

2 - Sociological preferences (learning alone, in pairs, in a small group of peers, as part of a team, with an adult, with variety or routines).

3 - Physiological characteristics (perceptual strengths, time of day, need for intake, mobility while learning).

4 - Psychological processing inclinations (global/analytic, impulsive/reflective) (Dunn & Burke, 2005).

In the end, when designing a course, teachers should address these diversities.

2.2. Flexibility and Adaptability in Curriculum Development :

"Curriculum flexibility is conceptualized in terms of adaptability and accessibility of the curriculum to students' needs and capabilities" (Jonker et al., 2020). So, The curriculum has the ability to be modified to meet the diverse needs and capabilities of students.

A successful flexible learning system involves careful planning, design, development, evaluation, and implementation to create an environment that actively supports learning. It should be meaningful for both learners and stakeholders, offering accessibility, learner-centered design, affordability, efficiency, and a facilitated learning environment. Meaningful learning for learners is demonstrated through easy accessibility, a learner-centered approach, and success in meeting course goals. Instructors find meaning when learners actively participate and succeed, while support staff are satisfied when learners enjoy uninterrupted access to support services (Khan, 2006.p. 03). This passage discusses the components of a successful flexible learning system, aiming to ensure active support for learning and create an inclusive environment that caters to learners' needs and preferences.

Khan (2006) supports Nunan's (1996) claimed that flexibility in curriculum development enables curriculum developers to provide a variety of teaching approaches to accommodate the diverse needs of students (p.02) . This means that flexibility in curriculum development permits curriculum developers to present various methods of teaching and approaches to accommodate the diverse needs and preferences of students.

2.3. Integration of Student Feedback and Assessment Data

Assessment and feedback data refer to the systematic process wherein educators gather and collect information from students using various assessment and feedback strategies. This data collection aims to enhance students' learning outcomes and overall performance. AFT, NCME, & NEA ' Organizations (1990) reported that assessment in education encompasses methods aimed at gauging students' knowledge, attitudes, and skills, informing educational decisions, providing feedback, assessing teaching effectiveness, influencing policymaking, and evaluating curriculum sufficiency (as cited in Kellaghan & Greaney, 2001,p. 19). Feedback, on the other hand, is data provided by various entities such as teachers, parents, oneself, classmates, books, or experiences in reaction to a performance (Elsayed & Cakir, 2022).

In addition, Black & William (2009), as cited in Subheesh & Sethy (2019), identified that feedback plays a pivotal role in formative assessment, with three main functions: informing students about their current learning status, indicating their progress towards course objectives, and facilitating the alignment between their current learning state and the pathway to achieve course objectives. Therefore, understanding the specific assessment methods employed in educational settings is crucial, particularly in higher education (p.09).

According to Subheesh & Sethy (2019, p.6) in higher education ,two primary types of assessment are commonly recognized: formative assessment (FA) and summative assessment (SA). Irons (2008) stated that formative assessement involves tasks or activities aimed at providing students with feedback about their learning, without assigning a quantitative score used in final grading. Instead, it includes qualitative feedback from instructors to aid students in improving their understanding of course content .Summative assessement , however , deals with tasks or activities that yield a final grade or score for a course, based on students' performance(as cited in Subheesh & Sethy, 2019 ,P.6) .

There is an essential need to draw attention to the nature of both data assessment and feedback in the first hand, then moving to how instructors could integrate it in the educational settings . Assessment data gives a brief overview of student achievement, while feedback provides understanding of the factors contributing to that achievement. By combining both assessment data and feedback, educators can better comprehend student needs. This combined information helps instructors tailor their instruction to meet those needs effectively.

3. Strategies for Implementing Tailored Course Design in Science Education:

3.1. Differentiated Instruction Techniques :

In the classroom, students present pieces of a puzzle, each unique and distinct. The teacher, acting as the player, employs various techniques to piece together these diverse elements into one cohesive picture, utilizing differentiated instruction techniques to tailor their approach to individual student needs. Therefore, differentiated instruction involves tailoring teaching and learning approaches to address the diverse abilities of students within the same classroom. Its purpose is to optimize the growth and achievement of each student by providing personalized support based on their individual learning needs and progress (Hall et al., 2011, p. 2-3) .

Talminson & Moon (2013) stated that The essence of differentiation lies in effective instruction, which focuses on how teachers teach and how students experience learning. Instructional strategies are emphasized as more impactful than curriculum content in student learning . The goal of differentiation is to optimize each student's learning experiences to maximize academic growth, considering various indicators of development. Effective instructional practices, along with a well-designed curriculum, assessment, and classroom management, are crucial for achieving this goal. Differentiation involves tailoring instruction to meet individual student needs, including readiness, interests, and preferred learning approaches. Flexibility in classroom routines and student participation accommodates diverse

learning needs. In such cases, teachers adjust instruction to address individual and collective student needs effectively (P.9-10).

- Concerning readiness , it pertains to a student's proximity to specific learning objectives, rather than their inherent ability or learning capacity. It is comparable to an iceberg, where only a fraction is visible, while much remains unseen. However, we often misclassify students based on perceived ability, leading to misguided instruction. Planning based on readiness asks, "What does this student need to succeed?" This aligns with a growth mindset. Various instructional approaches address readiness, such as tiering, small-group activities, varied reading materials, learning contracts, and technology integration to support diverse learning needs. (P.10).
- Interest serves as a powerful motivator for learning, encompassing topics or skills that resonate with students' talents, experiences, or passions. A skilled teacher fosters student engagement by connecting curriculum content to their lives and aspirations. This connection occurs through various instructional methods, such as exploring diverse cultural perspectives, integrating subjects like mathematics with art or music, and allowing students to pursue personal interests within academic assignments. Instructional approaches like independent studies, interest centers, and authentic assessments further support this connection between required content and student interests.(10-11).
- Learning profiles : This approach acknowledges that students may excel using various strategies across different subjects or tasks. Instead of categorizing students based on assumed learning preferences, educators should prioritize offering diverse learning opportunities. Techniques like RAFTs, learning contracts, and flexible group work

options are effective in accommodating diverse learning profiles and enhancing learning outcomes.(P.11).

- Regarding flexible Grouping and Respectful Tasks :The principles are essential for effective instructional differentiation. Flexible grouping involves planning to ensure that students have diverse opportunities to work with peers of varying readiness levels, interests, and learning approaches. This helps students appreciate their own strengths and needs as well as those of others, while preventing them from labeling themselves or others. Respectful tasks ensure that every student encounters engaging and challenging work that reflects the teacher's belief in their abilities as critical thinkers capable of addressing complex problems.(P.12).

The differentiated instruction is important because its helps instructors adapt teaching method to fit each student's needs in readiness, interests ,and learning profiles thus making learning process more effective.

In addition to employing differentiated instruction techniques to address individual student needs, teachers can adapt various components of instructional differentiation. According to Tomlinson and Moon (2013, p.12), there are five components:

1/ Content, which pertains to what students must learn or how they access knowledge and skills.

2/ Process, referring to the methods through which students acquire and internalize knowledge and skills.

3/ Product, which involves how students demonstrate their learning.

4/ Affect, representing the overall learning environment and interactions among students and teachers.

5/ Learning environment, encompassing the personal, social, and physical setup of the classroom.

All of these elements can be tailored to accommodate students' readiness levels, interests, and learning preferences.

3.2. Incorporation of Real- World Applications and Examples :

To enhance students' understanding and success in their academic endeavors, teachers bring reality into the classroom, seamlessly blending practical and theoretical learning. By doing so, students can better grasp complex concepts and excel in their academic pursuits. When teachers incorporate real-world applications into their courses, they are engaging in what is known as real-world learning. Therefore, Real-world learning involves students actively engaging with and making a meaningful impact on their surroundings. The objective is for students to encounter authentic learning experiences by directly interacting with real-world environments, completing tasks, and solving problems (Maxwell & Stobaugh, 2015).Similarly , by incorporating real-world applications and examples, it leads to the enhancement of the authenticity of student learning where Authentic learning typically focuses on real-world, complex problems and their solutions (Lombardi, 2007,p.02). Additionally, in an authentic learning environment, when learners perceive a high level of authenticity in their learning experiences, they are better able to directly relate their acquired knowledge and experiences to real-life situations (Park et al., 2011). Incorporating real world application and examples , closely aligns with context-based education , this approach helps students see and appreciate more clearly links between the science they studied and their everyday lives (Hofstein et al., 2000 as cited in Donna King & Stephen M. Ritchie, 2012). It means that when students connect their courses or lessons, especially in the science field, to the real-world context or their experiences, and when teachers integrate real-world examples into their lessons, it facilitates the comprehension of complex information. Therefore, this approach contributes to a more effective learning experience for both educators and learners. This approach was designed to enhance the relevance of subject matter for students. In

implementing such programs, structured learning materials included examples of real-world applications, everyday experiences, laboratory experiments, and targeted problem-solving tasks. These elements were incorporated to illustrate the connections between theoretical concepts and their practical contexts, thus emphasizing the relationship between concepts and their real-world application (Gilbert, et al., 2011).

Conclusion :

This chapter presents a theoretical background on the research variables. It was divided into two sections. The first section was dedicated to providing an overview of EMI in higher education , and theoretical frameworks for curriculum development in Algeria. However, the second section centered on tailored course design in science education, including the conceptual framework of tailored course design ,the principles and strategies used for its implementation in science education .

Chapter Two : Research Methodology ,Results and Discussion of Findings

Introduction

This chapter bridges between the theoretical framework and the practical methodology of the study conducted. Its goal is to provide a clear and detailed description of this research , including the methods employed, criteria for sample selection, and research instruments utilized. Furthermore, it covers the different adopted procedures used to answer the research questions and highlighting the findings .The present study seeks to investigate the integration of English as a current medium of instruction through tailored courses to fit students' needs in the Department of biology and the challenges that they face as a result from the implementation of this trend .This chapter describes the data analysis frameworks and study design , because after exploring the elements discussed previously in the literature review , data collection, analysis and discussion are fundamental procedures that should be followed in order to answer the research questions.

1.Section One : Research Methodology Design :

This research adopts an exploratory approach to investigate the integration of English-Medium Instruction (EMI) in teaching a fundamental chemistry unit to first-year biology students at Echahid Chiekh Larbi Tébessi University. To ensure a comprehensive exploration of this complex phenomenon, a mixed-methods approach has been chosen as the methodology for data collection and analysis. This methodological choice is grounded in the need to triangulate findings from quantitative and qualitative data sources, thereby enhancing the validity and reliability of the study.

The mixed-methods approach combines the strengths of both quantitative and qualitative methods. Quantitative data are primarily collected through a mixed questionnaire designed specifically for this study. This questionnaire is structured to align with the research questions and aims to capture a broad understanding of students' perceptions and experiences with EMI in their biology education context.

Qualitative data collection involves a rigorous content analysis of selected chemistry course materials and exercises. This method allows for an in-depth examination of how course content is aligned with EMI objectives and identifies any potential gaps in the existing curriculum. In instances where the content analysis reveals incomplete insights, structured interviews are conducted to gather additional qualitative data and to provide context that complements the quantitative findings.

Qualitative data are analyzed using qualitative content analysis techniques. This approach provides depth and context to the statistical findings derived from the questionnaire, facilitating a nuanced exploration of how tailored course design strategies can effectively mitigate challenges associated with EMI implementation in the specific context of first-year biology education.

2. Section Two : Students 'Questionnaire :

This section is devoted to describe the Students ' questionnaire. The form of the questionnaire, its population and its sample will be clearly identified through this section. It is also devoted to analyze the results and interpret the data.

2.1.The Description of the Questionnaire:

A mixed questionnaire was designed to collect data about the current medium of instruction through tailored courses to fit students' needs in Biology department and exploring the challenges that the students encounter in their learning situation (Appendix 9) . In addition , the questionnaire aims to acknowledge the students 'opinions in terms of the materials needed to enhance their English proficiency in Chemistry unit. Each item in the questionnaire is written in English and translated into Arabic to ensure that respondents clearly understand the questions. Accordingly, data collected through the questionnaire administered to the department of Biology, after getting permission from both the English and the Biology departments (Appendix 10). Section One gathers background information

like age, gender, and English proficiency, then dives into their experiences with English in biology courses. In section two, The survey gauges their confidence, explores difficulties they face, and asks their preferred language of instruction (English vs. French) for biology classes. Finally, section three focuses on their ideal learning materials and support for an English language course designed to strengthen their academic progress .

2.2.Sampling Strategy:

The study focuses on approximately 400 first-year biology students at the Department of Biology, Echahid Chiekh Larbi Tébessi University, Faculty of Exact Sciences, Natural and Life Sciences, during the academic year 2023-2024. A sample of 150 students was selected to participate in the study.

The sampling method employed was purposive sampling, specifically targeting the chemistry module due to its fundamental nature (coefficient 3). This module was chosen because of its importance in the first-year curriculum and its relevance to the research objectives.

To ensure the sample's representativeness, the stratified random sampling technique was used. First-year biology students were divided into two sections, each further divided into eight groups, resulting in a total of sixteen groups with approximately 25-27 students per group. From these groups, six were randomly selected to participate in the study, totaling 150 students. This approach ensured that the selected sample adequately represented the entire population of first-year biology students at the university.

Additionally, a probability strategy was integrated into the sampling process to ensure each elementary unit had an equal chance of being selected. Random drawing was used to select the final six groups out of the sixteen, further enhancing the credibility and fairness of the study's sampling approach.

2.2.1.Validity and Reliability of the Questionnaire:

The validity and reliability of the Students ' questionnaire is determined by our supervisor and other teachers as part of a pilot study before the actual administration to evaluate its internal reliability.

2.3.Analysing the Results of the Students 'Questionnaire:

For the analysis of the data gathered from the questionnaire, the results are highlighted by means of tables which make the results visible with their percentage. We proceeded in the calculation of the percentage using the Statistical Package for the Social Sciences (SPSS) in which we have entered the necessary information, then we get the results in a form of tables.

The initial study sample consisted of 150 participants. However, upon data entry in SPSS, it was discovered that 10 questionnaire response sheets were invalid due to incomplete responses to most of the questions. Consequently, these were excluded, resulting in a final sample size of 140 participants.

Section one: Background Information :

1.

A. Age of the sample :

Table 2

Age of the Sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-22	136	97.0	97.0	97.0
	23-27	4	3.0	3.0	100.0
	Total	140	100.0	100.0	

The table shows that the vast majority (97.0%) of the individuals fall within the 18-22 age range, while only a small percentage (3.0%) fall within the 23-27 age range.

B. Gender of the sample :

Table 3

Gender of the Sample.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	121	86.6	86.6	86.6
	Male	19	13.4	13.4	100.0
	Total	140	100.0	100.0	

The gender distribution of this student group leans heavily towards females, with 86.6% of students identifying as female and only 13.4% identifying as male.

- **Age of the sample X Gender of the sample:**

Table 4

Relational Table between the Age and the Gender of the Sample.

		Age of the sample			
		18-22	23-27	28-32	Older
Gender of the sample	Female	98.3%	1.7%	0.0%	0.0%
	Male	88.9%	11.1%	0.0%	0.0%

An interesting trend emerges when analyzing the relationship between age and gender in this student sample. The data reveals a higher concentration of females (98.3%) within the 18-22 age group compared to males (88.9%). This suggests that a larger portion of the

younger student population identifies as female. Conversely, the trend flips in the 23-27 age group, where a significantly higher proportion identifies as male (11.1%) compared to females (1.7%). It is important to note that the data shows zero females in the 28-32 age group, but the small sample size in this category makes it difficult to draw definitive conclusions.

2- How would you describe your level in English language? X Age of the sample X Gender of the sample :

Table 5

Cross tabulation of the English Language Level between the Age and the Gender of the Sample.

				Age of the sample			
				18-22	23-27	28-32	Older
How would you describe your level in English language?	Average	Gender of the sample	Female	90.7%	0.0%	0.0%	0.0%
			Male	9.3%	0.0%	0.0%	0.0%
	Good	Gender of the sample	Female	75.0%	50.0%	0.0%	0.0%
			Male	25.0%	50.0%	0.0%	0.0%
	Very good	Gender of the sample	Female	66.7%	0.0%	0.0%	0.0%
			Male	33.3%	0.0%	0.0%	0.0%

	Excellent	Gender of the sample	Female	0.0%	0.0%	0.0%	0.0%
			Male	0.0%	0.0%	0.0%	0.0%

This cross tabulation table paints a nuanced picture of how gender, age, and self-reported English language proficiency interact within the student population. An interesting trend emerges when looking at gender. Females across all age groups are more likely to report their English skills as "average" or "good" compared to males. This could indicate a tendency for females to be more critical of their abilities, even if their actual proficiency is like males. There also seems to be a connection between age and confidence among females. Younger females (18-22) are more likely to rate their English as "good" or "very good" compared to older females. This might suggest that recent English language learning experiences for younger students boost their perceived proficiency.

It is important to acknowledge some limitations in the data. There is a complete absence of information for males in the "excellent" category and for females in the older age groups. This could be due to a lack of students in these categories or a data collection issue.

3- How often do you use English in your daily life? X Age of the sample X Gender of the sample :

Table 6

Cross tabulation of the Frequency of using English in Daily life between the Age and the Sample of the Sample.

	Age of the sample			
	18-22	23-27	28-	Older

						32	
How often do you use English in your daily life?	Rarely	Gender of the sample	Female	100.0%	0.0%	0.0%	0.0%
			Male	0.0%	0.0%	0.0%	0.0%
	Occasionally	Gender of the sample	Female	82.1%	0.0%	0.0%	0.0%
			Male	17.9%	100.0%	0.0%	0.0%
	Frequently	Gender of the sample	Female	87.5%	0.0%	0.0%	0.0%
			Male	12.5%	0.0%	0.0%	0.0%
	Biology Education	Gender of the sample	Female	88.2%	100.0%	0.0%	0.0%
			Male	11.8%	0.0%	0.0%	0.0%

This cross tabulation table unveils interesting connections between gender, age, English language use, and the context of Biology education. A striking gender difference emerges when looking at English usage frequency. All females (100%) in the 18-22 age group report rarely using English daily, and this pattern seems to hold true for older females as well. In contrast, males appear to use English more frequently, with some males in all age groups reporting occasional or frequent use. It is important to explore the reasons behind this disparity. Perhaps the females in this sample received most of their prior Biology education in their native language, leading to less need for daily English use in this domain. Cultural or social factors influencing how often females use English compared to males in this age group could also be at play. Interestingly, when it comes to "Biology Education" specifically, both genders show a shift. Here, both females (88.2%) and males (11.8%) report frequent English

use. This suggests that regardless of their prior reported usage, students recognize the importance of English within the Biology education context.

4- In what contexts do you currently use English? X Age of the sample X Gender of the sample :

Table 7

Cross tabulation of Contexts in Which the Sample use English.

				Age of the sample			
				18-22	23-27	28-32	Older
In what contexts do you currently use English?	Academic settings	Gender of the sample	Female	88.9%	0.0%	0.0%	0.0%
			Male	11.1%	100.0%	0.0%	0.0%
	Social settings	Gender of the sample	Female	80.0%	100.0%	0.0%	0.0%
			Male	20.0%	0.0%	0.0%	0.0%
	Professional settings	Gender of the sample	Female	100.0%	0.0%	0.0%	0.0%
			Male	0.0%	0.0%	0.0%	0.0%
	Others	Gender of the sample	Female	85.7%	0.0%	0.0%	0.0%
			Male	14.3%	0.0%	0.0%	0.0%

This cross tabulation table paints a fascinating picture of how gender and age influence the contexts in which students use English. A clear trend emerges when looking at females. Across all age groups, they report using English primarily in academic settings (88.9% - 100%). This suggests their exposure to English likely comes from their studies. In contrast, males report very limited English use across all other contexts (social, professional, others). This could indicate that males enter the program with lower baseline English proficiency or have less need to use English outside of academic settings. There might also be age-related trends. Younger females (18-22) report using English in social settings (80%) more than older females. This pattern could suggest a decrease in social English use as they progress through the program, or perhaps a difference in how social interaction happens across age groups.

It is important to acknowledge some limitations in the data. The complete absence of data for males in most contexts makes it difficult to draw definitive conclusions about their English use patterns. It is unclear if these limited responses are due to a lack of students in these categories or a data collection issue.

Specification for Q4 : Analysis of the 'other' responses in the questionnaire about the other contexts which they currently use English in are revealed in variety of specifications such as **:** I use Arabic and English almost equally , في الدراسة البيولوجية ...etc.

Section two :

5.

Table 8

The percentage about if the Sample Studied Biology in English Before.

Have you previously studied biology in English?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	96	68.7	68.7	68.7
	Yes	44	31.3	31.3	100.0
	Total	140	100.0	100.0	

As can be seen from the table, a majority (68.7%) of the students have not studied biology in English before. This suggests that a significant portion of the class might require additional support with scientific English language terminology.

6.

Table 9

The Confidence Level of Understanding and Communicating in English of the Sample.

How confident do you feel in your ability to understand and communicate in English?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not confident at all	21	14.9	14.9	14.9
	Somewhat confident	119	85.1	85.1	100.0
	Total	140	100.0	100.0	

This data sheds light on your students' confidence levels in using English for scientific communication. A significant portion (14.9%) of students' report feeling "Not confident at all." This highlights the need for strong scaffolding and support in the course to ensure all students can effectively participate and learn Biology concepts. Most students (85.1%)

express "Somewhat confident" . This suggests that while they might have a basic grasp of English, they could benefit from activities and resources that boost their confidence and fluency in the scientific context of Biology. Considering these factors can inform the course design in several ways. Strive for clear and concise explanations of Biology concepts, using visuals and real-world examples to enhance understanding. Integrate activities and resources that explicitly target scientific vocabulary relevant to the biology unit. Additionally, consideration of offering various assignments or activities that cater to different confidence levels, providing additional support for students who are less confident. Finally, fostering a safe learning environment where students feel comfortable asking questions and making mistakes without judgment is crucial.

7.

Table 10

Sample 's motivation Level towards improving their English Proficiency Specially in their Biology Studying.

How motivated are you to improve your English proficiency specifically for studying biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not motivated	8	5.8	5.8	5.8
	Somewhat motivated	36	26.2	26.2	32.0
	Very motivated	96	68.0	68.0	100.0
	Total	140	100.0	100.0	

The table above shows that a large majority of students (68.0%) are very motivated to improve their English proficiency specifically for studying biology. This suggests a strong desire among students to develop the language skills necessary for success in their biology studies. There is also a significant portion of students (26.2%) who are somewhat motivated, indicating a general understanding of the importance of English proficiency in biology. However, a small number of students (5.8%) are not motivated. Overall, the findings suggest a positive trend in student motivation towards improving their English language skills for biology studies. This highlights the importance of providing adequate support and resources to help students achieve their goals.

8.

Table 11

Sample 's Opinions about the Importance of English Proficiency in Studying Biology.

Do you believe that English proficiency is important for studying biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	17	11.9	11.9	11.9
	Yes	123	88.1	88.1	100.0
	Total	140	100.0	100.0	

Even though a vast majority of students (88.1%) acknowledge the importance of English proficiency for studying Biology, a small minority (11.9%) disagrees. This might be because they have studied Biology with limited English before, perhaps through translated materials or a program in their native language. It is also possible they have some misconceptions about the role of English in the program.

9. Analysis of the 'other' responses in the questionnaire about the importance of English in studying Biology are revealed in variety of specifications such as **:** Because all researches and studies are in English , لأنها اللغة الأولى عالميا, parceque c'est une langue demamdée dans le monde et qui profite à l'étudiant dans son parcours professional …etc.

10. What are the difficulties you may encounter by using English?

Table 12

Sample 's difficulties Towards using English.

Q9 Frequencies

		Responses		Percent of
		N	Percent	Cases
What are the difficulties you may encounter by using English	Understanding technical vocabulary	37	14.5%	35.9%
	Grammar	61	23.8%	59.2%
	Comprehension	60	23.4%	58.3%
	Others	98	38.3%	95.1%
Total		256	100.0%	248.5%

The table reveals that students face a multitude of challenges when using English. While there is no single most prevalent difficulty, some areas stand out:

- **Understanding Technical Vocabulary (14.5%)**: Grasping scientific terminology can be a challenge , highlighting the need for targeted vocabulary development.
- **Grammar Challenges (23.8%)**: Mastering English grammar is a common difficulty for non-native speakers, and the course can provide support in this area.

- **Comprehension Difficulties (23.4%)**: Understanding the subtleties of English, especially in complex scientific texts, can be challenging. The course can help students develop stronger comprehension skills.

Interestingly, a significant portion of students (38.3%) indicated "Others" as a difficulty. This likely encompasses a wider range of challenges such as pronunciation, fluency, and broader vocabulary development beyond just scientific terms.

Specification Q10

11.

Table 13

Sample 's Degree of Understanding Biology Concepts in English.

How would you rate your understanding of biology concepts?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	16	11.9	11.9	11.9
	Fair	105	74.6	74.6	86.6
	Good	19	13.4	13.4	100.0
	Total	140	100.0	100.0	

This data offers valuable insight into how the students perceive their understanding of Biology concepts. A significant portion (74.6%) rate their understanding as "Fair." This suggests that while they may have some foundational knowledge, they likely need additional support and clarification to solidify their grasp of the material. On either end of the spectrum, a smaller group of students (8%) feel their understanding is "Poor," indicating they might require substantial foundational support in Biology. Conversely, another smaller group (13.4%) rate their understanding as "Good."

12.

Table 14

Sample 's Confidence of Understanding towards some Areas in Biology.

Are there any specific areas within biology where you feel less confident in your understanding?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Molecular Biology	62	44.8	44.8	44.8
	Animal Biology	30	20.9	20.9	65.7
	Genetics	30	20.9	20.9	86.6
	Others	18	13.4	13.4	100.0
	Total	140	100.0	100.0	

This data highlights the specific areas within Biology where students feel less confident. The largest percentage of students (44.8%) report feeling less confident in Molecular Biology. This is followed by Genetics (20.9%) and Animal Biology (20.9%). The remaining students (13.4%) indicated a lack of confidence in other unspecified areas of Biology.
By understanding these areas of weakness, it can tailor the course content and provide additional support to address these specific topics.

Specification for Q12 .

13.

Table 15

Sample 's challenges to Grasp in English Scientific terms and concepts.

Are there any specific scientific terms or concepts that you find challenging to grasp in English?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	14	10.4	10.4	10.4
	Yes	126	89.6	89.6	100.0
	Total	140	100.0	100.0	

From the table above, a significant portion of students (89.6%) seem comfortable with scientific terms in English. However, a minority (10.4%) does find them challenging.

14.

Table 16

Sample 's Choice of the current Language used for Instructing Chemistry Unit.

What is the current language used for instructing Chemistry unit?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Arabic	19	13.4	13.4	13.4
	Frensh	4	3.0	3.0	16.4
	English	117	83.6	83.6	100.0
	Total	140	100.0	100.0	

This data shades a light on the language used for instruction in the Chemistry unit. Most students (83.6%) receive instruction in English. This suggests that course materials, lectures, and discussions likely happen primarily in English.

It is important to note that a small percentage of students receive instruction in Arabic (13.4%) and French (3.0%). This might indicate a multilingual classroom environment.

15. (117 samples out of 140 answered this question) :

Table 17

The Frequency of Using English inside the Classroom.

If English, please indicate the extent to which is frequently used inside the classroom?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	3.0	3.1	3.1
	Rarely	25	11.9	12.3	15.4
	Occasionally	32	35.8	36.9	52.3
	Often	31	34.3	35.4	87.7
	Very frequently	25	11.9	12.3	100.0
	Total	115	97.0	100.0	
Missing	System	2	3.0		
Total		117	100.0		

The data reveals a range in how frequently English is used for instruction. A significant portion of students (34.3%) report English is used "Often," while another group (35.8%) indicates it is used "Occasionally." This suggests that the amount of English used might vary

depending on the specific lesson or activity. It is important to note that only a very small percentage of students report English is "Never" (3.0%) or "Rarely" (11.9%) used in the classroom. There are also a few students (2) with missing data for this question. Overall, this data indicates that English is generally the primary language of instruction in your Chemistry class.

16.

Table 18

Sample 's Comfort towards either being taught in English or French.

Do you feel more comfortable being taught by English rather than Frensh?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	40	28.4	28.4	28.4
	Yes	100	71.6	71.6	100.0
	Total	140	100.0	100.0	

The data reveals a clear preference for English instruction over French. A large majority of students (71.6%) feel more comfortable being taught in English. This could be due to several factors, such as a stronger foundation in English compared to French, English being the primary language of scientific communication in Biology, or perhaps more positive experiences with English language learning. There is a minority of students (28.4%) who feel more comfortable with French instruction. Their reasons might include French being their native language or a language they are more proficient in, or perhaps positive prior learning experiences in French.

17.What specific language barriers do you face when studying fundamental chemistry unit in English?

Table 19

Sample 's Language Barriers when Studying Fundamental Chemistry Unit in English.

		Responses	
		N	Percent
Barries	Reading	88	19.10%
	Listening	85	18.60%
	Grammar	69	11.80%
	Speaking	69	11.80%
	Writing	69	11.80%
	Pronunciation	65	11.10%
	Vocabulary	38	6.50%
	All Above	/	/
Total		583	100.0%

It is clearly obvious from the table; students face a multitude of language barriers when studying fundamental chemistry in English. There is not a single most common difficulty, but a significant portion of students struggle with all the listed areas (Reading, Listening, Grammar, Speaking, Writing, and Pronunciation). This suggests that challenges encompass understanding written and spoken English related to chemistry, as well as producing clear and grammatically correct English when discussing chemical concepts. While vocabulary is a

concern for some (6.50%), the data highlights the broader challenge of comprehending and using English effectively in the context of chemistry.

18.

Table 20

Sample's Choice about if Chemistry unit should be taught in English by Biology Teachers or specialized Teachers.

Do you think that the chemistry unit should be taught in English by biology teachers?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	58	41.8	41.8	41.8
	Yes	80	56.7	56.7	98.5
	Others	2	1.5	1.5	100.0
	Total	140	100.0	100.0	

The data reveals a divided opinion on whether biology teachers, presumably teaching in English, are the best fit for the chemistry unit. A slight majority of students (56.7%) are comfortable with this approach. This might be because they trust their biology teachers' ability to explain scientific concepts effectively in English, perhaps due to training in English as a Medium of Instruction. However, a significant portion of students (41.8%) disagree. Their concerns might stem from potential gaps in the biology teachers' chemistry expertise. Students might prefer dedicated chemistry teachers who are well-versed in the specific terminology and curriculum of the subject. There were also a small number of students (1.5%) with other responses, which could offer valuable insights but require further analysis.

Specification Q18 .

19. Ranking skills from the weakest to strongest :

Table 21

Sample 's Ranking of Language Skills from the Weakest to the Strongest .

Q18 Frequencies

		Responses		Percent of
		N	Percent	Cases
Ranking[a]	Grammar	38	27.5%	27.5%
	Vocabulary	12	7.8%	7.8%
	Listening	18	12.7%	12.7%
	Speaking	17	11.8%	11.8%
	Reading	21	14.7%	14.7%
	Writing	17	12.7%	12.7%
	Pronunciation	17	12.7%	12.7%
Total		140	100.0%	100.0%

From the extracted data of the previous table we can rank the skills as shown below:

Table 22

Order of Language Skills.

Rank	Skill	Percent
1	Vocabulary	7.80%

2 (tie)	Listening	12.70%
2 (tie)	Speaking	12.70%
2 (tie)	Writing	12.70%
2 (tie)	Pronunciation	12.70%
5	Reading	14.70%
6	Grammar	27.50%

The later table shows an interesting trend in skill levels. Vocabulary appears to be the area needing the most improvement, with only 7.8% of respondents ranking it as their strongest skill. Following Vocabulary is a group of skills that seem to be at a similar level: Listening, Speaking, Writing, and Pronunciation. Each of these areas was ranked as the strongest by around 12.7% of the respondents. This suggests that students may have similar levels of proficiency in these areas of communication. Reading comprehension shows a slight edge over the communication skills group, with 14.7% ranking it as their strongest skill. This could indicate that students find understanding written English in this context slightly easier than expressing themselves through speaking or writing. Finally, Grammar stands out as the strongest skill, with a significantly higher percentage (27.5%) of respondents ranking it highest. This suggests that students may have a relatively strong foundation in grammar compared to the other assessed areas.

20.

Table 23

Sample's Expectations towards English Tailored Courses in Biology.

What do you expect to gain from this English language course tailored for biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved communication skills	60	43.3	43.3	43.3
	Better understanding of scientific texts	38	26.9	26.9	70.1
	Enhanced academic writing abilities	38	26.9	26.9	97.0
	Others	4	3.0	3.0	100.0
	Total	140	100.0	100.0	

Students enrolled in this English language course tailored for biology expect a variety of benefits, with the most frequent expectation being improved communication skills (43.3%). This suggests a strong desire to be able to communicate scientific concepts and ideas more effectively. In addition, a significant number of students are looking to gain a better understanding of scientific texts (27%) and enhance their academic writing abilities (27%). These findings highlight the importance of courses that can equip students with the specific English language skills necessary for success in biology.

Specification Q20 .

21.

Table 24

Sample 's Goals from Tailored Courses.

What specific goals do you aim to achieve through this course?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improving academic writing	49	35.0	35.0	35.0
	Presenting research in English	48	34.0	34.0	68.9
	Understanding scientific literature	40	29.1	29.1	98.1
	Others	3	1.9	1.9	100.0
	Total	140	100.0	100.0	

These results suggest that a significant portion of students are seeking to develop the communication skills necessary to effectively write about and present scientific findings. In addition, a considerable number of students (29.1%) are interested in improving their understanding of scientific literature.

Specification Q21 (see appendix)

22.

Table 25

Sample 'Motivated Aspects to Enroll in English Language Tailored Courses for Biology.

What motivated you to enroll in this English language course tailored for biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Requirement for program	46	33.0	33.0	33.0
	Improve academic performance	42	30.1	30.1	63.1
	Enhance research skills	50	35.9	35.9	99.0
	Other	2	1.0	1.0	100.0
	Total	140	100.0	100.0	

This data unveils a fascinating mix of reasons behind student enrollment. The most prominent motivation (35.9%) is a desire to enhance research skills. This suggests many students might be aiming for careers in scientific inquiry, planning to participate in research projects, or potentially preparing for graduate studies. Another significant group (30.1%) is looking to improve their academic performance in biology. This could translate to better grades, a deeper understanding of the subject matter, or increased confidence in their biology studies. Interestingly, a substantial portion of students (33.0%) are enrolled because the course fulfills a requirement for their biology program. This highlights the importance of ensuring the course content aligns with the specific needs and learning outcomes of the program.

Specification Q22 .

Section three :

23.

Table 26

Sample ' Choices of Materials 'Types which should be included in the Course.

What type of materials do you think the course should include?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Text book, equipment manuals, CDs, CVCs, video tapes, multimedia projectors	34	24.3	24.5	24.5
	Work forms Charts and samples of relevant course assignment and students papers	18	12.6	12.7	37.3
	Combination of all of this	87	62.1	62.7	100.0
	Total	139	99.0	100.0	
Missing	System	1	1.0		
Total		140	100.0		

The data reveals a clear preference for a comprehensive approach to course materials (62.1% favoring a combination of all options). This suggests students value a well-rounded learning experience that caters to different learning styles. The most popular option involves

a combination of traditional materials like textbooks, equipment manuals, and worksheets/charts with samples, alongside multimedia tools such as CDs, CVCs, videotapes, and projectors. While smaller groups of students (around 24% and 12%) show preference for a more traditional approach with textbooks, manuals, and worksheets, the overall data suggests a strong desire for a variety of resources.

Specifications for Q24 : Suggestions : Analysis of the 'other' responses in the questionnaire about the types of materials should be used in the course are revealed the variety of specifications such as : Laptop and modern scientific calculator , Data show , اللوحات الالكترونية , حصص اضافية للدعم …etc.

Specifications for Q25: Suggestions : Analysis of the 'other' responses in the questionnaire about types of resources would be helpful in enhancing their comprehension level in chemistry are revealed the variety of specifications such as : Posters , textbooks and traditional materials , الشرح من خلال مخططات واسهم, تمارين تفاعلية ومقاطع فيديو …etc.

Specifications for Q26 : Suggestions : Analysis of the 'other' responses in the questionnaire about if there anything should the researchers know (special needs, learning difficulties, medical conditions or other factors which may affect your learning journey) are revealed the variety of specifications such as : lack of materials , medical conditions like migraine headache , no الحمد الله , صعوبة فهم بعض المصطلحات العلمية باللغة, صعوبة تعلم اللغة, استيعاب الكلمات الانجليزية, ضعف في الكتابة والنطق , عدم توفر لغة سليمة للأساتذة, نقص كتب مترجمة باللغة الانجليزية ... etc.

27.

Table 27

Sample ' Choices of Learning Resources are the most Helpful to Improve English Proficiency in Biology.

What types of learning resources do you find most helpful for improving your English proficiency in biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Textbooks	24	17.5	17.5	17.5
	Online articles	24	17.5	17.5	35.0
	Videos/lectures	54	38.8	38.8	73.8
	Interactive exercises	34	24.3	24.3	98.1
	Others	4	1.9	1.9	100.0
	Total	140	100.0	100.0	

The data reveals a clear preference for video and lecture resources (38.8%) for enhancing English language skills in the context of biology. This suggests that a significant portion of students (nearly two-fifths) find educational videos or lectures delivered in English to be most helpful. However, there is also a strong desire for a balanced approach to learning (42.0%). A considerable number of students find value in textbooks (17.5%), online articles (17.5%), and interactive exercises (24.3%). This highlights the importance of offering a variety of resources to cater to different learning styles and preferences. While a small group of students (1.9%) mentioned using other resources, it's important to acknowledge their

preferences as well. A consider to following up with them to explore the usefulness of these additional resources (Specification Q27).

Specification Q27 .

28.

Table 28

Sample 'Choices of Type of Support to Improve English Proficiency in Biology.

What support do you think would be helpful for you to improve your English proficiency in biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Additional language support classes	56	39.8	39.8	39.8
	Tutoring sessions	65	46.6	46.6	86.4
	English-language biology workshops/seminars	12	8.7	8.7	95.1
	Access to bilingual dictionaries or glossaries	4	2.9	2.9	98.1
	Others	3	1.9	1.9	100.0
	Total	140	100.0	100.0	

The table reveals that students are eager for a variety of support options to enhance their English proficiency in biology. The most sought-after options are direct and

personalized forms of guidance, with tutoring sessions (46.6%) and additional language support classes (39.8%) being the most popular choices. This suggests that students value focused attention on their English language skills in the context of biology. There is also interest in subject-specific resources, with a smaller portion of students finding English-language biology workshops/seminars (8.7%) and bilingual dictionaries or glossaries (2.9%) helpful. These resources could be particularly beneficial for those seeking to solidify their grasp of biological terminology. Additionally, a small group of students (1.9%) mentioned other forms of support, highlighting a potential need to explore a wider range of resources.

Specification Q28 .

2.4.Discussion of the Results:

The addressed questionnaire is conducted to explore the challenges faced by first-year biology students when integrating English as a medium of instruction (EMI), particularly within the fundamental chemistry unit. In addition , the questionnaire aims to acknowledge the students 'preferences in terms of the materials needed to enhance their English proficiency in chemistry unit.

We added the gender element to the questions in order to account for the differences in learning styles between females and males. However, since the study population is not that homogeneous type due to the fact that females make up a higher proportion than males, this question does not have a significant impact. As researchers, we were transparent about the gender imbalance in our sample and its potential impact on the generalizability of our findings. Because with taking into account the learning style differences, the gender could affect many other questions in the questionnaire such as : Proficiency level, Frequency of using English outside the classroom , the context in which using English, the confidence level, The importance of English in biology studies, motivation towards learning biology mainly chemistry in English , ...etc.

First-year biology students are encountering English as a medium of instruction for the first time .They struggle from a multitude of language skill challenges when tackling their biology courses specifically the fundamental chemistry unit. These challenges encompass the entire spectrum of language skills. The findings attained from students' questionnaire reveal that the predominant challenges faced by students are manifested in terms of understanding scientific terminology with a percentage of (14.5%) because grasping technical vocabulary specific to chemistry presents a significant hurdle. In the case of chemistry, understanding and using the specialized vocabulary of chemistry is difficult because the jargon of chemistry poses difficulties, especially for students whose native language does not share common scientific roots. Grammar difficulties (23.8%) because non-native English speakers commonly struggle with complex grammar rules. Then, comprehension difficulties (23.4%) which indicates that understanding the meanings in English, especially in scientific texts, is challenging. Scientific writing in chemistry employs complex sentence structures to convey precise information. Complex structures, with unfamiliar vocabulary and the overall scientific tone, creates difficulties in grasping the written material. Other challenges with a portion of (38.3%) appeared as a broad category likely encompasses pronunciation , fluency, and other aspects of vocabulary development. Going back to chemistry case, it introduces new sounds not present in a student's native language. Mastering these pronunciations within the context of formulas and reactions can be challenging. Furthermore, Lectures on chemical concepts might be delivered at a fast pace, with instructors using technical terms and accents. Keeping up with the flow of information and understanding the spoken language becomes difficult. Regarding writing, Formulating arguments and explanations in written assignments or discussions requires a strong demand of both scientific knowledge and clear communication skills.

These noticed challenges are due to several factors . Firstly, a substantial 68.7% portion from the sample lack prior experience with biology in English. This causes a weak foundation in the specific scientific terminology crucial for understanding the courses . In addition, The low confidence in scientific communication reported by 85.1% of students. This lack of confidence makes it difficult for them to effectively participate in class discussions, ask clarifying questions, and ultimately grasp complex concepts explained in English. However, a large majority of students (68.0%) are very motivated to improve their English specifically for studying biology. These two factors – limited prior exposure and low confidence – create a significant barrier for students as they are learning biology through English .

Moving into the Learning materials preferences and course design considerations based on students 'needs . There is a mix of motivations for enrolling in the course , improving research skills (35.9%), academic performance (30.1%), and fulfilling program requirements (33.0%). When the instructor acknowledges the diverse motivations and tailoring the course accordingly, he can create a more engaging and effective learning experience for all students enrolled in the English language course for biology. Students prefer a comprehensive approach with a variety of materials (62.1%), including textbooks, equipment manuals, multimedia tools, worksheets, charts, and samples of course assignments and student papers to bring real word into the classroom , because a comprehensive approach with a variety of materials which require to diverse learning styles reinforces understanding, promotes critical thinking, helps prepare for assessments, and keeps students engaged in the learning process. Students seek to improve their English proficiency in biology via tutoring sessions (46.6%), additional language support classes (39.8%), English-language biology workshops (8.7%), bilingual dictionaries. students recognize the need for various support mechanisms to succeed in an English-medium biology program. They seek a combination of

active learning, structured support, targeted instruction in scientific English, and reference tools to solidify their vocabulary foundation. A significant portion (74.6%) rate their understanding as "fair," . This indicates a need for additional support to bridge the gap between their current understanding and achieving learning objectives. a multilingual classroom can be enriching. Multilingual students might be able to explain concepts to each other in their native languages, fostering deeper understanding. Additionally, the large majority (71.6%) feeling more comfortable with English instruction suggests a potential preference for English as the primary language of instruction compared to French (28.4%). While most receive instruction in English (83.6%), a minority use Arabic (13.4%) and French (3.0%).

To sum up, by acknowledging these challenges and providing targeted support through clear explanations, visuals, and activities focusing on scientific vocabulary, the course designer can create a more supportive learning environment that equips students to bridge the language gap in their first-year biology studies.

3.Section Three : Content Analysis

According to Krippendorff (2004): "Content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use."(p. 18). So , it is a research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data in terms of texts. In addition, the structured interview "which is used as a document tool to gather more data about the course design " . We have prepared a list of questions addressed for teachers (Appendix 11). It consists of fifteen (15) questions in which we have used open-ended questions . The interview has been conducted with two (02) teachers of chemistry module in the department of Biology . Therefore, The questions are fixed and asked in a given order. The interview is divided into two parts: the first questions are about their teaching career background in

Chemical domain in Biology department and the others are about the considerations they take in designing courses tailored to specific learner's needs in terms of : materials, assessing, objectives, goals and evaluation .

Our case covers documents are gathered from a chemistry unit which is a fundamental module for first-year biology students. It allows first biology students to acquire basic aspects of general chemistry (electron and periodic classification) and organic chemistry (organic compounds and reaction mechanisms). This subject aims to provide knowledge on the fundamental basics of the organization and chemical structure. It serves as a complement to other subjects as it helps facilitate the understanding of biological phenomena from a chemical perspective (Appendix 12). In fact, this study's objective is to comprehend and analyze the analytical units from the chosen documents .

3.1.The description of Content Analysis Framework :

Following Cohen' steps of content analysis and Graves' components of course design, we analyzed the courses, exercises, and the practical work (PW) of the Chemistry module in first-year biology as follow :

- ✓ Data Collection:

-Gather Materials: we have collected all relevant materials related to the Chemistry module, including courses , Practical work "PW" , exercise instructions, and data gathered from teachers ' interview .

- ✓ Data Analysis:

The steps of Cohen for conducting content analysis (2018, p 676-678), which are applied besides the essential components of a tailored course design are listed as :

-Summarizing the collected data (Stage 01): It is about extracting the interpretive remarks that have been made on the data is the first stage. We red through all the collected materials to understand the overall structure and objectives of the Chemistry module. Then , we extracted

key points about the content in terms of structure, vocabulary, grammar, course 'organization , teaching methods used, assessment needs and strategies, materials selected. Those are the units of analysis to ascertain the degree to which the course designer has taken into account the various course design components .They include frequency of occurrence in the summarized data (Appendix 14).

-Key headings (Stage 02): According to Cohen et ., al (2018), "Coding is the ascription of a category label to a piece of data, decided in advance or in response to the data that have been collected."(p. 668).This stage focuses on separating data into key codes (Appendix 15).

-Grouping codes (stage 03): Organize the codes on the list created in stage 2 into categories (Appendix 16).

-Calculate the frequency of codes (Stage 04): the frequencies are calculated in this stage(Appendix 17).

-Calculate the percentage of codes (Stage 05): it requires tabulating and reporting the codes' frequencies into percentages (Appendix 18).

-The interpretation (final stage): The synthesis stage, is the final stage where the coded data are analyzed then drawing conclusions about the findings.

3.2. Data Collection Strategies and Tools :

In the present research, a methodological procedure is used for conducting content analysis of First year selected English documents related to chemistry module . In order to answer the research question asked in the general introduction related to content analysis , we have used two methods of data collection which are: an analysis of selected English documents related to chemistry module and a structured interview which is also administered to two (02) teachers of chemistry in the department of Biology.

In this study, we used the case of fundamental General and Organic Chemistry module to select the courses , exercises and practical work guidelines that we analyzed for

the study purposes if they can be adapted for an English-medium instruction (EMI) biology course that meets the needs of students. The course is chosen from the syllabus (Caneva) of "Chemistry "first semester which is the case unit of study (Appendix 12).

The analytical plan (Appendix 13) is based on Graves 'model of course design components. The essential components of this data collection instrument are : "Assessing needs", "Formulating goals and objectives", "Conceptualizing content " ,"Organizing the course" ,"Developing materials "and "Evaluation " .

3.2.1.For Validity and Reliability of Content Analysis :

The course materials, exercises, practical work on laboratory activities, and data from structured interview with teachers are valid sources to understand how English is integrated as a medium of instruction (EMI) in the fundamental chemistry unit because they represent the tools and activities used in the EMI chemistry unit and analyzing them reveals the specific language demands for students needs and how scientific concepts are presented in English. By combining these sources, we gained a richer understanding of how English is actually integrated within the fundamental chemistry unit . This triangulation enhances the validity of this content analysis.

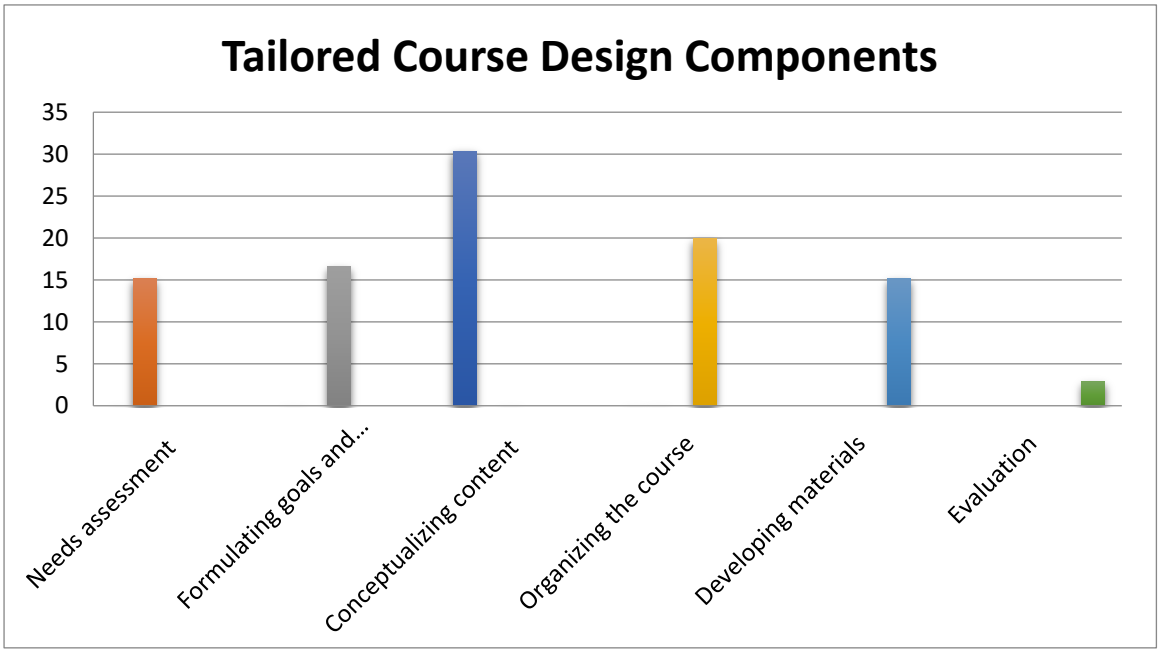
3.3.Analysing the Results of the Content Analysis :

Based on the comprehensive data gathered from the course , exercises and laboratory work guide of chemistry module first semester besides the teachers 'interview , the analysis moves into utilizing the codes summarized in the adopted analysis framework.
(Appendix 14).

The tailored course components are used to structure the course , exercises and practical work guidelines analysis besides data gathered for the interview , which includes frequency of occurrence (Appendix 17) .

Figure 4

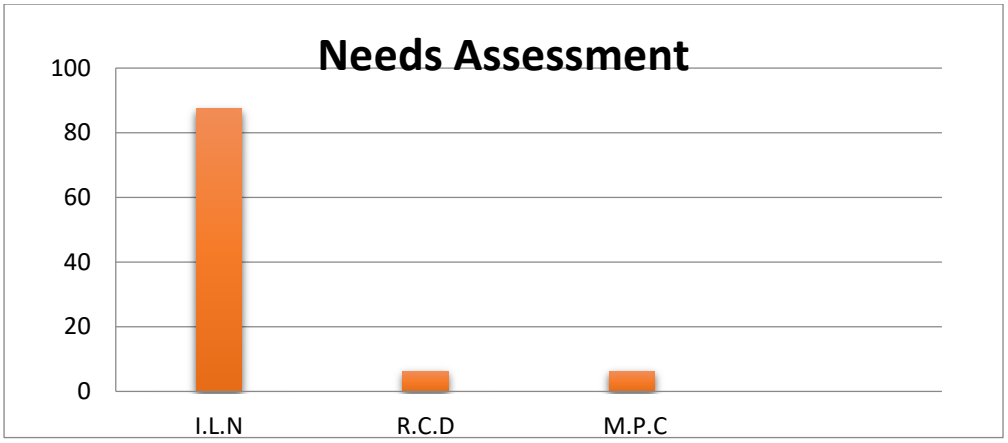
Frequency of Tailored Course Design Components in Documents Related to First Biology Chemistry Module .



The graph breaks down the course design process , revealing that the selected documents related to chemistry module emphasize focusing on conceptualizing content (30.33%) followed by organizing the course (19.90%) and formulating goals and objectives (16.58%).This suggests a well-defined learning path with clear objectives and a well-structured course. Needs assessment (15.16%) and material development (15.16%) receive balanced attention ,while these aspects are present to allocating more resources to understanding students' needs could significantly improve the course. However, evaluation (2.84%) receives the least emphasis.

Figure 5

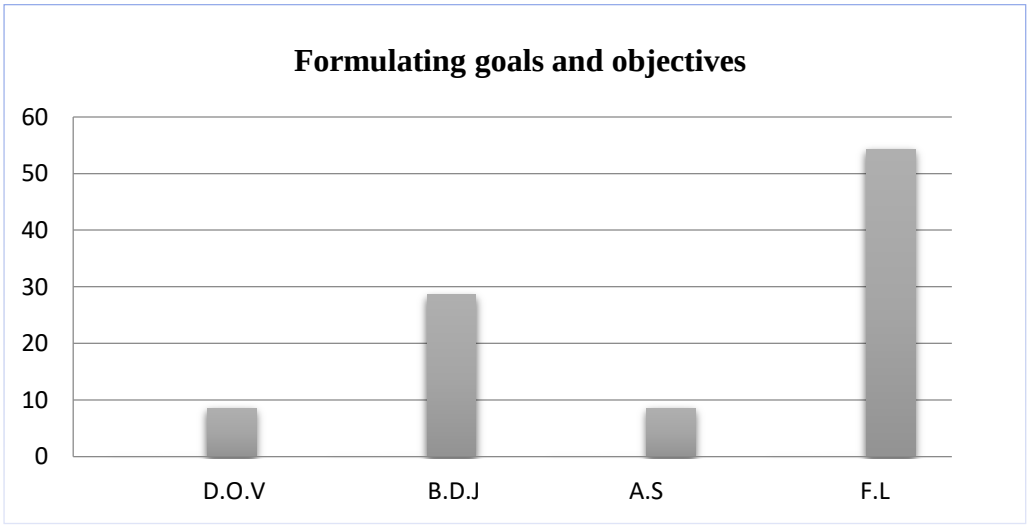
Frequency of Needs Assessment .



This chart provides an insightful breakdown of the aspects within the Needs Assessment phase of course design. The most prominent element is Identify Learner Needs (I.L.N) at 87.5%. This signifies a strong emphasis on understanding learning styles, needs, preferences, and expectations of students before designing the course. Additionally, 'Refine Course Design' (R.C.D) and Monitor Progress Continuously (M.P.C) are at 6.25%. This suggests that while prioritizing the identification of learners' needs, some resources are dedicated to refining the course design and monitoring student progress throughout the course.

Figure 6

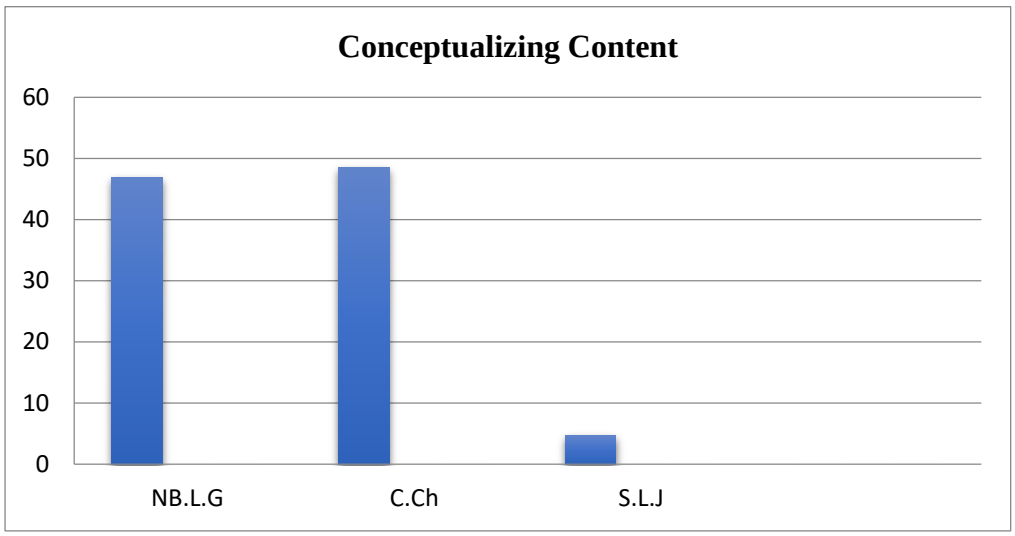
Frequency of Formulating Goals and Objectives.



This chart reveals a clear priority on emphasizing learning outcomes, with Focus on Learning (F.L.) taking the lead at 54.28%. This underscores the significance of defining what students will gain from the course. Break Down the Journey (B.D.J.) follows at 28.57%, emphasizing the need for specific steps to achieve these learning outcomes. Define Overall Vision (D.O.V.) and Align for Success (A.S.) receive a comparatively lower emphasis at 8.57%, indicating a lesser focus on crafting comprehensive goals and ensuring alignment with objectives.

Figure 7

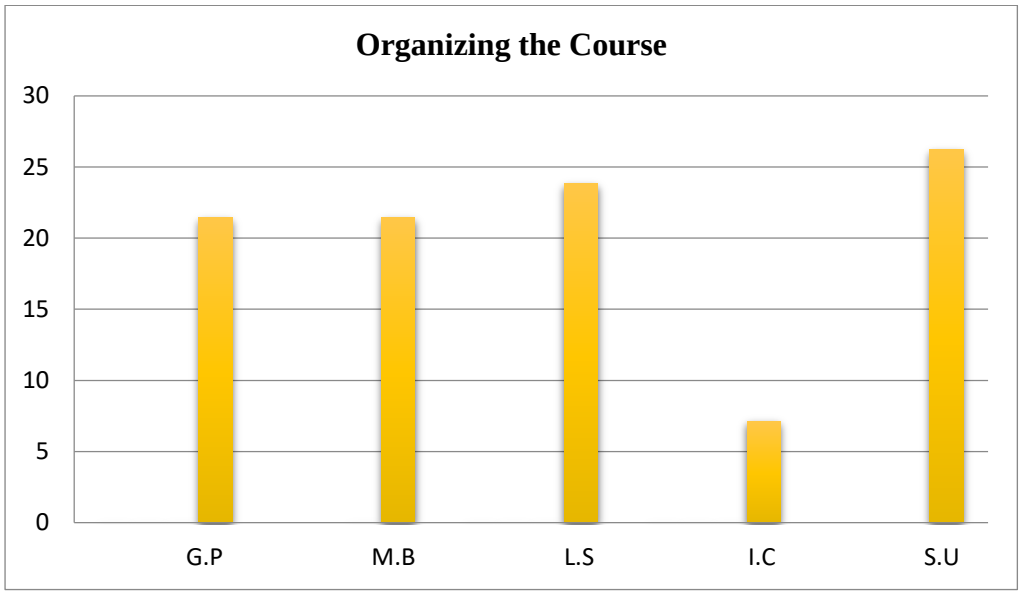
Frequency of Conceptualizing Content .



This chart reveals the elements involved in conceptualizing content for a course. Interestingly, Structured Learning Journey (S.L.J) receives the least emphasis 4.68% compared to Needs-Based Learning Goals (N.B.L.G) 46.87% and Curatorial Choices C.Ch 48.43%.The higher emphasis on (NB.L.G)and (C.Ch) indicates a priority on building a solid foundation for the content itself .(NB.L.G) ensures the content aligns with students needs while C.Ch focuses on selecting the most relevant information . While Structured learning Journy (S.L.J) receives less emphasis ,but it plays a vital role in ensuring the selected content is presented in a logical sequence with clear connections between different elements.

Figure 8

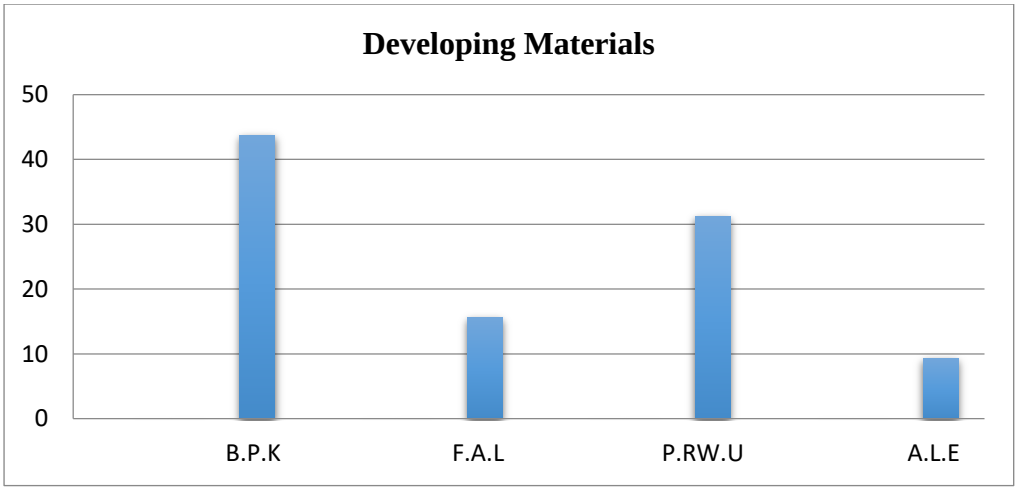
Frequency of Organizing the Course .



This chart emphasizes the importance of clear learning objectives and well-organized content in a course, with Structured Units (S.U.) receiving the highest emphasis at 26.19%. Guiding Principles (G.P.) and Modular Breakdown (M.B.) contribute around 21% , highlighting the significance of establishing a strong foundation. Logical Sequencing (L.S.) ensures a coherent learning path, representing 23.80% of the focus. While Integrated Content (I.C.) receives 7.14%, the less emphasis remains on core concepts.

Figure 9

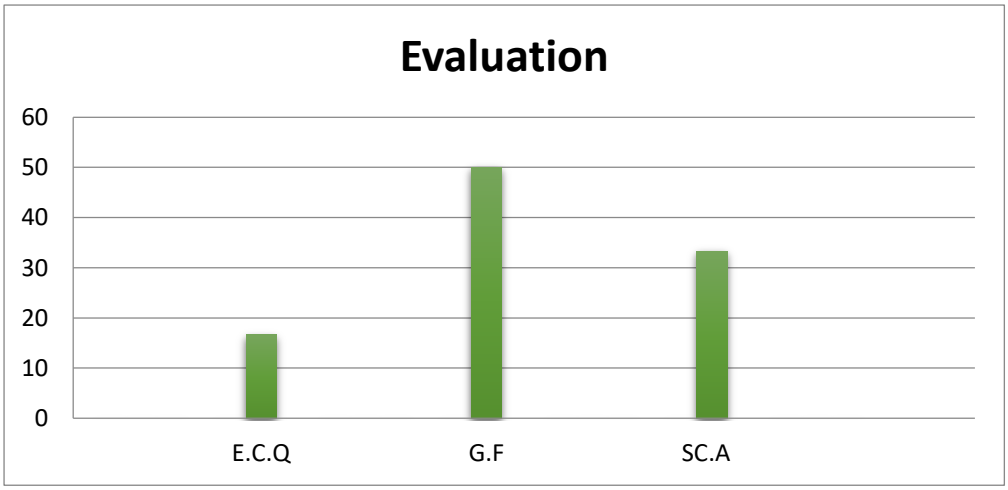
Frequency of Developing Materials .



This chart underscores the significance of developing materials that prioritize a strong foundation (B.P.K., 43.57%), foster active learning (F.A.L., 15.62%), connect concepts to the real world (P.R.W.U., 31.25%), and incorporate authentic learning experiences (A.L.E., 9.37%). This comprehensive approach in material development aims to deepen understanding, enhance student engagement, and establish stronger connections between learning and practical applications.

Figure 10

Frequency of Evaluation .



The chart illustrates that gathering feedback (G.F) holds the highest percentage 50 % among the evaluated components, emphasizing its paramount importance in course evaluation. Following closely behind is the student-centered approach (SC.A) at 33.33%,

highlighting the significance of empowering students in their learning journey. Evaluation of course quality (E.C.Q) at 16.66% holds a comparatively lower percentage but remains a crucial aspect in assessing and enhancing various course elements.

3.4.Discussion of the Results:

After conducting the analysis, we can delve into the how the key components of tailored course design are used in first-year biology program's EMI Chemistry unit. By examining data on the frequency of various course design elements, we can identify areas of strength and potential areas for improvement.

1.Needs assessment: The analysis reveals a strong focus on understanding student' needs, evident in the high emphasis placed on Needs Assessment (I.L.N.) at 87.5%. This suggests a course that prioritizes understanding student backgrounds and their diversity, learning styles. The course focuses on English, but strategically incorporating French with English explanations might leverage prior knowledge and improve comprehension for some learners. By taking these factors into account, the course becomes more accessible and caters to the diverse needs of the student population, fostering an inclusive environment. While the course design prioritizes understanding student needs through a strong focus on Needs Assessment, allocating a balanced but smaller percentage (6.25%) to "Refine Course Design" (R.C.D) and "Monitor Progress Continuously" (M.P.C) misses a valuable opportunity. Consistently refining the course according to student progress can greatly improve their learning journey. For instance, incorporating feedback mechanisms like quizzes or polls after each module can reveal areas where students struggle, allowing instructors to adjust teaching methods or provide additional support.

2.Formulating objectives and goals : In this component, the data highlights a strong emphasis on formulating clear and achievable learning objectives. Focus on Learning (F.L) receives a dominant focus of 54.28%, underscoring the importance of clearly defining what students

will be able to do by the end of the course. This goes beyond simply understanding the material and emphasizes applying acquired knowledge and skills. Break Down the Journey (B.D.J) at 28.57% provides a roadmap for achieving these learning goals. This detailed breakdown serves as a guide for both educators, ensuring they cover essential elements, and learners, enabling them to monitor their progress and understand how each learning activity, such as attending lectures, completing quizzes, participating in discussions, contributes to their overall understanding of the concepts.

While the emphasis on F.L and B.D.J is commendable, the lower focus placed on Define Overall Vision (D.O.V) and Align for Success (A.S) at 8.57% suggests there might be room for improvement. A well-defined overall vision clarifies the big-picture goal of the course, and ensuring learning objectives align with that vision strengthens the course design by directing student learning towards achieving the desired outcomes.

3.Conceptualizing Content : The data reveals a strong emphasis on tailoring course content to student needs. Needs-Based Learning Goals (NB.L.G) at 46.87% ensure the content aligns with the specific learning objectives designed to address student requirements. Furthermore, Curatorial Choices (C.Ch) at 48.43% emphasize careful selection of the most relevant information. This combined focus on student needs and content selection fosters a deeper understanding of core principles. However, a potential shortcoming exists when it comes to presenting the content in a logical sequence, as there is a notable gap in focusing on Structured Learning Journey (S.L.J) at just 4.68%. Especially in science courses like chemistry, where building upon foundational knowledge is crucial, a well-structured learning journey is essential for comprehension.

4.Organizing the course: The analysis of this course reveals a focus on clear learning objectives and well-organized content. A strong foundation is established through "Structured Units" (S.U) at 26.19%, ensuring content is divided into manageable sections. Additionally,

"Guiding Principles" (G.P) and "Modular Breakdown" (M.B), both around 21%, suggest a focus on outlining core principles and breaking down the course into clear modules. Furthermore, "Logical Sequencing" (L.S) at 23.80% further strengthens this structure, ensuring a coherent flow of information where each concept builds upon the previous one. This well-organized structure provides students with a clear framework for navigating the course material, which enhances their learning efficiency. However, while the data paints a positive picture in terms of content development and structure, a potential gap emerges in explicitly integrating language development with core concepts. Integrated Content (I.C.) receives a significantly lower emphasis of 7.14% compared to the elements focused on content itself. The analysis highlights a potential gap in the course design. While it excels at teaching core chemistry concepts, it might not provide enough support for students learning science in English and understanding scientific ideas in a new language requires specific skills beyond just grasping the concepts. The course could be improved by incorporating strategies to develop these language skills, such as using labeled visuals, glossaries of scientific terms, and activities that encourage using those terms in context (writing lab reports, discussing experiments). This would give students a stronger foundation to not only understand the science but also communicate it effectively in English.

5.Developing materials : The data underlines a well-structured approach to material development, prioritizing student engagement and understanding. A strong emphasis (43.57%) is placed on "Basic Principles Knowledge" (B.P.K), ensuring students build a solid foundation in core concepts. This allows them to connect different areas of the course, succeed in future studies and enhance understanding . The course promotes active learning through "Foster Active Learning" (F.A.L) at 15.62% this may include problem-solving exercises, or group discussions. Furthermore, the course material emphasizes the connection between core principles and the "Real World" (P.RW.U) at 31.25% to enhancing engagement

and deepening understanding, the course material emphasizes connections to the real world through authentic learning experiences (A.L.E) at 9.37%, such as using colors in diagrams to depict real-world phenomena. As a result, the course material can create a more visually engaging and impactful learning experience and students will not only grasp the core principles but also see how they connect to the colorful world around them.

6. Evaluation :The data reveals a strong emphasis on gathering feedback (G.F) at 50% and a student-centered approach (SC.A) at 33.33% during the evaluation stage. These aspects are crucial to understand student experiences and improve the course. However, "Evaluation of Course Quality" (ECQ) receives less emphasis at 16.66% , this clarifies that the current evaluation focuses less on the course's quality .So, a comprehensive evaluation should assess both how students perceive the course and how it achieves its learning objectives.

In conclusion, this analysis of a first-year biology program's EMI Chemistry unit reveals a well-designed course with a strong foundation. It prioritizes understanding student needs, establishes clear learning objectives, and utilizes engaging materials. However, there is potential to enhance the experience for students learning science in English by integrating language development strategies with core concepts, the course can become even more effective in supporting student success in this challenging EMI environment.

Discussion of Findings :

The results obtained from both the questionnaire and the content analysis answered the research questions explicitly and reached the research aim of this current study . Students struggle with scientific terminology, grammar, comprehension, and pronunciation in English. They lack prior experience with biology in English and have low confidence in scientific communication. For instance, grammatical errors, such as incorrect verb tenses, further complicate their written communication. Additionally, comprehension issues arise from the complex vocabulary and sentence structures in scientific texts, leading to misunderstandings.

These difficulties collectively hinder their ability to effectively engage in class and understand course materials. However, they are highly motivated to improve their English for biology. To address these challenges, the course design prioritizes understanding student needs, establishes clear learning objectives, and utilizes a variety of engaging materials. The focus is on building a strong foundation in core concepts and connecting them to the real world. While the course excels in content development and structure, there is room for improvement in integrating language development strategies with scientific concepts to better support students learning science in English. This study provides valuable insights for strengthening the EMI Chemistry unit and creating a more effective learning experience for students.

General Conclusion:

English nowadays serves as the predominant language of science in contemporary global world , acting as a bridge that fosters collaboration among researchers and encourages scientific advancement. Students pursuing higher education, especially in countries where English is not the primary language are discovering a new approach known as English as a Medium of Instruction (EMI) which has emerged approximately in several world countries . This trend seeks to provide students with a specialized English language skill that aligns with the requirements of scientific fields.

The transition to English as a Medium of Instruction (EMI) presents both challenges and opportunities for first-year biology students, particularly in a crucial subject like fundamental chemistry. This study investigated the impact of EMI on these students at Larbi Tébessi University in Algeria, exploring how tailored course design can bridge the language gap and enhance learning. In this investigation ,a mixed approach combines both quantitative and qualitative methods is applied . On the basis of the research questions, a mixed questionnaire has been adopted in this study. Moreover, A content analysis method of research has been applied to analyze the chosen courses and exercises of Chemistry module, using a structured interview to fill the gaps which are not mentioned clearly in the previous selected documents in content analysis .

Students reported difficulties with scientific terminology, grammar, comprehension, and pronunciation in English. This highlights the need for more clear learning objectives which they cater to diverse learning styles. Even though , the content reveals a well-designed course with a strong foundation. In the meanwhile , a strong motivation to improve their English for biology studies was evident. The findings highlight the importance of understanding student needs through a comprehensive needs assessment, a component demonstrably prioritized in the current design. Furthermore, the preference for a variety of

learning materials aligns with the benefits of a comprehensive approach that meets students requirements .

This study will add valuable insights to the field of EMI in Algerian biology education. By acknowledging the challenges faced by students and recommending improvements in course design, particularly the integration of language development strategies which it paves the way for a more supportive and effective learning environment. Moving forward, it is crucial for educators and curriculum developers to continue refining course designs to optimize learning outcomes for students in EMI settings, ultimately fostering an inclusive and engaging learning environment.

Research Limitations and Restrictions:

Although the study results successfully addressed the research questions and met its objectives, the process was not without its set of limitations :

- A significant limitation was the lack of time, as this type of research requires noticed effort to obtain more reliable data and to find suitable solutions for the current challenges in implementing English as a Medium of Instruction (EMI) in scientific fields to meet learners' needs.
- We were seek to analyze four courses in chemistry module, but when the analysis reached around 30 pages of tables, and we covered almost all the units of analysis, then we compared the course selected to the others, we observed that all courses have the same structure and content used by the teacher to design his lectures.
- Only few limited studies have explored the potential implementation of EMI in Algeria's scientific disciplines, making it difficult to access a substantial theoretical background since this research topic is recent.
- The study used a mixed questionnaire with 150 students, which is a sufficient sample size. However, interviewing only two chemistry teachers could limits the generalizability of the

results. The integration of English as a medium of instruction in the Biology department for first-year students began only in the academic year 2023-2024, making it challenging to find teachers with relevant experience in teaching Chemistry using English.

Due to the shift in research scope from ESP to EMI, we were constrained by time limitation. Even the two fields share some similarities, but the overall objective of the research changed because ESP is more a consuming topic, however EMI is a current global trend. As a result, we had less time to conduct the practical part of the research and gather the necessary resources in the meanwhile.

Pedagogical Implications and Recommendations :

Based on the results from this research study, several pedagogical implications can improve the adoption of an successful EMI designed courses. These pedagogical implications concern policy makers, teachers and students in scientific disciplines mainly Biology due to our study focus:

- Teachers' Implications:

- Teachers should motivate their attitudes towards integrating English to engage in continuous professional development activities related to EMI.

-Teachers should seize opportunities to attend conferences, workshops, and seminars focused on EMI pedagogy and English language teaching guides in scientific fields.

-Teachers should raise students' awareness about the global importance of English and highlight the benefits of integrating English into the teaching and learning process within their biology classes .

- Teachers should encourage students to write their research homework in English.

- Teachers should integrate language development into the curriculum through activities like reading scientific literature, writing research papers, and presenting findings in English.

- Teachers should organize language workshops and seminars focused on scientific English, including grammar, pronunciation, and comprehension skills.
- Teachers should collaborate with language experts to design and deliver specialized courses and materials that address the unique needs of biology students learning in English.

- Students' Implications:

- Students should work on improving their English proficiency levels before entering university via daily practice .
-Students should take advantage of online training courses in English to meet their language needs before engaging in higher EMI studies.
- Students should accept replacing French with English and work to extend their knowledge of using it as a medium of instruction to succeed in their career then professional fields .
- Students should learn scientific terms in English, read scientific articles in English, and gradually apply this knowledge in their studies.
- Students should regularly assess their English proficiency to identify areas needing improvement and seek targeted support.

- Implications for Policymakers:

- Government officials should equip academic facilities and materials with the necessary technology and resources to facilitate English teaching and learning processes , including a strategic plan for EMI implementation in specific scientific disciplines with clear goals, timelines, and required resources.
- Government officials should establish collaborations between Algerian universities and international universities abroad that use English as a medium of instruction to gain a clear vision about the strategies that improve students language performance along with content of scientific research.

- Government officials should begin integrating English from earlier stages of education to prepare learners for higher education research in English .

-Government officials should suggest training courses in English for students helping them to meet their language needs before engaging in EMI studies.

References

Abbaszadeh, Z. (2013). Genre-Based Approach and Second Language Syllabus Design. *Procedia Social and Behavioral Sciences, 84*, 1879-1884. www.sciencedirect.com

Abdelmalak, M., & Trespalacios, J. (2013). Using a learner-centered approach to develop an educational technology course. *International Journal of Teaching and Learning in Higher Education, 25* (3), 324-332. http://www.isetl.org/ijtlhe/

Abdul Karim, N. A.-H., & Khoo, Y. Y. (2013). Outcome-Based Education: An approach for teaching and learning development. *Journal of Research, Policy & Practice of Teachers & Teacher Education, 3* (1), 26-35.

Akcay, B. (2009). Problem-Based Learning in Science Education. *Journal of Turkish Science Education, 6*(1), 26-36.https://www.researchgate.net/publication/26605577

Alkathiri, M. S. (2021). Course design for teaching development: Key considerations for faculty developers. *International Journal of Innovation, Creativity and Change, 15* (3). DOI:10.53333/IJICC2013/15304

Anthony, L. (2018). *Introducing English for Specific Purposes*. Routledge Introductions to English for Specific Purposes (Brian Paltridge & Sue Starfield, Series Eds.). Routledge.

Benkhettou, F. (2023). *From Policy to Practice: Investigating Algerian University Teachers' Language-Related Challenges and Training Needs to Inform Effective EMI Implementation in Higher Education Institutions: The Case of Teachers at Salhi Ahmed University Centre Naama* [Master's thesis, Larbi Tébessi University].

Bouteldji, I. (2023, October 6). *These are the challenges of the language transition in the Algerian university*. Echoroukonline. https://www.echoroukonline.com

Brown, J. D. (1995). *The elements of language curriculum: A systematic approach to program development* . Boston, MA: Heinle & Heinle.

Cohen, L., Manion, L., & Morrison, K. (2018). Research Methods in Education (8th ed.). London: Routledge.

Colborn, N. W. (2011). Introduction to instructional design: A brief primer. *Indiana Libraries, 30*(1), 15-19.

De Graaff, E., & Kolmos, A. (2003). Characteristics of Problem-Based Learning. *International Journal of Engineering Education, 19* (5), 657-662.

Dearden, J. (2015). *English as a medium of instruction-a growing global phenomenon*. British Council.

DelliCarpini, M., & Alonso, O. B. (2013). *Content-Based Instruction: English Language Teacher Development.* Edited by T. S. C. Farrell.

Dick, W., Carey, L., & Carey, J. O. (2015). *The systematic design of instruction* (8th ed.). Pearson.

Dunn, R. S. (1996). *How to Implement and Supervise a Learning Style Program*. Association for Supervision and Curriculum Development.

Dunn, R., & Burke, K. (2005). *Learning Style: The Clue to You (LSCY): Research and Implementation Manual*.

Elsayed, S., & Cakir, D. (2023). Implementation of assessment and feedback in higher education. *Journal Name, Volume* (Issue), 34-42. https://doi.org/10.53623/apga.v2i1.170

Galloway, N., & Rose, H. (2021). English Medium Instruction and the English Language Practitioner. *ELT Journal, 75* (1).

Gilbert, J. K., Bulte, A. M. W., & Pilot, A. (2011). Concept development and transfer in context-based science education. *International Journal of Science Education, 33* (6), 817-837. https://doi.org/10.1080/09500693.2010.493185

Graves, K. (2000). *Designing Language Courses: A Guide for Teachers.* School for International Training, A Teacher Source Book. Freeman, D. (Series Editor).

Grosser, M., & de Waal, E. (2006). Enhancing pedagogical needs and fundamental rights at school by accommodating diverse learning styles. *Education as Change, 10* (2), 17-32. https://doi.org/10.1080/16823200609487137

Gustafson, K. L., & Branch, R. M. (2002). *Survey of instructional development models* (4th ed.). ERIC Clearinghouse on Information & Technology.

Hall, T., Strangman, N., & Meyer, A. (2011). Differentiated instruction and implications for UDL implementation. *NCAC Effective Classroom Practices*.

Hutchinson, T., & Waters, A. (1987). *English for Specific Purposes: A learning centred approach*. Cambridge: Cambridge University Press.

Jonker, H., März, V., & Voogt, J. (2020). *Curriculum flexibility in a blended curriculum. Australasian Journal of Educational Technology, 36* (1), 68.

Katz, J. (2012). *Teaching to Diversity: The Three-Block Model of Universal Design for Learning.* Foreword by Faye Brownlie.

Kellaghan, T., & Greaney, V. (2001). Using assessment to improve the quality of education. Paris: UNESCO: International Institute for Educational Planning. http://www.unesco.org/iiep

Khan, B. H. (Ed.). (2007). *Flexible learning in an information society*. Hershey, London, Melbourne, Singapore: Information Science Publishing.

Khenioui, N., & Boulkroun, M. (2023). Exploring the implementation of English as a medium of instruction in Algerian higher education: Motivations, challenges, and strategies for success. *Afak For Sciences Journal, 8*(5), 50-73.

Kindervatter, S. (1977). *Learner-centered training for learner-centered programs*. Center for International Education, University of Massachusetts Amherst.

King, D., & Ritchie, S. (2012). Learning science through real-world contexts. In K. G. Tobin, B. J. Fraser, & C. J. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 24, pp. 69-79). Springer. https://doi.org/10.1007/978-1-4020-9041-7_6

Krippendorff, K. (2004). *Content analysis: An introduction to its methodology* (2nd ed.). SAGE Publications.

Larsen, L. B. (2015). *Tailored courses – a road to learning for shipping companies* (Master's thesis). Buskerud and Vestfold University College, Faculty of Technology and Maritime Sciences.

Lombardi, M. M. (2007). Authentic Learning for the 21st Century: An Overview. *EDUCAUSE Learning Initiative, 1*, 1-12

Macaro, E. (2018). *English medium instruction: Content and language in policy and practice.* Oxford University Press.

Maxwell, M., & Stobaugh, R. (2015). *Real-World Learning Framework for Secondary Schools: Digital Tools and Practical Strategies for Successful Implementation*. Solution Tree.

Medfouni, I. (2020). *International aspirations, French legacies and translingual practices: Exploring the potential implementation of EMI in Algerian universities* [Doctoral dissertation].

Mekki, K. (2023). *Evaluating EFL Third Year Primary Education Textbook Alignment with the Didactic Guide for Intercultural Communicative Competence*. [master's thesis]

Messeded, M. (2023). English as a medium of instruction in Algerian higher education: Lecturers' attitudes towards learning English in Blida 2 University. *Afak For Sciences*, *8*(5), 87. https://www.asjp.cerist.dz/en/PresentationRevue/351

Ministry of Higher Education and Scientific Research. Retrieved May 27, 2023, from https://www.mesrs.dz/

Morrison, G. R., Ross, S. M., & Kemp, J. E. (2004). *Designing effective instruction* (4th ed.). John Wiley & Sons.

Ornstein, A. C., & Hunkins, F. P. (2018). *Curriculum: Foundations, principles, and issues* (7th Global Ed.). Pearson Education Limited, pp. 210-221.

Ouarniki, O. (2023). Exploring teachers' perspectives on the implementation of English as a medium of instruction (EMI) in Algerian higher education institutions: Challenges and opportunities . *Afak For Sciences, 8* (3), 176-192. https://www.asjp.cerist.dz/en/PresentationRevue/351

Park, S.-H., Kim, M., & Yu, D. (2011). The effects of learning authenticity on the learning achievements in the online corporate training programme. *British Journal of Educational Technology, 42* (2), E37–E41. https://doi.org/10.1111/j.1467-8535.2010.01163.x

Paudel, P. (2022). Models of evaluating curriculum for language education in Higher Education. *AWADHARANA*, *7*(1), 148. https://doi.org/10.3126/awadharana.v7i1.49158

Posner, G. J. (2004). *Analyzing the curriculum* (3rd ed.). Cornell University Press.

Saidani, R., & Afkir, M. (2023). English medium instruction from the perspective of university students in Algeria. *Afak For Sciences, 8*(3), 299. https://www.asjp.cerist.dz/en/PresentationRevue/351

Schreurs, J., & Dumbraveanu, R. (2014). A Shift from Teacher Centered to Learner Centered Approach. *International Journal of Engineering Pedagogy (iJEP), 4*(3), 36–41. https://doi.org/10.3991/ijep.v4i3.3395 4

Slavin, R. E. (2018). *Educational Psychology: Theory and Practice* (12th ed.). Pearson.

Spady, W. G. (1988). Organizing for results: The basis of authentic restructuring and reform. *Educational Leadership, 46* (2), 4-8.

Subheesh, N. P., & Sethy, S. S. (2020). Learning through assessment and feedback practices: A critical review of engineering education settings. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(3), em1829. https://doi.org/10.29333/ejmste/114157

Thompson, S. (1994). Frameworks and Contexts: A Genre-Based Approach to Analysing Lecture Introductions. *English for Specific Purposes, 13*(2), 171-186.

Tomlinson, C. A., & Moon, T. R. (2013). *Assessment and Student Success in a Differentiated Classroom*. United States: ASCD.

U.S. Embassy Algiers. (2021). *افتتاح الجامعة التي ستغير نظام التعليم في الجزائر* [Video]. YouTube. Retrieved May 26, 2023, from https://www.youtube.com/watch?v=bzDyE2LOEJ4

Appendices

Appendix 1

Tayeb Bouzid ’ First Post

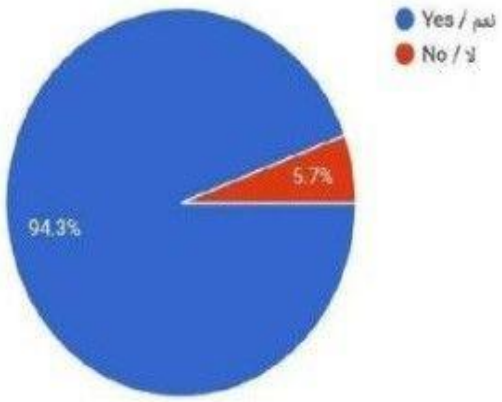
Tayeb Bouzid’s First Post

Appendix 2

Poll results

تعزيز استعمال اللغة الانجليزية في قطاع التعليم العالي والبحث العلمي -
Enhance the use of English language in the Higher Education & Scientific Research

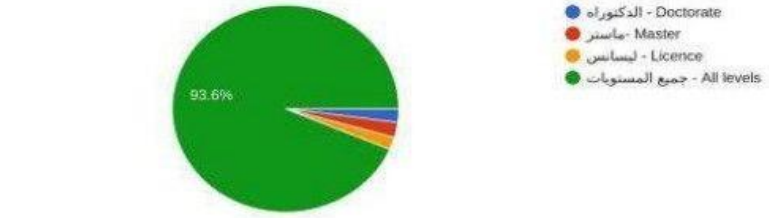
94,741 responses



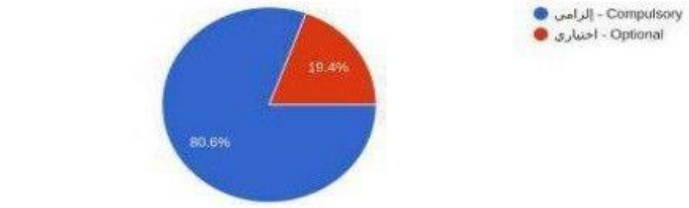
Appendix 3

The results of Second Survey

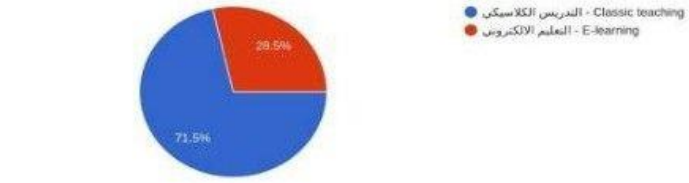
1. هل تعتقد أن اللغة الإنجليزية يجب أن تدرس في
2,884 responses



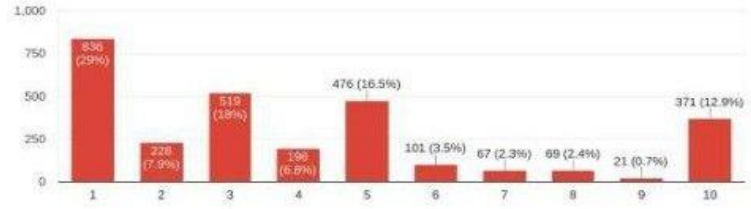
2. هل تعتقد أنه ينبغي أن يكون
2,884 responses



3. ما هي الطريقة الأنسب؟
2,884 responses

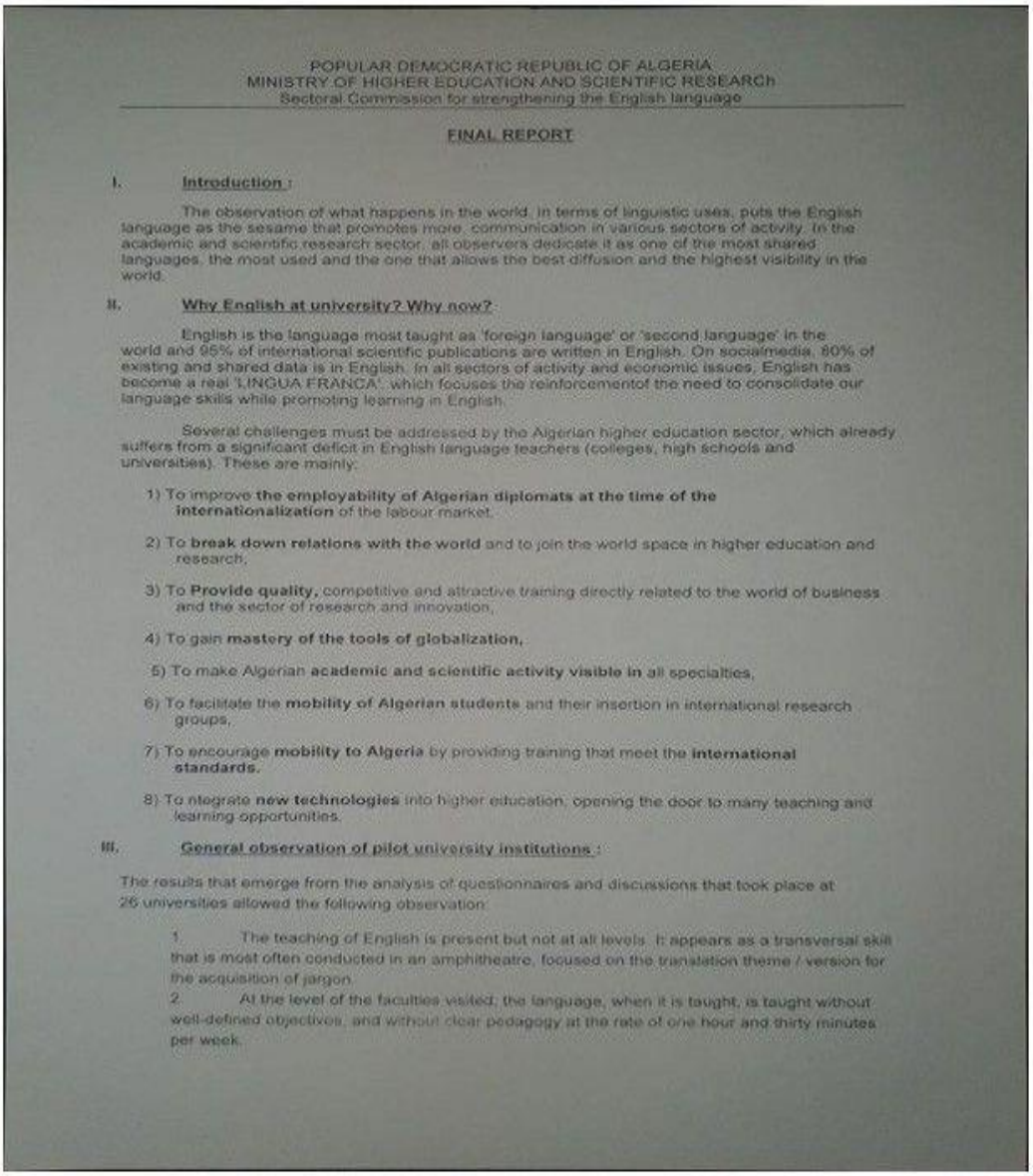


4. يجب أن تدرس اللغة الإنجليزية تدريجيا ، في
2,884 responses



Appendix 4

The Final Report which Includes Plans for Enhancing for English in Algerian Universities



POPULAR DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCh
Sectoral Commission for strengthening the English language

FINAL REPORT

I. Introduction :

The observation of what happens in the world, in terms of linguistic uses, puts the English language as the sesame that promotes more communication in various sectors of activity. In the academic and scientific research sector, all observers dedicate it as one of the most shared languages, the most used and the one that allows the best diffusion and the highest visibility in the world.

II. Why English at university? Why now?

English is the language most taught as 'foreign language' or 'second language' in the world and 95% of international scientific publications are written in English. On socialmedia, 80% of existing and shared data is in English. In all sectors of activity and economic issues, English has become a real 'LINGUA FRANCA', which focuses the reinforcementof the need to consolidate our language skills while promoting learning in English.

Several challenges must be addressed by the Algerian higher education sector, which already suffers from a significant deficit in English language teachers (colleges, high schools and universities). These are mainly:

1) To improve **the employability of Algerian diplomats at the time of the internationalization** of the labour market.

2) To **break down relations with the world** and to join the world space in higher education and research.

3) To **Provide quality,** competitive and attractive training directly related to the world of business and the sector of research and innovation.

4) To gain **mastery of the tools of globalization.**

5) To make Algerian **academic and scientific activity visible in** all specialties.

6) To facilitate the **mobility of Algerian students** and their insertion in international research groups.

7) To encourage **mobility to Algeria** by providing training that meet the **international standards.**

8) To integrate **new technologies** into higher education, opening the door to many teaching and learning opportunities.

III. General observation of pilot university institutions :

The results that emerge from the analysis of questionnaires and discussions that took place at 26 universities allowed the following observation:

1. The teaching of English is present but not at all levels. It appears as a transversal skill that is most often conducted in an amphitheatre, focused on the translation theme / version for the acquisition of jargon.
2. At the level of the faculties visited, the language, when it is taught, is taught without well-defined objectives, and without clear pedagogy at the rate of one hour and thirty minutes per week.

POPULAR DEMOCRATIC REPUBLIC OF ALGERIA
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3. The temporary teachers, for the most part, use specialized texts they translate with students from Arabic into English or French to English. The goal is to teach the jargon of the specialty.

4. General English (text comprehension, grammar) is taught at the level of the faculties of the human and social sciences in a discerning way, it is almost non-existent at the level of the licenses of the faculties of law and the political sciences. It is taught or in class or in a seminar blocked in master according to the availability of teachers. Sometimes, the English module is replaced by French for lack of supervision.

5. At the doctoral level, an hourly volume of 20 to 25 hours / week is provided in the outline. Teaching is mostly done in a blocked seminar depending on the availability of the teacher.

6. A lack of supervision in English is recorded in all the same faculties at the English departments of the whole pilot universities with the exception of the ENS of Constantine, where this issue was not raised.

7. English language teachers at the department's English do not know the CEFR and continue to teach with methods based on the transmission, not the interactive pedagogies and approaches each task and project.

8. Absence of detailed program with clear objectives.

9. The canvases offer only outline and teachers develop their own program which explains the heterogeneity of the output profiles.

IV. The activities to be undertaken in the short term :

The short-term measures to be applied principally at the doctoral level from the year 2019 to 2020.

- The setting up of the CECRL's Doctoral Reference System from the start of the next academic year ;
- The Instauration of level B2 certificate as a condition prior to the defence of the doctorate.
- The Requirement of a grade of English in the baccalaureate equal to or greater than 12/20).
- The Requirement of grade 11/20 and above (without catching up) to access the Master.
- The Increase of the hourly volume at 3 o'clock including 1h30 in situ and 1h30 at a distance.
- The Increase in coefficient.
- The Creation of Doctoral Schools of English of Specialties (EDAS) at the level of four (04) regional poles: (East, Center, West, South).
- The Renewal of the intensification of the English language that will be charged of the reflection, educational monitoring, from content design and training goals, and review of approaches to art teaching methods to in place.
- The Establishment ofa schedule of meetings CPND for the updating of training programs (input profile, content and appropriate pedagogy, and output profile).
- The Review the status of the CEIL - Language Resource Center.

V. The activities to be implemented in the medium term :

- Require training for the new recruited teachers (trainees), through an educational support policy.
- Organize training workshops for teachers to assist them in the development and structuring of specialist training given in English.
- Develop pilot projects in some universities, evaluate what s experiences to get feedback and capitalize on the achievements of this feedback.

- Train teachers in strategy of development of educational programs to meet the requirements and trends existing in the market.
- Encourage the «American Corner» establishment in several universities across the country and also strengthen cooperation with the British Council through cooperation programs and conventions between academic institutions.
- Created first service of distance education with necessary resources dedicated to teacher training and course design in English online.
- Initiate a dynamic of cultural and educational activities in English-language clubs.
- Redeploy cooperation to English-speaking countries.
- Establish collaboration, cooperation and exchange agreements with international institutions.

VI. The activities to be long-term :

ENGLISH FOR ALL LICENSED STUDENTS

To achieve this objective strategic, should start preparing for this since the needs that stage are drastic , it is there , prepare for the arrival / training tens of thousands of English teachers to ensure quality courses (L1, L2, L3) in all specialties.

Just in this condition the English language will take off across the Algerian university with the arrival of graduates already sufficiently well prepared in English from the primary, the meeting of these conditions remain the same token of our future progress.

Appendix 5

Ministry's Training Target for English Proficiency among Professors

الجمهورية الجزائرية الديمقراطية الشعبية
وزارة التعليم العالي والبحث العلمي
People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research

الديوان
خلية الاعلام والاتصال

الجزائر، 6 نوفمبر 2022

مؤشرات وإجراءات عملية لتكوين الأساتذة الباحثين في اللغة الإنجليزية

في إطار تعزيز مكانة اللغة الإنجليزية في التعليم والتكوين بمؤسسات التعليم العالي، ومتابعة لتقييم مسعى تكوين الأساتذة في اللغة الإنجليزية، وجهت مراسلة في هذا الصدد إلى رؤساء الندوات الجهوية للجامعات، بالإتصال بالسيدات والسادة مديري مؤسسات التعليم العالي، تتضمن أهم التوجيهات والمؤشرات التي حددها السيد الوزير، بخصوص عدد الأساتذة المستهدف تكوينهم، من طرف مؤسسات التعليم العالي، مع نهاية الموسم الجامعي الحالي 2022/2023:

1. بالنسبة للعلوم والتكنولوجيا تكوين 80 بالمائة على الأقل منهم.
2. بالنسبة للأساتذة في ميدان العلوم الاجتماعية والإنسانية وميدان العلوم الطبية، تكوين 100 بالمائة من الأساتذة الذين يدرسون الوحدات الأفقية.
3. أما بالنسبة للمؤسسات الجامعية التي تتوفر على مراكز للتعليم المكثف للغات،أو أقسام تكوين في اللغة الإنجليزية، فعليها التكفل باستغلالها في تكوين أساتذتها.
4. بالنسبة للمؤسسات الأخرى سيوضع تحت تصرفها منصة رقمية من طرف اللجنة الوطنية المكلفة بالتعليم عن بعد ، بدءا من 1 ديسمبر 2022 ، مخصصة لتكوين الأساتذة في اللغة الإنجليزية.
5. بالنسبة للمؤسسات الجامعية التي تتوفر على مكونين متحكمين في اللغة الإنجليزية، فيتعين عليها الشروع في تدريس المواد التي يشرف عليها هؤلاء الأساتذة باللغة الإنجليزية، بدءا من السنة الجامعية الجارية.

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Appendix 6

Minister's Directive on English-Taught Subjects and Teachers' Training

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

المديرية العامة للتعليم والتكوين

رقم: 301 /م.ع.ت.ت.ع/ 2023 الجزائر في18 ماي 2023

السادة رؤساء الندوات الجهوية للجامعات

بالاتصال مع السيدات والسادة مدراء مؤسسات التعليم العالي

الموضوع: حول ترقية التدريس باللّغة الانجليزية.

بغية ترقية التدريس باللّغة الانجليزية كلغة للعلم والتكنولوجيا ، أطلب منكم ما يلي:

- برمجة مواد التعليم في الجذع المشترك بالانجليزية وإسنادها لأساتذة حاصلين على الأقل على مستوى (B2) في اللّغة الانجليزية.
- مواصلة تكوين الأساتذة باللّغة الانجليزية لبلوغ مستوى (B2).
- وضع مخطط استراتيجي لتطوير التدريس باللّغة الانجليزية في مؤسستكم.

كما أطلب منكم القيام بنمذجة لاستعمال الزمن ابتداء من اليوم وذلك لتفادي كل النتائج الناجمة عن نقص في التأطير والتواصل مع الأساتذة المكونين في الجذوع المشتركة اللذين تمت برمجتهم من أجل المعالجة المسبقة لأية نقائص محتملة وكذا معرفة وتقييم مدى استعدادهم لهذه العملية.

كما أحيطكم علمًا أنه سيتم متابعة وتقييم هذه العملية على مستوى كافة المؤسسات الجامعية عقب الشروع فيها.

آولي أهمية بالغة لتنفيذ فحوى هذه المذكرة.

تفضلوا، بقبول فائق عبارات التقدير والاحترام.

Signature numérique de Ali CHOUKRI
Date : 2023.05.18 14:31:58 +02'00'

Appendix 7

Timetable, University of Annaba, Faculty of Sciences, Department of Biochemistry, 3rd year bachelor's degree.

UNIVERSITE MOKHTAR – ANNABA

FACULTE DES SCIENCES

DEPARTEMENT : BIOCHIMIE

LICENCE : BIOCHIMIE

EMPLOI DU TEMPS SEMESTRE 6

Année Universitaire 2018/2019

EFFECTIF DES ETUDIANTS L3 : 180

Horaires / Jours	8h.00'----9h.30'	9h.45' ------ 11h.15'	11h.30'-------13h.00'	13h.15'-----14h.45'	15h.00'----16h.30'
DIMANCHE		Structure et fonction des complexes formés par les protéines. Boutteba Amphi 23		Structure et fonction des complexes formés par les lipides et les glucides M. Aouadi Amphi 23	
LUNDI	TP	TP	Génie génétique Bouraoui Amphi 23 G 4.5.6	Cytologie hématologie Habbèche /Saka Amphi 23	
MARDI	Structure et fonction des complexes formés par les lipides et les glucides Aouadi Amphi 23	Génie génétique Bouraoui Amphi 23 G 1.2.3	Biologie fondamentale des grandes fonctions Kadi /Bouali, Amphi 23	Biologie moléculaire Abdi / Bouacha Amphi 23	
MERCREDI		Biologie moléculaire Abdi / Bouacha Amphi 23	Cytologie hématologie Habbèche /Saka Amphi 23	Anglais scientifique Amphi 23 Slimani	
JEUDI	Biologie fondamentale des grandes fonctions Kadi /Bouali, Amphi 23	Structure et fonction des complexes formés par les protéines. Boutteba Amphi 23			

Appendix 8

Timetable, University of Annaba, Faculty of Sciences, Department of Biochemistry, 1 year master's degree in Applied Biochemistry semester 1+2.

UNIVERSITE BADJI MOKHTAR – ANNABA

FACULTE DES SCIENCES
DEPARTEMENT : BIOCHIMIE

MASTER 1: Biochimie Appliquée
EMPLOI DU TEMPS SEMESTRE 2
Année Universitaire 2018/2019

Effectif étudiants : **55**

Horaires / Jours	8h.00'----9h.30'	9h.45' ----- 11h.15'	11h.30'------13h.00'	13h.15'----14h.45'	15h.00'.....16h.30'
DIMANCHE	Législation, Djeribi Amphi 23	Endocrinologie Pathologie Kechrid S 36	Neuroendocrinologie Besnaci/Boufermes/TD S 51		
LUNDI	Biotechnologie enzymatique Ladjama /S.36	Neuroendocrinologie Boufermes/ Cours S 51	Toxicologie pharmacologie Henchiri/Bouchahdène/ S23	Endocrinologie Pathologie Kechrid S 36	
MARDI	Biotechnologie enzymatique Ladjama S 36	Biochimie appliquée : biomolécules d'origine végétale M. AOUADI/ S28	Biochimie Appliquée : Biomoles d'origine végétale Aouadi/Boutebba S23 Par quinzaine	Méthodes Générales de Biologie Moléculaire Benmostefa/Bouasla S 23	
MERCREDI	Méthodes Générales de Biologie Moléculaire Benmostefa / Bouasla S51	Anglais Kechrid S 51		Biochimie Appliquée : Biomoles d'origine végétale BOUTEBBA/ S.36	
JEUDI	Toxicologie pharmacologie Henchiri /Saka/ S51	Rédaction de mémoire et lecture de publication Boufermes S51	Biochimie Appliquée : Biomoles d'origine végétale Aouadi/Boutebba S.36 Par quinzaine		

Appendix 9

Learner's Needs Analysis Questionnaire For Biology Students

"Learner's Needs Analysis Questionnaire For Biology Students "

Dear students,

We will be extremely grateful if you take a part to this questionnaire which is designed to collect data pertaining to Master 's dissertation on "**Integrating English as a medium of instruction in first year biology level through tailored course design -case of fundamental chemistry unit -".**

Please answer the following questions by ticking (√) on the appropriate box (es) corresponding to option (s) you think most appropriate or making full answers if necessary. The participants 's answers will be devoted mainly for research purposes and your data will remain strictly anonymous .

استبيان حول تحليل احتياجات طلبة قسم البيولوجيا

زميلي الطالب :

سنكون ممتنين لمشاركتك في هذا الاستبيان الذي يهدف إلى جمع بيانات متعلقة بمذكرة ماستر حول **" إدماج اللغة الانجليزية كوسيلة لتدريس مستوى اولى بيولوجي من خلال تصميم دروس - حالة مادة الكيمياء " .**

يرجى الإجابة على الأسئلة التالية عن طريق وضع علامة (√) على الخانة (أو الخانات)المناسبة المتوافقة مع الاختيار(أو الاختيارات) التي تعتقدون أنها الأنسب أو إعطاء إجابات كاملة إذا لزم الأمر. ستكون إجابات المشاركين مخصصة أساسا لأغراض البحث وبياناتكم ستبقى سرية تماما.

SECTION ONE : BACKGROUMG INFORMATION

القسم الأول : معلومات عامة

1.Please provide the following information :

1. الرجاء تقديم المعلومات التالية :

A. Age : (العمر)

18-22 ☐

23-27 ☐

28-32 ☐

More (أكبر).....

B. Gender : الجنس

Male (ذكر) ☐

Female (أنثى) ☐

2.How would you describe your level in English language?

2. كيف تصف مستواك في اللغة الانجليزية؟

☐ A. Average (متوسط)

☐ B. Good (جيد)

☐ C. Very Good (جيد جدا)

☐ D. Excellent (ممتاز)

3. How frequently do you use English in your daily life ? (circle the most appropriate choice)

3. كم مرة تستخدم اللغة الانجليزية في حياتك اليومية ؟ (حدد الاختيار الأنسب بدائرة)

A. Rarely نادرا

B. Occasionally احيانا

C. Frequently بشكل متكرر

D. Biology Education الدراسة البيولوجية

4.In what contexts do you currently use English?

4 . في أي سياقات تستخدم اللغة الإنجليزية حاليا ؟

☐A. Academic settings (السياق الأكاديمي)

☐B. Social settings(السياق الاجتماعي)

☐C. Professional settings (السياق المهني)

☐D. Others (اخرى) : please specify (من فضلك حدد)

…….....

SECTION TWO : THE MEDIUM OF INSTRUCTION IN THE BIOLOGY DEPARTMENT

القسم الثاني : لغة التدريس في قسم البيولوجيا

5. Have you previously studied biology in English?

5. هل درست مسبقا البيولوجيا باللغة الانجليزية ؟

a. Yes (نعم) ☐

b. No (لا) ☐

6.How confident do you feel in your ability to understand and communicate in English?

6. ما مقدار ثقتك بقدرتك على فهم اللغة الإنجليزية والتواصل بها؟

☐A. Not confident at all (لست واثقا إطلاقا)

☐B. Somewhat confident (واثق نوعا ما)

7. How motivated are you to improve your English proficiency specifically for studying biology?

7.لأي درجة أنت محفز لأجل تحسين مستوى لغتك الإنجليزية خاصة لهدف دراسة البيولوجيا ؟

☐ A . Not motivated (لست محفز)

☐ B. Somewhat motivated (نوعا ما محفز)

☐ C. Very motivated (جد محفز)

8. Do you believe that English proficiency is important for studying biology?

8. هل تعتقد أن إتقان اللغة الإنجليزية مهم لدراسة علم الأحياء ؟

A. Yes (نعم) ☐

B. No (لا) ☐

9. Why do you think English is important in the study of biology?

9. لماذا تعتقد أن اللغة الإنجليزية مهمة لدراسة البيولوجيا ؟

.....

10. What are the possible difficulties you may encounter by using English? (you can choose more than one option)

10. ما هي الصعوبات المحتملة التي قد تواجهها عند استخدام اللغة الانجليزية ؟ (يمكنك اختيار أكثر من خيار واحد) ؟

☐A. Understanding technical vocabulary (فهم المفردات التقنية)

☐B. Grammar (قواعد اللغة)

☐C. Comprehension (فهم اللغة)

☐D. Others (اخرى) : please specify (من فضلك حدد)

.....

.

11. How would you rate your understanding of biology concepts?

11.كيف يمكن أن تقيم مستوى فهمك للمفاهيم البيولوجية ؟

☐A. Poor (ضعيف)

☐B. Fair (متوسط)

☐C. Good (جيد)

☐D. Excellent (ممتاز)

12 . Are there any specific areas within biology where you feel less confident in your understanding?

12. هل توجد مجالات معينة ضمن علم الأحياء تشعر بأن لديك ثقة أقل بفهمك لها؟

☐A. Molecular Biology (علم الأحياء الجزيئية)

☐B. Animal Biology BA (علم الحيوان)

☐C. Genetics (علم الوراثة)

☐D. Others (اخرى) : please specify (من فضلك حدد)

.....

13. Are there any specific scientific terms or concepts that you find challenging to grasp in English?

13.هل هناك اي مصطلحات علمية تجد صعوبة في فهمها ؟

A. Yes (نعم) ☐

B. No (لا) ☐

14.What is the current language used for instructing Chemistry unit?

14.ماهي اللغة الحالية المستخدمة في تدريس مادة الكيمياء ؟

☐A. Arabic(العربية).

☐B . Frensh (الفرنسية)

☐C. English (الانجليزية)

15.If English, Please indicate the extent to which is frequently used inside the classroom? (Circle the most appropriate choice)

15. اذا كانت اجابتك الانجليزية. الرجاء تحديد مدى استخدامها المتكرر داخل القسم ؟ (حدد الاختيار الأنسب بدائرة)

A. Never (أبدا)

B. Rarely (نادرا)

C. Occasionally)احيانا

D. Often (غالبا)

E. Very frequently (بشكل متكرر جدا)

16.Do you feel more comfortable being taught by English rather than Frensh?

16 .هل تشعر بالراحة اكثر عندما يتم تدريسك باللغة الانجليزية بدلا من الفرنسية ؟

A. Yes (نعم) ☐

B. No (لا) ☐

17.What specific language barries do you face when studying fundamental Chemistry unit in English? (you can chose more than option)

17. ما هي العقبات اللغوية الخاصة التي تواجهك عند دراسة مادة الكيمياء الأساسية (يمكنك اختيار اكثر من اختيار واحد) في اللغة الانجليزية ؟

☐ A. Vocabulary (المفردات)

☐ B. Grammar (قواعد اللغة)

☐ C. Pronunciation (النطق)

☐ D. Reading (القراءة)

☐ E. Listening (الاستماع)

☐ F. Speaking (التحدث)

☐ G. Writing (الكتابة)

☐ H. All above (كل ما سبق)

18.Do you think that the chemistry unit should be taught in English by biology teachers

18.هل تعتقد أن مادة الكيمياء ينبغي تدريسها باللغة الانجليزية من قبل أساتذة تخصص البيولوجيا ؟

A. Yes (نعم) ☐

B. No (لا) ☐

C. Others:(أخرى)

.....

19.Rank your skills in order form 1-7 from the weakest to the strongest :

19. قيم مهاراتك بالترتيب من 1 الى 7 من الأضعف الى الأقوى ؟

A. Grammar (قواعد اللغة) ☐

B. Vocabulary (المفردات) ☐

C. Listening (الاستماع) ☐

D. Speaking (التحدث) ☐

E. Reading (القراءة) ☐

F. Writing (الكتابة) ☐

G. Pronunciation (النطق) ☐

20. What do you expect to gain from this English language course tailored for biology?

20. ماذا تتوقع أن تستفيد من هذه المادة المخصصة باللغة الإنجليزية في البيولوجيا ؟

☐A. Improved communication skills (تحسين مهارات الإتصال)

☐B. Better understanding of scientific texts (فهم أفضل للنصوص العلمية)

☐C. Enhanced academic writing abilities (تعزيز مهارات الكتابة الأكاديمية)

☐ D. Others (اخرى) : please specify (من فضلك حدد)

…….

21. What specific goals do you aim to achieve through this course?

21. ما هي الأهداف المحددة التي تسعى إلى تحقيقها من خلال هذه المادة؟

☐A. Improving academic writing (تحسين الكتابة الأكاديمية)

☐B. Presenting research in English (عرض البحوث باللغة الانجليزية)

☐C. Understanding scientific literature (فهم المؤلفات العلمية)

☐D. Others (اخرى) : please specify (من فضلك حدد)

…….

22. What motivated you to enroll in this English language course tailored for biology?

22. ما الذي دفعك لتواصل في هذه المادة في اللغة الانجليزية المصصمة في علم الاحياء

☐a. Requirement for program (متطلبات البرنامج)

☐b. Improve academic performance (تحسين الأداء الأكاديمي)

☐c. Enhance research skills (تعزيز مهارات البحث)

☐d. Other (اخرى)

……

SECTION THREE : MEANS ANALUSIS

القسم الثالث : تحليل الوسائل

23. What type of materials do you think the course should include?

23. أي نوع من الوسائل تعتقد انه ينبغي ان يتضمنه الدرس ؟

☐ A. Text books(الكتب المدرسية), equipment manuals(دليل المعدات), CDs (اقراص مدمجة) ,

CVCs (اقراص مضغوطة), video tapes(شرائط الفيديو), multimedia projectors (مشغلات الوثائق المتعددة)

☐ B. Work forms (نماذج عمل), Charts and samples of relevant course assignment and students papers (جداول وعينات من الواجبات المتعلقة بالدرس وأوراق الطلاب)

☐ C. Combination of all of this (مزيج من كل هذا)

24.Please suggest what type of materials you want to be used in the courses?

24. يرجى اقتراح نوع الوسائل التي ترغب في استخدامها في تقديم الدروس ؟

.....

……

25. What types of resources do believe would be helpful in enhancing your comprehension level in chemistry?

25. ماهي أنواع الموارد التي تعتقد انها ستساعد في تحسين مستوى فهمك لمادة الكيمياء؟

.....

.....

..

26.Is there anything we should know about? (special needs, learning difficulties, medical conditions or other factors which may affect your learning journey)

26. هل هناك أي موضوع يجب علينا معرفته احتياجات خاصة صعوبات التعلم, حالات طبية, أو عوامل أخرى قد تأثر على مسيرتك التعليمية)

.....

.....

27.What types of learning resources do you find most helpful for improving your English proficiency in biology?

27. ما أنواع موارد التعلم التي تجدها الأكثر فائدة لتحسين إتقان اللغة الإنجليزية في علم الأحياء؟

☐A. Textbooks (الكتب)

☐B. Online articles (المقالات عبر الأنترنت)

☐C. Videos/lectures (مقاطع الفيديو والمحاضرات)

☐D. Interactive exercises (تمارين تفاعلية)

☐E. Others (اخرى) : please specify (من فضلك حدد)

……

28. What support do you think would be helpful for you to improve your English proficiency in biology?

28 .ما هو الدعم الذي تعتقد أنه سيكون مفيدًا لك لتحسين إتقان اللغة الإنجليزية في علم الأحياء؟

☐A. Additional language support classes (صفوف دعم إضافية في اللغة)

☐B. Tutoring sessions (جلسات تدريس خاصة)

☐C. English-language biology workshops/seminars(ورش عمل / ندوات باللغة الإنجليزية في علم الأحياء)

☐D. Access to bilingual dictionaries or glossaries(الوصول إلى قواميس ثنائية اللغة أو معاجيم)

☐E. Others (اخرى) : please specify (من فضلك حدد)

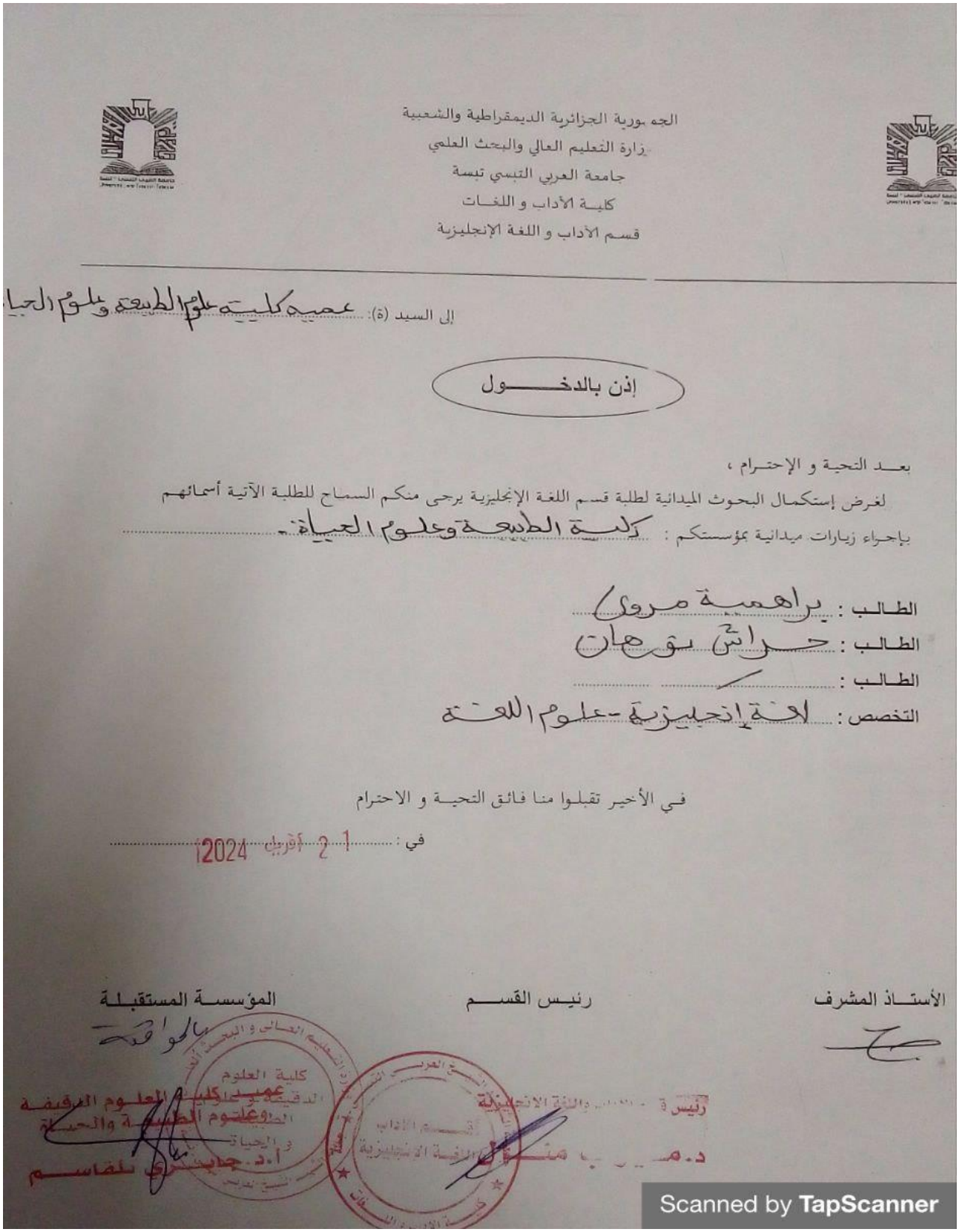
……

☺Thanks for your collaboration!☺

شكرا لتعاونك

Appendix 10

Admission to enter Biology University



الجمهورية الجزائرية الديمقراطية والشعبية
وزارة التعليم العالي والبحث العلمي
جامعة العربي التبسي تبسة
كلية الآداب و اللغات
قسم الآداب و اللغة الإنجليزية

إلى السيد (ة): عميد كلية علوم الطبيعة وعلوم الحيا

إذن بالدخول

بعد التحية و الإحترام ،

لغرض إستكمال البحوث الميدانية لطلبة قسم اللغة الإنجليزية يرجى منكم السماح للطلبة الآتية أسمائهم بإجراء زيارات ميدانية بمؤسستكم : كلية الطبيعة وعلوم الحياة

الطالب : براهمية مروى
الطالب : حراش نورهان
الطالب : /
التخصص : لغة إنجليزية - علوم اللغة

في الأخير تقبلوا منا فائق التحية و الاحترام

في : 21 أفريل 2024

الأستاذ المشرف | رئيس القسم | المؤسسة المستقبلة

عميد كلية العلوم الدقيقة وعلوم الطبيعة والحياة
أ.د. جابشري لقاسم

رئيس قسم الآداب واللغة الانجليزية
د.م...

Appendix 11

Structured Interview for Chemistry Teachers on English as a Medium of Instruction (EMI) in Biology

Structured Interview for Chemistry Teachers on English as a Medium of Instruction (EMI) in Biology

Thank you for taking the time to participate in this interview. We are interested in understanding the current state of English as a Medium of Instruction (EMI) in first-year biology courses, particularly in the fundamental chemistry unit.

1.Did you have any training sessions in English language courses ?

2.How many years have you been teaching chemistry in the first year biology , and what language did you use to teach chemistry before ?

3. Did you find teaching in English easier than the other languages (French and Arabic) ?

4.As a teacher , did you face any challenges in teaching chemistry due to the integration of English as a medium of instruction?

5. How do you consider learner's style before you design the course ?

6.How do you adjust your teaching approach based on initial needs assessment?

7. Do you utilize any specific methods or tools for pre-course needs assessment (e.g., surveys, diagnostic tests)?

8.When you present the course , do you encounter misconception or misunderstanding regarding the specific jargon ?

9. When designing objectives, do you find it helpful to consider the different learning styles of your students (e.g., visual, auditory, kinesthetic) ?

10..Beyond just grammar and vocabulary, do you integrate other aspects of "linguistic skills" (e.g., pronunciation, scientific terminology) into your course design?

11. How do you develop or select teaching materials to ensure they are clear, engaging, and support student understanding of chemistry concepts in English?

12.. Do you ask the students to do the classwork individually or in group?

13.Do you involve your students in the evaluation process through feedback mechanisms?

14.Take the example of "Atom Structure course " , what is the main goal and set of objectives you formulate before tailor you final product ?

1.Do you have any additional comments or suggestions regarding the use of EMI in first-year biology, particularly in the fundamental chemistry unit?

Thank you for your time and valuable insights!

Appendix 12

The Chemistry Fundamental Module Caneva

Canevas socle commun 1er année SNV

Semestre: 1 er Semestre

Matière 1 : Chimie générale et organique Crédits : 6, Coefficient : 3

Chimie générale et organique Cette matière permet à l'étudiant d'acquérir des bases élémentaires de chimie générale (électron et classification périodique), et de la chimie organique (composés organiques et mécanismes réactionnels).

Objectifs de l'enseignement

Cette matière consiste à assurer un enseignement sur les bases fondamentales de l'organisation et la structure chimique de la matière. C'est un complément des autres matières car il sert à faciliter la compréhension au plan chimique des phénomènes biologiques.

Programme détaillé

Contenu de la matière

1. Chimie générale

1.1. Généralité :

1.1.1. Atome, noyau, isotopie,

1.1.2. Stabilité et cohésion du noyau, énergie de liaison par nucléon

1.2. Radioactivité :

1.2.1. Définition

1.2.2. Radioactivité naturelle : principaux types de rayonnement

1.2.3. Radioactivité artificielle

1.2.4. Loi de désintégration radioactive

1.2.5. Différent types de réaction nucléaire

1.3. Configuration électronique des atomes

1.3.1. Introduction des nombres quantiques

1.3.2. Principes régissant la structure électronique d'un atome :

1.3.3. Règle énergétique (règle de Klechkoweski)

1.3.4. Règle d'exclusion de Pauli

1.3.5. Règle de Hund

1.4. Classification périodique :

1.4.1. Groupe (Colonne), Période (ligne)

1.4.2. Evolution des propriétés physiques au sein du tableau périodique : rayon

Appendix 13

Analytical Framework

Course components	objectives	Code	description
Needs assessment	Identify Learner Needs (Pre-course)	**I.L.N**	Needs assessments (pre-course , initial, ongoing) inform course design and empower student ownership of learning.
	Refine Course Design (Initial)	**R.C.D**	
	Monitor Progress Continuously	**M.P.C**	
Formulating goals and objectives	Define Overall Vision	**D.O.V**	Clear Course Goals & Objectives: Start with a big-picture learning goal and break it down into achievable objectives on student knowledge and skills.
	Break Down the Journey	**B.D.J**	
	Align for Success	**A.S**	
	Focus on Learning	**F.L**	
Conceptualizing content	Needs-Based Learning Goals	**NB.L.G**	Student needs drive clear goals which are achieved through curated content and a structured learning roadmap.
	Curatorial Choices	**C.Ch**	
	Structured Learning Journey	**S.L.J**	
Organizing the course	Guiding Principles (Overall)	**G.P**	Course structure is governed by core principles which guide content and unit focus for clear learning progression
	Modular Breakdown (Subsets)	**M.B**	
	Logical Sequencing (Subsets)	**L.S**	
	Integrated Content (Units)	**I.C**	
	Structured Units (Internal)	**S.U**	
Developing materials	Bridge Prior Knowledge	**B.P.K**	Students needs drive clear learning goals achieved through emphasizing the essence of creating materials that engage and help students to develop valuable skills beyond the course
	Foster Active Learning	**F.A.L**	
	Prioritize Real-World Use	**P.RW.U**	
	Authentic Learning Experiences	**A.L.E**	
Evaluation	Evaluate Course Quality	**E.C.Q**	Constant course evaluation fueled by feedback leads to improvement and through formative assessment, giving them ownership of their learning
	Gather Feedback	**G.F**	
students	Student-Centered Approach	**SC.A**	

Note . Components and objectives are synthesized from Graves 'model (2000)of course design. Codes are representing objectives and are used to ease the analysis process. Descriptions of objectives reflect the researchers' operational definitions (adopted from Mekki, K,2023,p.82).

Appendix 14

Stage 01 of Content Analysis

Content Analysis of English Chemistry Courses

➢ Stage 1 (Summary of Data Gathered from English Language used in Documents Related to Chemistry)

Selected Documents	Units of Analysis	Summary of Data
Course: Atom Structure	Sentence structure	• In terms of sentence length , mostly short and simple sentences make the text easy to be readable and understood . • In terms of sentences complexity , primarily simple and compound sentences are used , however it lacks somehow sentence variety openings .
	Paragraph structure	• In terms of paragraph length , they are short and focused on single concepts • In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details for example : **Paragraph 1:** **Clear topic Sentence**: "Matter is the substance that makes up any body that contains non-zero mass." **Supporting Details:** Explains the different physical states of matter (solid, liquid, gas) and their properties. Provides an example (air) for the gaseous state. **Paragraph 2:** **Clear topic Sentence**: "Atoms are microscopic grains that make up matter. Atoms can stick together to form molecules." **Supporting Details:** Introduces the concept of atoms. Explains that atoms can combine to form molecules. • The use of numbers (1. Matter definition, 2. Mixtures and pure bodies, etc.) suggests a logical progression of topics.
	Grammar	• In terms of verbs consistency , it appears the use of present tense for example : _States of matter: "Matter can generally exist in three different physical states..." _Properties of states: "The solid state has a well-determined volume and shape..." _Definitions: "A mixture is combination of two or more..." , "An atom is a microscopic grain..." _General statements about science: "Avogadro's number is noted NA..." • In terms of Subject-verb agreement, are consistently used, for example : -Singular subject with singular verb: "Matter is the substance..." "An atom is a microscopic grain..." -Plural subject with plural verb: "Matter can generally exist in three different physical states..." (Matter refers to a general concept, but "can exist" indicates the different states) "There are two main types of mixtures" • The use of agreement between pronouns and their antecedents ,for example : "It (the mole) is the quantity of matter..." "The mass of a carbon atom (12)" (the pronoun "its" later refers back to "carbon atom") • In terms of active voice , here the examples : **Matter definition**: "Matter is the substance..." (Active - Matter is the subject performing the action of being the substance) **States of matter**: "The liquid state has a determined volume..." (Active - Liquid state is the subject performing the action of having a volume) **Mixtures**: "A mixture is a combination..." (Active - Mixture is the subject performing the action of being a combination) **The mole**: "It contains an NA number of elementary constituents..." (Active - The mole is the subject performing the action of containing) • In terms of punctuation , several instances of correct punctuation as follow : **-Periods**: Periods are used effectively to terminate complete sentences throughout the text. (e.g., "Matter is the substance...," "A mixture is a combination..." etc.)

		-Commas: Commas are used appropriately in various situations: **-Separating clauses**: "The solid state has a well-determined volume and shape, the liquid state has a determined volume..." **-Non-essential appositives**: "Avogadro's number, noted NA..." **-Items in a list**: "...three different physical states: •The solid state, •The liquid state, •The gaseous state..." **-Colons:** Colons are used correctly to introduce explanations or lists: "There are two main types of mixtures: heterogeneous mixtures and homogeneous mixtures." "The mole: It is the quantity of matter..." **-Parentheses**: Parentheses are used to provide additional information or clarify a point: "Heterogeneous mixtures, (which include more than one phase visible to the naked eye)..." "(e.g., air)" (example of gaseous state) • In terms of spelling and capitalization , spelling is correctly found for instance, names of elements, compounds, or scientific concepts are spelled and capitalized appropriately (Spelling, e.g., Sodium, Carbon dioxide). (Capitalization, e.g., "Molecule").
	Vocabulary and Clarity	• In terms of vocabulary level, it introduces key terms and provides explanations for some, for example : **-Basic Concepts:** The use of fundamental chemistry terms like matter, mixture, atom, molecule, state (solid, liquid, gas). Also, Other terms are explained through context (e.g., "heterogeneous mixtures" are described as having multiple phases visible).It introduces basic chemical formulas (H2, H2O) without going into complex structures. **-Increased Complexity**: While starting with basic terms, it introduces slightly more complex vocabulary like heterogeneous/homogeneous mixtures, simple/compound bodies, Avogadro's number, mole, and molar mass. **-Limited Scope:** It focuses on core concepts of matter, its composition (mixtures, pure substances), and basic atomic structure (atoms, molecules). It avoids overly advanced terminology specific to more in-depth areas of chemistry. Some new terms are clearly defined within the text (e.g., Avogadro's number, mole, molar mass). • In terms of formal scientific register , here are some examples from the text: - The use of specific jargon, the frequency of using scientific terms appears well such as : Matter, Mixture ,Heterogeneous mixture , Homogeneous mixture ,Pure body ,Simple pure, body, Compound pure body, Atom ,Molecule, State (of matter) ,Solid state, Liquid state ,Gaseous state ,Avogadro's number (NA) ,Mole (mol),Molar mass (MM),Atomic molar mass (MA) and Atomic mass unit (amu). -Avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. For instance, instead of saying "The most interesting state of matter is gas," it states that "The gaseous state neither has a fixed volume nor a determined shape..." -Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not". • In terms of clarity and conciseness , the language used is clear and concise, using scientific terminology accurately , it uses clear and concise sentence structures. For instance: "Matter is the substance that makes up any body that contains non-zero mass." - This sentence defines "matter" in a straightforward way. "The liquid state has a determined volume, but adopts the shape of the container in which it is found." .This sentence explains a property of the liquid state concisely. _When introducing new terms, it uses clear and concise definitions ,for example: "Avogadro's number (NA) corresponds to the number of elements (atoms or molecules) in a mole..." .This definition explains Avogadro's number in a way that's easy to understand. -It uses scientific terminology accurately but avoids overly complex terms , for instance: -"Solid state" and "liquid state" are clear terms for the different phases of matter. -"Molecule" is a precise term for a group of atoms chemically bonded together. _It uses brief examples to illustrate concepts. For instance: -"Air" is used as an example of a gas. -"H2O" is used as an example of a molecule. • In terms of the logical flow of information, building upon basic concepts to introduce more complex ones. Here is a breakdown of the logical structure with examples:

		-Introduction of Matter: it starts with the fundamental concept of matter, defining it and describing its existence in three states (solid, liquid, gas). **-Mixtures and Pure Substances**: It then introduces the concept of mixtures (heterogeneous and homogeneous) as a way to categorize matter. This builds upon the understanding of matter by explaining how matter can be combined. **-Diving Deeper**: **Pure Bodies:** After introducing mixtures, the text delves into pure substances, a subcategory of matter, and differentiates between simple pure bodies (elements like H2, Fe) and compound pure bodies (compounds formed from elements like H2O). This uses the concept of matter and introduces a classification system based on composition. **-Atoms and Molecules**: it progresses to even smaller building blocks - atoms and molecules. It defines atoms and explains how they can combine to form molecules. This concept builds upon the understanding of pure substances by explaining their fundamental composition. **-Quantities**: **Avogadro's Number and the Mole**: Having introduced atoms and molecules, the text introduces Avogadro's number and the concept of a mole, which are essential for quantifying these tiny particles. This builds upon the understanding of atoms and molecules by introducing a system for measuring their quantities. **-Molar Mass**: The concept of molar mass is explained, which relates to the mass of one mole of a substance. This uses the concept of the mole and connects it to mass measurements. **-Atomic Mass Unit (amu):** Since the mass of atoms is extremely small in grams, the passage introduces the atomic mass unit (amu) as a more suitable unit. This uses the concept of molar mass and introduces a more relevant unit for atomic measurements .
	Visuals and diagrams	• In terms of clarity and Importance of Diagrams in Portraying Atom Structure: • The diagram in **first page** : It focuses on the concept of moles and molar mass. There are different elements displayed which include: **Top**: Shows elements (Mn, O) and formulas ('n', 'm', 'M') likely related to calculating molar mass. **Center**: Emphasizes a concept (large '2') and suggests understanding chemical formulas (lightbulb with formula). **Bottom**: Links molar mass to grams with a periodic table section and a 1 mole = 1.0 g note. Colored cubes labeled with 'Mn' and 'O', representing elements (Manganese and Oxygen) from the periodic table. -It uses French labels for key concepts: Masse molaire atomique (Atomic molar mass) Masse molaire moléculaire (Molecular molar mass) Mole (Mole). This terminology aligns with the French language course and the introduction to the mole concept. -The diagram uses a simple and effective color scheme :The blue background provides a neutral backdrop. The blue shading for the particles creates a three-dimensional effect, helping students perceive the spatial arrangement. -The diagram avoids unnecessary details and focuses on the essential concept – molar mass. It introduces the mole as a unit and positions it between atomic and molecular molar mass. -Integrating real -world : It uses colored cubes labeled with element symbols (Mn, O) to represent tangible objects (elements) and connect them to the abstract concept of molar mass . The inclusion of formulas ('n', 'm', 'M') alongside the elements prepares students for the mathematical calculations involved in molar mass problems. The placement of 'M' near the element symbols subtly suggests its connection to molar mass. The light bulb with a chemical formula inside suggests the diagram aims to aid in understanding how chemical formulas relate to molar mass calculations. • The diagram number 01 titled "**The three states of matter**." : It depicts three spheres representing atoms or molecules arranged differently in the solid, liquid, and gaseous states of matter. The diagram effectively uses labels for each state of matter (solid, liquid, gas). This makes it clear what each section represents. The diagram complements the information presented in the text by visually representing the arrangement of particles in the three states. There is consistency in terminology, using "particles" which aligns with the text's general introduction, avoiding the complexity of atomic structure at this stage. -The diagram uses a simple and effective color scheme. The blue background provides a neutral backdrop, and the blue shading for the particles creates a three-dimensional effect, helping students perceive the spatial arrangement. The particles are depicted as simple blue spheres.

		While spheres don't show atomic structure, they are a suitable choice for this introductory level representation of particles . -Simplicity vs. Complexity: The diagram avoids unnecessary details and focuses on the essential feature – the arrangement of particles in each state. This makes it clear and easy for students to understand. -An interactive element, like allowing students to click and see the particles move between states, could enhance engagement. Including small images or references to real-world examples (e.g., ice, water, steam) could solidify the connection between the concepts and everyday observations. • The diagram number 02 titled " **Mixture** " : It depicts a mixture composed of two visually distinct regions, one colored blue and yellow , the other color is green which provides a neutral and visually calming backdrop compared to a stark white background. The blue and yellow colors effectively differentiate the components. The diagram uses a simple and distinct color scheme of blue and yellow. This effectively differentiates between the two components of the mixture. -The diagram avoids unnecessary details and focuses on the key concept of how components are arranged in a mixture. -Real-world references, like small images of water and oil (assuming these are the depicted components), solidify the connection between the scientific concept and everyday observations . - Importance to Learner's Understanding: the diagram partially helps students visualize a mixture. The intermixed colors suggest a heterogeneous mixture, Consider incorporating small images or references to real-world mixtures (e.g., water and oil).The diagram partially helps students visualize a mixture. The intermixed colors suggest a heterogeneous mixture . • The diagram number 03 titled " **Atoms and Molecules** ": It depicts several red and blue spheres representing atoms. Some of these spheres are connected by black lines, forming structures that likely represent molecules. Red and yellow spheres representing atoms . Black lines connecting some spheres, likely representing bonds between atoms to form molecules. • Clarity in this diagram appears in labeling the spheres with element symbols (e.g., H for hydrogen, O for oxygen) would explicitly connect the visual representation to real elements. spheres are basic circles, avoiding complex details about atomic structure at this introductory level. • Interactive elements, such as: Clicking on an atom to see its element information. Allowing students to manipulate the diagram to explore how atoms bond to form different molecules. • Real-world integration in the diagram : the spheres are labeled with element symbols (e.g., H for hydrogen, O for oxygen, C for carbon), this directly connects the diagram to real-world elements on the periodic table. The diagram depicts a specific molecule, like a water molecule (H2O), where the red and yellow spheres represent hydrogen and oxygen atoms connected by black lines, it demonstrates a real-world example of how atoms combine to form a well-known molecule .
Series of The Exercises	Sentence Structure	• The exercises use a good mix of question formats: • <u>Calculation-based:</u> These questions ask students to perform calculations using chemical concepts like molar mass, moles, and atomic mass. **Example**: Exercise N.01 asks students to calculate the molar mass of various compounds like NaOH and KMnO4. This requires them to use the given atomic masses and the concept of molar mass (mass of one mole of a substance). • <u>Conceptual understanding</u>: These questions go beyond calculations and assess students' grasp of the underlying concepts. **Example**: Exercise N.02 (part 2) asks for the number of molecules present in 49 g of HCl. This doesn't require just a calculation, but also understanding the relationship between moles and molecules (Avogadro's number). Similarly, Exercise N.04 (part 4 & 5) asks for the number of atoms of hydrogen and sulfur in a given amount of H2S. This

		requires understanding how a compound is formed from its constituent elements. • Application: These questions require students to apply their knowledge to solve a problem in a more realistic context. **Example**: Exercise N.05 presents a sample of methane (CH4) with a specific mass and asks for various calculations. Students need to use their knowledge of molar mass, moles, and the composition of CH4 to determine the number of moles, molecule mass, and number of atoms of carbon and hydrogen. Exercise N.04 goes beyond calculations and delves into the relationship between number of moles, grams, and number of atoms of individual elements within a compound. Exercise N.05 adds a real-world context by introducing a sample mass and asking students to calculate multiple aspects.
	Grammar	• The consistent use of imperative verbs ("Calculate," "Explain" , " How many ") for clear instructions.
	Vocabulary and Clarity	• Scientific vocabulary related to chemistry is used appropriately, including terms like "molar mass," "moles," "molecules," and "atoms."
Practical Work(PW)	Sentence Structure	• The sentences are short and simple, focus on conveying clear instructions without unnecessary complexity. • The instructions are straightforward easy to understand .
	Grammar	• In terms of verb use : clear and concise instructions are provided using imperative verbs like "pour," "attach," "aspirate," and "allow" to guide students on how to use the equipment. • Strong verbs are used to highlight the severity of consequences ("Corrosive liquids can severely burn skin"). • It incorporates action verbs to highlight appropriate responses to encountering these hazards (e.g, "wash skin immediately" for irritant pictogram). • The instructions are written in the active voice ("heat the test tube gently") for clear and concise direction.
	Vocabulary	• The use of chemistry-specific terms like "work and safety rules," "laboratory equipment," "reactions," "reagents," and "heating." specific terminology related to lab equipment, including "graduated pipette," "volumetric pipette," "Éprouvette" (graduated cylinder), and "burette." • It uses specific terms related to test tubes, including their function ("used for reactions involving small quantities of reagents") and properties ("can receive a stopper" and "be heated"). This indicates the text is aimed at students with some basic science background. • The paper consists of terms are written in French (such as "tube à essais" translates to "test tube"). • Warning Tone: the language emphasizes warnings with phrases like "attention" (warning) and "porter des vêtements de protection" (wear protective clothing). • Words and phrases like "safety rules," "carefully," "prohibited," and "protective clothing" highlight the importance of safety in a chemistry lab. • The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. • It defines technical terms like "graduated pipette" to ensure students understand their function.

		• This indicates the text is geared towards students with some basic science background. • The language is clear and concise, using imperative verbs like "wear," "record," "use," and "clean" to provide step-by-step instructions for laboratory safety and procedures. • Formal and professional tone, consistent with scientific writing.
	Organizing	• In terms of organization : • It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. • Key safety rules and work methods are presented in bullet points for better organization and emphasis. • It uses clear headings like "4. Definition of Some Manipulation Equipment" to organize the information. • In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment • The table present laboratory equipment, further aiding organization and clarity.
	Visuals and Diagrams	• The use of visual aids: the document include diagrams, pictures, or flowcharts to illustrate the experimental setup or procedures. • It combines safety symbols with written descriptions for clear communication. • The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication. • Each pictogram is accompanied by a written description of the hazard.
Interview	Students' needs, Preferences and setting goals , objectives , Selecting materials and evaluation.	• Taking into account learner styles and preferences before designing the courses , while presenting the course , while discussing and during selecting materials via : -Observe student behavior via paying attention to how students participate in class discussions, take notes, and complete assignments and this offer clues about their learning preferences. -For visual learners , try to encourage them to take visual notes, draw mind maps, or create concept maps. For auditory learners, encourage participation in class discussions and presentations and motivate them by adding extra marks to correct answers for sudden questions . -For Kinesthetic learners, try to incorporate hands-on activities, experiments, and simulations into my lessons. -For learners who prefer reading and writing rather than speaking to protect their zone safety "Introverted ", assign reading comprehension questions and writing assignments. • Make the courses concise and precise for two reasons : because scientific modules do not rarely on complex, long explanations but rather, they rely on clear explanations. Also, consider the different levels of students proficiency, so summarize the lectures due to this reason. • Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities. • The teacher does not rely on pre-course needs assessment tools or methods in terms of surveys, diagnostic tests but he tries to depend on some clues which they can reveal learning styles and prior knowledge, allowing him to adjust his teaching approach. • The teacher tries to consider different learning styles of his students hand with hand with his learning objectives which they set them before he design the course. • The teacher depends on materials which they are varied between using Data -Show projector to present some parts of his lesson , however he relies more by drawing in the board using colored chalks to attract students ' attention. Also real-world examples and

		applications are used such as :when he connect chemistry concepts to everyday life. • The teacher asks his students to solve the sudden questions and short exercises individually to test each student's understanding .However, after finishing the lesson explanation, he asks them to solve the exercises at the end of the lesson in groups. • The teacher involves his students in the evaluation process through feedback via emphasizing that mistakes are learning opportunities, encouraging a positive learning environment. He provides clear and specific feedback that helps students improvement, for instance, he circles the wrong answers with red pen and put exclamation mark beside the ambiguous explanations to direct the student into his mistake . He create a safe space for students to ask questions and seek clarification. • The teacher tries to simplify the language because the students struggle in terms of it . So in each part, he includes sentences or new words, especially scientific terms, which they should be explained with examples. • The teacher in each course session starts by providing general and important information, simplifying it as much as possible to help students grasp the essence of the course or module easily. Then, during the practical application sessions, he introduces examples or applications to enrich the course further. • In practical exercises, a bit of creativity is needed. For instance, he applies the concept to a real-life scenario, such as calculating the solubility of a substance for a patient suffering from renal issues. This example helps students see the relevance of the field in real life. • The teacher tries to be adaptive especially with the development and everyone is increasingly working with AI and also he utilizes technology to demonstrate phenomena or stimulate imagination, such as showing dilution, addition, or colorimetric reactions and he believes these tools can attract students and simplify the course for them. • The teacher in each session introduces new scientific words and ensure to repeat them so that everyone can understand and become familiar with their pronunciation. Additionally, he provides opportunities for each student to read aloud while others listen, allowing everyone to gradually develop their understanding and proficiency. • The teacher aims to simplify the course and provide opportunities for students to read and listen to each other, correcting pronunciation when necessary and explaining keywords. he also upload the course onto the platform, giving students the chance to read at home and make an effort to translate or research any concepts they don't understand. • The teacher depends on the individual homework, and reports during laboratory sessions to develop both personal skills and teamwork. • The teacher utilizes feedback mechanism to empower students to assess their own progress and receive constructive guidance for improvement in their learning journey. • In terms of goal and objectives of Atom structure course : ➢ Main goal : To equip students with a strong foundation in the language related to atomic structure and the ability to collaboratively explore the connection between matter's macroscopic properties and its microscopic building blocks. ➢ The objectives : ✓ Define key terms: Students will be able to define atomic structure vocabulary accurately. ✓ Explain composition: Students will be able to explain the difference between mixtures/pure substances and elements/compounds using scientific language. ✓ Use correct unit: Students will be able to identify and use the atomic mass unit (amu) for atomic mass measurements. ✓ Participate in discussions: Students will actively participate in discussions on atomic structure topics.

		✓ Collaboratively explain: Students will work together to explain how atoms form molecules and how scientists quantify them using clear scientific language. ✓ Solve problems: Students will work together to solve problems related to molar mass calculations.

Appendix 15

Stage 02 of Content Analysis

➢ Stage 2 (Coding the Data Gathered from Language used in Documents Related to Chemistry)

Selected Documents	Units of Analysis	Summary of Data	Code.
Course: Atom Structure	Sentence structure	• In terms of sentence length , mostly short and simple sentences make the text easy to be readable and understood . • In terms of sentences complexity , primarily simple and compound sentences are used.	**I.L.N / C.Ch**
	Paragraph structure	• In terms of paragraph length , they are short and focused on single concepts • In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details for example : **Paragraph 1:** **Clear topic Sentence**: "Matter is the substance that makes up any body that contains non-zero mass." **Supporting Details:** Explains the different physical states of matter (solid, liquid, gas) and their properties. Provides an example (air) for the gaseous state. **Paragraph 2:** **Clear topic Sentence**: "Atoms are microscopic grains that make up matter. Atoms can stick together to form molecules." **Supporting Details:** Introduces the concept of atoms. Explains that atoms can combine to form molecules. • The use of numbers (1. Matter definition, 2. Mixtures and pure bodies, etc.) suggests a logical progression of topics.	**I.L.N / C.Ch** **I.L.N / C.Ch / G.P/ M.B / L .S/ I.C / S.U**
	Grammar	• In terms of verbs consistency , it appears the use of present tense for example : _States of matter: "Matter can generally exist in three different physical states..." _Properties of states: "The solid state has a well-determined volume and shape..." _Definitions: "A mixture is combination of two or more..." , "An atom is a microscopic grain..." _General statements about science: "Avogadro's number is noted NA..." • In terms of Subject-verb agreement, are consistently used, for example : -Singular subject with singular verb: "Matter is the substance..." "An atom is a microscopic grain..." -Plural subject with plural verb: "Matter can generally exist in three different physical states..." (Matter refers to a general concept, but "can exist" indicates the different states) "There are two main types of mixtures" • The use of agreement between pronouns and their antecedents ,for example : "It (the mole) is the quantity of matter..." "The mass of a carbon atom (12)" (the pronoun "its" later refers back to "carbon atom") • In terms of active voice , here the examples : **Matter definition**: "Matter is the substance..." (Active - Matter is the subject performing the action of being the substance) **States of matter**: "The liquid state has a determined volume..." (Active - Liquid state is the subject performing the action of having a volume) **Mixtures**: "A mixture is a combination..." (Active - Mixture is the subject	**C.Ch / NB.L.G** **C.Ch / NB.L.G** **C.Ch / NB.L.G** **C.Ch / NB.L.G**

		performing the action of being a combination) **The mole**: "It <u>contains</u> an NA number of elementary constituents..." (Active - The mole is the subject performing the action of containing) • In terms of punctuation , several instances of correct punctuation as follow : **-Periods**: Periods are used effectively to terminate complete sentences throughout the text. (e.g., "Matter is the substance...," "A mixture is a combination..." etc.) **-Commas**: Commas are used appropriately in various situations: **-Separating clauses**: "The solid state has a well-determined volume and shape, the liquid state has a determined volume..." **-Non-essential appositives**: "Avogadro's number, noted NA..." **-Items in a list**: "...three different physical states: •The solid state, •The liquid state, •The gaseous state..." **-Colons:** Colons are used correctly to introduce explanations or lists: "There are two main types of mixtures: heterogeneous mixtures and homogeneous mixtures." "The mole: It is the quantity of matter..." **-Parentheses**: Parentheses are used to provide additional information or clarify a point: "Heterogeneous mixtures, (which include more than one phase visible to the naked eye)..." "(e.g., air)" (example of gaseous state) • In terms of spelling and capitalization , spelling is correctly found for instance, names of elements, compounds, or scientific concepts are spelled and capitalized appropriately (Spelling, e.g., Sodium, Carbon dioxide). (Capitalization, e.g., "Molecule").	**C.Ch / NB.L.G** **C.Ch / NB.L.G**
	Vocabulary and Clarity	• In terms of vocabulary level, it introduces key terms and provides explanations for some, for example : **-Basic Concepts:** The use of fundamental chemistry terms like matter, mixture, atom, molecule, state (solid, liquid, gas). Also, Other terms are explained through context (e.g., "heterogeneous mixtures" are described as having multiple phases visible).It introduces basic chemical formulas (H2, H2O) without going into complex structures. **-Increased Complexity**: While starting with basic terms, it introduces slightly more complex vocabulary like heterogeneous/homogeneous mixtures, simple/compound bodies, Avogadro's number, mole, and molar mass. **-Limited Scope:** It focuses on core concepts of matter, its composition (mixtures, pure substances), and basic atomic structure (atoms, molecules). It avoids overly advanced terminology specific to more in-depth areas of chemistry. Some new terms are clearly defined within the text (e.g., Avogadro's number, mole, molar mass). • In terms of formal scientific register , here are some examples from the text: - The use of specific jargon, the frequency of using scientific terms appears well such as : Matter, Mixture ,Heterogeneous mixture , Homogeneous mixture ,Pure body ,Simple pure, body, Compound pure body, Atom ,Molecule, State (of matter) ,Solid state, Liquid state ,Gaseous state ,Avogadro's number (NA) ,Mole (mol),Molar mass (MM),Atomic molar mass (MA) and Atomic mass unit (amu). -Avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. For instance, instead of saying "The most interesting state of matter is gas," it states that "The gaseous state neither has a fixed volume nor a determined shape..."	**I.L.N / C.Ch/ NB.L.G /F.L / I.C** **I.L.N / C.Ch / NB.L.G / F.L /**

		-Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not". • In terms of clarity and conciseness , the language used is clear and concise, using scientific terminology accurately , it uses clear and concise sentence structures. For instance: "Matter is the substance that makes up any body that contains non-zero mass." - This sentence defines "matter" in a straightforward way. "The liquid state has a determined volume, but adopts the shape of the container in which it is found." .This sentence explains a property of the liquid state concisely. _When introducing new terms, it uses clear and concise definitions ,for example: "Avogadro's number (NA) corresponds to the number of elements (atoms or molecules) in a mole..." .This definition explains Avogadro's number in a way that's easy to understand. -It uses scientific terminology accurately but avoids overly complex terms , for instance: -"Solid state" and "liquid state" are clear terms for the different phases of matter. -"Molecule" is a precise term for a group of atoms chemically bonded together. _It uses brief examples to illustrate concepts. For instance: -"Air" is used as an example of a gas. -"H2O" is used as an example of a molecule.	**I.L.N / NB.L.G / P.RW.U**
		• In terms of the logical flow of information, building upon basic concepts to introduce more complex ones. Here is a breakdown of the logical structure with examples: **-Introduction of Matter**: it starts with the fundamental concept of matter, defining it and describing its existence in three states (solid, liquid, gas). **-Mixtures and Pure Substances**: It then introduces the concept of mixtures (heterogeneous and homogeneous) as a way to categorize matter. This builds upon the understanding of matter by explaining how matter can be combined. **-Diving Deeper**: **Pure Bodies:** After introducing mixtures, the text delves into pure substances, a subcategory of matter, and differentiates between simple pure bodies (elements like H2, Fe) and compound pure bodies (compounds formed from elements like H2O). This uses the concept of matter and introduces a classification system based on composition. **-Atoms and Molecules**: it progresses to even smaller building blocks - atoms and molecules. It defines atoms and explains how they can combine to form molecules. This concept builds upon the understanding of pure substances by explaining their fundamental composition. **-Quantities**: **Avogadro's Number and the Mole**: Having introduced atoms and molecules, the text introduces Avogadro's number and the concept of a mole, which are essential for quantifying these tiny particles. This builds upon the understanding of atoms and molecules by introducing a system for measuring their quantities. **-Molar Mass**: The concept of molar mass is explained, which relates to the mass of one mole of a substance. This uses the concept of the mole and connects it to mass measurements. **-Atomic Mass Unit (amu):** Since the mass of atoms is extremely small in grams, the passage introduces the atomic mass unit (amu) as a more suitable unit. This uses the concept of molar mass and introduces a more relevant unit for atomic measurements .	**I.L.N / G.P / M.B / L.S / S.U / B.D.J**
	Visuals and diagrams	• In terms of clarity and Importance of Diagrams in Portraying Atom Structure: • The diagram in **first page** : It focuses on the concept of moles and molar	**I.L.N / FL / P.RW.U / A.L.E /**

		mass. There are different elements displayed which include: **Top**: Shows elements (Mn, O) and formulas ('n', 'm', 'M') likely related to calculating molar mass. **Center**: Emphasizes a concept (large '2') and suggests understanding chemical formulas (lightbulb with formula). **Bottom**: Links molar mass to grams with a periodic table section and a 1 mole = 1.0 g note. Colored cubes labeled with 'Mn' and 'O', representing elements (Manganese and Oxygen) from the periodic table. -It uses French labels for key concepts: Masse molaire atomique (Atomic molar mass) Masse molaire moléculaire (Molecular molar mass) Mole (Mole). This terminology aligns with the French language course and the introduction to the mole concept. -The diagram uses a simple and effective color scheme :The blue background provides a neutral backdrop. The blue shading for the particles creates a three-dimensional effect, helping students perceive the spatial arrangement. -The diagram avoids unnecessary details and focuses on the essential concept – molar mass. It introduces the mole as a unit and positions it between atomic and molecular molar mass. -Integrating real -world : It uses colored cubes labeled with element symbols (Mn, O) to represent tangible objects (elements) and connect them to the abstract concept of molar mass . The inclusion of formulas ('n', 'm', 'M') alongside the elements prepares students for the mathematical calculations involved in molar mass problems. The placement of 'M' near the element symbols subtly suggests its connection to molar mass. The light bulb with a chemical formula inside suggests the diagram aims to aid in understanding how chemical formulas relate to molar mass calculations. • The diagram number 01 titled "**The three states of matter**." : It depicts three spheres representing atoms or molecules arranged differently in the solid, liquid, and gaseous states of matter. The diagram effectively uses labels for each state of matter (solid, liquid, gas). This makes it clear what each section represents. The diagram complements the information presented in the text by visually representing the arrangement of particles in the three states. There is consistency in terminology, using "particles" which aligns with the text's general introduction, avoiding the complexity of atomic structure at this stage. -The diagram uses a simple and effective color scheme. The blue background provides a neutral backdrop, and the blue shading for the particles creates a three-dimensional effect, helping students perceive the spatial arrangement. The particles are depicted as simple blue spheres. While spheres don't show atomic structure, they are a suitable choice for this introductory level representation of particles . -Simplicity vs. Complexity: The diagram avoids unnecessary details and focuses on the essential feature – the arrangement of particles in each state. This makes it clear and easy for students to understand. -An interactive element, like allowing students to click and see the particles move between states, could enhance engagement. Including small images or references to real-world examples (e.g., ice, water, steam) could solidify the connection between the concepts and everyday observations. • The diagram number 02 titled " **Mixture** " : It depicts a mixture composed of two visually distinct regions, one colored blue and	

		yellow , the other color is green which provides a neutral and visually calming backdrop compared to a stark white background. The blue and yellow colors effectively differentiate the components. The diagram uses a simple and distinct color scheme of blue and yellow. This effectively differentiates between the two components of the mixture. -The diagram avoids unnecessary details and focuses on the key concept of how components are arranged in a mixture. -Real-world references, like small images of water and oil (assuming these are the depicted components), solidify the connection between the scientific concept and everyday observations . - Importance to Learner's Understanding: the diagram partially helps students visualize a mixture. The intermixed colors suggest a heterogeneous mixture, Consider incorporating small images or references to real-world mixtures (e.g., water and oil).The diagram partially helps students visualize a mixture. The intermixed colors suggest a heterogeneous mixture . • The diagram number 03 titled " **Atoms and Molecules** ": It depicts several red and blue spheres representing atoms. Some of these spheres are connected by black lines, forming structures that likely represent molecules. Red and yellow spheres representing atoms . Black lines connecting some spheres, likely representing bonds between atoms to form molecules. • Clarity in this diagram appears in labeling the spheres with element symbols (e.g., H for hydrogen, O for oxygen) would explicitly connect the visual representation to real elements. spheres are basic circles, avoiding complex details about atomic structure at this introductory level. • Interactive elements, such as: Clicking on an atom to see its element information. Allowing students to manipulate the diagram to explore how atoms bond to form different molecules. • Real-world integration in the diagram : the spheres are labeled with element symbols (e.g., H for hydrogen, O for oxygen, C for carbon), this directly connects the diagram to real-world elements on the periodic table. The diagram depicts a specific molecule, like a water molecule (H2O), where the red and yellow spheres represent hydrogen and oxygen atoms connected by black lines, it demonstrates a real-world example of how atoms combine to form a well-known molecule .	
Series of The Exercises	Sentence Structure	• The exercises use a good mix of question formats: • <u>Calculation-based:</u> These questions ask students to perform calculations using chemical concepts like molar mass, moles, and atomic mass. **Example**: Exercise N.01 asks students to calculate the molar mass of various compounds like NaOH and KMnO4. This requires them to use the given atomic masses and the concept of molar mass (mass of one mole of a substance). • <u>Conceptual understanding</u>: These questions go beyond calculations and assess students' grasp of the underlying concepts. **Example**: Exercise N.02 (part 2) asks for the number of molecules present in 49 g of HCl. This doesn't require just a calculation, but also understanding the relationship between moles and molecules (Avogadro's number). Similarly, Exercise N.04 (part 4 & 5) asks for the number of atoms of hydrogen and sulfur in a given amount of H2S. This requires understanding how a compound is formed	**I.L.N / C.Ch / B.P.K / M.P.C / D.O.V / A.S / F.L / E.C.Q/ SC.A/ F.A.L**

		from its constituent elements. • Application: These questions require students to apply their knowledge to solve a problem in a more realistic context. **Example**: Exercise N.05 presents a sample of methane (CH4) with a specific mass and asks for various calculations. Students need to use their knowledge of molar mass, moles, and the composition of CH4 to determine the number of moles, molecule mass, and number of atoms of carbon and hydrogen. Exercise N.04 goes beyond calculations and delves into the relationship between number of moles, grams, and number of atoms of individual elements within a compound. Exercise N.05 adds a real-world context by introducing a sample mass and asking students to calculate multiple aspects.	
	Grammar	• The consistent use of imperative verbs ("Calculate," "Explain" , " How many ") for clear instructions.	**C.Ch / NB.L.G / B.P.K**
	Vocabulary and Clarity	• Scientific vocabulary related to chemistry is used appropriately, including terms like "molar mass," "moles," "molecules," and "atoms."	**I.L.N /C.Ch/ NB.L.G /F.L/**
Practical Work(PW)	Sentence Structure	• The sentences are short and simple, focus on conveying clear instructions without unnecessary complexity. • The instructions are straightforward easy to understand .	**I.L.N / C.Ch**
	Grammar	• In terms of verb use : clear and concise instructions are provided using imperative verbs like "pour," "attach," "aspirate," and "allow" to guide students on how to use the equipment. • Strong verbs are used to highlight the severity of consequences ("Corrosive liquids can severely burn skin"). • It incorporates action verbs to highlight appropriate responses to encountering these hazards (e.g, "wash skin immediately" for irritant pictogram). • The instructions are written in the active voice ("heat the test tube gently") for clear and concise direction.	**C.Ch / NB.L.G**
	Vocabulary	• The use of chemistry-specific terms like "work and safety rules," "laboratory equipment," "reactions," "reagents," and "heating." specific terminology related to lab equipment, including "graduated pipette," "volumetric pipette," "Éprouvette" (graduated cylinder), and "burette." • It uses specific terms related to test tubes, including their function ("used for reactions involving small quantities of reagents") and properties ("can receive a stopper" and "be heated"). This indicates the text is aimed at students with some basic science background. • The paper consists of terms are written in French (such as "tube à essais" translates to "test tube"). • Warning Tone: the language emphasizes warnings with phrases like "attention" (warning) and "porter des vêtements de protection" (wear protective clothing).	**I.L.N /C.Ch/ NB.L.G /F.L / B.P.K**

		• Words and phrases like "safety rules," "carefully," "prohibited," and "protective clothing" highlight the importance of safety in a chemistry lab. • The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. • It defines technical terms like "graduated pipette" to ensure students understand their function. • This indicates the text is geared towards students with some basic science background. • The language is clear and concise, using imperative verbs like "wear," "record," "use," and "clean" to provide step-by-step instructions for laboratory safety and procedures. • Formal and professional tone, consistent with scientific writing.	
	Organizing	• In terms of organization : • It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. • Key safety rules and work methods are presented in bullet points for better organization and emphasis. • It uses clear headings like "4. Definition of Some Manipulation Equipment" to organize the information. • In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment • The table present laboratory equipment, further aiding organization and clarity.	**G.P / M.B / L.S / S.U**
	Visuals and Diagrams	• The use of visual aids: the document include diagrams, pictures, or flowcharts to illustrate the experimental setup or procedures. • It combines safety symbols with written descriptions for clear communication. • The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication. • Each pictogram is accompanied by a written description of the hazard.	**I.L.N / B.P.K / F.A.L / P.RW.U**
Interview	Students' needs, Preferences and setting goals , objectives , Selecting materials and evaluation.	• Taking into account learner styles and preferences before designing the courses , while presenting the course , while discussing and during selecting materials via : -Observe student behavior via paying attention to how students participate in class discussions, take notes, and complete assignments and this offer clues about their learning preferences. -For visual learners , try to encourage them to take visual notes, draw mind maps, or create concept maps. For auditory learners, encourage participation in class discussions and presentations and motivate them by adding extra marks to correct answers for sudden questions . -For Kinesthetic learners, try to incorporate hands-on activities, experiments, and simulations into my lessons. -For learners who prefer reading and writing rather than speaking	**I.L.N/ R.C.D / A.L.E**

		to protect their zone safety "Introverted ", assign reading comprehension questions and writing assignments.	
		• Make the courses concise and precise for two reasons : because scientific modules do not rarely on complex, long explanations but rather, they rely on clear explanations. Also, consider the different levels of students proficiency, so summarize the lectures due to this reason.	**I.L.N / NB.L.G**
		• Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities.	**I.L.N / R.C.D / M.P.C / B.P.K**
		• The teacher does not rely on pre-course needs assessment tools or methods in terms of surveys, diagnostic tests but he tries to depend on some clues which they can reveal learning styles and prior knowledge, allowing him to adjust his teaching approach. • The teacher tries to consider different learning styles of his students hand with hand with his learning objectives which they set them before he design the course.	**A.S**
		• The teacher depends on materials which they are varied between using Data -Show projector to present some parts of his lesson , however he relies more by drawing in the board using colored chalks to attract students ' attention. Also real-world examples and applications are used such as :when he connect chemistry concepts to everyday life.	**P.RW.U / A.L.E**
		• The teacher asks his students to solve the sudden questions and short exercises individually to test each student's understanding .However, after finishing the lesson explanation, he asks them to solve the exercises at the end of the lesson in groups. • The teacher involves his students in the evaluation process through feedback via emphasizing that mistakes are learning opportunities, encouraging a positive learning environment. He provides clear and specific feedback that helps students improvement, for instance, he circles the wrong answers with red pen and put exclamation mark beside the ambiguous explanations to direct the student into his mistake . He create a safe space for students to ask questions and seek clarification.	**F.A.L / G.F**
		• The teacher tries to simplify the language because the students struggle in terms of it . So in each part, he includes sentences or new words, especially scientific terms, which they should be explained with examples.	**R.C.D / F.L / C.Ch / S.L.J /**
		• The teacher in each course session starts by providing general and important information, simplifying it as much as possible to help students grasp the essence of the course or module easily. Then, during the practical application sessions, he introduces examples or applications to enrich the course further.	**R.C.D / S.L.J / S.U / B.P.K**
		• In practical exercises, a bit of creativity is needed. For instance, he applies the concept to a real-life scenario, such as calculating the solubility of a substance for a patient suffering from renal issues.	**P.RW.U**

		This example helps students see the relevance of the field in real life.	
		• The teacher tries to be adaptive especially with the development and everyone is increasingly working with AI and also he utilizes technology to demonstrate phenomena or stimulate imagination, such as showing dilution, addition, or colorimetric reactions and he believes these tools can attract students and simplify the course for them.	**A.LE**
		• The teacher in each session introduces new scientific words and ensure to repeat them so that everyone can understand and become familiar with their pronunciation. Additionally, he provides opportunities for each student to read aloud while others listen, allowing everyone to gradually develop their understanding and proficiency.	**NB.L.G / S.U / S.L.J**
		• The teacher aims to simplify the course and provide opportunities for students to read and listen to each other, correcting pronunciation when necessary and explaining keywords. he also upload the course onto the platform, giving students the chance to read at home and make an effort to translate or research any concepts they don't understand.	
		• The teacher depends on the individual homework, and reports during laboratory sessions to develop both personal skills and teamwork.	**L.S / SC.A**
		• The teacher utilizes feedback mechanism to empower students to assess their own progress and receive constructive guidance for improvement in their learning journey.	**G.F**
		• In terms of goal and objectives of Atom structure course : ➢ Main goal : To equip students with a strong foundation in the language related to atomic structure and the ability to collaboratively explore the connection between matter's macroscopic properties and its microscopic building blocks. ➢ The objectives : ✓ Define key terms: Students will be able to define atomic structure vocabulary accurately. ✓ Explain composition: Students will be able to explain the difference between mixtures/pure substances and elements/compounds using scientific language. ✓ Use correct unit: Students will be able to identify and use the atomic mass unit (amu) for atomic mass measurements. ✓ Participate in discussions: Students will actively participate in discussions on atomic structure topics. ✓ Collaboratively explain: Students will work together to explain how atoms form molecules and how scientists quantify them using clear scientific language. ✓ Solve problems: Students will work together to solve problems related to molar mass calculations.	**D.O.V / B.D.J / A.S / F.L /**

Appendix.16

Stage 03 of Content Analysis

➢ Stage 3 (Categorizing Codes)

Code	Selected Documents	Data
I.L.N	Atom structure course	✓ In terms of sentence length , mostly short and simple sentences make the text easy to be readable and understood . ✓ In terms of sentences complexity , primarily simple and compound sentences are used. ✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details . ✓ In terms of vocabulary level, it introduces key terms and provides explanations for some. ✓ In terms of formal scientific register , the use of specific jargon, the frequency of using scientific terms Also , avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. appears well . Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not". ✓ In terms of clarity and conciseness , the language used is clear and concise, using scientific terminology accurately , it uses clear and concise sentence structures. When introducing new terms, it uses clear and concise definitions .It uses scientific terminology accurately but avoids overly complex terms and It uses brief examples to illustrate concepts. ✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones. In terms of clarity and Importance of Diagrams in Portraying Atom Structure .The diagram in **first page** : It focuses on the concept of moles and molar mass. It u;ses French labels for key concepts. The diagram uses a simple and effective color scheme. The diagram avoids unnecessary details and focuses on the essential concept – molar mass. The diagram number 01 titled **"The three states of matter."** , it uses a simple and effective color scheme. The use of an interactive element. The diagram number 02 titled **" Mixture "**. The diagram avoids unnecessary details and focuses on the key concept of how components are arranged in a mixture. The diagram number 03 titled **" Atoms and Molecules "**, conveys clarity and uses interactive elements .
	Series of exercises	✓ The exercises use a good mix of question formats. ✓ Scientific vocabulary related to chemistry is used appropriately, including terms like "molar mass," "moles," "molecules," and "atoms."
	Practical work	✓ The sentences are short and simple, focus on conveying clear instructions without unnecessary complexity. ✓ The instructions are straightforward easy to understand . ✓ The use of chemistry-specific terms . ✓ specific terminology related to lab equipment. ✓ It uses specific terms related to test tubes, including their function and properties .This indicates the text is aimed at students with some basic science background. ✓ The paper consists of terms are written in French . ✓ Warning Tone: the language emphasizes warnings highlights the importance of safety in a chemistry lab. ✓ The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. ✓ It defines technical terms like "graduated pipette" to ensure students understand their function. ✓ This indicates the text is geared towards students with some basic science background. ✓ The language is clear and concise, using imperative to provide step-by-step instructions for laboratory safety and procedures. ✓ Formal and professional tone, consistent with scientific writing. ✓ The use of visual aids: the document include diagrams, pictures, or flowcharts to

		illustrate the experimental setup or procedures. It combines safety symbols with written descriptions for clear communication. The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication. Each pictogram is accompanied by a written description of the hazard.
	Interview	✓ Taking into account learner styles and preferences before designing the courses , while presenting the course , while discussing and during selecting materials via : -Observe student behavior via paying attention to how students participate in class discussions, take notes, and complete assignments and this offer clues about their learning preferences. -For visual learners , try to encourage them to take visual notes, draw mind maps, or create concept maps. For auditory learners, encourage participation in class discussions and presentations and motivate them by adding extra marks to correct answers for sudden questions . -For Kinesthetic learners, try to incorporate hands-on activities, experiments, and simulations into my lessons. -For learners who prefer reading and writing rather than speaking to protect their zone safety "Introverted ", assign reading comprehension questions and writing assignments. ✓ Make the courses concise and precise for two reasons : because scientific modules do not rarely on complex, long explanations but rather, they rely on clear explanations. Also, consider the different levels of students proficiency, so summarize the lectures due to this reason. ✓ Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities.
R.C.D	Interview	✓ Taking into account learner styles and preferences before designing the courses , while presenting the course , while discussing and during selecting materials via : - Observe student behavior via paying attention to how students participate in class discussions, take notes, and complete assignments and this offer clues about their learning preferences. -For visual learners , try to encourage them to take visual notes, draw mind maps, or create concept maps. For auditory learners, encourage participation in class discussions and presentations and motivate them by adding extra marks to correct answers for sudden questions . -For Kinesthetic learners, try to incorporate hands-on activities, experiments, and simulations into my lessons. -For learners who prefer reading and writing rather than speaking to protect their zone safety "Introverted ", assign reading comprehension questions and writing assignments. ✓ Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities.
M.P.C	Series of exercises	✓ The exercises use a good mix of question formats.
	Interview	✓ Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities .
D.O.V	Series of exercises	✓ The exercises use a good mix of question formats.

	Interview	✓ In terms of goal and objectives of Atom structure course : ✓ Main goal : To equip students with a strong foundation in the language related to atomic structure and the ability to collaboratively explore the connection between matter's macroscopic properties and its microscopic building blocks.
B.D.J	Atom structure course	✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones.
	Interview	✓ In terms of goal and objectives of Atom structure course : ✓ Main goal : To equip students with a strong foundation in the language related to atomic structure and the ability to collaboratively explore the connection between matter's macroscopic properties and its microscopic building blocks. ✓ The objectives : ✓ Define key terms: Students will be able to define atomic structure vocabulary accurately. ✓ Explain composition: Students will be able to explain the difference between mixtures/pure substances and elements/compounds using scientific language. ✓ Use correct unit: Students will be able to identify and use the atomic mass unit (amu) for atomic mass measurements. ✓ Participate in discussions: Students will actively participate in discussions on atomic structure topics. ✓ Collaboratively explain: Students will work together to explain how atoms form molecules and how scientists quantify them using clear scientific language. ✓ Solve problems: Students will work together to solve problems related to molar mass calculations.
A.S	Series of The Exercises	✓ The exercises use a good mix of question formats.
	Interview	✓ The teacher does not rely on pre-course needs assessment tools or methods in terms of surveys, diagnostic tests but he tries to depend on some clues which they can reveal learning styles and prior knowledge, allowing him to adjust his teaching approach. ✓ The teacher tries to consider different learning styles of his students hand with hand with his learning objectives which they set them before he design the course.
F.L	Atom structure course	✓ In terms of vocabulary level, it introduces key terms and provides explanations for some. ✓ In terms of formal scientific register , the use of specific jargon, the frequency of using scientific terms Also , avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. appears well . ✓ Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not". ✓ In terms of clarity and Importance of Diagrams in Portraying Atom Structure .The diagram in **first page** : It focuses on the concept of moles and molar mass. It u;ses French labels for key concepts. The diagram uses a simple and effective color scheme. The diagram avoids unnecessary details and focuses on the essential concept – molar mass. The diagram number 01 titled **"The three states of matter."**

		It uses a simple and effective color scheme plus the use of an interactive element. ✓ The diagram number 02 titled " **Mixture** ". The diagram avoids unnecessary details and focuses on the key concept of how components are arranged in a mixture. The diagram number 03 titled " **Atoms and Molecules** ", conveys clarity and uses interactive elements .
	Exercises series ; Practical work	• The exercises use a good mix of question formats. ✓ Scientific vocabulary related to chemistry is used appropriately, including terms like "molar mass," "moles," "molecules," and "atoms." ✓ The sentences are short and simple, focus on conveying clear instructions without unnecessary complexity. ✓ The instructions are straightforward easy to understand . ✓ The use of chemistry-specific terms . ✓ specific terminology related to lab equipment. ✓ It uses specific terms related to test tubes, including their function and properties. This indicates the text is aimed at students with some basic science background. ✓ The paper consists of terms are written in French . ✓ Warning Tone: the language emphasizes warnings highlights the importance of safety in a chemistry lab. ✓ The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. ✓ It defines technical terms like "graduated pipette" to ensure students understand their function. ✓ This indicates the text is geared towards students with some basic science background.
	Interview	✓ The teacher tries to simplify the language because the students struggle in terms of it . So in each part, he includes sentences or new words, especially scientific terms, which they should be explained with examples. ✓ In terms of goal and objectives of Atom structure course .
NB.L.G	Atom structure course	✓ In terms of verbs consistency , it appears the use of present tense . ✓ In terms of Subject-verb agreement, are consistently used. ✓ The use of agreement between pronouns and their antecedents . ✓ In terms of active voice . ✓ In terms of punctuation . ✓ In terms of spelling and capitalization , spelling is correctly found . ✓ In terms of vocabulary level, it introduces key terms and provides explanations for some. ✓ In terms of formal scientific register , here are some examples from the text: - The use of specific jargon, the frequency of using scientific terms appears well . -Avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. . -Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not". ✓ In terms of clarity and conciseness , the language used is clear and concise, using scientific terminology accurately , it uses clear and concise sentence structures ✓ When introducing new terms, it uses clear and concise definitions . ✓ It uses scientific terminology accurately but avoids overly complex terms .
	Series of	✓ The consistent use of imperative verbs ("Calculate," "Explain" , " How many ") for clear instructions.

	Exercises	✓ Scientific vocabulary related to chemistry is used appropriately.
	Practical work	✓ In terms of verb use : clear and concise instructions are provided using imperative verbs to guide students on how to use the equipment. ✓ Strong verbs are used to highlight the severity of consequences . ✓ It incorporates action verbs to highlight appropriate responses . ✓ The instructions are written in the active voice for clear and concise direction. ✓ The use of chemistry-specific terms . ✓ specific terminology related to lab equipment. ✓ It uses specific terms related to test tubes, including their function and properties. This indicates the text is aimed at students with some basic science background. ✓ The paper consists of terms are written in French . ✓ Warning Tone: the language emphasizes warnings . ✓ Words and phrases like "safety rules," "carefully," "prohibited," and "protective clothing" highlight the importance of safety in a chemistry lab. ✓ The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. ✓ It defines technical terms like "graduated pipette" to ensure students understand their function. ✓ This indicates the text is geared towards students with some basic science background. ✓ The language is clear and concise, using imperative verbs like "wear," "record," "use," and "clean" to provide step-by-step instructions for laboratory safety and procedures. ✓ Formal and professional tone, consistent with scientific writing.
	Interview	✓ Make the courses concise and precise for two reasons : because scientific modules do not rarely on complex, long explanations but rather, they rely on clear explanations. Also, consider the different levels of students proficiency, so summarize the lectures due to this reason. ✓ The teacher in each session introduces new scientific words and ensure to repeat them so that everyone can understand and become familiar with their pronunciation. Additionally, he provides opportunities for each student to read aloud while others listen, allowing everyone to gradually develop their understanding and proficiency.
C.Ch	Atom structure course	✓ In terms of sentence length , mostly short and simple sentences make the text easy to be readable and understood . ✓ In terms of sentences complexity , primarily simple and compound sentences are used. ✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details . ✓ In terms of verbs consistency , it appears the use of present tense . ✓ In terms of Subject-verb agreement, are consistently used. ✓ The use of agreement between pronouns and their antecedents . ✓ In terms of active voice . ✓ In terms of punctuation , ✓ In terms of vocabulary level, it introduces key terms and provides explanations for some. ✓ In terms of formal scientific register , here are some examples from the text: - The use of specific jargon, the frequency of using scientific terms appears well .

		-Avoids personal opinions or subjective statements. It focuses on presenting facts and established knowledge about matter and its composition. -Formal scientific writing typically avoids contractions like "isn't" or "don't" and uses full phrasings instead like : "is not" and "do not".
	Series of exercises	✓ The exercises use a good mix of question formats: ✓ The consistent use of imperative verbs ("Calculate," "Explain" , " How many ") for clear instructions. ✓ Scientific vocabulary related to chemistry is used appropriately. The sentences are short and simple, focus on conveying clear instructions without unnecessary complexity. ✓ The instructions are straightforward easy to understand .
	Practical work	✓ In terms of verb use : clear and concise instructions are provided using imperative verbs to guide students on how to use the equipment. ✓ Strong verbs are used to highlight the severity of consequences . ✓ It incorporates action verbs to highlight appropriate responses . ✓ The instructions are written in the active voice . ✓ The use of chemistry-specific terms . ✓ Specific terminology related to lab equipment. ✓ It uses specific terms related to test tubes, including their function and properties. This indicates the text is aimed at students with some basic science background. ✓ The paper consists of terms are written in French . ✓ Warning Tone: the language emphasizes warnings. ✓ Words and phrases like "safety rules," "carefully," "prohibited," and "protective clothing" highlight the importance of safety in a chemistry lab. ✓ The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. ✓ It defines technical terms like "graduated pipette" to ensure students understand their function. ✓ This indicates the text is geared towards students with some basic science background. ✓ The language is clear and concise, using imperative verbs like "wear," "record," "use," and "clean" to provide step-by-step instructions for laboratory safety and procedures. ✓ Formal and professional tone, consistent with scientific writing.
	Interview	✓ The teacher tries to simplify the language because the students struggle in terms of it . So in each part, he includes sentences or new words, especially scientific terms, which they should be explained with examples.
S.L.J	Interview	✓ The teacher tries to simplify the language because the students struggle in terms of it . So in each part, he includes sentences or new words, especially scientific terms, which they should be explained with examples. ✓ The teacher in each course session starts by providing general and important information, simplifying it as much as possible to help students grasp the essence of the course or module easily. Then, during the practical application sessions, he introduces examples or applications to enrich the course further. ✓ The teacher in each session introduces new scientific words and ensure to repeat them so that everyone can understand and become familiar with their pronunciation. Additionally, he provides opportunities for each student to read aloud while others listen, allowing everyone to gradually develop their

		understanding and proficiency.
G.P	Atom structure course	✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details ✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones
	Practical work	✓ In terms of organization : ✓ It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. ✓ Key safety rules and work methods are presented in bullet points for better organization and emphasis. ✓ It uses clear headings to organize the information. ✓ In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment ✓ The table present laboratory equipment, further aiding organization and clarity
M.B	Atom structure course	✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details for example : **Paragraph 1:** **Clear topic Sentence**: "Matter is the substance that makes up any body that contains non-zero mass." **Supporting Details:** Explains the different physical states of matter (solid, liquid, gas) and their properties. Provides an example (air) for the gaseous state. ✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones.
	Practical work	✓ In terms of organization : ✓ It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. ✓ Key safety rules and work methods are presented in bullet points for better organization and emphasis. ✓ It uses clear headings to organize the information. ✓ In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment ✓ The table present laboratory equipment, further aiding organization and clarity.
L.S	Atom structure course	✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details for example : Paragraph 1: Clear topic Sentence: "Matter is the substance that makes up any body that contains non-zero mass." Supporting Details:

		Explains the different physical states of matter (solid, liquid, gas) and their properties. Provides an example (air) for the gaseous state. ✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones.
	Practical work	✓ In terms of organization : ✓ It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. ✓ Key safety rules and work methods are presented in bullet points for better organization and emphasis. ✓ It uses clear headings to organize the information. ✓ In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment ✓ The table present laboratory equipment, further aiding organization and clarity.
	Interview	✓ The teacher depends on the individual homework, and reports during laboratory sessions to develop both personal skills and teamwork.
I.C	Atom structure course	✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details . ✓ In terms of vocabulary level, it introduces key terms and provides explanations for some, for example :basic concepts ,increased complexity, limited scope.
S.U	Atom structure course	✓ In terms of paragraph length , they are short and focused on single concepts ✓ In terms of paragraph organization , several paragraphs have clear topic sentences and supporting details for example : **Paragraph 1:** **Clear topic Sentence**: "Matter is the substance that makes up any body that contains non-zero mass." **Supporting Details:** Explains the different physical states of matter (solid, liquid, gas) and their properties. Provides an example (air) for the gaseous state. ✓ In terms of the logical flow of information, building upon basic concepts to introduce more complex ones.
	Practical work	✓ In terms of organization : ✓ It uses numbering (1., 2., 3.) for the main sections (Introduction, Objectives, Work Methods) and lettering (a., b.) for sub-sections within the Work Methods section. This creates a clear hierarchy of information and makes it easy to follow the instructions. ✓ Key safety rules and work methods are presented in bullet points for better organization and emphasis. ✓ It uses clear headings to organize the information. ✓ In the end, students write a rapport paper summarizing their findings and the key takeaways from the experiment ✓ The table present laboratory equipment, further aiding organization and clarity.
	Interview	✓ The teacher in each course session starts by providing general and important information, simplifying it as much as possible to help students grasp the essence

		of the course or module easily. Then, during the practical application sessions, he introduces examples or applications to enrich the course further. ✓ The teacher in each session introduces new scientific words and ensure to repeat them so that everyone can understand and become familiar with their pronunciation. Additionally, he provides opportunities for each student to read aloud while others listen, allowing everyone to gradually develop their understanding and proficiency.
B.P.K	Atom structure course	✓ In terms of clarity and Importance of Diagrams in Portraying Atom Structure.
	Series of exercises Practical work	✓ The exercises use a good mix of question formats. ✓ The consistent use of imperative verbs ("Calculate," "Explain" , " How many ") for clear instructions. ✓ The use of chemistry-specific terms like "work and safety rules," "laboratory equipment," "reactions," "reagents," and "heating." specific terminology related to lab equipment. ✓ It uses specific terms related to test tubes, including their function and properties. This indicates the text is aimed at students with some basic science background. ✓ Warning Tone: the language emphasizes warnings and highlights the importance of safety in a chemistry lab. ✓ The language complexity and detail level is adjusted based on the assumed knowledge of first-year biology students. ✓ It defines technical terms like "graduated pipette" to ensure students understand their function. ✓ This indicates the text is geared towards students with some basic science background. ✓ The use of visual aids: the document include diagrams, pictures, or flowcharts to illustrate the experimental setup or procedures. ✓ It combines safety symbols with written descriptions for clear communication. ✓ The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication.
	Interview	✓ Assessing student learning styles ,prior knowledge and tailor instruction (visuals, activities, pacing) based on assessment and monitor, adjust, and offer flexible learning opportunities. ✓ The teacher in each course session starts by providing general and important information, simplifying it as much as possible to help students grasp the essence of the course or module easily. Then, during the practical application sessions, he introduces examples or applications to enrich the course further.
F.A.L	Series of exercises	✓ The exercises use a good mix of question formats.
	Practical work	✓ The use of visual aids: the document include diagrams, pictures, or flowcharts to illustrate the experimental setup or procedures. ✓ It combines safety symbols with written descriptions for clear communication. ✓ The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication

	Interview	✓ The teacher asks his students to solve the sudden questions and short exercises individually to test each student's understanding .However, after finishing the lesson explanation, he asks them to solve the exercises at the end of the lesson in groups.
P.RW.U	Atom structure course	✓ The use of diagrams to portray reality : ✓ Integrating real -world : It uses colored cubes labeled with element symbols (Mn, O) to represent tangible objects (elements) and connect them to the abstract concept of molar mass . The inclusion of formulas ('n', 'm', 'M') alongside the elements prepares students for the mathematical calculations involved in molar mass problems. ✓ Real-world references, like small images of water and oil (assuming these are the depicted components), solidify the connection between the scientific concept and everyday observations . ✓ Consider incorporating small images or references to real-world mixtures (e.g., water and oil).The diagram partially helps students visualize a mixture. The intermixed colors suggest a heterogeneous mixture . ✓ Real-world integration in the diagram : the spheres are labeled with element symbols (e.g., H for hydrogen, O for oxygen, C for carbon), this directly connects the diagram to real-world elements on the periodic table. The diagram depicts a specific molecule, like a water molecule (H2O), where the red and yellow spheres represent hydrogen and oxygen atoms connected by black lines, it demonstrates a real-world example of how atoms combine to form a well-known molecule .
	Practical work	• The use of visual aids: the document include diagrams, pictures, or flowcharts to illustrate the experimental setup or procedures. • It combines safety symbols with written descriptions for clear communication. • The image quality of the pictograms is crucial for accurate understanding. Blurry or low-resolution images could hinder communication.
	Interview	• The teacher depends on materials which they are varied between using Data -Show projector to present some parts of his lesson , however he relies more by drawing in the board using colored chalks to attract students ' attention. Also real-world examples and applications are used such as :when he connect chemistry concepts to everyday life. • In practical exercises, a bit of creativity is needed. For instance, he applies the concept to a real-life scenario, such as calculating the solubility of a substance for a patient suffering from renal issues. This example helps students see the relevance of the field in real life.
A.L.E	Atom Structure course	• In terms of clarity and Importance of Diagrams in Portraying Atom Structure.
	Interview	• Selecting materials via : -Observe student behavior via paying attention to how students participate in class discussions, take notes, and complete assignments and this offer clues about their learning preferences. -For visual learners , try to encourage them to take visual notes, draw mind maps, or create concept maps. For auditory learners, encourage participation in class discussions and presentations and

		motivate them by adding extra marks to correct answers for sudden questions . -For Kinesthetic learners, try to incorporate hands-on activities, experiments, and simulations into my lessons. -For learners who prefer reading and writing rather than speaking to protect their zone safety "Introverted ", assign reading comprehension questions and writing assignments. • The teacher tries to be adaptive especially with the development and everyone is increasingly working with AI and also he utilizes technology to demonstrate phenomena or stimulate imagination, such as showing dilution, addition, or colorimetric reactions and he believes these tools can attract students and simplify the course for them.
E.C.Q.	Series of exercises	• The exercises use a good mix of question formats according to course content .
G.F	Interview	• The teacher utilizes feedback mechanism to empower students to assess their own progress and receive constructive guidance for improvement in their learning journey. • The teacher asks his students to solve the sudden questions and short exercises individually to test each student's understanding .However, after finishing the lesson explanation, he asks them to solve the exercises at the end of the lesson in groups. • The teacher involves his students in the evaluation process through feedback via emphasizing that mistakes are learning opportunities, encouraging a positive learning environment. He provides clear and specific feedback that helps students improvement, for instance, he circles the wrong answers with red pen and put exclamation mark beside the ambiguous explanations to direct the student into his mistake . He create a safe space for students to ask questions and seek clarification.
SC.A	Series of exercises	• The exercises use a good mix of question formats .When students solve them , the teacher gives them scores .
	Interview	• The teacher depends on the individual homework, and reports during laboratory sessions to develop both personal skills and teamwork (the teacher gives the students marks after doing the report).

Appendix 16

Stage 04 of Content Analysis

- Stage 4 : (Calculating codes)

	Code	Frequently	Total
Needs assessment	**I.L.N**	28	32
	R.C.D	2	
	M.P.C	2	
Formulating goals and objectives	**D.O.V**	3	35
	B.D.J	10	
	A.S	3	
	F.L	19	
Conceptualizing content	**NB.L.G**	30	64
	C.Ch	31	
	S.L.J	3	
Organizing the course	**G.P**	9	42
	M.B	9	
	L.S	10	
	I.C	3	
	S.U	11	
Developing materials	**B.P.K**	14	32
	F.A.L	5	
	P.RW.U	10	
	A.L.E	3	
Evaluation	**E.C.Q**	1	06
	G.F	3	
	SC.A	2	

Appendix 17

Stage 05 of Content Analysis

- Stage 5 (Percentage of the codes)

	Code	Frequently	Percentage	Total frequently	Total Percentage
Needs assessment	**I.L.N**	28	87.5%	32	15.16%
	R.C.D	2	6.25%		
	M.P.C	2	6.25%		
Formulating goals and objectives	**D.O.V**	3	8.57%	35	16.58%
	B.D.J	10	28.57%		
	A.S	3	8.57%		
	F.L	19	54.28%		
Conceptualizing content	**NB.L.G**	30	46.87%	64	30.33%
	C.Ch	31	48.43%		
	S.L.J	3	4.68%		
Organizing the course	**G.P**	9	21.42%	42	19.90%
	M.B	9	21.42%		
	L.S	10	23.80%		
	I.C	3	7.14%		
	S.U	11	26.19%		
Developing materials	**B.P.K**	14	43.75%	32	15.16%
	F.A.L	5	15.62%		
	P.RW.U	10	31.25%		
	A.L.E	3	9.37%		
Evaluation	**E.C.Q**	1	16.66%	06	2.84%
	G.F	3	50%		
	SC.A	2	33.33%		
				211	**100%**

Résumé

Avec la tendance croissante à intégrer l'anglais comme moyen d'enseignement (AME) dans les classes de sciences, des inquiétudes ont été soulevées quant à la réussite des étudiants. Cette étude explore les défis rencontrés par les étudiants en biologie de première année à l'Université de Tébessa et comment une conception de cours sur mesure souhaitée peut soutenir l'intégration de l'AME dans une unité de chimie fondamentale pour répondre aux besoins des étudiants. De plus, la recherche actuelle vise à obtenir une analyse générale de ce à quoi ressemblerait un potentiel cours AME en unité de chimie. Les données ont été collectées selon une approche mixte auprès d'un échantillon de 150 étudiants en première année licence de biologie à l'Université de Tébessa, à travers un questionnaire quantitatif mixte et une analyse qualitative du contenu des cours existants, des exercices et des travaux pratiques. Les résultats révèlent des défis importants pour les étudiants associés à l'AME en chimie, mais soulignent l'impact positif des composants de conception de cours sur mesure pour surmonter ces défis. Cette recherche met en lumière l'importance d'utiliser des matériaux intégrés aux AME pour l'apprentissage de la chimie, fournissant ainsi une base préliminaire pour de futures initiatives visant à concevoir un cours AME destiné aux étudiants de première année en biologie, spécifiquement pour leur unité de chimie fondamentale. Il est recommandé de souligner la nécessité de prendre en compte l'utilisation de la langue dans les domaines scientifiques lors de l'élaboration de matériels pédagogiques.

Mots clés : Intégration d'AME, conception de cours sur mesure, composants de la conception de cours AME, module de chimie fondamentale, défis des étudiants, besoins des étudiants, analyse de contenu, recherche sur les méthodes mixtes, étudiants de première année en biologie.

الملخص

مع الاتجاه المتزايد لدمج اللغة الإنجليزية كلغة للتدريس في الفصول الدراسية العلمية ، زادت المخاوف بشأن نجاح الطلاب. تبحث هذه الدراسة عن التحديات التي يواجهها طلاب السنة الأولى في مجال علم الأحياء بجامعة تبسة وكيف يمكن لتصميم درس مخصص وهادف أن يدعم إدماج اللغة الإنجليزية كلغة للتدريس في مادة الكيمياء الأساسية ليلبي احتياجات الطلاب. علاوة على هذا ، يهدف البحث الحالي إلى الحصول على تحليل عام حول كيف يمكن أن يكون الشكل المحتمل للدروس في ظل اللغة الانجليزية كلغة للتدريس في مادة الكيمياء. لذلك ، تم إجراء البيانات من خلال نهج مختلط الأساليب . وهكذا ، أجابت عينة تتكون من 150 طالبًا في السنة الأولى ليسانس في مجال علم الأحياء بجامعة تبسة إستبيان كمّي مختلط حول تحديد تحديات الطلاب ومواد التعلم المفضلة لديهم. بالإضافة إلى ذلك ، يقوم تحليل محتوى نوعي بفحص الدروس الموجودة ، التمارين والعمل التطبيقي ، بينما تقدم المقابلة مع أستاذ المادة المبنية على أسئلة لجمع بيانات إضافية لأجل تحليل الوثائق وتحديد مكونات تصميم دروس باللغة الإنجليزية كلغة للتدريس من حيث محتوى المحاضرات ومواد التعلم. تكشف النتائج عن تحديات عديدة للطلاب مرتبطة باستخدام اللغة الإنجليزية كلغة للتدريس في الكيمياء. ومع ذلك ، تؤكد الدراسة على تأثير مكونات تصميم درس مخصص على التغلب على هذه التحديات. يسلط هذا البحث الضوء على أهمية استخدام مواد متكاملة مع اللغة الإنجليزية كلغة للتدريس لتعلم الكيمياء. توفر هذه النتائج أرضية أولية لمبادرات مستقبلية لتصميم مساق دراسي هادف باللغة الإنجليزية كلغة للتدريس لطلاب السنة الأولى في علم الأحياء ، وخاصة لمادة الكيمياء الأساسية لديهم. توصي الدراسة لتسليط الضوء على الحاجة إلى مراعاة استخدام اللغة في المجالات العلمية عند تطوير المواد التعليمية

الكلمات المفتاحية : دمج اللغة الإنجليزية كلغة للتدريس ، تصميم درس مخصص ، مكونات تصميم درس باللغة الإنجليزية كلغة للتدريس ، مادة الكيمياء الأساسية ، تحديات الطلاب ، احتياجات الطلاب ، تحليل المحتوى ، البحث باستخدام الأساليب المختلطة ، طلاب السنة الأولى في علم الأحياء.