

Assessing ESP Needs of Chemistry Students: A Case Study from Algeria



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Abstract:

The study purposes to investigate English Language needs of learners of chemistry in the department of Material Sciences at Ibn-Khaldun university of Tiaret, Algeria. Specifically, this research aims to identify the specific needs of learners and their language deficiencies in English. To collect data, a needs analysis questionnaire was developed according to Munbian Communication Needs Processor (CNP) parameters and was completed by 95 undergraduate students. To effectively address the target needs, an interview was conducted with three English language teachers working at the same department. Results showed significant insights, ESP learners admitted several strengths and weaknesses in both productive and receptive skills. In particular, the students outlined communication and writing as an area of improvement, anticipating for a more appropriate needs-based ESP course that would appropriately meet with their current specific requirements and language needs. The study highlights the need for designing a tailored ESP syllabus that addresses the linguistic and academic need, and incorporating educational technology materials that would enhance the students' learning outcomes.

key words: ESP; Chemistry learners, needs analysis; undergraduate students

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1. Introduction:

English is considered the most utilitarian language and serves the world's lingua franca. Learning English thus can have considerable benefits, it may broaden individuals' understanding of nearly any aspect of life through wide access to knowledge in media, permit individuals to fully immerse themselves in other cultures, and facilitate communication among human beings around the world. Subsequently, business growth, occupational mobility and the development of science and technology across the globe has intensified the demand for English. Gradually, English becomes the language of communication, especially when this latter is needed to get access to scientific research and data. The growing interest into learning English seems to be a real concern. Algeria, like multiple countries in the world, has introduced English in the teaching curricula, schools, and higher education, either as second, or foreign language. However, the incorporation of English language in Algerian universities is considered a criterion to keep pace with globalization. Following the significance of English, the Algerian ministry of higher education has recently announced strict policies to support English language learning among both students and educators (Bouherar & Salem, 2025). Currently, the ministry is implementing a gradual transition to fully establish English as the medium of instruction (EMI) across all faculties and institutions (Bouherar & Salem, 2025; Boumechaal, 2021). As English receives prominence in academic and professional settings in Algeria, analyzing ESP students' needs can help educators understand thoroughly the language needs of ESP learners in chemistry classes, the findings of the study may positively optimize the teaching practices of the ESP practitioners. The current research examines the needs profile of chemistry learners and identifies the major challenges and barriers impeding their English language development. This study holds significant value in outlining the overlooked pedagogical and institutional challenges surrounding the teaching of English for Specific Purposes (ESP) to chemistry students in the Department of Material Sciences. By shedding light on the lack of needs analysis practices, the research can contribute to a better understanding of the structural gaps that hinder effective ESP course delivery.

In pursuit of this aim, the study addresses the following research questions

1. What are the specific language needs of ESP learners of chemistry at Ibn-khaldoun university?
2. What instructional materials and teaching methods ESP students of chemistry prefer for effective ESP course?

Based on the research objectives and questions formulated for this study, two hypotheses were developed to address the identified issues

- a) It is hypothesized that ESP learners of chemistry at Ibn Khaldoun University may need support in improving writing skills including grammar accuracy, cohesion, and spoken fluency.
- b) It is hypothesized that ESP learners of chemistry at Ibn Khaldoun University may show significant preference for authentic, context-specific materials (e.g., scientific texts, lab reports) and face-to-face teaching combined with multimedia and online aids.

2. Literature review

2.1. ESP defined

ESP stands for English for Specific Purposes, it is an approach of language teaching aiming to address the immediate and the very specific academic or professional needs of learners for the target language. ESP is a sub-part of Language for Specific Purposes (LSP), it focuses on language courses specifically for learners who need to use the target language for particular purposes such as in a job, academic field, or professional setting. In particular, ESP differs significantly from general English, for instance, ESP course has specific characteristics that differentiates it from other general English courses. Dudely-Evans & St. John (1998) advocated a modified definition of absolute and variable characteristics of ESP. The Absolute characteristics addresses learners 'target needs and emphasis on relevant language forms and practices, whereas the variable characteristics comprise its adaptability to particular discipline, levels of the learners, and teaching setting which is most of the time intended for adults having prior knowledge of English. The aforementioned characteristics outlined are important key stages in ESP course.

In the same vein, Hutchinson and Waters (1987) maintained that what distinguishes ESP from general English is an awareness of the needs. Similarly, Robinson (1988) contended that ESP is concerned with non-native speakers who need the language to achieve targeted purposes. Perhaps the most concise and significant definition of ESP is the one provided by van Naerssen, Brinton and Kuzetnova (1978), they contended that the core principals of ESP are needs based analysis and relevance.

2.2. Historical Background of Needs Analysis

"Analysis of needs" in education can be traced back to India in 1920s (Howatt,1984, p. 245; White,1988, p. 12). Actually, Michael West, first to develop this concept, viewed needs as how learners use the foreign language in the target situation, and how they best learn language during training. In West's approach, "needs" are items that can be understood broadly but lack a precise definition (Howatt,1984). Since West, the concept of need has disappeared for almost 50 years. This could be explained by the influence imposed by traditional structural proponents in Foreign Language Teaching approaches who believed that foreign language learning is merely the mastery of the linguistic elements such as grammar units, lexis items (Richards & Rodgers, 1986). After short years of silence, the Council of Team work of Europe has resurfaced the term "needs", the team have alternatively developed approaches to European learners such like the communicative approach which in turn significantly paved the way for the raise of need analysis. However, in many cases, it was not possible to identify all the needs for a general language learner. Once again, the concept needs analysis was neglected again. With the emergence of the field of English for Special Purposes (ESP), NA returned to central prominence and has become a key requirement in course design in ESP. The most thorough and widely known work on needs analysis is John Munby's Communicative Syllabus Design (1978), Munby introduced a detailed set of procedures for discovering target situation needs. He called this set of procedures the Communication Needs Processor (CNP). The CNP is formed by a group of questions related to key communication variables which can be used to spot the target language needs of any group of learners. The term Target Situation Analysis (TSA) was, in fact, first used by Chambers in his 1980 article in which he tried to clarify the confusion of terminology. For Chambers TSA is "communication in the target situation" (p.29). Present situation analysis is often viewed as a complement to target situation analysis (Robinson, 1991; Jordan, 1997). If target situation

analysis tries to establish what the learners are expected to be like at the end of the language course, present situation analysis attempts to identify what they are like at the beginning of it.

2.3. Needs Analysis in English for Specific Purposes

Needs analysis is a crucial component in ESP, ESP is nothing without needs analysis. In fact, needs analysis is necessary to develop the language course content or design a language programme; be it for GE or for ESP context. In this perspective, several scholars and educators acknowledged the centrality of needs analysis in ESP educational practices e.g., (Munby, 1978 ; Hutchinson & Waters 1987; Dudley-Evans & St-john 1998; Saraa, 2020; Hyland, 2022; Basturkman, 2025; Chaovanapricha et al., 2024). Linguists and scholars on their hand interpreted the term ‘needs’ in different ways. Brown (2016) suggested that ‘needs’ are synonyms to “wants, desires, necessities, lacks, gaps, expectations, motivations, deficiencies, requirements, requests, prerequisites, essentials, the next step” (p. 13). Brindley (1989) as cited in Brown (2016) classified needs into subjective and objective needs. The former is determined through the investigation of the context, the learners, and their use of language, the latter is more complex and difficult to observe, it involves inspecting wishes and expectations of learners. Brown (1995) made a further categorization on the types of needs : situation needs and language needs. The former alludes to the type of information focusing on a language program’s human aspect, referring to the physical, social, and psychological context in which learning occurs. The latter includes details about the target linguistic behaviors that the learners should gain, it sets details about the situations via which language will be used, highlights the required competency, and describes learners’ reasons for learning the language. Hutchinson and Waters (1987), as shown in Figure 1, conceptualize needs analysis from two perspectives: “target needs” and “learning needs”. The target needs are grouped into “necessities”, “lacks” and “wants” while learning needs involve the knowledge and the abilities that learners need to require to performing effectively in the target situation. The co-authors suggested a list of questions in the process of needs assessment.

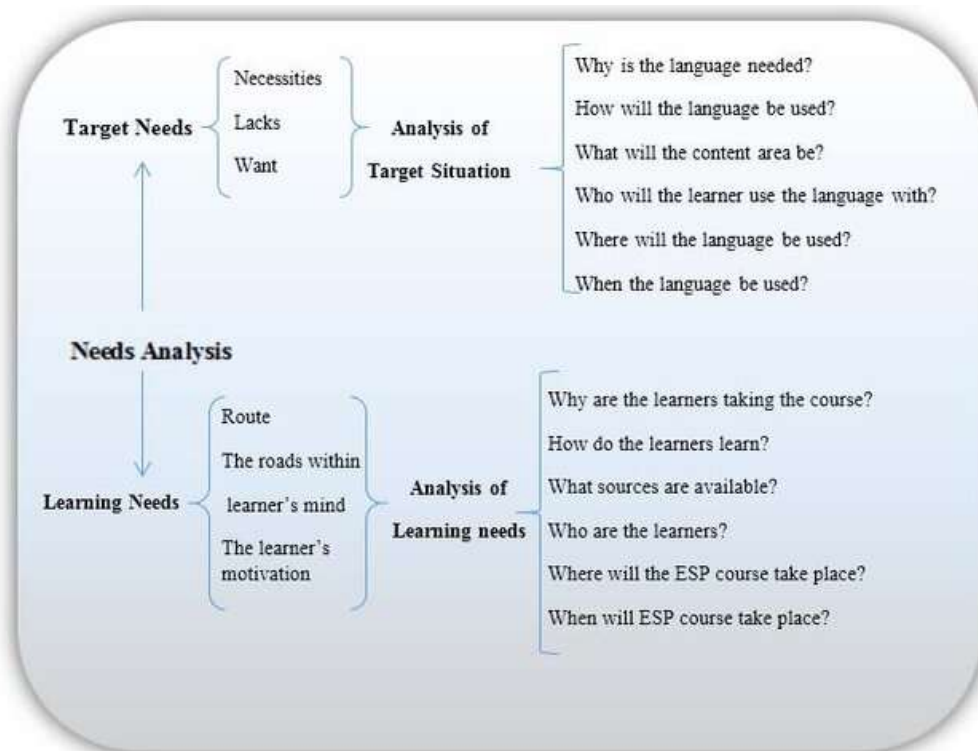


Figure 1: List of the questions used for collecting needs assessment information (Hutchinson & Waters, 1987, p.54)

3. Method

As Hutchinson & Waters (1987) emphasis, “The choice of method will depend on time and resources available and the procedures of each will depend on accessibility” (p.56). Since every situation in ESP context is dissimilar, there is not a unified approach to needs analysis that fits all. In this study, the researcher adopted a mixed-methods approach integrating data from an online questionnaire with students and an interview with teachers. This combination allowed triangulation and enhanced the credibility and validity of the findings by collecting the perspectives from both learners and teachers.

3.1. The instrument

The needs analysis questionnaire was written in English, it contained three parts. Part 1 was developed to analyze the Target Situation (TS), part 2 was designed to analyze the Present Situation Analysis (PSA) and part 3 to explore the Context Situation (CS). The students could pick answers from multiple options of each question. However, in some questions the students can choose more than one option if they wished. The items of the needs analysis questionnaire were constructed according to Munby Communication Needs Processor (CNP) parameters. The selection of CNP takes into account “the variables that affect communication needs by organizing them as parameters in a dynamic relationship to each other” (p.32). As far as the questions for PSA and CS, they were formed according to the suggestions provided by Westerfield (2010) model. Thus it is clear that the needs analysis survey of this research conforms to face and content validity.

3.2. Participants

The study comprised ESP chemistry learners enrolled in the department of Material Sciences, and ESP teachers responsible for teaching the target ESP course were also involved in the qualitative phase of the investigation. The NA questionnaire was conducted with second and third year students during the first semester of the academic year 2024-2025. Before distributing the questionnaire, a pilot test was conducted to assess the relevance of the items. Based on feedback

from a preliminary online trial with 44 students, minor revisions were made specifically in question 5 and Question 9. To increase credibility, the questionnaire was reviewed by panel of experts to assess the surface validity and compatibility for the target context. The study consisted of 120 ESP chemistry learners, however, due to issue related to answers' completion, only 95 participants submitted fully responses.

4. Results

4.1. Discussion of the students' needs analysis questionnaire

The first part of the NA survey explored the demographic variable and the Target Situation of the study. High percentage of the students (51.4%) ages ranged between to 20-23, and the large number of students (55.7%) were females.

Table 01: Demographic and language level analysis

Demographic Variables	Groups	N	%
Gender	Male	42	44.3%
	Female	53	55.7%
Grade Level	2 nd	53	55.87%
	3 rd	42	44.21%
Age	19 and less	7	7.36%
	20 -23	58	61.01%
	24 and more	30	31.57%
English proficiency	Average	73	76.8%
	Good	12	12.6%
	Very Good	8	8.4%
	Excellent	2	2.1%
Total		95	100

Analysis of question 1 and 2

As shown in Figure 2, nearly (76.8%) of the students had an average level of proficiency in English. The results of question tow found that (77.7%) needed to learn English for communication and advanced English for study and future profession. For ESP learners of chemistry, proficiency in the English language is often regarded as a prerequisite for engaging with the global science community. It is highly recommended for effective communication, pursuing academic advancement, and enhancing employment prospect. Understandably, these results are in a good agreement with the findings of Adnan (2012).

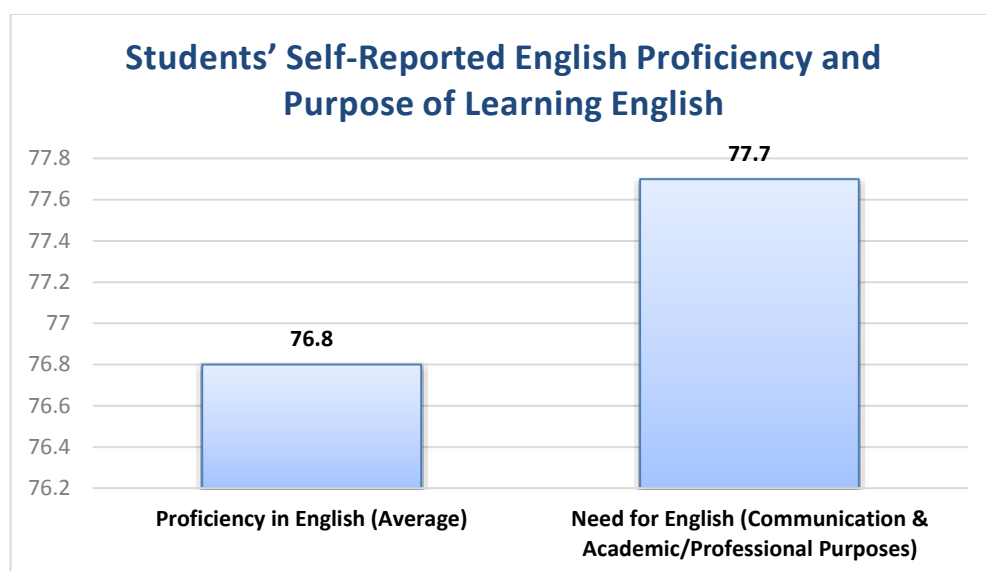


Figure 2: Participants' self-assessed English proficiency levels and their main reasons for learning English in a chemistry-related context

Analysis of Question 3, 4 and 5

Also, the highest portion as shown in figure 3 with (75.7%) reported that the ESP course content should tackle organic chemistry and analytic chemistry because the majority (65.2%) of them would work as lab assistant or and they many need English for graduate research. Afterwards, large number of learners (73.6 %) conceived that language would be used for both writing and speaking, (68.4%) of them would use it for laboratory and conferences. However, a good number of them (47.3%) recorded that they need the language for face to face communication. Students displayed divergent needs, emphasizing on productive skills.

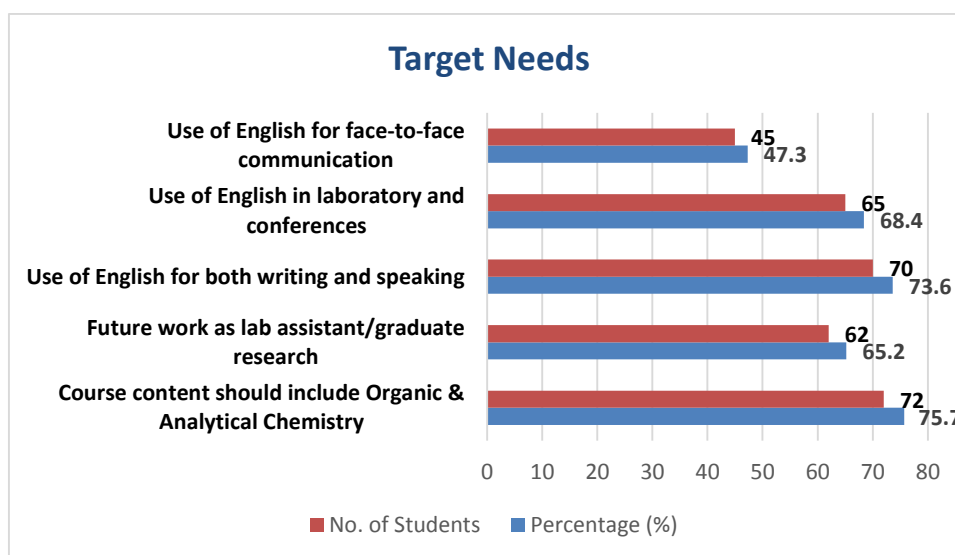


Figure 3: ESP Content Areas, Language Skills, and Contexts of Use
Analysis of question 6, 7, 8 and 9

As indicated in Figure 4, the second part of the NA investigated the PSA. (63.1%) of the students admitted that they have average background in English chemistry related communication A good number of students have deficiency in

the productive skills (51,57% speaking, 62.1 % writing). However, they avowed having slight difficulties in the receptive skills, namely listening and reading with 4% and 6.31% respectively. Next, most of the students (72.6%) pointed that their strengths in writing could be formulating analytical research arguments and maximum (11.5%) could speak about lab procedures in context. Regarding their weaknesses in writing, the majority with (96.8 %) mentioned that they could not produce academic analytical, coherent and cohesive writing style while the second largest proportion (69.4%) contended that they failed to produce grammatically correct paragraphs. ESP students' weaknesses in speaking showed that high percentage (78.9%) added that they could not speak fluently in context. The second highest level of participants (48.4%) failed to express in chemical contexts and the third highest (87.3%) had problem with grammatical accuracy. The high percentage of grammar deficiencies signals an urgent need for integrating contextualized grammar instruction in ESP chemistry curricula.

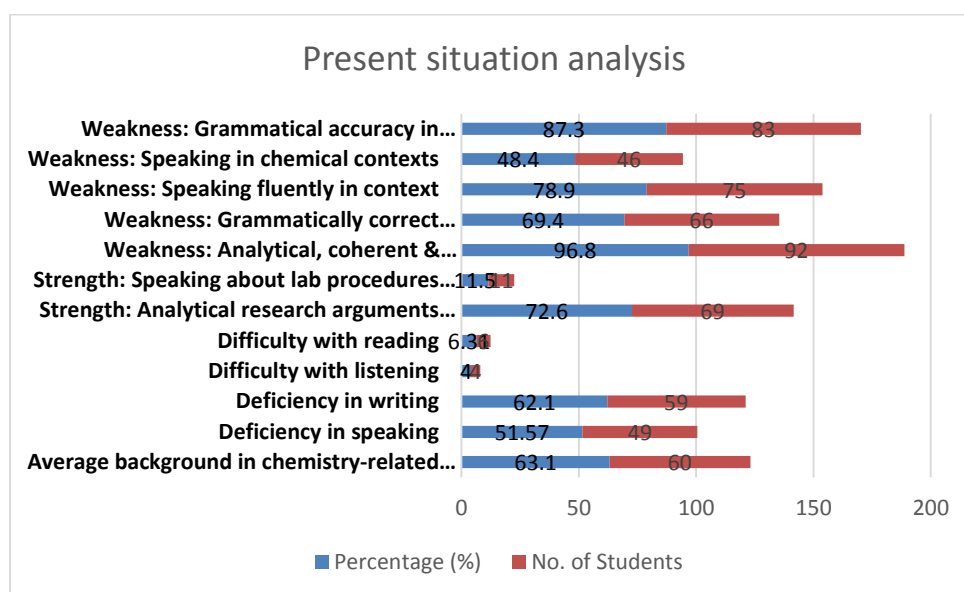


Figure 4: Present Situation Analysis: Language Background, Strengths, and Weaknesses

Analysis of question 10, 11 and 12

Furthermore, (64.2%) of the learners lacked the skill of report and lab note writing and (37.8%), the second highest, lacked the skill of scientific oral presentation as indicated in Figure 5. In addition, important number with (69.4%) reported that their language learning experiences were average. The last question of this part inquired about their purpose of the ESP course. Nearly (63.8%) noted that their purpose was to improve professional/scientific communication, and (50.5%) avowed that the objective of the ESP is to write accurate lab and research reports. Generally, students enrolled in ESP courses tend to perceive themselves as competent readers, yet they frequently record difficulties with speaking. These parallels support the conclusion that a tailored ESP syllabus is essential to meet chemistry learners' academic and professional demands of English.

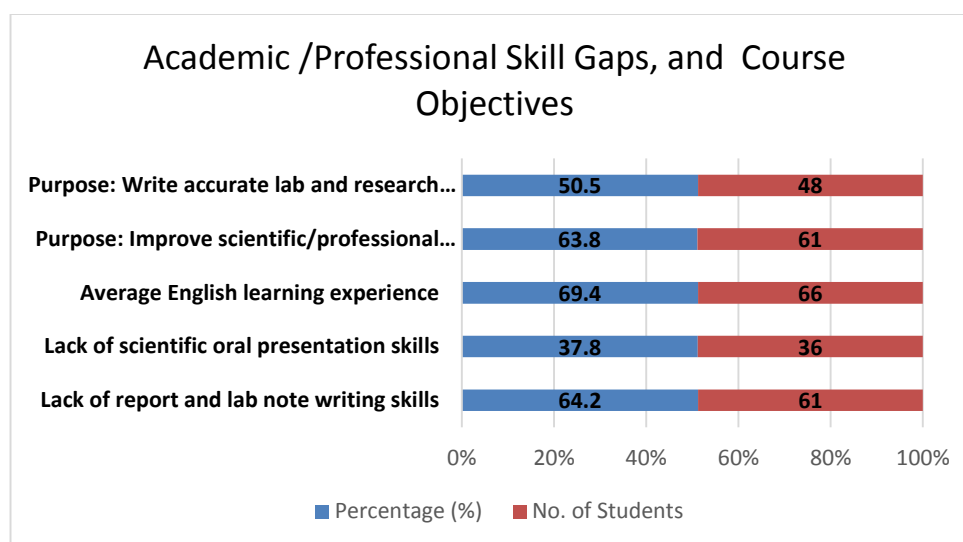


Figure 5: Learners' perceived gaps in professional communication skills, their prior English learning experience, and their expectations from the ESP course

Analysis of question13 to 17

The last part of the NA questionnaire surveyed the CS, the first question revealed that 63.1% of the students wanted courses to be delivered not only face to face but also through internet and multimedia resources. To answer the second question, majority (85.2%) viewed that the chemistry ESP course should be held in a classroom using educational technology facilities with sound system, decorated with posters and diagrams with speaking and writing tips, lab demonstration tools, puzzles, vocabulary learning tips, etc. Subsequently the largest part (62.1%) of the students realized that the current teaching classroom materials (white-board, projector.) were not sufficient.

The majority (84.2 %) of the respondents agreed that the course materials should be selected from wide range of sources like scientific texts, manuals, and journals textbooks, and other materials used in content courses like experiment videos, podcasts, Lab forms, and research assignments. In answer to the last question of the NA questionnaire, the highest proportion of learners (60 %) viewed that the course classes should be held in the early hours of the morning or evening. Findings underscore the need for ESP courses to incorporate authentic, field-specific materials. The research revealed that a majority of learners preferred content drawn from scientific texts, manuals, lab forms, and multimedia resources such as videos and podcasts.

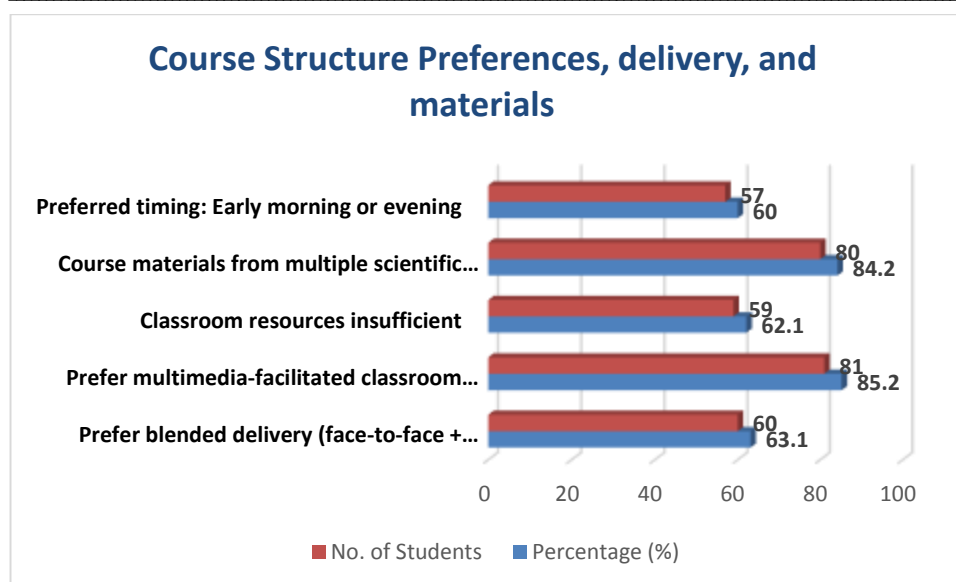


Figure 6: students' preferences regarding instructional delivery modes, classroom environment, types of learning materials

4.2. Analysis and Discussion of the Interview of Teachers

4.2.1. Insights from the Interview with the language teachers

As outlined in the methodology section, the researcher deemed the questionnaire insufficient as a standalone data collection tool. Therefore, it was backed with a semi-structured interview to provide in depth understanding of the situation and the specific needs of ESP learners in the department of Material Sciences, particularly those studying chemistry. The potential of this approach was to explore the issue from a different angle. Accordingly, the interview elicited several key insights from the participating teachers, which will be presented in the following thematic description, the three participating teachers were coded as Teacher A, Teacher B, and Teacher C.

4.2.2. Absence of Systematic Needs Analysis

Initially, the researcher sought to check whether the language teachers conducted any form of needs analysis prior to delivering the ESP course. As expected, the interviewed teachers reported that they had not engaged in any form of needs analysis with their learners and had instead proceeded directly to the course content. One participant remarked: *"I often start teaching right away because we don't have any clear procedure for assessing what students of the different specialties need for their studies."* (Teacher A). Additionally, Teacher B stated: *"Honestly, no one trained us specifically for ESP, I follow the Canva without asking students about their expectations or difficulties."* This shortfall was linked to limited professional development opportunities in ESP methodology for Algerian higher education instructors. This was primarily due to a lack of awareness regarding the significance of this process. We contend that this gap is attributed to the lack of qualified trained specialized ESP teachers within this context. Therefore, we strongly recommend that the Ministry of Higher Education give serious consideration to recruit ESP specialized teachers who would undoubtedly contribute to more effective course delivery.

4.2.3. Disparities in Learners' Language Proficiency

Based on interviews conducted with three language teachers, several critical needs and challenges facing ESP learners in the chemistry department were highlighted. A major concern was the students' overall weakness in English, particularly in grammar, speaking fluency, and the ability to construct coherent academic sentences. Although several students achieved a relatively strong command of technical vocabulary within their discipline, they struggle to formulate paragraphs or articulate their ideas effectively in scientific writing. This discrepancy highlights the need for targeted instruction that bridges the gap between lexical knowledge and productive language use. teachers are invited to integrate more oral presentations and writing tasks to attain the expectations of the learners.

The respondents also added that wide variation in students' language proficiency levels. They noted that while some students demonstrate a strong command of English, others possess only a basic understanding. One teacher highlighted: *"In one class, I have students who can understand advanced texts and others who still struggle with basic words. It's very challenging to plan lessons for everyone."* (Teacher C). This diversity sometimes forces instructors to adjust their approach, for instance, Teacher B added that *"Many times I have to go back to teaching General English, otherwise half of the class won't follow the ESP material."* The issue of mixed ability levels emerged as reoccurring obstacle. As a result, teachers often feel compelled to shift towards General English in order to accommodate lower-levels. To address this disparity, it is essential to implement a needs-based placement system prior to course enrollment then grouping learners according to their actual language levels.

4.2.4. Language Proficiency and ESP Course Design

The interviewed teachers emphasized that the primary objective of the ESP course is to prepare learners to communicate and apply English in a variety of chemistry-related contexts, including laboratory procedures, research discussions, and academic research. *"Our main goal is to help students use English confidently in their chemistry labs and research including scientific discussions"* According to Teacher A. On the other hand, Teacher C emphasized *"It's not just about grammar or general vocabulary; it's about giving them the language tools they need for experiments, papers, and international collaboration."* This highlights that the primary function of a chemistry-specific English course is to bridge the gap between general language skills and professional scientific tasks.

In addition, the students' varying proficiency levels ranging from relatively competent to very weak pose an additional challenge for instruction. When asked about students' strengths in scientific writing, the interviewed teachers noted that most chemistry learners demonstrate an ability to generate scientific content and use discipline-specific terminology accurately. For instance, one teacher reported that *"They know how to follow the standard lab report structure such like introduction, methods, results, and conclusion, and they employ the right chemistry terminology for each section."* (TeacherA). However, despite this strength, teachers observed significant weaknesses in the grammatical correctness and logical flow of students' writing. Another teacher explained: *"While their reports include the right sections and technical terms, the sentences themselves often have grammar mistakes and lack clear connections between ideas."* (TeacherB). Students' familiarity with discipline-specific formats and terminology may suggest that their education in French and Arabic have given them a strong foundation in science knowledge, which they can transfer into English. While the content

knowledge and document structure are crucial in ESP, language accuracy and textual connectivity require further support within the ESP course to help them write appropriate academic scientific texts. Teachers viewed the speaking abilities of students as hesitant and underdeveloped. Many students are familiar with scientific content but lack the confidence and practice to express ideas fluently in English. One teacher illustrated this challenge: *“They understand the experiments very well, but when I ask them to explain in English, they hesitate and sometimes switch back to French.”* (Teacher A). This underscores the need for more structured speaking activities, pronunciation practice, and confidence-building tasks within the ESP curriculum to bridge the gap between content knowledge and oral communication. Furthermore, it was noted that student motivation remains low, partly because the English course is perceived as a transversal subject rather than a core component of their field. One teacher added that *“For most students, English is not a priority. They think it’s separate from their chemistry degree, so they don’t invest much effort in it.”* (Teacher C). These findings underscore the importance of designing an ESP course that is both accessible and contextually relevant, with differentiated activities that support learners at all proficiency levels while increasing engagement through chemistry-specific content. Thus, tailoring activities to reflect real-life lab scenarios, research writing, and scientific discussions can make the course more meaningful and encourage active participation across varying proficiency levels.

Teachers observed that a combination of face-to-face and online methods works best for teaching ESP to chemistry students. One participant noted: *“Face-to-face classes are essential for speaking and lab activities, but online resources help students review and practice on their own time.”* (TeacherA). For teaching materials, all teachers emphasized the need for authentic specific resources. As one explained: *“We should use real research papers, lab forms, and experiment videos — not just generic grammar exercises.”* (Teacher B). Using blended method increases interactivity and caters to students’ diverse learning styles and supports practice outside class hours.

5. Discussion of Results

The results of this study underscore several critical insights into the linguistic needs and instructional preferences of ESP learners in the chemistry department at Ibn Khaldoun University. In response to the first research hypothesis that ESP learners may need support in improving writing skills including grammar accuracy, cohesion, and spoken fluency, the findings offer strong confirmation. While most students reported average proficiency in English, a significant proportion demonstrated pronounced difficulties in productive skills mainly writing, and speaking. In addition, important proportion were unable to produce cohesive, coherent academic writing. These findings support the hypothesis and align with previous studies by Boudresa (2018) and Bouyacoub (2018), which also observed grammar and vocabulary deficiencies among Algerian ESP learners.

In relation to the second hypothesis that ESP learners may show significant preference for authentic, context-specific materials and a blended delivery mode combining face-to-face and multimedia/online instruction, the data again offers clear validation. A large majority of the students preferred materials derived from scientific texts, lab forms, manuals, podcasts, and experiment videos. Moreover, ESP instructors welcomed the blended delivery teaching approach. These findings are consistent with Saraa’s (2023) recommendation to use discipline-specific academic texts for biology and with the participants’ own emphasis on practical, real-world applications, conferences, and research writing.

Additional evidence from the teacher interviews reinforces these conclusions. Instructors noted the absence of systematic needs analysis, observed a wide range of proficiency levels, and emphasized the necessity of differentiated instruction, our finding corroborate with the research work of (Mebitil, 2011; Elbah 2024; Tourche 2018; Assassi, 2021; Saraa, 2020). The interviewed teachers also reported that while students could organize scientific content and use scientific terminology accurately, their grammatical structures, paragraph writing, and oral fluency remained weak. These challenges, coupled with low motivation due to the perception of English as a transversal subject rather than a core component in the curriculum. The study highlights the need for a redesigned ESP syllabus that integrates communicative and academic language skills, discipline-specific content, and a blended instructional approach. Such a model would not only align with learners' preferences and professional goals but also address the foundational language deficits that currently hinder their performance in chemistry-related English tasks.

6. Recommendation model

6.2. ESP Course Syllabus for Chemistry Learners

To address the challenges in the chemistry department, ESP course syllabus was proposed for second year students, specifically the ESP course syllabus was designed to meet students' linguistic and academic needs. This course syllabus was developed following curriculum design model outlined by Brown (1995), which includes steps such as needs analysis, goal setting, content selection, methodology planning, and assessment.

6.3. Aims and Objectives of the Syllabus

The central aim of the ESP course syllabus is to provide chemistry learners with the linguistic tools necessary to function effectively in academic and professional scientific contexts. Specifically, the course seeks to develop students' ability to produce structured and coherent lab reports and research abstracts, while also enhancing their fluency in oral communication during lab discussions, presentations, and academic exchanges.

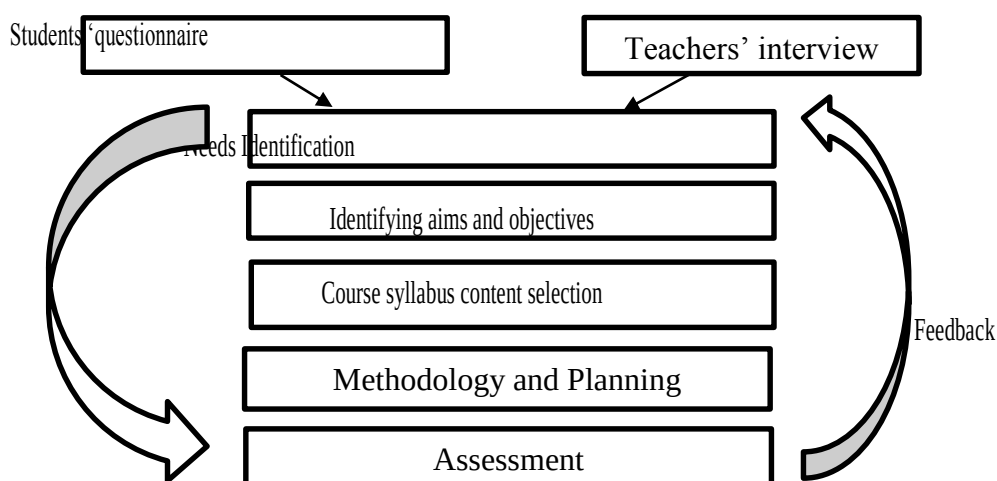


Figure7: Course Syllabus Framework

Table 2: Sample Units of the Proposed ESP Course Syllabus

Unit	Topic & Activities	Teaching Aids	Language Focus	Online Supplementary Activities
Unit 1	Title: States of Matter - Speaking: describing changes(solid/liquid/gas) - Reading: Skimming and scanning experiment texts - Writing: Writing short lab observations	Visual diagrams, textbook extracts, lab videos	Present simple, scientific terms (melting, freezing)	Interactive simulation tasks, vocabulary matching games, voice recording tasks
Unit 2	Title: Chemical Reactions & Equations - Listening: Understanding lab instructions - Speaking: Describing procedures - Writing: Reporting experimental results	Lab demonstration video, safety manual	Passive voice, sequencing connectors (first, then)	Video demonstrations with comprehension quizzes, drag-and-drop sequencing activities, passive voice worksheets
Unit 3	Title: The Periodic Table & Element Properties - Reading: Interpreting chemical data tables - Speaking: Comparing elements - Writing: Describing atomic structure	table and charts, journal article excerpt	Comparatives, superlatives, symbols & abbreviations	Online quizzes on comparatives and superlatives
Unit 4	Title: Organic Chemistry in Daily Life - Listening: Podcast on hydrocarbons - Reading: Analyzing organic compounds - Writing: Describing molecule structures	Podcasts, molecular models, images	Compound nouns, subject-verb agreement	Online quizzes on compound structures, subject verb agreement
Unit 5	Title: Scientific Research Skills - Speaking: Presenting research topics - Writing: Drafting research abstracts - Reading: Analyzing abstracts from journals	Exemplary abstracts, research paper templates	Academic reporting verbs (demonstrate, reveal)	Abstract writing templates, feedback via Moodle platform and video presentations

7. Conclusion

The study investigated the ESP needs of chemistry students at Ibn Khaldoun University using a mixed-methods approach. It aimed to assess students' language proficiency, learning goals, and instructional preferences. The findings revealed key challenges in writing and speaking, particularly in grammar, coherence, and fluency. Students also showed a clear preference for authentic, chemistry-specific materials and blended instruction that combines face-to-face learning with multimedia resources. The absence of systematic needs analysis and the lack of ESP-trained instructors were identified as major barriers to course effectiveness. These results highlight the urgent need for an ESP curriculum that is learner-centered, contextually relevant, and aligned with students' academic and professional trajectories. It is recommended that future ESP courses be developed based on formal needs assessments, incorporate real-world scientific content, and use varied delivery methods. Equipping instructors with ESP-specific training and enhancing classroom resources will further support meaningful and effective language learning in scientific disciplines.

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Appendix A

ESP Needs Analysis Questionnaire of Chemistry Students

This questionnaire is part of a research project; your participation will support the study. Confidentiality is guaranteed. Please tick the correct options and write information where required.

1. Personal Information

1) Your age:

19 and less

20–23

24 and more

2) Your sex:

Male

Female

Part 1: Target Situation Analysis**1) Describe your proficiency in English:**

Average Good Very Good 5Excellent

2. For what purposes do you need to learn Chemistry-related English?

Study Research Communication Travel

Future profession/Job Study Abroad Other.....

3. What will the content areas be?

☐ Organic Chemistry ☐ Analytical Chemistry ☐ Physical Chemistry ☐ Others

4. According to you, what is the most important language skill in your field?

Listening Speaking Reading Writing Others

5. Where will the language be used?

Lab Assistant Undergraduate Research Graduate Research Industrial

Part 2: Present Situation analysis**6. How would you define your background in Chemistry-related English communication?**

Average Good Very Good Excellent

7. What is your current level of English in writing and speaking?

• a) Writing:

Average Good Very Good Excellent

• b) Speaking:

Average Good Very Good Excellent

8. What strengths do you have in writing and speaking?

• a) Writing:

☐ Writing grammatically correct lab reports

☐ Summarizing experiments in free-hand

☐ Writing structured chemical explanations

☐ Formulating analytical research arguments

• b) Speaking:

☐ Explaining chemical concepts with grammatical accuracy

☐ Speaking about lab procedures in context

☐ Presenting fluently in group discussions

☐ Explaining topics with fluency, context, and intonation

9. What weaknesses do you have in writing and speaking?

• a) Writing:

☐ Difficulty with grammatically correct paragraph reports

☐ Difficulty writing chemical concepts in free-hand

☐ Difficulty organizing explanations coherently

☐ Difficulty producing analytical and cohesive writing

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• b) Speaking:

- ☐ Difficulty with grammatical accuracy
- ☐ Difficulty expressing in chemical contexts
- ☐ Difficulty with fluency
- ☐ Difficulty with both fluency and proper context

10. Which academic/professional skills do you lack most?

- ☐ Report and lab note writing
- ☐ Scientific oral presentation
- ☐ Poster presentation at conferences
- ☐ Writing research abstracts

11. How is your previous English learning experiences?

- ☐ Average ☐ Good ☐ Very Good ☐ Excellent

12. Why are you taking a Chemistry-specific English course?

- ☐ To improve professional/scientific communication
- ☐ To write accurate lab and research reports
- ☐ To improve participation in academic discussions
- ☐ To prepare for international opportunities

13. How do you want the instructional materials to be delivered?

- ☐ I do not know
- ☐ face-to-face
- ☐ Online
- ☐ Both face-to-face and online with audio-visual aids

14. What type of classroom environment do you prefer?

- ☐ Whiteboard and projector
- ☐ Multimedia-facilitated with sound system
- ☐ Equipped with Internet and lab demonstration tools
- ☐ Enriched with visual aids (posters, scientific terms, diagrams, etc.)
- Others.....

15. What materials should the course include?

- ☐ Scientific texts, manuals, and journals
- ☐ Lab forms, experiment samples, and research assignments
- ☐ Online scientific articles, experiment videos, podcasts
- ☐ A combination of all above

16. Are the classroom resources (whiteboard, multimedia, lab tools, etc.) sufficient?

- ☐ Yes ☐ No ☐ Have no idea

17 Preferred class timing:

- ☐ Early morning or evening
- ☐ Mid-morning or evening
- ☐ Late morning or evening
- ☐ Any time

Thank you for your participation