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Toward Designing Education 4.0 Competency-Based ESP Curriculum (E4CEC) in the Context of Iranian Education: The Challenges and Opportunities

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Abstract

Developing students' various competencies and skills of the Fourth Industrial Revolution has posed serious challenges for university students. However, only a few studies have been carried out regarding incorporating project-based learning activities that integrate general education and Fourth Industrial Revolution competencies as an education 4.0 project-based ESP curriculum (E4PEC). Therefore, this exploratory mixed-methods study has been carried out to develop a Medical English for Specific Purposes (ESP) course that is in line with a specific academic institution's curriculum, in order to understand how students perceived the challenges and benefits of studying Medicine based on E4PEC. A total of 64 fourth-year medical majors, 46 females and 18 male students at Najafabad Islamic Azad University in Iran, participated in the study. Cronbach's Alpha test was run to test the reliability of the questionnaires' items in order to explore students' perceptions of the challenges and benefits of E4PEC. Regarding their perceptions of the benefits, it was found that all five categories received the students' positive attitudes. More specifically, most of the students perceived that PBL brought the benefits of fostering language and content knowledge and skills, and enhancement of self-responsibility and personal qualities. The study findings suggest that the E4PEC-based ESP medicine courses were more beneficial than challenging for the students and had the potential to improve students' utilization and development of technology, communication, critical thinking and analysis, creativity, and problem-solving skills. Nevertheless, issues with peers frequently surfaced, including a lack of digital and research skills, as well as difficulties with both hard and soft skills. This study provides implications for the integration of E4PEC into ESP medical classes in Iranian higher education and other similar educational contexts.

Keywords: education 4.0, project-based curriculum, ESP, opportunities, challenges

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Introduction

In the twenty-first century, soft skills such as critical thinking, cooperation, communication, and creativity, sometimes known as the four Cs, are in great demand in any setting and for any type of job (Van Laar et al., 2020). As a result, those abilities are critical for people to master, and the most effective way to do so is through educational resources (Lawati & Khan, 2023). Additionally, English teachers are responsible for cultivating critical thinking in learners, beyond helping them progress from one academic level to the next. They should design critical thinking-focused syllabi that lead to the development of critical thinking in language learners (Yazdankhah et al., 2021). Project-based learning (PBL) can facilitate the enhancement of the four C's—communication, collaboration, critical thinking and problem solving, creativity and innovation—essential skills for the twenty-first century, as evidenced by research from the Buck Institute for Education (BIE) (Önür & Kozikoğlu, 2020). This approach aligns with both past and present curricula that prioritize scientific methodologies and the genuine assessment of learning outcomes through techniques such as observation, inquiry, exploration, association, and communication. Although PBL has its genesis in medical education, a brief telescopic view of the literature in the last 30 years reveals that it is now widely used in different disciplines (Alemi et al., 2021). The PBL model can therefore act as a bridge to this. In reaction to this situation, the Education 4.0 Project-Based ESP Curriculum (E4PEC) integrates the 4Cs framework by promoting PBL as a key instructional model for educators.

PBL is strongly advocated as it empowers students to enhance their communication skills, collaborate effectively with peers to accomplish tasks, engage in critical thinking to address challenges, and foster creativity (González- pérez & Ramírez- montoya, 2022). Project-based learning (PBL) is recognized as an effective pedagogical strategy that allows students to assess their skills and competencies. This approach significantly fosters students' creativity and critical thinking abilities (Sumarni & Kadarwati, 2020). As a result, PBL can have a profound effect on students' understanding of various subjects and enhances their preparedness for future employment (Gary, 2015). Furthermore, PBL not only engages students and equips them for higher education, career paths, and civic responsibilities, but it also aids them in fulfilling academic standards and excelling in assessments that necessitate critical thinking and comprehensive knowledge (Dias & Brantley-Dias, 2017). Additionally, research by Manurung (2018) indicates that PBL can significantly boost students' creative learning processes.

At the university level, PBL emphasizes the active exploration and development of knowledge and skills, aligning seamlessly with the fundamental principles of PBL (Lasauskiene & Rauduvaite, 2015). The authors further elaborate that the results of PBL are extensively outlined, addressing various aspects such as student motivation, preparedness for college, career trajectories, civic involvement, and supporting students in achieving their goals while excelling in challenging

assessments. However, based on the authors' observations, implementing PBL in higher education presents considerable obstacles. A majority of students, whether enrolled in undergraduate or graduate programs, tend to be more familiar with traditional educational approaches. These conventional methods often involve tasks such as completing assignments derived from lectures, summarizing content, and engaging in group discussions focused on specific topics or course materials. As a result, students encounter challenges in fulfilling their project requirements as they do not fully engage in realizing their potential (Almulla, 2020).

Moreover, despite the implementation of PBL, the acquisition of English in English for Specific Purposes (ESP) classes continues to face several challenges. A significant obstacle is the prevalent use of traditional lecturing methods by educators, which promotes a unidirectional flow of information from the instructor to the students. This pedagogical approach can severely hinder students' proficiency in the English language, as well as their capacity to communicate effectively and with enthusiasm for specific objectives. Teacher-centered instructional methods create barriers for students striving to achieve targeted English language competencies. Therefore, it is essential to prioritize learning activities that focus on the effective and relevant acquisition of English tailored to specific purposes (Marcu, 2020).

PBL distinguishes itself from conventional teaching methods by emphasizing a student-centered, multidisciplinary framework that mirrors real-life scenarios. In the context of ESP, PBL prioritizes a learner-focused methodology that addresses contemporary issues and practices. The objective of implementing PBL in ESP courses is to enhance students' abilities to employ strategies for effectively addressing the complex challenges they face in their daily lives. This pedagogical approach is grounded in inquiry-based methods that cultivate a genuine interest in topics and issues that resonate with the students' experiences (Guo &Yang, 2012). A significant advantage of PBL is its capacity to foster student engagement in self-directed learning, which is customized to align with their individual interests and requirements (Gary, 2015). This perspective underscores the critical role of constructivist teaching and learning in creating a relevant context for acquiring the English language. Such an approach guarantees that the educational experience is interconnected with real-world situations and the everyday lives of students (Anazifa & Djukri, 2017). The exploration of PBL and ESP has been addressed in various studies, including those carried out by Ergül and Kargın (2014), Anazifa and Djukri (2017), Dias and Brantley-Dias (2017), Guo and Yang (2012), Kim (2020), Almulla (2020), Sumarni and Kadarwati (2020), and Hira and Anderson (2021). However, there is a notable scarcity of research specifically targeting university students within English classes, as the majority of existing studies have concentrated on primary school students and other subjects. Consequently, this study aims to bridge this gap by examining the application of PBL in the context of ESP classes, particularly focusing on students' perceptions. As language educators increasingly acknowledge the significance of engaging students in authentic tasks that reflect

real-world professional scenarios, it becomes essential to comprehend students' attitudes and experiences regarding PBL. The importance of this research lies in its capacity to enhance ESP pedagogy and curriculum development, providing valuable insights into the effective integration of PBL into language instruction to better align with learners' needs and objectives. By clarifying the elements that shape students' perceptions of PBL, educators can refine their instructional strategies to improve learning outcomes and create a more engaging and meaningful educational experience.

Furthermore, the findings of the study of Riazi and Aliasgar (2020) about the curriculum of undergraduate nursing in Iran in compared with the top universities of the world's similar curricula, along with some similarities, show significant differences in the curricula. The lack of skills of nursing graduates was the main concern of the participants. They noted that the curriculum could not motivate students and provided graduates with the necessary understanding, attitude, and skills in their careers, despite the efforts of nursing authorities.

The significance of this study lies in its potential to provide valuable insights for ESP pedagogy and curriculum design. It aims to shed light on the effective integration of PBL into language instruction to better cater to learners' needs and objectives. By identifying the factors that influence students' perceptions of PBL, educators can refine instructional practices to enhance learning outcomes and cultivate a more engaging and impactful learning environment (Syarifah & Emiliasari, 2019).

Method

The study attempted to address the following research questions:

1) What are Iranian ESP students' perceptions about the challenges of the ESP course design based on the education 4.0 project-based curriculum?
2) What are Iranian ESP students' perceptions about the effects of the ESP course design based on the education 4.0 project-based ESP curriculum?

Participants

The participants of the current study were 64 fourth-year students (46 females and 18 males) from 2 classes majoring in Medicine at Islamic Azad University, Najafabad Branch in Iran. Their ages ranged from 22 to 25. English for Medical Students is one of the compulsory courses they have to complete to meet the requirements of the undergraduate program.

For selecting the participants, the researchers selected those students who were familiar with competency–based curriculum and 4.0 education. Participation in this study was not mandatory.

Instruments and Data Collection

The current study adopts a mixed-methods design incorporating an open-ended questionnaire and a semi-structured interview. It provided an opportunity for considering different aspects of the problem under study (Kothari, 2004).

First, the open-ended questionnaire was used in this study. Five experts in the field of medical ESP and education 4.0 were invited to establish the content validity of the questionnaires' items. The researchers established four intervals based on the interval coefficient, and the data were interpreted using a Likert-type scale with four categories: strongly agree, agree, disagree, and strongly disagree.

In this study, semi-structured interviews with medical ESP students were used. The questionnaire comprised three sections with forty-four items, grounded on the theoretical framework of ACEC and the exploration of previous studies, designed to capture neutral responses using a 4-point Likert scale ranging from "strongly disagree" to "strongly agree. The reliability of the questionnaire was tested using Cronbach's alpha, resulting in a reliability index of .653 for 14 items measuring scholars' understanding of challenges and .934 for 37 items measuring scholars' understanding of the benefits of E4CEC.

Additionally, ten volunteers from the two classes were selected for interviews. They were asked a set of standardized questions about their experiences, and their responses were systematically recorded for future investigations. Each interview lasted around 20 minutes.

Data Analysis

Quantitative data from the survey questionnaire were analyzed using SPSS 20.0 software, which computed descriptive statistics such as the percentage, the mean, and the standard deviation.

The qualitative data from interviews underwent content analysis, where the responses were categorized, analyzed, and interpreted based on the research questions and themes. Specifically, C1, C2, and C3 represented environmental, teacher-related, and student-related challenges, respectively. Additionally, B1 to B5 represented benefits related to language and cognitive skills, language abilities, plant-related skills, tone-responsiveness, specific abilities, and internal motivation. Finally, the students were assigned codes from SI-1 to SI-10, and interviews were extracted and coded from SJ-1 to SJ-10 to represent the data.

Results

ESP Course Design Challenges

One of the objectives of this study was to identify the challenges faced by students enrolled in an ESP course in Iran. As Table 1 highlighted, there were various challenges related to the academic environment, teachers, students, language proficiency, cognitive skills, plant-related skills, emotional maturity, and personal development. Overall, the majority of students reported positive experiences, indicating the effectiveness of PBL in ESP classes.

A few students reported facing challenges with the textbook they encountered. The difficulties they encountered, however, remain unspecified. It is essential to address these concerns in a timely and effective manner to ensure that all students can benefit from the resources provided to them.

Table 1
Descriptive Results on Context-Related Challenges

No		M	S. D
1	To carry out all the activities needed for the project, e.g., choosing the topic, assigning tasks, or discussing the methods, the students were not given sufficient time.	2.14	.687
2	For implementing the whole project, the students were not given sufficient time	2.06	.560
3	Applying project-based learningfor learning ESP was not suitable because students face challenges.	2.34	.648
4	Because project-based learning is a newapproach, all the steps and activities were unfamiliar to students, and they faced challenges.	2.69	.639
5	The implementation of the project was too difficult for the students.	2.45	.754
6	Some students faced challenges because too much work is required to implement the project.	2.72	.786

Challenges of the Teachers

As Table 2 shows, most students reported that their teachers were not responsible for the challenges they faced. These challenges included issues with guidance, attitude, and ability to instruct on project implementation, ESP knowledge, communication ability, and evaluation the work of students.

Table 2
Descriptive Results on Teachers' Challenges

No	Items	M	SD
7	Students received little guidance from the teacher during the time for executing the project.	1.97	.992
8	Students were motivated in the implementation of the project by teachers' attitudes toward students' work.	1.84	.801
9	The teacher could not instruct on how to carry out the project.	1.70	.634
10	The teacher did not have enough knowledge of ESP.	1.56	.560
11	The teacher was not able to communicate and assess the students' projects.	1.56	.560

The study's findings indicate that the teacher's responsibilities, behavior, teaching ability, knowledge of ESP, communication, and assessment methods did not pose any problems for the students. The teacher was adept at integrating PBL into the ESP courses. The success of PBL is significantly influenced by the teacher's abilities and characteristics. Both teachers and students need to plan carefully for PBL, as stated by Mikulec and Miller (2011). The students recognized that the educator diligently fulfilled various responsibilities, including outlining the course's objectives and how the project could help them achieve their goals. The teacher's role has shifted from an authoritarian figure to that of a facilitator, coordinator, initiator, and guide, working with students to address challenges related to their ESP knowledge and learning strategies. The teacher can impart English language skills and specialized vocabulary, as well as professional competencies such as analyzing, evaluating, and synthesizing information from various sources for the project. Furthermore, the teacher can employ various formative assessment techniques to track the students' progress. The absence of any issues between the teacher and numerous students can be attributed to various factors.

Challenges of the Students

Table 3 outlines three significant challenges faced by students during the project work: skills, English proficiency, and attitudes. The analysis of the average scores for Items 12, 13, and 14 indicates that more than 50% of the students identified these aspects as challenging. The mean scores for skills, English proficiency, and attitudes were 2.56, 2.63, and 2.84, respectively, with corresponding standard deviations of 0.794, 0.678, and 0.912.

Table 3
Descriptive Results on Students' Challenges

No	Items	M	S. D
12	Incompleting the project, the students lacked skills such as discipline, teamwork, and initiative.	2.56	.794
13	Some problems among group members were caused by students' different English proficiency levels.	2.63	.678
14	For the completion of the project, the students' different attitudes toward the project caused problems.	2.84	.912

In Table 3, among the three categories of challenges—context challenges, teacher challenges, and student challenges—the mean score for teacher challenges was the lowest (M = 1.72), indicating that most students did not attribute the challenges they faced to the teacher. The mean score for context challenges was 2.40, while that for student challenges was 2.67.

Benefits of the ESP Class Based on E4CC

Question 2 in the study of ESP classes in the Iranian context specifically focused on examining the perceived advantages of E4CC-based ESP classes among students. The results from the survey and interviews were presented and analyzed below.

Content Knowledge and Language

As Table 4 indicates, the mean values for Items 1, 2, 3, and 4 were 3.27, 3.05, 3.16, and 3.09, respectively, with corresponding standard deviations of 0.718, 0.677, 0.511, and 0.526. A majority of students expressed that they could leverage the E4CC program in the ESP class to create a product in real-world settings and enhance their understanding of the product production process. The mean values for Items 5 and 6 were 2.95 and 3.16, with standard deviations of 0.547 and 0.541. The students' consistent perspectives were further supported by data gathered from their journals and interviews. For example, SJ-4 stated, "I gained knowledge on the correct pronunciation of ESP words and acquired a plethora of new ESP vocabulary." SJ-6 reported, "I was able to enhance my listening and comprehension skills, while mastering new concepts in medical terminology." In addition, SJ-2 stated, "I have expanded my vocabulary and grammar, particularly after completing the class through project work." Similarly, some students mentioned during interviews that they gained substantial knowledge in medical vocabulary. For instance, SI-3 stated, "I believe I gained more knowledge in vocabulary rather than content knowledge and key terms."

Table 4

Descriptive Results on Language and Content Knowledge

No	Items	M	S. D
15	I enhanced my general English languageknowledge, such as grammar, vocabulary, and pronunciation, through the project work.	3.27	.718
16	My ESP vocabulary knowledge was enhanced by the project work.	3.05	.677
17	I benefited from the content knowledge of the project work.	3.16	.511
18	My knowledge of how to do things in real-life working environments was enhanced by the project work.	3.09	.526
19	I created a product in real-life working environments through the project work.	2.95	.547
20	My knowledge of the process of producing a paper could be developed through the project work.	3.16	.541

Language Skills

The findings of the survey presented in Table 5 aimed to assess the scholars' proficiency in the four language skills. The results revealed that the

integration of PBL in ESP classes had a positive impact on the majority of the scholars' reading, speaking, and writing abilities (Items 8, 9, 10). The mean scores of 3.17, 3.17, and 3.03, and standard deviations of .680, .656, and .712, respectively, signify the improvement. In addition, over 50% of the participants experienced an enhancement in their listening skills (Item 7), with the mean score of 2.69 and the standard deviation of .794. The scholars had ample opportunities to apply all four skills.

Table 5

Descriptive Results on Language Skills

No	Items	M	S. D
21	I improved my English listening skills through the project work.	2.69	.794
22	I improved my English reading skills through the project work.	3.17	.680
23	I improved my English speaking skills through the project work	3.17	.656
24	I improved my English writing skills through the project work.	3.03	.712

Skills of the Workplace

Table 6 demonstrates that scholars' proficiency in plant-related abilities is associated with four key skills: communication, cooperation, interpersonal skills, and problem-solving. Notably, the scholars' cooperation skills displayed significant improvement, which played a crucial role in the successful completion of the project. They effectively communicated their viewpoints while engaging with scholars from diverse backgrounds and preferences (Items 11-14), with average scores of 3.14, 3.163, 3.16, 3.13, and standard deviations of .814, .672, .655, .577, respectively. However, they identified the need to enhance their negotiation, persuasion, collaboration, and time management skills to further develop their communication abilities (Items 15-18), with average scores of 2.81, 2.83, 3.12, 2.80, and standard deviations of .664, .656, .745, .694, respectively.

Table 6

Descriptive Results on Collaboration and Communication Skills

No	Items	M	S. D
Collaboration skills			
25	My teamwork skills were enhanced through the project work.	3.14	.814
26	A successful outcome of the project was achieved through good teamwork.	3.16	.672
27	I could make decisions when discussing something with my group members.	3.13	.655
28	I had the chance to work with students of different proficiency levels andpreferences.	2.98	.577
Communication skills			
29	My negotiation skills with other group members about something in the project were increased by the project work.	2.81	.664
30	My persuasion skills when working in a group were enhanced through the project work.	2.83	.656
31	My presentation skills were developed in public.	3.12	.745
32	I could finish all my tasks on timewith satisfying results because I learned how to manage my time.	2.80	.694

The results presented in Table 7 demonstrate unanimous agreement among scholars that the design work provided significant opportunities for collaboration with other groups, utilization of formal and informal English, and communication with fellow group members.

The mean values and standard deviations for each aspect were as follows: 2.56 (0.639) for collaboration, 2.97 (0.689) for formal and informal language use, and 2.70 (0.659) for communication. However, classmates did not consistently support these interactions, with a mean value of 2.44 (0.639) for Item 22. The mean values and standard deviations for problem-solving activities, exchanging ideas, working in groups, and concluding were as follows: 2.84 (0.511), 2.84 (0.570), 2.83 (0.521), and 2.80 (0.540), respectively.

Table 7
Descriptive Results on Interpersonal Skills

No	Items	M	S. D
Creativity skills			
33	I learned to use a wide range of idea-generation techniques (such as brainstorming) in class.	2.56	.639
34	I learned to elaborate, refine analysis, and evaluate ideas to improve and maximize creative effort.	2.97	.689
35	I enhanced my social skills by meeting and talking to other group members and the instructor.	2.70	.659
36	I learned how to demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas.	2.44	.639
Problem-Solving Skills			
37	I learned how to give solutions to problems arising during the implementation of the project.	2.84	.570
38	I learned how to identify problems arising during the implementation of the problems.	2.84	.511
39	I learned how to conclude from the results of the project.	2.80	.540

Personal and Self-Responsibility Skills

PBL was shown to provide numerous benefits to students. Specifically, design work, encompassing Items 27 and 28, was found to notably enhance students' independence, creativity, and active learning. The average scores for these items were 3.33 and 3.28, with minimal standard deviations of 0.506 and 0.576, respectively. Furthermore, the design work was proven to assist students in exploring their interests and abilities, taking charge of their learning, working independently, and cultivating critical thinking skills. These findings were derived from the scores for Items 29-31, which had the average scores of 3.05, 3.05, and

3.17, with standard deviations of 0.653, 0.628, and 0.680, respectively. All ten students who were interviewed reported that they enhanced their autonomy through the assignments given by their teacher.

Table 8
Descriptive Results on Critical Thinking

No	Items	M	S. D
40	Enhancing students' sense of responsibility through the project work.	3.33	.506
41	Being more independent, creative, and active learners through the project work.	3.28	.576
42	Giving more opportunities for the students to discover their preferences and qualities through the project work.	3.05	.653
43	Learning how to respect others and be a responsible member of mygroup.	3.05	.628
44	Providing students the chance to learn independently and develop critical thinking skills through the project work.	3.17	.680

Internal Motivation

As it can be inferred from Table 9, the significance of motivation in students' academic performance when learning a foreign language cannot be overstated. The research demonstrated the substantial impact of motivation on students' learning of ESP. Remarkably, over half of the students expressed their eagerness to participate in the project work, despite not being in complete agreement with every aspect.

Table 9
Descriptive Results on the Problems of Internal Motivation

No	Items	M	St. D
45	My interest was increased by the project work because it was fun, motivating, and challenging.	2.77	.611
46	I could get familiar with a real-life workplace by executing projects, and the classroom brought enjoyment.	2.75	.535
47	My attitudes toward ESP learning were changed by the project work.	2.84	.597
48	To participate in English class activities, the project work made me happy.	2.66	.597
49	learning ESP was not so difficult for me and it was shaped for me by the project work.	2.48	.563
50	I learned something good for my future job from the project work.	3.03	.597

Discussion and Conclusion

The results of a recent study showed that students faced two main challenges when they were adjusting to the PBL approach: getting used to the PBL approach itself and managing the workload associated with it (Items 4 and 6). These findings align with previous research by Devkota et al. (2017), which suggested that students may find PBL difficult because they are more familiar with traditional teaching methods. Despite this, the PBL approach is often considered more interactive and engaging than traditional methods/approaches, and it can improve students' progress in language and technical knowledge, as well as their communication, critical thinking, and problem-solving skills. However, students who are used to traditional teaching may find it less challenging to attend teacher-directed ESP classes than to engage in inquiry-based literacy. In inquiry-based literacy environments, students are expected to take charge of conducting their own investigations/research (Kirschner et al., 2006). These challenges are not impossible to overcome, and the findings of the study support Thomas's (2000) assertion that design work involves complex tasks and that the team-based literacy (TBL) approach requires students to be actively involved in the literacy process and to take responsibility for their own knowledge and skill development (Funke, 2022). The study also revealed that the students received significant support from their teachers and did not encounter any major obstacles during the project. In summary, despite the common occurrence of teacher-related challenges during project work, the students in this study recognized the instrumental role of their teachers' support and guidance in their success. Additionally, the text highlights two students' opinions expressing appreciation for the support they received from their teachers.

Also, the study showed a significant number of the students encountered difficulties related to their competencies, English language proficiency, and attitudes. In ESP courses, students face considerable pressure to produce tangible real-world outcomes, necessitating the acquisition of both linguistic and substantive knowledge and skills. This lack of skills was particularly evident among the students taking the "English for Medical Students" course for the first time. Additionally, differences in English proficiency and inadequate group work skills resulted in collaboration issues for less proficient students when working in groups of four, while more proficient students were at risk of shouldering all the work and becoming discouraged. The study highlighted a lack of awareness on the teacher's part regarding students' self-efficacy, autonomy, learning styles, and skill levels, leading to an inadequately organized class. Among the challenges faced by students were the low English language skills, the lack of skills among peers, and a negative attitude towards PBL in medical course projects.

Based on the quantitative and qualitative data provided, it can be inferred that E4CC's ESP class has significantly contributed to the students' improvement in both general and specialized English knowledge, as well as their content knowledge. Moreover, it has effectively equipped students with valuable skills that can be directly applied in real-world work settings. PBL has been identified as an effective method for promoting the development of language, content, and skills simultaneously, according to the findings of the study cited earlier (Beckett & Slater,

2005; Stoller, 1997). Scholars in the field of ESP recognize the importance of learning through systems to prepare students for the challenges of their future careers in real-life work environments. The study conducted by Huzairin et al. (2018) has revealed that ESP classes based on PBL have a positive impact on students' knowledge and proficiency. Through collaborative group work and problem solving, students engage in language-rich interactions that facilitate content negotiation and co-construction. This process leads to the development of both language and content knowledge, resulting in enhanced learning outcomes.

The study underscores that PBL is an effective approach to enhancing students' language skills, vocabulary, and overall English proficiency. PBL offers abundant opportunities to practice listening, speaking, reading, and writing in English. These findings are consistent with previous research conducted by Farouck (2016) and Efendi (2017). Various PBL activities, such as presenting, interviewing, researching, and answering questions in English, help students gain a better understanding of their language learning needs, as identified by Beckett (2002). Moreover, students' performance in English is reported to be superior in a PBL setting, as indicated by Kelsen (2004). As PBL requires the use of English as the primary language for completing the curriculum, particularly in reading, speaking, and writing, it is a valid approach for enhancing English language proficiency and may be more effective than traditional instructional methods, as supported by Moss & Van Duzer (1998), Thomas (2000), Rousová (2008), and Ke (2010). Nonetheless, the study revealed that students lacked sufficient listening resources beyond teacher lectures and peer presentations. Indeed, the scholars' research significantly contributed to the development of advanced collaboration and communication capabilities. Their project work provided a platform for them to apply and refine their technical skills, which, in turn, enhanced their understanding of complex problem-solving processes. This experience was particularly beneficial in cultivating their ability to thrive in a team-oriented environment, where effective cooperation and communication are vital for success.

In the educational approach known as PBL, scholars employ a constructivist teaching method to collaboratively address and tackle problems. PBL facilitates the acquisition of crucial skills such as communication, problem-solving, cooperation, and interpersonal skills, as demonstrated in the study carried out by Musa et al. (2012). Through group projects or product creation, PBL equips scholars with teamwork capabilities and enhances their cooperation skills. During the design process, scholars have the opportunity to engage in goods exchange, negotiate with peers, and develop other skills that can be invaluable in real-life situations, as evidenced in Rousova's (2008) study. Consequently, ESP classes based on E4CEC impart 21st-century skills such as communication, cooperation, and problem-solving as well as language and content knowledge.

Research indicates that involvement in design work can have a positive impact on researchers' accountability, autonomy, and specific abilities. This conclusion was based on the average scores of five specific areas, as well as the insights from interviews with researchers. The study's claim that the design work can nurture learner independence is consistent with the findings of Yuliani and

Lengkanawati's (2017) research. Researchers engaged in creating plant-related designs tend to become more proactive, self-assured, self-reliant, and productive in generating and articulating ideas. PBL can help researchers progressively enhance their abilities and prepare them for the future, improving both their English language proficiency and social skills, and offering them a wide range of opportunities (Lam, 2011). Through participating in design work, researchers can develop attributes similar to those required in real-world work environments, such as patience, open-mindedness, discipline, and accountability, which can assist them in achieving success in their careers (Fried-Booth, 2002).

The study highlights that PBL plays a crucial role in boosting students' motivation to learn English, in line with the findings of Shin's (2018) study. Participation in PBL can transform students' attitudes toward learning ESP by involving them in classroom activities, inspiring them to create projects with potential future career benefits, and fostering their active engagement in the learning process. The study further emphasizes that integrating PBL in ESP classes offers several advantages for students, including enhanced language and content knowledge, language skills, teamwork, communication, interpersonal and problem-solving abilities, personal responsibility, and internal motivation. The research also aimed to explore the impact of PBL on students' motivation for ESP. The study found that PBL positively influenced students' motivation, with over half of them showing a strong interest in participating in the project work. These results are consistent with Shin's (2018) study, which also emphasized the positive impact of PBL on student motivation. Engaging in PBL can change students' attitudes toward learning ESP, encouraging them to be more attentive in class, actively participate in the learning process, and take pride in creating things that they believe will benefit their future careers. The findings suggest that incorporating PBL in ESP courses has led to various benefits for students, including improved language and content comprehension, language abilities, collaboration, communication, interpersonal and critical-thinking skills, self-reliance, individual attributes, and intrinsic motivation.

The objective of this study was to investigate the benefits, along with the challenges involved in designing an ESP course through the Education 4.0 ESP class in the Iranian context. The study revealed that the students faced several difficulties related to their peers, learning environment, teachers, and fellow learners. However, all groups of the students had positive experiences and believed that PBL improved their language skills, knowledge, responsibility, and other abilities. The teachers found PBL to be an effective teaching approach that enhances students' language and professional skills. ESP courses equip students with both language and subject knowledge, essential for success in professional settings.

Developing an ESP course based on the Education 4.0 faculty-grounded ESP class can be challenging for both educators and students. Therefore, it is recommended that teachers have a clear understanding of the stages, tasks, and criteria to be implemented during the design process. Additionally, students with lower language proficiency should be given adequate support to prevent them from feeling overwhelmed. Furthermore, increased collaboration between teachers and students is highly recommended, as PBL is still new to Iranian learners. Effective

group work and the competencies required for collaborative tasks should be explicitly guided by ESP teachers, as students encountered challenges when working in groups during the design process.

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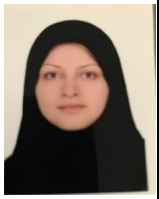

Shadi Forutanian is a well-qualified educator specializing in English instruction. She brings literary works to life, explores themes, and helps students explore complex material. Shadi is a talented lecturer with solid background in planning and leading wide range of courses. Amongst her skills are designing and developing AI-based curriculum platform and intelligent data management platforms. She can also design platforms for data processing and analyzing and quality assurance and data integrity by using data analytic. Finally, Shadi has designed different AI based platforms and can help you in developing AI-based curriculum for all majors from elementary to Ph.D. Her platforms are very unique and new.