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# *Artificial Intelligence-based Tools for Problem Solving Abilities in the EFL Classroom: Advantages and Threats*

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**Abstract**:

This study seeks to give an account of the problem solving level of English as a foreign language (EFL) university students. It also attempts to understand the perceptions that exist among students and their teachers of the potential of using artificial intelligence (AI) tools in problem solving. In this regard, a questionnaire is administered to students, and a semi-structured interview is conducted with teachers at Skikda university. Findings reveal that although students claim their good level in problem identification and evaluation as problem solving processes, their teachers express that their level is low. For their perceptions, the overall responses indicate positive and negative views. While teachers and students report that AI helps to analyse problems and suggest multiple solutions, they also feel that it does not help with suggesting innovative solutions.

**Keywords :** *Artificiel intelligence (AI) ; EFL ; perceptions, problem solving.*

# I. INTRODUCTION

With the spread and advancement of digital technology in the last decades, a number of revolutions have been brought to all sectors of life including education. For the latter, the way of delivering the teaching and learning have been reconsidered. That is, within a technology-based classroom, and English as a foreign language 'EFL' environment is no exception, new demands for both teachers and students have been created. The shift towards a more learner-centred paradigm to promote students' active participation, engagement, and monitoring of the learning process is inevitable mainly with the number of technological devices and applications introduced such as artificial intelligence (AI henceforth). Consequently, since students are responsible for their own learning process, they can individualize and personalize their learning through having control over their problem solving abilities in identifying, exploring, setting goals, looking at alternatives, selecting, implementing, and evaluation, and hence develop their self-directed learning, and attaining positive academic outcomes with the implementation of such types of AI tools (Xiao& Zhi, 2023). Accordingly, the present paper seeks to answer the following research questions:

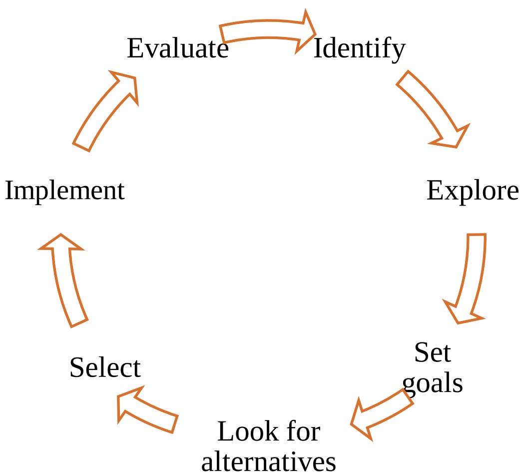
1. To what extent do Algerian EFL students master problem solving skills?
2. How do Algerian EFL students perceive the use of artificial intelligence tools for problem solving?
3. What are the perceptions of Algerian EFL teachers of the role of artificial intelligence tools in students' problem solving skills?

## 1. Literature review

### 1.1. Conceptualization of problem solving skills

As one of the individuals' cognitive processes, a variety of definitions of the term problem solving have been suggested (Bransford & Stein, 1993; Jonassen, 2004), with all authors agreeing is a complex process which includes generating novel solutions for existing problems which "cannot be solved routinely or mechanically" (Aouine& Fodil, 2020, p. 63). That is, the essence of problem solving is to involve students in situations that require their critical and analytical thinking abilities to solve new learning problems which go beyond simplicity. This can be achieved through the application of the different problem solving processes and steps (Figure 1) which would help in accomplishing the different tasks successfully. Therefore, it is recommended that within an EFL teaching and learning context, there should be a change in both teachers' and learners' practices by bringing novel and innovative tools and strategies which would have an impact on bettering the level of problem solving abilities. One suggested way is the implementation of the different technological tools and application, namely, AI tools which have been considered as an effective way for teaching and learning in the EFL context. More details about the use of AI tools in language teaching and learning are provided in the subsequent sections.

**Figure (1): Steps in problem solving**




**(Centre for good governance: knowledge, technology, people, p.15)**

### 1.2. AI in language teaching and learning

Artificial intelligence (AI) as "systems that display intelligent behaviour by analysing their environment and taking action – with some degree of autonomy – to achieve specific goals". (Boucher, 2020, p. 1) was first introduced in 1955 by John McCarthy. It focuses mainly on analysing how human mind works, thinks, and proceeds when being involved in certain problem solving situations. AI has rapidly increased and affected all sectors of life including language teaching and learning, aiming at bettering the teaching and learning process. Therefore, many educational researchers welcomed the integration of AI tools such as Chatgpt, Grammarly, Bearly, and Duolingo in the field of education. To illustrate, Sumakul et al. (2022) conducted a qualitative study using an interview with four EFL teachers at Indonesia university to collect data on their views on the beneficial role of AI tools in their teaching. All teachers perceived AI use positively. They felt that all types of AI tools implemented in an EFL context would benefit both teachers and students in the sense that they make learners more motivated and creative, know more about the target language such as extending students' knowledge about parts of speech, enhance their writing skills and good pronunciation. In the same vein, Xiao and Zhi (2024) noted that the use of Chatgpt as an AI tool has a significant impact on language tasks accomplishment. Students are provided with immediate feedback, generate new ideas, learn more independently, and hence achieve good learning outcomes. Other researchers who have looked at the use of AI tools in EFL teaching and learning have found that they have the potential to reduce students' errors in writing in terms of grammar, vocabulary, and writing mechanics (Ghufron, & Rosyida, 2018), improving their overall proficiency level in the language skills (Alfuhaid, 2021), and developing their linguistic competence (Al Ghazali, 2020).

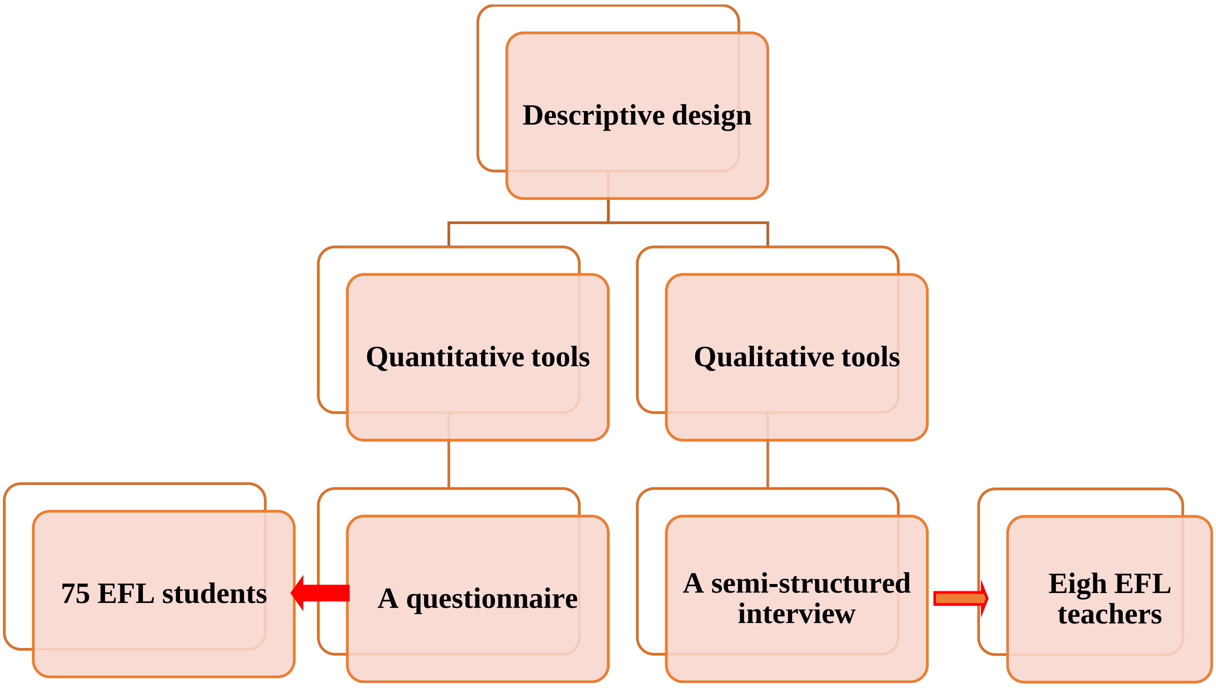
### 1.3. AI and problem solving skills

Whilst a number of studies has shown the potential of AI tools in the EFL classroom, much uncertainty still exists about the effectiveness of such tools in enhancing EFL students' problem solving abilities. For example, while Exintaris (2023), Wu et al. (2024), Rasul et al. (2023) found that AI helps students to think critically, analyse problems deeply, use different metacognitive strategies, and promote self-regulated learning and autonomous learning, Ahmad et al. (2023) and Nguyen (2024) concluded that AI makes people lazy, loose their decision making abilities, and think narrowly about the problems that need strong and evident solutions. The present study, therefore, seeks to remedy this discrepancy by answering the aforementioned research questions.

## II. Methods and materials

This study follows a descriptive design, with in-depth analysis of Algerian EFL students' and teachers' perceptions of the use of AI tools in problem solving skills. Therefore, the methodological approach taken in this study is a mixed methodology based on both a questionnaire administered to 75 third year EFL students in the department of letters and foreign languages at Skikda university, with an interview conducted with eight teachers in the respective department as illustrated in the figure below. That is, to ensure a comprehensive approach, a mixed methods approach that combines both quantitative (a questionnaire) and qualitative (an interview) data collection methods was employed as it might "provide a fuller description and/or more complete explanation of the phenomenon being studied by providing more than one perspective on it. By encouraging the use of qualitative and quantitative methods and by facilitating a blend of exploratory and explanatory research" (Denscombe, 2007, p.118).

**Figure 1: Data collection tools used in the present study**




### 1. Description of the students' questionnaire

The quantitative aspect of the present study involved the use of a questionnaire to gather numerical data on various dimensions related to the research objectives. This method would allow to collect standardized and measurable information from a larger number of participants, providing statistical insights into teachers' and students' perspectives. The questionnaire consisted of three sections mixing between closed and open-ended questions, multiple-choice questions, and Likert scale. The first section **'Students' problem-solving skills'** aimed at collecting information which would help in answering the first research question: **To what extent do Algerian EFL students master problem solving skills?** The second section **'students' AI tools use'** asked questions related to students' frequency of using AI tools for their studies, the types of tools used, and their perceptions of the role of using AI tools in impacting their overall language performance. The last section '**AI tools and problem solving skills'** was a Likert scale consisting of ten questions related to students' perspectives on the way AI tools can impact their problem solving skills.

## III. Results and discussion

### 1. Students' questionnaire

Before conducting further analysis of the questionnaire, its reliability was checked first using SPSS version 26. That is, all students' answers to the items of the questionnaire were entered into SPSS for measuring their internal consistency using Cronbach's alpha. The Cronbach's alpha calculated was .8.45 as demonstrated in Table1, meaning that the questionnaire is of a good reliability value as claimed by Larson-hall (2010). This can be attributed to the large number of items consisting the questionnaire "if a scale has enough items (i.e. more than 20), then it can have an alpha of greater than .70". (Cortina, 1994, p.102).

**Table (1): Cronbach's alpha reliability statistics of the students' questionnaire**

| Cronbach's alpha | Number of items |
|---|---|
| .845 | 32 |

## 1.1.Section One: Problem-solving skills

**Table (2): Students' perceptions of their level in problem solving skills**

| Statements | Agree | SA | Neutral | Disagree | SD |
|---|---|---|---|---|---|
| **Problem identification** | | | | | |
| I am skilful enough in identifying a problem within a given situation | 45 | 15 | 01 | 09 | 05 |
| I am skilful in identifying the most important information that might help with the identification of a problem | 35 | 35 | 00 | 03 | 02 |
| **Problem exploration** | | | | | |
| I can analyse the problem carefully by asking questions such as who, what, when, where, why, and how | 08 | 07 | 05 | 37 | 18 |
| I can make effective plans to deal with the problem | 10 | 05 | 00 | 40 | 20 |
| **Setting goals** | | | | | |
| I can design effective goals for the way of solving the problem | 20 | 25 | 00 | 18 | 12 |
| I can opt for more than one solution for the problem | 20 | 20 | 00 | 20 | 15 |
| **Looking at alternatives** | | | | | |
| I can develop possible solutions by looking at how others provided solutions | 15 | 15 | 05 | 20 | 20 |
| I can focus on techniques such as reading, brainstorming, and thinking to find optimal solutions from all alternative solutions | 50 | 15 | 00 | 08 | 02 |
| **Selecting the best solution** | | | | | |
| I can select the best and relevant solution from all alternatives to fix the problem | 45 | 25 | 00 | 05 | 00 |
| I can narrow down the options that I provided | 48 | 17 | 02 | 08 | 00 |
| **Implementing** | | | | | |
| I can make adjustments on how the problem will be approached | 25 | 20 | 10 | 10 | 10 |
| I can apply the solutions I provide to other learning situations | 05 | 05 | 05 | 50 | 10 |
| **Evaluating** | | | | | |
| By the end, I can decide whether my solution works well or not | 60 | 15 | 00 | 00 | 00 |
| I can say what further procedures need to be taken for future considerations about the problem | 08 | 07 | 05 | 20 | 35 |

This first section of the questionnaire required respondents to give information on their problem-solving skills based on the six steps involved in problem-solving process. The findings summarized in Table 2 indicate that there was an overall varying response to the different items. That is, while the majority of the respondents (60 students) agreed that they can decide whether their solution works well or not as an evaluation skill, only eight of them agreed with the second item of evaluation (I can say what further procedures need to be taken for future considerations about the problem). Similar data were generated from looking at alternatives and implementing. Additionally, evaluation (I can decide whether my solution works well or not) was the most selected option in which the vast majority of the participant agreed with the statement, compared to none of them who disagreed and strongly disagreed with the same statement.

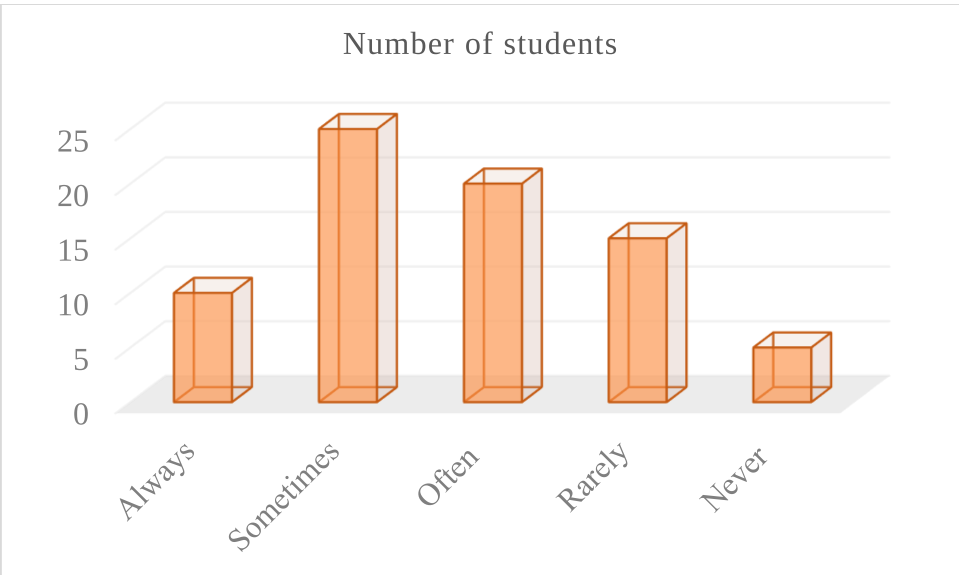
For problem exploration, it seems many participants struggled with. 40 and 37 students respectively disagreed that they can make effective plans to deal with the problem, and to analyse the problem carefully by asking questions such as who, what, when, where, why, and how. Only eight and ten students agreed with the first and the second statements respectively. Conversely, while 45 participants agreed that they are skilful enough in identifying a problem within a given situation, only nine students disagreed with statement. Approximately, the same portion of participant agreed and disagreed with statements of setting goals. That is, 40 students agreed and 35 disagreed that they can opt for more than one solution for the problem. Overall, data summarized above demonstrate that students are good in problem identification and in focusing on techniques such as reading, brainstorming, and thinking to find optimal solutions from all alternative solutions. They also have skills of deciding whether their suggested solutions for a given problem work well or not within the evaluation step.

### 1.2. Section Two: Students' AI tools use

**Item1. How often do you rely on AI in your learning?**

In response to the question 'How often do you rely on AI in your learning?', 25 students commented that they sometimes use AI tools, with only ten and five students who reported respectively that they always or never use them. 20 students said that they often rely on them, and 15 students who opted for the option 'rarely'. This finding might be explained by the fact that AI tools gained their popularity within different disciplines, and EFL is no exception.

**Figure (1): Students' frequency of using AI tools**




**Item 2. What AI tools do you use?**

When asked about the types of AI tools used by students, the vast majority (50 student) mentioned that they use Chatgpt. 20 students expressed the view that they use Grammarly. Only a minority of participants (five) said that they use Duolingo. None of the participants selected the other tools including Chatbots, Bearly, SlidesAI, Notion, and Knowji compared to 20 students who reported that they focus on both Chatgpt and Grammarly. This denotes that students might only be familiar with three AI tools (Chatgpt, grammarly, and Duolingo).

**Figure (2): Type of AI tools used by students**

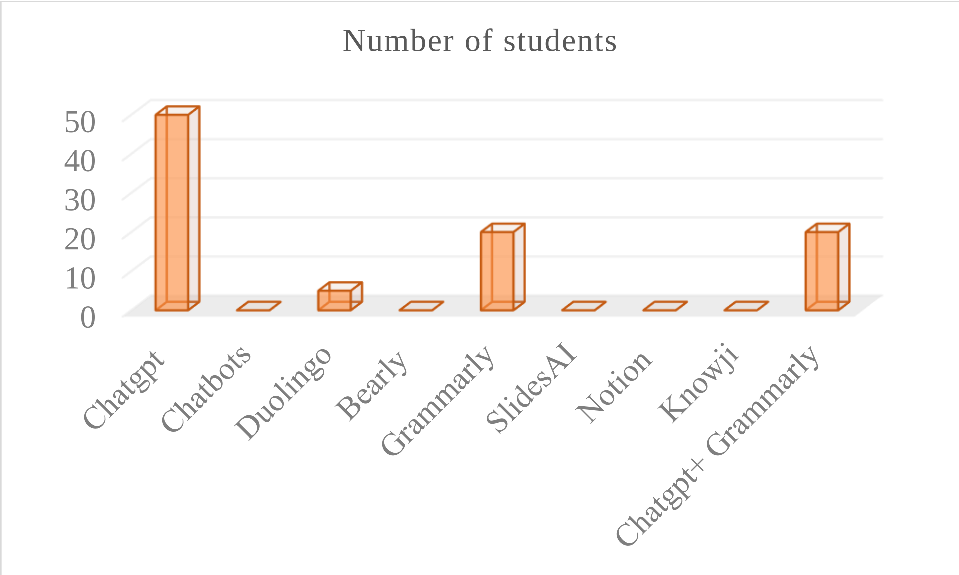
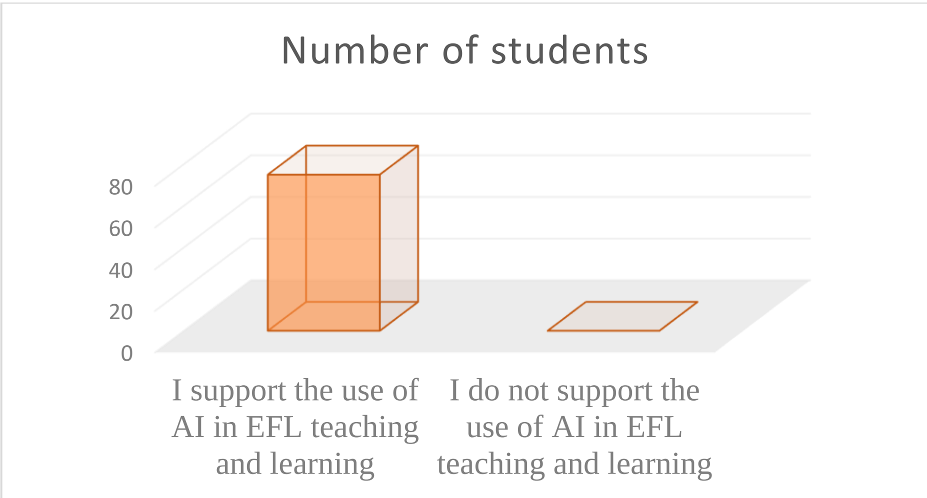
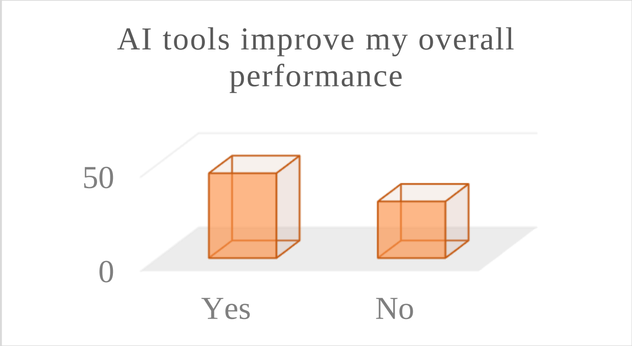



**Figure (3): Students' perceptions of using AI in the EFL classroom**



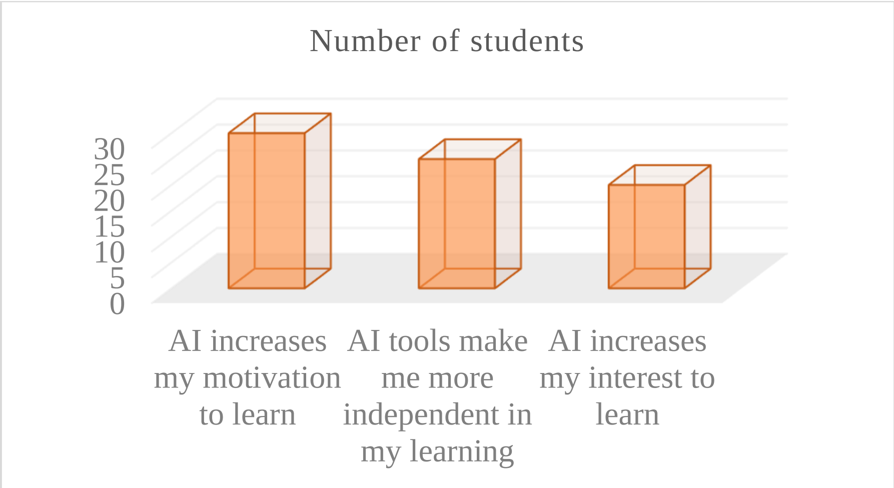

It is worth noting that data presented in the figure above demonstrated that all participants supported the use AI tools in the teaching and learning process. A possible explanation for this might be that students perceive AI tools positively for the many advantages that they may have on their learning achievements.

**Figure (4): Students' perceptions of the impact of AI on their overall performance**



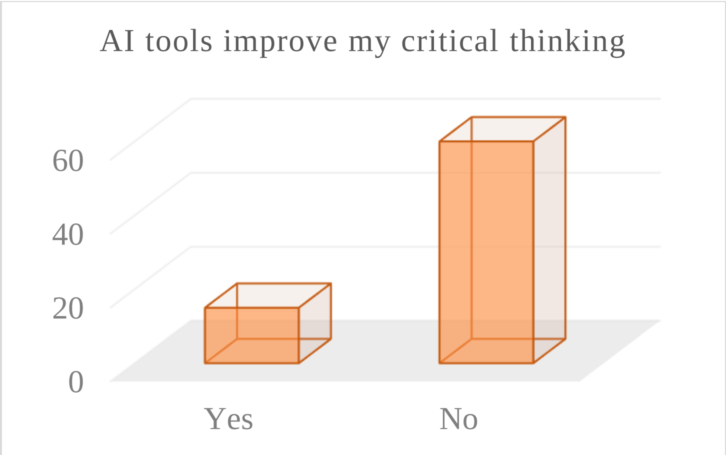

Of the 75 participants who responded to this question, 50 reported a positive impact of the AI tools on their overall learning performance. However, only 25 students disconfirmed the statement. This denotes their overall positive perceptions of the usefulness of AI tools. Further analysis on the ways in which AI tools impact students' overall performance are provided in the following section.

**Figure (5): Different ways in which AI tools impact students' overall performance**




Of the 75 students who completed the questionnaire, 30 felt that AI increases their motivation to learn, 25 said that it makes them independent in their learning, and 20 indicated that it increases their interest to learn as shown in Figure 5 above. It seems possible that these results are due to the innovative and interactive features of the AI tools which help students to be interested and motivated to learn. Also, AI tools provides a variety of resources for students to be responsible for their own learning and independent from their teachers, and hence become more autonomous learners.

**Figure (6): Students' perceptions of the impact of AI on their critical thinking**



Surprisingly, when asked whether AI tools improve their critical thinking almost all students replied negatively, with only 15students who said yes. This result may be explained by the fact that because of their overreliance on AI, students may lack the sense of creativity to approach different learning tasks. They may directly access one of the tools and write down the question without reflecting on the answers and then take this answer for granted without further analysis, synthesis, and evaluation.

### 1.3. Section three: AI tools and problem solving skills:

**Table (3): Students' level of agreement with the impact of AI on their problem solving skills**

| Statements | Agree | SA | I do not know | Disagree | SD |
|---|---|---|---|---|---|
| AI tools improve my problem solving skills | 20 | 10 | 00 | 20 | 25 |
| AI helps me to generate new ideas | 45 | 25 | 00 | 05 | 00 |
| AI makes me think critically and analytically | 10 | 15 | 05 | 35 | 10 |
| AI helps to identify a problem and use appropriate solutions | 45 | 05 | 05 | 10 | 10 |
| AI makes me able to sift relevant information (solutions)from the irrelevant ones | 10 | 00 | 20 | 20 | 25 |
| With the use of AI, I can approach the problem from various angles | 08 | 12 | 10 | 25 | 20 |
| AI helps generate innovative solutions | 50 | 20 | 00 | 05 | 00 |
| AI gives multiples options to deal with a problem and find an optimal solution | 45 | 15 | 05 | 05 | 05 |
| AI helps to deeply analyse the problem | 30 | 25 | 03 | 10 | 07 |
| AI provides clear solutions | 20 | 50 | 03 | 02 | 00 |

A range of responses was elicited on students' perceptions of the impact of AI tools on their problem solving skills. Data highlighted in Table 3 indicate that the large number of participants (50) agreed that AI helps to generate innovative solutions, with 45 students agreed with the statements that AI helps to identify a problem and use appropriate solutions, and AI gives multiples options to deal with a problem and find an optimal solution. Additionally, 50 students strongly agreed that AI provides clear solutions, 30 stated that AI helps to analyse the problem deeply. A similar number of students (20) agreed and disagreed that AI tools improve their problem solving skills. Moreover, while only ten students agreed that AI makes them think critically and analytically, 35 students disagreed with the statement. Similarly, 25 students strongly disagreed with the statement 'AI makes me able to sift relevant information (solutions)from the irrelevant ones', ten students only agreed with the statement. Therefore, it can be inferred that the respondents hold both positive and negative perceptions of the effectiveness of AI tools in enhancing their problem solving skills.

## 2. Teachers' interview

In order to "improve the validity of a subsequent survey questionnaire that produces quantitative data" (Denscombe, 2007, p.110), a semi-structured interview was conducted with eight EFL teachers. Teachers' responses were audio recorded for the researcher to provide an accurate quoting of the exact words when necessary, then transcribed after many careful readings to generate the most common answers. After that, those transcripts were coded into different themes related to the aim of the interview to create different categories. That is, based on their frequency of answers, teachers' perceptions of the overall level of their students' problem solving skills along with the role of AI tools in affecting students' problem solving skills, different codes were created.

### 2.1. Teachers' perceptions of the overall level of students' problem solving skills

Teachers were first asked about the overall level of their students' problem solving abilities. All those interviewed expressed the view that the level problem solving of their EFL students is low. Students do not think critically and deeply at all, they do not analyse the tasks when trying to accomplish them, and they also do not have a sense of independent learning. To illustrate, one interviewee put it "*I do not really like the way my students think and react to the different activities provided. They lack what we call critical thinking and deep analysis*". Another interviewee added "*Well, honestly speaking, I can say that the level of my students regarding problem solving is low. They do not possess this ability to follow the different steps of problem solving starting from identifying the problem and reaching the evaluation of the problem*".

### 2.2. Teachers' perceptions of the benefits of AI tools in EFL teaching and learning

When asked about their AI tools integration in teaching, five teachers stated that they rely on them for the benefits they add to the process of teaching and learning. Those benefits as reported by the interviewees are summarized in: effective lesson planning, empowering their creativity, varying their teaching styles, lifting their students' motivation and lowering their stress and anxiety in the classroom, and finally increasing the performance of the students. Interview 1 said "*of course, I always try to use the different AI tools for my teaching as they help in good lesson preparation, make the lesson more enjoyable and interesting for my students, and hence achieve good learning*".

Three teachers claimed that they do not support the use of AI because of the many obstacles that they encounter. They referred to their unfamiliarity with most of those tools, internet connectivity issues, and their beliefs that AI tools do not really help in both teaching and learning for the reason that they kill the sense of creativity among both teachers and students. As an illustration one interview mentioned "*I am not a fun of the integration of AI in my teaching. I feels that I might not be that creative in delivering my lectures and the same for my students of course without dismissing some advantages that they might have*".

### 2.3. Teachers' positive perceptions of the role of AI tools in promoting EFL students' problem solving skills

Based on their responses to the interview, teachers' perceptions were categorized into positive and negative perceptions. For their positive perspectives on the role of AI in promoting students' problem solving abilities, teachers indicated that AI helps students to critically analyse the different language problems, encourages students' self-directed learning and to obtain knowledge which would be transferred to other similar learning situations. In this sense, teachers encouraged the use of AI by their EFL students as it may have an impact on their problem solving skills as one interview suggested "*I encourage my students to use some AI tools to increase their level of problem solving. Those tools can help with critical thinking, and deep instead of surface analysis of the problem*". Another interview referred to AI as being effective in helping students to approach a task following different strategies and suggesting different or multiple solutions, and hence their cognitive abilities.

### 2.4. Teachers' negative perceptions of the role of AI tools in promoting EFL students' problem solving skills

For the negative perceptions, those interviewed expressed the view that AI tools might not always help with selecting the most relevant option for the different options provided. Students cannot decide whether a solution can work well for a particular situation or not, and also they cannot come up with innovative solutions by sticking to only those provided by the AI tools.

Taken together, the quantitative and qualitative results presented in this section indicate that Algerian EFL university students have a low problem-solving level in their teachers' eyes. Teachers claimed that their students lack critical thinking, analysis, and independent learning. Nevertheless, students believed that they have good problem solving skills in terms of evaluation in which the majority students (60) agreed that they can decide whether my solution works well or not. Students also claimed that they are good in problem identification and in focusing on techniques such as reading, brainstorming, and thinking to find optimal solutions from all alternative solutions. Additionally, a large proportion of the participants (40) reported that they cannot make effective plans to deal with the problem, and to analyse the problem carefully by asking questions such as who, what, when, where, why, and how within the problem exploration step. A possible explanation for these results might be that students are not independent in their learning; they might only rely on the amount of knowledge provided by their teachers in the classroom. Additionally, students might lack the sense of motivation and interest in learning, and hence think less critically and analytically about the problem to be solved. All those factors may be one source for the low level of students' problem solving skills.

As regards the perceptions of teachers and students, the overall responses demonstrate that both positive and negative perceptions. These results match those observed in earlier studies conducted by in which they found that AI tools have both positive and negative impact on students' problem solving skills (Darwin et al. 2024; Harunasari, 2023; & Marzuki et al. 2023). Both teachers and students felt that AI tools might have advantages and threats in respects of problem solving skills. Students (50) believed that AI tools help to generate innovative solutions, identify a problem and use appropriate solutions, provides clear solutions, and provide multiples options to deal with a problem and find an optimal solution. These results are consistent with those of other studies (Alshumaimeri & Alshememry, 2023; Kenchakkanavar, 2023) and suggest that AI tools are effective in lifting students' problem solving skills. Teachers thought that AI tools help students to critically analyse the different language problems, encourages self-directed learning, approach a task following different strategies, suggesting multiple solutions, and thus increasing students' cognitive abilities.

In terms of the negative perceptions, students and teachers believed that AI tools may not help with improving problem solving skills. For example, students (35) disagreed that AI makes them think critically and analytically. They also felt that AI do not help in to sifting relevant information (solutions)from the irrelevant ones when dealing with different problem solving situations. Similarly, teachers expressed the view that AI tools might not always help with selecting the most relevant option for the different options provided. For them, students cannot decide whether a solution can work well for a particular situation or not, and also they cannot come up with innovative solutions by sticking to only those provided by the AI tools. These findings are in agreement with the findings of Nguyen (2024) and Ahmad et al. (2023), which showed that AI based tools have a negative impact on problem solving.

In short, although teachers and students support the integration of AI tools in the process of teaching and learning as they help with increasing students' overall performance, motivation, interest, independent learning, and good lesson preparation, teachers and students believed that they do not help with critical thinking and problem solving. It is recommended that there is, therefore, a definite need for both teachers and students to optimize the use of AI tools in the EFL context to fully benefits from their advantages. They might be involved in trainings on the use of AI to familiarize themselves with their types and optimal procedures.

## IV. Conclusion

The main purpose of this study is to develop an understanding of Algerian EFL students' level of problem solving skills. It also attempts to scrutinize the perceptions of both teachers and students with regards the role of AI tools in students' problem solving skills. Accordingly, the study followed a descriptive mixed research design using both a questionnaire and a semi-structured interview. The findings revealed that although teachers claimed the low level of their students' problem solving skills, students still felt that they are good in certain aspects of problem solving such as evaluation and problem identification. As regards their perceptions, both teachers and students perceived the effectiveness of the AI tools positively and negatively. For its benefits, AI helps students to critically analyse the different language problems, encourages self-directed learning, approach a task following different strategies, suggesting multiple solutions. Moreover, AI helps to generate innovative solutions, identify a problem and use appropriate solutions, provides clear solutions, and provide multiples options to deal with a problem and find an optimal solution. As far as the negative perceptions are concerned, teachers and students commented that AI does not help with critical and analytical thinking, selecting the most appropriate solution, and suggesting more innovative and creative solutions.

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