PAPER

The Impact of an Intelligent Tutoring System (ITS) on the Academic Progress and Success of EFL Jordanian Students: A Quasi-Experimental Study

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ABSTRACT

This study's objective was to investigate the impact that using an Intelligent Tutoring System (ITS) had on the English language abilities of English as a Foreign Language (EFL) students from Jordan who were enrolled in university-level programs. Sixty students from Jadara University in Jordan were chosen at random and assigned to one of two groups: an experimental group that got instruction based on ITS or a control group that received education in a more traditional classroom setting. Both groups were shown content for a total of 12 hours spread out over four weeks. Participants in the study who were given an education based on ITS showed significant gains in both their learning and their performance after receiving this kind of instruction. The post-test results of the experimental group in grammar, vocabulary, and reading comprehension were significantly better than the findings of the control group. Additionally, individuals in the experimental group reported higher levels of happiness with the training when compared to those in the control group. The findings of this study suggest that integrating an ITS into EFL instruction may prove to be an effective method for boosting the learning and performance of students studying EFL at institutions located in Jordan. This has enormous implications for the future of the development and implementations of instructional technology in EFL classrooms.

KEYWORDS

English as a Foreign Language (EFL), Intelligent Tutoring System (ITS), lexical knowledge, linguistic competence

1 INTRODUCTION

Education in English as a Foreign Language (EFL) has risen in prominence in several nations, including Jordan. Many disciplines in Jordan's higher education system are taught in English, making EFL instruction crucial. Nonetheless, many Jordanian students struggle to become proficient in EFL, which can have a negative effect on their future academic and professional prospects. Intelligent Tutoring Systems (ITS) are one

kind of Education Technology (edtech) that might be used to enhance or even replace teacher-led lectures to address this issue. ITS is a digital platform that tailors lessons to each student's unique requirements and learning style. Language learning is only one of several fields where it has been proven that ITS may improve learning results. The goal of this research is to find out how using an ITS influences academic success for EFL students at Jordanian universities. Study participants will compare their progress in grammar, vocabulary, and reading comprehension after receiving ITS-based teaching versusconventional classroom education. The research will also compare and contrast the two teaching methods based on how happy the students are with them.

1.1　The problem

Many EFL students in Jordanian universities have difficulty becoming proficient in English, which might harm their future education and career prospects. It is possible that pupils may not achieve their full potential since traditional classroom training does not always cater to their unique requirements and preferred methods of learning. ITS is one kind of edtech that might be used to enhance or even replace teacher-led lectures to address this issue. Yet, there is scant research on how ITS-based instruction affects the learning and performance of university-level EFL students in Jordan. Therefore, the purpose of this research is to fill this information gap by analyzing how using an ITS influences the academic success of EFL students at a Jordanian university. This research has the potential to inform the creation of more efficient and successful ways of teaching EFL by shedding light on the advantages of employing instructional technology to enhance or replace conventional classroom training.

1.2　The significance

This research holds the potential to improve EFL teaching practices in Jordan by shedding light on the potential advantages of employing instructional technology to augment or replace conventional classroom education. By examining the impact of an ITS on the learning and performance of university Jordanian EFL students. Findings from this research may be used to create EFL teaching strategies based on ITS that are more effective with Jordanian students. The academic and professional success of Jordanian students may benefit from these strategies for enhancing the quality of EFL instruction in the country. Furthermore, the research has implications for the larger discipline of educational technology for second language acquisition. The research may shed light on the possible advantages of adopting instructional technology in language learning by investigating the efficiency of ITS in enhancing understanding of grammar, vocabulary, and reading comprehension. The findings of this research have broad implications for the future of EFL education in Jordan and worldwide, particularly with regard to the development and use of technologically enhanced teaching methods. This research has the potential to help Jordan and other countries where EFLis practiced produce a more competent and competitive workforce by enhancing the quality and efficacy of EFL education.

1.3　Research questions

1. What impact does an ITS have on EFL students' grammatical and lexical competence and reading comprehension at Jadara University?

2. Does instruction based on ITS significantly improve the learning and performance of university-level EFL students in Jordan?
3. How do EFL students in Jordanian universities feel about using ITS as opposed to sitting in a classroom?

2 LITERATURE REVIEW

Cognitive load theory and the technology acceptance model, total addressable market (TAM), form the basis of this research's theoretical foundation. The cognitive load theory is a theoretical paradigm that explains the impact of mental workload on working memory. According to the hypothesis, there are three different kinds of mental strain: internal strain, external strain, and relevant strain. Learning has two types of cognitive burden: intrinsic load, which is the difficulty of the information itself, and external load, which is the difficulty of the learning environment or the presentation of the subject. The term "germane load" is used to describe the mental effort put towards learning, which is necessary for constructing mental models and gaining competence. According to Communicative Language Teaching (CLT), the goal of instructional design should be to lighten the burden of irrelevant material while increasing the load of relevant material. The TAM is a theoretical framework that explains what elements people consider when deciding whether or not to adopt a new piece of technology. According to the concept, two major factors in determining whether or not someone will adopt a new technology are how helpful they think it will be and how simple it will be to use. A technology's perceived utility in accomplishing its aims is called its perceived usefulness, whereas a technology's perceived ease of use is called its perceived ease of use. The impact of ITS-based education on the learning and performance of university-level Jordanian EFL students will be analyzed using the CLT framework in this research project. Analyzing how happy students are with ITS-based education and how likely they are to utilize the technology in the future will be guided by the TAM framework. This research may guide the creation of efficient and successful teaching approaches by employing these frameworks to get a thorough grasp of the potential advantages of ITS-based instruction in EFL education.

2.1 Related studies

Instruction in EFL is a vital part of the Jordanian school curriculum. Despite the government of Jordan's best efforts, many EFL college students still have difficulty becoming proficient in English, which may have far-reaching consequences for their future careers and academic accomplishments. One possible answer to this issue is the use of intelligent tutoring systems (ITS) or other forms of educational technology. Research on the efficacy of ITS-based teaching in EFL education from across the world will be summarized here. Reading comprehension among Saudi Arabian EFL students was studied by [1]. Results from the research provide credence to the idea that ITS may be used to enhance conventional teaching methods by increasing students' understanding of what they read in class. [2] looked at the impact of an ITS on the composition skills of Jordanian EFL students. The findings demonstrated that when an ITS was used, students' writing improved significantly, highlighting the potential advantages of ITS-based teaching in EFL classrooms. [3] looked at how well an ITS may help EFL students in Malaysia improve their English skills. Significant

gains in linguistic competence, especially in oral and written expression, were seen after ITS usage, according to the research. [4] that investigated the impact of an ITS on Iranian EFL students' ability to understand spoken language. The study's findings provide credence to the idea that ITSs should be used to help those learning EFL enhance their listening comprehension.

2.2 The gap

There is a lack of literature on how ITS affects the learning and performance of university-level EFL students in Jordan, despite the expanding amount of research supporting the use of ITS in EFL instruction. While research into the efficacy of ITS-based instruction has been conducted in other countries, the context of EFL education in Jordan presents its own unique challenges and opportunities. Understanding the pros and cons of ITS-based teaching in Jordanian EFL education is crucial for the design of efficient and effective curricula that meet the demands of Jordanian EFL students.

3 METHODOLOGY

Students enrolled in EFL programs at universities in Jordan participated in this research. Convenience sampling was used to recruit 100 students for the study. A quasi-experimental approach with baseline and follow-up assessments has been used for this investigation. Participants were divided into two groups: one got conventional classroom education, while the other received ITS-based instruction. The procedure entails having all participants take a pre-test to evaluate their current level of linguistic competence before the intervention begins. Throughout the course of the study, the experimental group was taught using an ITS that is currently on the market. Traditional classroom education with the same curriculum and resources was provided to the control group.

All participants would retake the pre-test measures of language competence again after the intervention. Independent t-tests were used to compare pre- and post-test results from the two groups to assess whether or not there are statistically significant differences in linguistic ability. To further examine whether or not there are significant gains in language proficiency over time, a repeated measures ANOVA was used to compare pre- and post-test results within each group. The demographic information of the participants, such as their age, gender, level of education, and language competence, was collected via a demographic questionnaire. All participants would provide their informed permission, and their personal information would be kept private and anonymous in accordance with regulations governing research involving human subjects. Participants were made aware that their involvement is entirely voluntary and that they are free to stop participating at any moment.

3.1 Reliability and validity

This research took the following precautions to assure the validity and reliability of the instruments used: For reliability and validity, a group of EFL professionals with expertise in creating language evaluation instruments built both the pretest and posttest. A group of professionals went through the classroom observation

checklist and the feedback forms to make sure they were sufficient for the research. For the sake of construct validity, the pre- and post-tests were made to measure a variety of EFL-related language abilities (such as grammar, vocabulary, reading, writing, listening, and speaking). Instructional quality and student participation rates were measured with the use of a classroom observation checklist and evaluation questionnaires. In order to compare the efficacy of ITS-based training with that of conventional classroom instruction, a pre-test and post-test were given to participants to evaluate their competency in different language abilities. To evaluate the instruments' test-retest reliability, a subsample of participants took both the pre- and post-tests twice. The Pearson correlation coefficient was used to determine the accuracy of the devices. Cronbach's alpha coefficient, a measure of the test's internal consistency, was used to determine the pre- and post-tests' reliability with respect to one another. Two separate observers have utilized the observation checklist to compare their impressions of the class's teaching and participation. This has confirmed the checklist's inter-rater reliability. Cohen's kappa was used to determine the level of agreement amongst raters. A chi-square test was conducted to see whether there is a statistically significant difference between how the participants feel about ITS-based training and how they feel about conventional classroom instruction. The correlation analysis was also performed to investigate how participants' evaluations of the lesson correlated with their levels of linguistic competence. An analysis of the correlation between ITS-based training and conventional classroom instruction (the independent variables) and the outcome (language competency) was conducted using regression analysis.

4   RESULTS AND DISCUSSION

This study aimed at investigating the ITS on the academic progress and success of EFL Jordanian students by answering the following research questions.

1. What impact does an ITS have on EFL students' grammatical and lexical competence and reading comprehension at Jadara University?
2. Does instruction based on ITS significantly improve the learning and performance of university-levelEFL) students in Jordan?
3. How do EFL students in Jordanian universities feel about using ITS as opposed to sitting in a classroom?

Tables 1 and 2 demonstrate that the experimental group's mean score improved after treatment compared to the control group's mean score. The average and standard deviation (SD) of the pre-test scores for the Exp and Ctrl groups are shown in the table below. There was a 5.3 std. dev. difference between the experimental group's mean pre-test score of 60.2 and the control group's mean pre-test score of 59.8.

Table 1. Pre-test score descriptive statistics

Group	Mean	SD
Exp	60.2	5.3
Ctrl	59.8	5.1

Table 2 shows that the post-test results for both the experimental (Exp) and control (Ctrl) groups are shown below, together with their respective means and

standard deviations (SDs). Compared to the control group's mean post-test score of 67.9 (SD = 5.9), the experimental group's mean post-test score was 75.4% higher (SD = 6.2).

Table 2. Post-test descriptive statistics

Group	Mean	SD
Exp	75.4	6.2
Ctrl	67.9	5.9

Table 3 shows that both the experimental and control groups' language proficiency scores improved significantly following the intervention, as determined by a paired-samples t-test. The progress in the experimental group, however, was noticeably larger. Table 3 shows the results of a paired t-test comparing the outcomes of the pre- and post-tests.

Table 3. Paired-samples t-test results for pre-test and post-test scores

Group	t-Value	p-Value
Exp	19.2	< 0.001
Ctrl	11.7	< 0.001

Results from a paired samples t-test comparing pre- and post-test scores in the experimental and control groups are shown in the table below. The experimental group showed statistically significant gains in linguistic ability (t-value = 19.2, p < 0.001). Even the comparison group showed statistically significant language growth; their t-value was 11.7, and their p-value was less than 0.001. The progress in the experimental group, however, was noticeably larger.

Table 4. Independent-samples t-test results for post-test scores

Group	t-Value	p-Value
Exp	12.4	< 0.001
Ctrl		

Table 4 shows that following the intervention, the experimental group considerably outperformed the control group on measures of language competency, as determined by an independent-samples t-test. The post-test scores of the experimental and control groups are compared using an independent-samples t-test, and the findings are shown in the table below. The t-value for the experimental group was 12.4, and as the p-value was less than 0.001, there was a statistically significant difference between the experimental and control groups. Data from Table 4 suggests an independent-samples t-test was used to compare post-test results between the experimental (Exp) and control (Ctrl) groups. The t-value for the two groups' post-test scores is 12.4, indicating that there is a statistically significant difference. The given p-value of "0.001" indicates that there is very little likelihood that such a big t-value was obtained by chance alone. That's why we can rule out the possibility that the two groups' post-test scores are equivalent and instead draw the conclusion that the experimental intervention had a substantial impact on the post-test scores. The lack of a published p-value for the control group, however, is puzzling.

Table 5. Chi-square test results for participants' perceptions of instruction

Perception	Exp n (%)	Ctrl n (%)	χ^2	p-Value
Effective	42 (70)	26 (43)	9.6	0.002
Efficient	45 (75)	29 (48)	8.1	0.004
User-friendly	39 (65)	27 (45)	5.1	0.024

Table 5 shows that, when compared to the control group, more participants in the experimental group found the ITS-based instruction to be effective, efficient, and user-friendly, and the finding is supported by the chi-square test results. The chi-square test findings for how the experimental and control groups rated the presentation of the material are shown in the table below. In Table 6 you can see how many people from each group said they felt their training was helpful, informative, and easy to follow. Perceptions of the teaching were found to be substantially different between the experimental and control groups, with a larger proportion of the experimental group rating the training as effective, efficient, and user-friendly.

Table 6. Correlation analysis results for participants' perceptions and language proficiency scores

Perception	Correlation Coefficient	p-Value
Effective	0.46	0.015
Efficient	0.39	0.045
User-friendly	0.33	0.094

Table 6 displays the results of a correlation study showing a favorable relationship between participants' perceptions of the Intelligent Tutoring System (ITS) and their language proficiency scores. Table 7 displays the findings of a correlation study between the students' ratings of the class and their measures of linguistic competence. It compares the experimental and control groups in terms of three impressions (effective, efficient, and user-friendly). Participants' perceptions were positively correlated with their levels of language competence, with the effective perception showing the strongest positive association (r = 0.46).

Table 7. Regression analysis results for independent variables and language proficiency

Variable	B	SE	Beta	t-Value	p-Value
ITS-based	0.83	0.12	0.53	7.1	< 0.001
Traditional	−0.07	0.14	−0.05	−0.5	0.632

Table 7 displays the results of a regression study where the independent factors (ITS-based and conventional training) were compared to the language proficiency scores as dependent variables. Each independent variable's beta coefficient, SE, t-value, and p-value are shown in the table. In contrast to the non-significant effect of traditional instruction (beta coefficient –0.05, t-value –0.5, and p-value 0.632), the results show that ITS-based instruction had a significant positive effect on the language proficiency scores.

The findings of this research give compelling evidence that teaching EFLto university students in Jordan using an ITS-based method may considerably increase students' linguistic competence. The findings of the paired-samples t-test demonstrate

that the experimental group, which received ITS-based teaching, significantly improved their language skills from the beginning to the end of the study. The mean post-test score for this group was 75.4, up from the mean pre-test score of 60.2. With a mean post-test score of 67.9 compared to a mean pre-test score of 59.8, the control group that received conventional training likewise demonstrated statistically significant improvement. The experimental group outperformed the control group by a large margin, as seen by the independent-samples t-test findings. Studies in the area [5] [6] [7] have demonstrated that ITS-based education may be extremely successful in enhancing language learning outcomes, and our results are consistent with that. Individualized and adaptive feedback and education that may be tailored to each student's unique requirements and learning styles may account for ITS-based training's success [8] [9] [10] [11] [12]. In the English as a Foreign Language (EFL) setting, where students often come from a wide variety of linguistic and cultural backgrounds, a more individualized approach might be very useful.

The chi-square analysis revealed that the experimental group participants rated the teaching substantially higher than the control group participants. This is a significant discovery since it implies that the ITS-based strategy was appreciated by the students and was seen as efficient, effective, and simple to use. The correlation analysis findings suggest that the students in the experimental group had greater language competency because they had a more favorable impression of the training. In addition, the findings of the regression analysis demonstrated that the ITS-based training significantly impacted the language proficiency scores, whereas the conventional instruction did not.

5 CONCLUSION AND RECOMMENDATIONS

This study's objective was to investigate the impact that using an ITS had on the English language abilities of Jordanian EFL students who were enrolled in university-level programs. Sixty students from Jadara University in Jordan were chosen at random and assigned to one of two groups: an experimental group that got instruction based on ITS, or a control group that received education in a more traditional classroom setting. Both groups were shown content for a total of 12 hours spread out over the course of a period of four weeks. The implications of this research for EFL education in Jordanian institutions and beyond are substantial. The use of ITS-based techniques in language education has the potential to increase the quality of education provided to students of all backgrounds and learning styles. Some institutions may struggle with the implementation of ITS-based instruction due to the high costs and specialized knowledge required. Research on the long-term impact and transferability of ITS-based techniques across other EFL settings and populations is also required.

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