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A WEB-BASED AI-POWERED LEARNING SYSTEM TO IMPROVE COGNITIVE AND PERFORMANCE ASPECTS OF GRAPHICAL USER INTERFACE DESIGN AMONG MANSOURA UNIVERSITY'S ENGLISH LANGUAGE COMPUTER PROGRAM STUDENTS

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ABSTRACT

The most important element of a successful educational system is teaching methodology, which serves as the link between the educators and students on the one hand, and the theory and practice on the other. Given the rapid advancements in technology, contemporary teaching approaches have evolved from their traditional forms to rely on contemporary technology to help achieve the desired learning outcomes, whether knowledge and understanding, mental skills, professional skills, or general skills. Keeping pace with post-coronavirus education, online education powered by artificial intelligence is among the latest technological innovations in the field of education, where it utilizes communication technology in ways that are compatible with the student's surroundings inside and outside of the classroom which raises their level of achievement and develops their skills, transforming them from a passive information consumer into an active participant and interactor in the educational process. During the teaching of User Interface Design course for the first-year English language computer program students at Mansoura University's Faculty of Specific Education, the researcher observed the weakness of cognitive and performance aspects of students in creating a well-designed user interface in terms of its multiple dimensions. Therefore, this study presents a software solution for teaching the user interface design course based on web technology powered by artificial intelligence to help students in designing an error-free graphical user interface according to the standards and guidelines gained from experts and scientific studies in this area. The evaluation plan included two tools: an achievement test to assess the

students' cognitive abilities and an observation card to assess their skills in the specified course among the control group and experimental group students prior to and following the use of the Proposed Web-based AI-Powered Learning System. The obtained results demonstrated that the study goals were achieved, because the experimental group results were superior compared to those in the control group in terms of cognitive and skill aspects following the use of the Proposed Web-based AI-Powered Learning System. Lastly, the study recommends integrating AI-Powered Web-based Learning with traditional Face-to-Face education to yield fruitful outcomes in various educational domains.

KEYWORDS: English Computer Program, Online Learning, Web-based Learning, AI-Powered Learning, User Interface Design Course, Achievement Test, Observation Card Test

1. INTRODUCTION

In light of the COVID-19 pandemic, a forced transition from classical educational technologies to distance learning has occurred, which requires the availability of the necessary software and hardware, the competence of teachers and students with the necessary skills to work with technical tools and software, as well as a number of organizational skills: such as skills of self-organization, self-development, and self-control on the part of students [1].

Given this, the global education system has experienced substantial modifications as a result of the widespread use of information and communication technology (ICT) in educational systems in keeping with the era's modernization, where utilizing e-learning as a successful method of teaching and learning, and integrating classroom learning with e-learning, provides chances for instructors and students to engage in active contact, particularly with the present generation of students who predominate in educational institutions and are referred to as "digital citizens" or "technology-learning generation" [2].

The concept E-Learning encompasses the domains of technology-based learning, online-based learning and web-based learning, allowing a greater number of students to learn via the Internet and User Interfaces (UIs) for platforms that deliver information quickly, allowing them to shift from a "passive" to a "active" learning style and make more effective choices [3].

In fact, E-Learning alters teaching and learning practices in schools and universities and opens up new possibilities for implementing educational innovations in a setting where students are expected to actively, independently, cooperatively, and reflectively participate, also it facilitates the management of online courses by enabling teachers and instructors to produce, add, alter, personalize, and repurpose digital content and educational resources [4].

Lately, the design principles for E-Learning platforms have been established, and much work has been done to explain how to create E-Learning platforms that are both attractive and effective in order to satisfy the end user, which is the student[5].

The UI is a crucial component of E-Learning systems because it serves as the interface between the user and the software, where if this connection is broken even with well-chosen educational content and a motivated user, the educational goals may not be achieved, therefore, the principles of User Interface Design (UID) must be taken into account in E-Learning systems[6,7, 8].

Based on a large number of scientific investigations, the key the ideas for designing an optimal UI include [9]:

- Simplicity: The UI should display basic functions in the main application window, and divide complex tasks into separate screens based on the requirements and expectations of the user.
- Consistency: The UI should be clear, simple to use, and focuses on the tasks users complete rather than the UI's functionality.
- Freedom: The UI should allow the user the freedom to choose in different ways while preventing potential user errors.
- Direct manipulation and feedback: The UI should allow the results of the operations being processed to be quickly displayed and provide the ability to undo the action if it is unacceptable.
- Forgiveness: The UI should guard applications against user errors when users make an incorrect action, while providing a set of correct alternatives, whenever possible.
- Intuitiveness: The UI should present real objects appropriately in the program and be understood by all users and should be arranged to simulate normal visual scanning: top to bottom, and from left to right, while hiding every visual item that is not directly involved in visual communication.

Nowadays, the word "User Interface" is currently used interchangeably with "Graphical User Interface (GUI)," which is essentially dependent on several elements, including: Windows Form, Textbox, Button, Picturebox, Slider, Dropdown, Radio Button, Checkbox, ListBox, ComboBox, Pulldown, etc [10-16].

Recent studies have shown that Artificial Intelligence (AI) algorithms are useful in tailoring quick feedback and customizing learning materials and strategies to each student's needs, which encourages student participation and comprehension and improves the effectiveness of the learning process, thus a number of AI-Powered Learning Platforms have emerged because of their encouraging potential to close educational gaps, improve student engagement and interaction, and solve the shortage of qualified faculty members and scarce resources that many educational institutions face [17].

Considering the aforementioned discussion, the current study intends to propose a Web-based AI-Powered Learning System to improve and develop the abilities of first-year English language computer program students at Mansoura University's Faculty of Specific Education in designing an attractive and

interactive software GUI.

The study's remaining structure continues as follows: Section 2 demonstrates the study problem. Section 3 presents the study significance. Section 4 provides the study objectives. Section 5 introduces the study approach. Section 6 identifies the study hypotheses. Section 7 defines the study boundaries. Section 8 elaborates the study theoretical background. Section 9 surveys the important related work. Section 10 is devoted to provide the materials & methods of the study. Section 11 provides the pilot study procedures. Section 12 discusses the study results. Section 13 defines the study recommendations. Finally, Section 14 concludes the study followed by future work.

2. STUDY PROBLEM

Now, the Internet plays a significant role in various fields, especially in the education sector, thanks to its benefits and features that make it a useful tool for students' ongoing self-learning at any time and from any location.

Examining earlier research has indicated the importance of using contemporary technology in education, particularly AI-Powered electronic courses, where the majority of research findings demonstrated how well AI-Powered electronic courses can help students improve their cognitive abilities and performance skills.

During the researcher's work at the university and daily interactions with students in the English language computer program since its launch in 2021, he observed that students had a glaring lack of knowledge and performance in designing software user interfaces. This was obvious in every practical application required of them in a variety of programming languages, specifically in the required programming language, Visual Basic .NET. In addition, this was evident in their inability to accurately record their designs on paper due to unfamiliarity with the guidelines for writing software user interface documentation, as demonstrated in the exploratory study conducted by the researcher.

Given the foregoing, the researcher used contemporary multimedia files, including texts, audio clips, images, animations, and videos, as well as AI-specific web links, to develop the Proposed Web-based AI-Powered Learning System. The aim of this system was to change the learning style of first-year students in the English language computer program at the Faculty of Specific Education, Mansoura University, and motivate them to design more attractive and interactive software GUI and to help them stay competitive in the job market.

Given the foregoing, the study problem can be stated as follows: "What is the effectiveness of the Proposed Web-based AI-Powered Learning System in developing the cognitive and performance aspects of software user interface design among first-year students in the computer program at the Faculty of Specific Education, Mansoura University?"

3. STUDY SIGNIFICANCE

The study's significance encompasses:

- Developing the knowledge and skills of designing software user interface among first-year students in the English-language computer program at Mansoura University's Faculty of Specific Education through the Proposed Web-based AI-Powered Learning System.
- Utilizing the Proposed Web-based AI-Powered Learning System, an achievement test, and an observation card to assess students' user interface design skills in the English-language computer program at Mansoura University's Faculty of Specific Education.
- keeping up with current trends that call for the development of the educational process and the fulfillment of the demands of rapidly evolving information technology through online self-learning courses that can benefit a large number of students from any location at any time, which will be reflected in the results of the students.

4. STUDY OBJECTIVES

The main objective of the study is to try to "identify the effectiveness of the Proposed Web-based AI-Powered Learning System in developing the knowledge and skills of software user interface design for students of the English-language computer program at the Faculty of Specific Education, Mansoura University".

From this goal, several sub-objectives can be derived, as follows:

- Identifying the user interface design skills to be enhanced for students of the English-language computer program at Mansoura University's Faculty of Specific Education.
- Designing a Proposed Web-based AI-Powered Learning System to help students in the English-language computer program at Mansoura University's Faculty of Specific Education, in designing optimal graphical user interfaces.
- Determining the effectiveness of the Proposed Web-based AI-Powered Learning System in enhancing the cognitive aspect of user interface design among students in the English-language

computer program at Mansoura University's Faculty of Specific Education.

- Determining the effectiveness of the Proposed Web-based AI-Powered Learning System in enhancing the performance aspect of user interface design among students in the English-language computer program at Mansoura University's Faculty of Specific Education.

5. STUDY APPROACH

The researcher utilized a quasi-experimental approach to determine the effectiveness of the Proposed Web-based AI-Powered Learning System in developing the cognitive and skill-based aspects of user interface design among two equivalent groups of English-language computer program students at Mansoura University's Faculty of Specific Education: an experimental group and a control group.

6. STUDY HYPOTHESES

The hypotheses of the study (SH) include:

- (SH1): The average scores of the students in the experimental group and the control group on the post-application of the achievement test differ statistically significantly in favor of the experimental group.
- (SH2): The average achievement test scores of the experimental group students before and after the application differ statistically significantly, favoring the post-application.
- (SH3): The average scores of the students in the experimental group and the control group on the post-application of the observation card (skills-total score) test differ statistically significantly in favor of the experimental group.
- (SH4): The average scores of the experimental group students on the observation card (skills-total score) test before and after the application differ statistically significantly, favoring the post-application.

7. STUDY BOUNDARIES

The boundaries of the study consist of the following:

- Objective borders: The point under consideration in the current study is to determine the effectiveness of the Proposed Web-based AI-Powered Learning System in enhancing the knowledge and skills of software user interface design for students of the English-language computer program at Mansoura University's Faculty of Specific Education.
- Human borders: The study sample included a group of first-year students in the English computer program at Mansoura University's Faculty of Specific Education.
- Time borders: All aspects of the study were completed within a period of time ranging from 2025 to 2026 AD.

8. STUDY BACKGROUND: WEB-BASED LEARNING (WBL)

With the Coronavirus (COVID 19) pandemic outbreak, many countries around the world have changed the way students study in schools and universities, as most countries around the world have decided to adopt digital education as a flexible and alternative option to traditional learning due to the positive features provided by this type of education, such as relying on educational practices that make good use of digital technology and allow students to learn at the right speed and time [18].

Thankfully, today's students are digital natives, they can easily learn through digital technologies in general and web-based techniques in particular, because they have many smartphone devices that allow them to instantly gather information from web servers about educational content in different formats, such as texts, images, videos, and more[19].

Practically speaking, the use of modern technology has brought about a radical transformation in university education, necessitating a comprehensive overhaul of the educational system, including faculty members, students, curricula, teaching strategies, and other components, to meet the demands of modern learning, address the steady increase in student numbers, and reduce the exorbitant costs of traditional education[20].

In fact, the ability to use technology in education actually differs from person to person, while some people have negative attitudes toward technology due to cost or ethical concerns, others are very excited about new technology, particularly technology that uses the web, which is widely accepted [21].

The Web-Based Learning (WBL) offers numerous advantages, including appropriate learning opportunities, cost-effectiveness, and flexibility in terms of time and location, moreover it also supports an active and dynamic learning environment, offers a variety of instructional materials, databases, electronic journals, software libraries, and links, and requires communication that allow students to have experiences that are personally meaningful [22].

Distance learning, which involves delivering courses via interactive video or the Internet, has gained increasing popularity and is expected to continue to grow rapidly in the coming period, to be officially adopted by prestigious universities as an

educational approach due to its advantages, which include reduced delivery costs, fewer geographic restrictions, interactivity, direct feedback, enhanced media, student engagement, flexibility, the ability to learn at their own pace, improved teamwork, and higher test scores [23].

In practice, distance learning requires more preparation and work than traditional classes, and it requires much more from both faculty and students[24].

Since distance education is based on multimedia files, which have many advantages in education, but they require huge information spaces depending on the scope and depth of the data they hold, the information they contain, the information must be well organized for easy access, which is what the web adopts a hierarchical approach to information organization to facilitate access to information and to keep up with in-person educational systems [25].

9. RELATED WORK

A literature review is a crucial component of scientific research because it provides an accurate survey of the most recent advancements made by scientists in the topic of the current field. Therefore, a review of the key earlier studies on the topic of the current investigation is presented in chronological sequence from oldest to newest in the Table 1.

Table 1: A list of related previous studies

Study Author(s)	Study Publication Year	Study Abstract
Vallerio, K.S., et al	2006	The study proposed investigating how GUIs may be made to increase hardware and software energy efficiency. The study provided mobile and computer designers with new solutions to develop less energy-consuming systems. The results demonstrated that the present study enhanced the mean energy consumption of three benchmarks (calculator, personnel viewer, and text-viewer) by 16.4%, 45.2%, and 26.9%, respectively. It also improved average performance at the same time by 23.7%, 34.6%, and 19.3% respectively [26].
Hvorecký, J., et al	2010	The study demonstrated how to create a user interface that allows users to concentrate on the main issue without being distracted by the specifics of query language syntax in database systems.The study offered a novel teaching style in order to help non-professionals make requests, create pertinent queries, and decipher database management system findings. This novel approach to query creation relies on a different language, Query-By-Example (QBE), rather than the well-known structured query language (SQL).The results demonstrated that the suggested approach produced favorable outcomes in terms of time, accuracy, and job difficulty, which pleased non-expert users when they were formulating the inquiry [27].
Palestra, G., et al	2017	The study offered an investigation to give a Graphical User Interface (GUI) that enables autistic spectrum sufferers to overcome their difficulties. The proposed GUI was combined with a human-like robot (Aldebaran Robotics NAO) to assist individuals with Autism Spectrum Disorder (ASD) in expressing their demands, a monitor to show particular tools, and a depth sensor to identify the hand movements of autism patients. The results demonstrated that the robot's presence facilitates triadic connections in individuals with ASD [28].
Soui, M., et al	2020	The study offered an investigation to develop a fully automated system that detects MUI's aesthetic defects by merging user profile information with quality indicators and standards agreed upon in the literature. The results demonstrated that the capacity of developers to recognize frequent defects and provide the most accurate detection criteria was successfully assessed by the indicator-based evolutionary algorithm[29].
Ridho, M.F.A., et al	2021	The study offered an investigation to use Thinkific learning platform to design an online course on graphic design for adult learners. The results demonstrated that the concept was well received by both professionals and students, suggesting that it can be used to improve the educational experiences of students [30].
Miraz, M.H., et al	2021	The study offered an investigation to provide an overview of numerous studies that addressed the user interface design in terms of usability, design flexibility, and ease of interface development. A total of 165 research papers published during a fifty-five-year period served as the basis for the survey. The results demonstrated that the user interface design experience can be improved by utilizing AI and dynamic approaches [31].

Study Gap and Motivation

Prior research has revealed a gap in the areas of graphical user interface, Web, AI, and education. While technological solutions for creating standard user interfaces have increased significantly, the integration of web technologies with an AI approach in the education sector to create adaptive

graphical user interfaces faces scalability and uncertainty challenges. This was the motivation for presenting the current study to enhance the proficiency of English-language computer program students at Mansoura University's Faculty of Specific Education in creating an effective software graphical user interface using a Web-based AI system.

10. MATERIALS & METHODS

The study materials and methods incorporate the following:

10.1 *Study Design and Ethical Approval*

The study was carried out at Mansoura University's Faculty of Specific Education. In order to register the study for improving user interface design knowledge and skills among English-language computer program students at the Specific Education Faculty, the author of the study initially wrote a formal letter to Mansoura University's Specific Education Faculty's Scientific Research Ethics Committee. The Ethics Committee then formally registered the study with the Computer Department Council in compliance with the regulations, and the Committee on Ethics and the Council of the Computer Department at Mansoura University's Specific Education Faculty, granted ethical approval. Following that, each participant in the study received a copy of the study information sheet, and each was asked to independently provide written informed consent.

10.2 Study Sample

The study was done using a random sample of first-year English-language computer program students at Mansoura University's Faculty of Specific Education. They were split up into two groups: thirty male and female students in the experimental group and thirty male and female students in the control group.

10.3 Study Instruments

A number of instruments were used in the study, the most crucial of which are as follows:

10.3.1 Achievement test

Generally, this test was designed to gauge the cognitive aspect of user interface design skills among the selected study sample students.The achievement test procedures included the following:

10.3.1.1 Determining the objective of the test

The achievement test aims to assess the ability of the Proposed Web-based AI-Powered Learning System to provide students with the cognitive aspects of the software user interface design skills.

10.3.1.2 Determining the type of the test items

The vocabulary of the achievement test was designed to cover all cognitive aspects of the educational content, and the test consisted of (40) questions divided into (18) true-false questions and (22) multiple-choice questions. For the multiple-choice questions, the researcher used a sequence starting from (1:22) and four alternatives under each question (A, B, C, D).For the true-false questions, the researcher used a sequence starting from (1:18) and two alternatives under each question (T, F).

10.3.1.3 Determining the instructions of the test

The achievement test guidelines were written in a clear and understandable manner to give students an idea about the test and how to answer its questions, which helped students understand the questions and avoided any ambiguity that may arise while answering the test questions.

10.3.1.4 Preparing the initial form of the test

After determining the objective of the achievement test, the type of questions, and its instructions, the achievement test was prepared in its initial form.

10.3.1.5 Verifying the validity of the test

The achievement test's validity was verified using the following two methods:

A-Validity verification using the arbitrators method

To confirm the validity of the achievement test, the researcher utilized the "Arbitration" method, in which the test was shown to a collection of specialized arbitrators to get their feedback on the quality and clarity of the test, and the extent to which it measures the objectives for which it was designed. According to the directives of the arbitrators, the required modifications were made, and the test was appropriate for use with the study population when it was finished, with 34 questions.

B-Validity verification using the internal consistency method

To confirm the validity of the achievement test, the researcher utilized the "Internal Consistency" method, in which the correlation coefficients of each item's score with the test's overall score were computed, and the results were displayed in Table 2.

Table 2: Results of the achievement test validity using Internal Consistency method

Item No	Correlation Coefficient	Item No	Correlation Coefficient	Item No	Correlation Coefficient	Item No	Correlation Coefficient
1	0.601	**10**	0.578	**19**	0.546	**28**	0.580
2	0.577	**11**	0.591	**20**	0.524	**29**	0.525
3	0.656	**12**	0.638	**21**	0.544	**30**	0.568
4	0.593	**13**	0.668	**22**	0.647	**31**	0.693
5	0.577	**14**	0.509	**23**	0.525	**32**	0.593
6	0.532	**15**	0.731	**24**	0.558	**33**	0.564
7	0.547	**16**	0.659	**25**	0.708	**34**	0.574
8	0.633	**17**	0.758	**26**	0.539		
9	0.506	**18**	0.595	**27**	0.500		

Significance Level: 0.01

The results of the previous table show that every correlation coefficient value was positive and statistically significant at the (0.01) level, where the correlation coefficients between each item's score and the accomplishment test's overall score varied from (0.500) to (0.758). This shows that there is a strong, significant, and positive correlation between each item's score and the test's overall result.

10.3.1.6 Verifying the stability of the test

The achievement test's stability was verified using the following two methods:

A-Stability verification using the Cronbach's alpha method

To confirm the stability of the achievement test, the researcher utilized the "Cronbach's Alpha" method, in which each item score was removed from the total test score to determine the impact of removing each item on the overall Cronbach's Alpha score, and the results were displayed in Table 3.

Table 3: Results of the achievement test stability using Cronbach's Alpha method

Item No	Alpha Reliability Coefficient	Item No	Alpha Reliability Coefficient	Overall Alpha Reliability Coefficient
1	0.897	**18**	0.902	0.903
2	0.898	**19**	0.900	
3	0.903	**20**	0.903	
4	0.903	**21**	0.898	
5	0.901	**22**	0.903	
6	0.900	**23**	0.897	
7	0.902	**24**	0.903	
8	0.896	**25**	0.900	
9	0.899	**26**	0.901	
10	0.902	**27**	0.897	
11	0.897	**28**	0.902	
12	0.903	**29**	0.896	
13	0.901	**30**	0.902	
14	0.901	**31**	0.899	
15	0.901	**32**	0.898	
16	0.903	**33**	0.898	
17	0.901	**34**	0.895	

The above table's results demonstrate that the stability value of the test as a whole reached (0.903), and it is also clear that the values of the stability coefficients obtained when deleting any item from the test items were slightly less than or equal to the test's overall stability coefficient, which indicated that all the items of the test are stable. This demonstrates that the test has a high level of stability.

B- Stability verification using the split-half method

To confirm the stability of the achievement test, the researcher utilized the "Spearman and Brown Split-Half" method, in which the reliability coefficient of any scale can be predicted by knowing the reliability coefficient of one half or any part of it.

In this context, by computing the correlation coefficient between the ranks of the paired items and the ranks of the individual items of the test, it was found that the correlation coefficient for half of the test was (0.811), and by substitution in the Spearman and Brown prediction formula, the test's overall stability coefficient was approximately (0.896).This demonstrates that the test has a high level of stability.

Ultimately, we conclude from the above that the achievement test as a whole possesses a degree of validity and stability that allows the researcher to use

it for final application in the current study.

10.3.1.7 Calculating the ease and difficulty coefficients of the test

The easiness and difficulty coefficients of the achievement test were determined by deleting the very easy questions or vocabulary with an ease coefficient of (0.8) or more, and the very difficult vocabulary with an ease coefficient of (0.2) or less. In this context, the achievement test's easy and difficulty coefficients varied from (0.41) to (0.58), which were considered acceptable coefficients.

10.3.1.8 Calculating the discrimination coefficients of the test

The achievement test's discriminatory coefficients were determined by the equation of distinguishing test items, in which the item that obtains a discrimination coefficient of less than (0.3) is deemed to have limited discrimination ability. In this context, the achievement test's discrimination coefficients test ranged from (0.49) to (0.50), which were considered good discrimination coefficients.

10.3.1.9 Determining the time of the test

The ideal time to answer the achievement test was identified by computing the arithmetic mean of the time taken by the first and last students in the survey sample, which numbered (30) students other than the original study sample, to answer the test.

10.3.1.10 Creating the final version of the test

Following the initial version of the achievement test was created and the required modifications were completed, including, for example, the arbitrators' adjustments, the test became final and suitable for application to the original study sample.

In this context, the final version of the achievement test consisted of a number of objective questions (multiple choice, true or false) and was converted electronically for students in the group under experimentation to answer it easily. Additionally, the students' pre- and post-achievement test scores were stored for statistical analysis at a later time.

10.3.2 Practical test

Generally, this test was designed to measure the practical aspect of user interface design skills among the selected study sample students. The practical test procedures included the following:

10.3.2.1 Determining the objective of the test

The practical test aims to gauge the ability of the Proposed Web-based AI-Powered Learning System to provide students with the performance aspects of software user interface design skills.

10.3.2.2 Determining the type of the test items

The vocabulary of the practical test was developed to cover all performance aspects of the educational content, and the test consisted of three questions, each which required the student to design a GUI for specific program, such as designing a GUI for an advanced calculator, designing a GUI for an image browser, designing a GUI for calculating the perimeter and area of geometric shapes, etc.

10.3.2.3 Determining the instructions of the test

The practical test guidelines were obviously formulated to encourage students to adhere to user interface design rules and guidelines, and to avoid any confusion that might arise while answering the test questions.

10.3.2.4 Preparing the initial version of the test

After determining the objective of the practical test, the type of questions, and its instructions, the practical test was prepared in its initial form.

10.3.2.5 Verifying the validity of the test

To confirm the validity of the practical test, the researcher utilized the "Arbitration" method, in which the test was shown to a collection of specialized arbitrators to get their feedback on the quality and clarity of the test, and the extent to which it measures the user interface design skills specified in the study objectives. The results showed that the practical test met the experts' satisfaction with minimal modifications.

10.3.2.6 Verifying the stability of the test

The practical test's stability was verified using the "Test-Retest" method, in which the test was given to a portion of 10% of the total study sample to ensure correct understanding of the questions and their clarity and order. The test was then repeated on a sample of 15% of the respondents, 3 weeks after the first test. The test's overall stability coefficient was approximately (92%). This demonstrates that the test has a high level of stability.

10.3.2.7 Determining the time of the test

The ideal time to answer the practical test was identified by computing the arithmetic mean of the time taken by the first and last students in the survey sample, which numbered (30) students other than the original study sample, to answer the test.

10.3.2.8 Creating the final version of the test

Following the initial version of the practical test was created and the required adjustments were implemented, including, for example, the arbitrators' adjustments, the test became final and suitable for application to the original study sample.

10.3.3 Observation card

Generally, this card was designed as a correction key for the practical test.The observation card procedures included the following:

10.3.3.1 Determining the objective of the card

The observation card aims to correct the pre-prepared practical test and to quantitatively classify each student's performance on this test into one of four levels of performance that will be discussed later.

10.3.3.2 Determining the skills involved in the card

The observation card consists of (4) main skills and under them falls a number of sub-skills, totally (41).

10.3.3.3 Determining the instructions of the card

The observation card instructions were formulated in an easy-to-understand format to facilitate their use in the evaluation process.

10.3.3.4 Preparing the initial form of the card

After determining the objective of the observation card, identifying the skills that were to be measured, and its instructions, the observation card was ready in its original form.

10.3.3.5 Verifying the validity of the card

The observation card's validity was verified using the following two methods:

A- Validity verification using the arbitrators method

To confirm the validity of the observation card, the researcher utilized the "Arbitration" method, in which the card was presented to a collection of specialized arbitrators to obtain their viewpoints on the quality and clarity of the card. According to the directives of the arbitrators, the required modifications were made and they became suitable for final application.

B- Validity verification using the internal consistency method

To confirm the validity of the observation card, the researcher utilized the "Internal Consistency" method, which was performed at two levels:

B.1- Calculating the correlation of the score of each item with the total score of the skill

The correlation coefficients of each item's score with the skill's overall score were computed, and the results were displayed in Table 4.

Table 4: Results of the observation card validity using Internal Consistency method based on correlation of each item score with the total score of the skill

Item No	Correlation Coefficient	Target Skill	Item No	Correlation Coefficient	Target Skill
1	0.792	**UI Implementation**	**1**	0.890	**UI Development**
2	0.804		**2**	0.890	
3	0.742		**3**	0.842	
4	0.834		**4**	0.845	
5	0.788		**1**	0.840	**UI Documentation**
6	0.821		**2**	0.824	
7	0.870		**3**	0.751	
8	0.801		**4**	0.844	
9	0.858		**5**	0.858	
10	0.815		**6**	0.837	
11	0.853		**7**	0.831	
12	0.782		**8**	0.878	
1	0.733	**UI Design**	**9**	0.886	
2	0.772		**10**	0.893	
3	0.863		**11**	0.883	
4	0.868		**12**	0.676	
5	0.825		**13**	0.852	
6	0.853				
7	0.874				
8	0.877				
9	0.845				
10	0.864				
11	0.829				
12	0.846				

Significance Level: 0.01

The results of the previous table show that every correlation coefficient value was positive and statistically significant at the (0.01) level, where the correlation coefficients between each item's score and the skill's overall score varied from (0.676) to (0.893). This shows that there is a strong, significant, and positive correlation between each item's score and the skill's overall result.

B.2- Calculating the correlation of the score of each main skill with the total score of the card

The correlation coefficients of each main skill's score with the card's overall score were computed, and the results were displayed in Table 5.

Table 5: Results of the observation card validity using Internal Consistency method based on correlation of each main skill score with the total score of the card

Main Skill	Correlation Coefficient
UI Design	0.886
UI Implementation	0.860
UI Documentation	0.891
UI Development	0.856

The results of the previous table show that every correlation coefficient value was positive and statistically significant at the (0.01) level, where the correlation coefficients between each skill's score and the card's overall score varied from (0.856) to (0.891). This shows that there is a strong, significant, and positive correlation between each skill's score and the card's overall result.

10.3.3.6 Verifying the stability of the card

The observation card's stability was verified using the following two methods:

A- Stability verification using the Cronbach's alpha method

To confirm the stability of the observation card, the researcher utilized the "Cronbach's Alpha" method, in which the Cronbach's Alpha coefficient for each main skill and the card's overall score was computed, and the results were displayed in Table 6.

Table 6: Results of the observation card stability using Cronbach's Alpha method

Main Skill	Alpha Coefficient
UI Design	0.876
UI Implementation	0.854
UI Documentation	0.866
UI Development	0.850
Overall Card Score	0.889

The above table's results demonstrate that the stability value of the card varied from (0.850) to (0.876), and it is also clear that the stability value of the card as a whole reached (0.889). This demonstrates that the observation card as a whole and its main skills have a high level of stability.

B- Stability verification using the Cooper's equation method

To confirm the stability of the observation card, the researcher utilized the "Cooper's equation" method, in which several observers recorded each student's impression of the observation card and the percentage of agreement between observers was calculated using the Cooper's equation. In this context, the researcher asked several of his colleagues to observe the performance of a survey sample of (30) students other than the original study sample. After the observation card was presented to the students to familiarize themselves with its content and usage instructions, the observers' agreement coefficient was calculated for each student individually. The researcher used (80%) as a minimum for the card's stability indicator. The results of the percentage of observers' agreement on students' performance in the UI design skills observation card (design & implementation - development - documentation) was calculated and were displayed in Table 7.

Table 7: Results of the observation card stability using Cooper's Equation method

Stu No	UI Design and Implementation			UI Documentation			UI Development		
	No of Agreed Times	No of Difference Times	Agreement Rate	No of Agreed Times	No of Difference Times	Agreement Rate	No of Agreed Times	No of Difference Times	Agreement Rate
1	36	5	87.8	39	2	95.1	38	3	92.7
2	35	6	85.4	33	8	80.5	39	2	95.1
3	34	7	82.9	39	2	95.1	35	6	85.4
4	38	3	92.7	35	6	85.4	38	3	92.7
5	33	8	80.5	36	5	87.8	40	1	97.6
6	33	8	80.5	35	6	85.4	34	7	82.9
7	35	6	85.4	36	5	87.8	40	1	97.6
8	34	7	82.9	33	8	80.5	35	6	85.4
9	37	4	90.2	35	6	85.4	40	1	97.6
10	33	8	80.5	37	4	90.2	34	7	82.9
11	39	2	95.1	38	3	92.7	38	3	92.7
12	36	5	87.8	40	1	97.6	36	5	87.8

13	34	7	82.9	34	7	82.9	35	6	85.4
14	39	2	95.1	40	1	97.6	36	5	87.8
15	35	6	85.4	37	4	90.2	34	7	82.9
16	38	3	92.7	36	5	87.8	33	8	80.5
17	34	7	82.9	34	7	82.9	40	1	97.6
18	37	4	90.2	40	1	97.6	39	2	95.1
19	35	6	85.4	37	4	90.2	34	7	82.9
20	33	8	80.5	39	2	95.1	40	1	97.6
21	38	3	92.7	33	8	80.5	38	3	92.7
22	34	7	82.9	33	8	80.5	33	8	80.5
23	39	2	95.1	38	3	92.7	34	7	82.9
24	35	6	85.4	37	4	90.2	39	2	95.1
25	34	7	82.9	39	2	95.1	35	6	85.4
26	33	8	80.5	36	5	87.8	35	6	85.4
27	39	2	95.1	35	6	85.4	37	4	90.2
28	37	4	90.2	34	7	82.9	37	4	90.2
29	34	7	82.9	40	1	97.6	40	1	97.6
30	37	4	90.2	36	5	87.8	37	4	90.2

The above table's results demonstrate that the level of agreement between observers regarding students' performance in the pre-prepared practical test evaluated using an observation card ranged from (80.5%) to (97.6%). This shows that there is a high rates of agreement among observers on the stability of the observation card.

Ultimately, we conclude from the above that the observation card as a whole possesses a degree of validity and stability that allows the researcher to use it for final application in the current study.

10.3.3.7 Quantitative assessment of the card

The performance levels were defined as follows: good (three points), average (two points), and poor (one point). While, if the student did not perform the required skill at all, he received a score of zero.

10.3.3.8 Creating the final version of the card

After verifying the validity of the observation card and calculating its stability, the card became final and suitable for application to the original study sample.

In this context, the observation card's final version included a number of main skills (4), and under it falls a group of sub-skills (41) that encompasses performances that must be applied practically. Additionally, the pre- and post-observation card results of the pupils were saved for statistical analysis at a later time.

In conclusion, after confirming the validity and stability of the study tools and presenting them to honorable arbitrators, the researcher conducted the pre-application on the original study sample.

10.4 Statistical Analysis

The statistical analysis methods used in the study included two types, as follows:

10.4.1 Statistical processing methods used to measure the study instruments

To confirm the psychometric properties of the study instruments, the researcher converted the participants' responses into numerical data after coding them, and then analyzed the codded data statistically using IBM SPSS software, employing the following statistical methods:

- Pearson's correlation coefficient: It was used to measure the internal consistency of the study's scales.
- Cronbach's alpha coefficient: It was utilized to determine the stability of the study's scales.
- Spearman brown equation: It was used to calculate the achievement test's stability by dividing it into two halves.
- Ease, difficulty and discrimination coefficients: They were used to calculate ease, difficulty, and discrimination coefficients of the achievement test.
- Cooper's equation: It was employed to determine the stability of the observation card.

10.4.2 Statistical processing methods used to verify the validity of the hypotheses

To confirm the validity of the study hypotheses, the data were extracted after coding from the sample participants' responses, and then analyzed the coded data statistically using IBM SPSS software, employing the following statistical methods:

- Independent samples t-test: It was employed to determine the significance of the differences between the scores of the experimental and control groups in both the pre- and post-application.
- Paired samples t-test: It was employed to determine the significance of the differences

between the scores of the experimental group in the pre- and post-application.
- Eta squared (η2): It was employed to determine the effect size of the Proposed Web-based AI-Powered Learning System in the study sample.

11. PILOT STUDY

The pilot study's procedures included the following two main aspects:

11.1 Determining the major skills involved of software user interface design

After reviewing a number of scientific resources, a list of GUI design skills that English language computer designers and programmers should possess have identified. These resources included the following:
- Reviewing previous literature that focused on designing software user interfaces.
- Investigating the websites and the internet that concentrate on creating software user interfaces for programming purposes.
- The researcher's direct observation while teaching the User Interface Design Course in the English Language Program.
- The produced skills from User Interface Design Course for first-level students in the English Language Program, Faculty of Specific Education, Mansoura University.
- The researcher conducted interviews with specialized professors to benefit from their opinions in determining the most important skills of designing software user interface.Through these interviews, the initial list of software user interface designs was produced.This list was then presented to the specialized referees, who agreed that these skills are appropriate for the current study.

11.2 Developing the proposed AI-Powered learning course

The researcher reviewed many educational design models and chose "Abdul Latif Al-Jazzar's" model to develop the proposed AI-Powered Learning Course due to its ease and simplicity.Practically speaking, the steps for building the proposed AI-Powered Learning Course were conducted in accordance with the subsequent steps:

A) Analysis stage

During this stage, the following steps were taken:

❖ ***Determining characteristics of the learners***

The study's targeted group are the first-level students of the English-language program at the Faculty of Specific Education who are close to each other in the same characteristics, such as: age, cognitive and performance, motivation towards developing software user interface design skills, etc.

❖ ***Determining educational needs and requirements***

The researcher's direct observation confirmed the students' low proficiency and the presence of flaws in their user interface design established the necessity of the Proposed AI-Powered Learning Course. By surveying students' opinions, the researcher discovered that they wanted to change the traditional teaching method. As a result, the researcher realized the necessity of designing AI-Powered Learning Course that uses online resources to help students develop their software user interface design skills.

❖ ***Determining educational resources***

This step is considered one of the most crucial steps in the analysis. The researcher found that most first-year students at the Faculty of Specific Education, Mansoura University have computers or tablets (iPads) connected to the Internet at home or at the college, which made it easier to conduct the experiment on the experimental group's students.

B) Design stage

During this stage, the following steps were taken:

❖ ***Formulating educational objectives***

This step includes the tasks and procedures that need to be performed, where the researcher developed a set of objectives and presented them to the referees to know their opinions about them and then separated the objectives of the Proposed AI-Powered Learning Course into two categories: general objectives, and procedural behavioral objectives (cognitive skills, emotional skills, and practical skills).

❖ ***Defining elements of the educational content***

The Proposed AI-Powered Learning Course has been divided into three chapters, each containing a chapter title, chapter content, and other relevant information. The proposed course allows students to access any topic they wish to study and utilize Internet resources anytime, anywhere. In this context, the researcher ensured that the course content aligns with its objectives, is appropriate for the students' level, and effectively conveys the key ideas and concepts of the course.

❖ ***Determining programming and learning style***

The researcher used a set of web programming languages that allow the course website to be used

from any electronic device, whether a computer, tablet, mobile phone, etc. In addition, researcher also used E-Learning methods and self-directed learning approaches, supported by AI services.

❖ ***Designing required materials***

The researcher designed the required components of the Proposed AI-Powered Learning Course and explained each of them, including text, images, audio files, videos, to enhance students' knowledge and skills in designing optimal user interfaces for software applications.

❖ ***Designing necessary activities***

Following each lecture, students were assigned a set of activities and exercises aimed at reinforcing the targeted knowledge and skills, using the tools available in the proposed course.

❖ ***Designing communication and interaction***

The researcher designed an interactive learning environment that facilitates communication between students themselves, as well as between students and the researcher, using the tools available in the system. These tools include both real-time and asynchronous interaction methods, and also incorporate AI services.

❖ ***Designing visualized screens***

The researchers designed the GUI of the Proposed AI-Powered Learning Course in accordance with established principles of interface design, such as simplicity, ease of use, and visual appeal through a careful balance of page and background colors, flexibility, etc.

❖ ***Designing scenario of the proposal***

The researcher designed a scenario to describe the pages of the Proposed AI-Powered Learning Course. This scenario included an explanation of the overall framework for the teaching process, as well as a description of the page layout, text placement, main and subheadings, images, videos, and the optimal navigation method for the learning modules, thus facilitating easy access to all parts of the proposed course for the student.

C) Production stage

During this stage, the following steps were taken:

❖ ***Determining development tools***

The researcher used a set of programming and software tools to develop the Proposed AI-Powered Learning Course, such as: HTML, JavaScript, CSS, Adobe Photoshop, Adobe Flash Player, Camtasia Studio, Quiz-Creator, Articulate 360, Bootstrap, Free AI Module (Open Source).

❖ ***Elements acquisition***

The researcher gathered multimedia files, including images, graphics, audio files, and videos, that were appropriate for the educational content and would contribute to developing the targeted knowledge and skills. These items were either created by the researcher himself or sourced from the Internet, with due respect to intellectual property rights and proper attribution to the original owners.

❖ ***Elements organization***

The researcher organized the elements in their appropriate locations and selected suitable font types, sizes, and colors for each item.

❖ ***Producing the initial version of the proposal***

The researcher designed the initial version of the Proposed AI-Powered Learning Course based on the aforementioned procedures, where he began to design the proposed system's screens, starting with the Login screen (using username and password), and then designing the Main screen, which includes the course content, course objectives, course outcomes, the pre-achievement test, the post-achievement test, the artificial intelligence services, and the means of communicating with students, whether via phone number, email, or WhatsApp chat group, Facebook Messenger ...etc. In addition, the other sub-screens were designed using the same methodology.

❖ ***Examining and assessing the initial version of the proposal***

The researcher tested the initial form of the Proposed AI-Powered Learning Course on a sample that was similar to the planned research sample in order to gather their opinions and implement their suggestions.

❖ ***Developing the final version of the proposal***

The researcher produced the final form of the Proposed AI-Powered Learning Course after making the required changes in response to the students' and experts' feedback.

In this context, examples of screenshots from the Proposed AI-Powered Learning Course are illustrated below:

Once the Proposed AI-powered Learning System has been launched, the "Login" page shown in Figure 1 will appear to confirm the student's identity.

Figure 1: Login page of the proposed AI-Powered learning system

From the "Login" page, the student is prompted to enter the required login data, which, if it is provided accurately, the "Main Page" screen shown in Figure 2 will appear to present the elements of the proposed system.

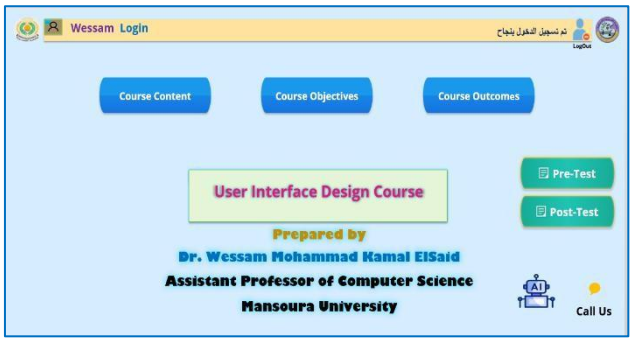

Figure 2: Main page of the proposed AI-Powered learning system

From the "Main Page", the key options of the Proposed AI-Powered Learning System are shown as follows:

- Course content: The purpose of this option is to display educational content of the targeted course.
- Course objectives: The purpose of this option is to display the objectives of the targeted course.
- Course outcomes: The purpose of this option is to display the outcomes of the targeted course.
- Pre-test: The purpose of this option is to apply the pre-test to the research sample and document the test results.
- Post-test: The purpose of this option is to apply the post-test to the research sample and document the test results.
- AI services: The purpose of this option is to connect the student with giving free AI services, which helps students find answers, acquire inspiration, and enhance their performance.
- Call us: The purpose of this option is to interact with pupils and respond to their questions.

From the "Main Page", when the button "Course Content" is pressed, the "Educational Content Page" screen shown in Figure 3 will appear to present the educational content of the targeted course.

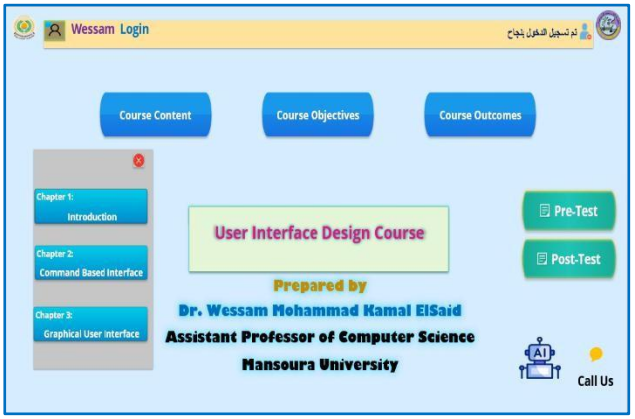

Figure 3: Educational content page of the proposed AI-Powered learning system

From the "Main Page", when the button "Course Objectives" is pressed, the "Objectives Page" screen shown in Figure 4 will appear to present the objectives of the targeted course.

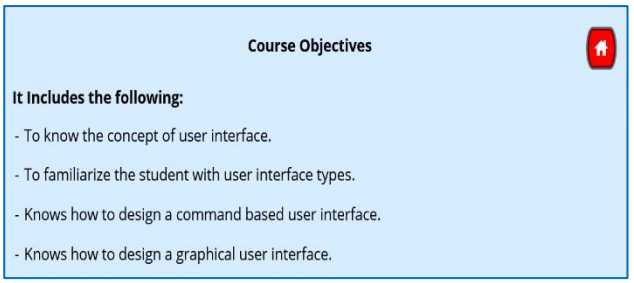

Figure 4: Course objectives page of the proposed AI-Powered learning system

From the "Main Page", when the button "Course Outcomes" is pressed, the "Outcomes Page" screen shown in Figure 5 will appear to present the outcomes of the targeted course.

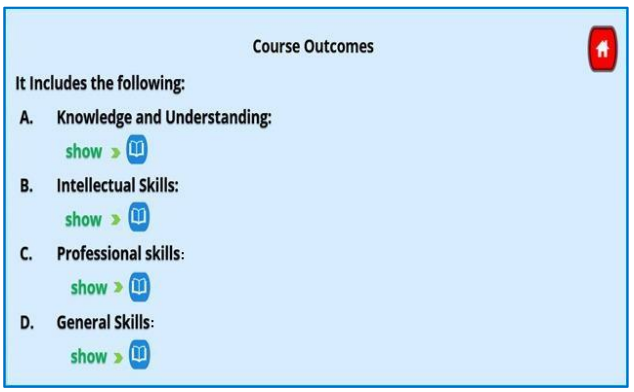

Figure 5: Course outcomes page of the Proposed AI-Powered learning system

From the "Main Page", when the option "AI" is pressed, the "Free AI Services Page" screen shown in Figure 6 will appear to link students to the homepage of a popular free website that offers free AI services.

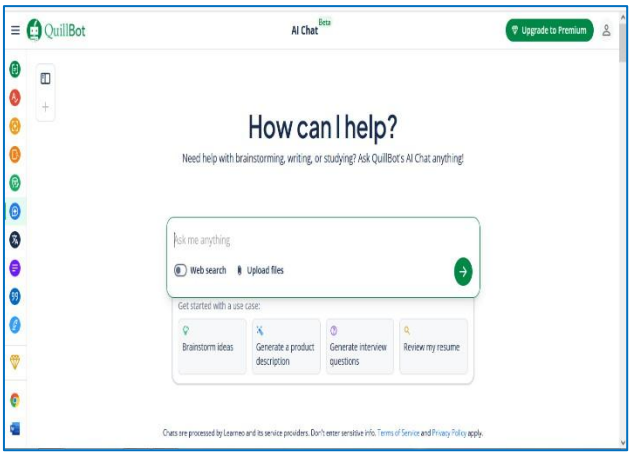

Figure 6: Homepage of free AI services

D) Application stage

During this stage, the following steps were taken:

❖ ***Exploratory experiment***

Before the main experiment was conducted and the study tools were applied to the original sample, an exploratory experiment was conducted for the Proposed AI-Powered Learning Course on a group of students who were not a part of the original research sample. The exploratory experiment aimed to identify technical and teaching issues and challenges through student feedback, and attempt to overcome them and address them at the maximum speed.

❖ ***Real use and follow-up***

The Proposed AI-Powered Learning Course was applied to the original research sample to determine its impact and effectiveness. In this context, the researcher's role shifted from a computer science lecturer to student supervisor, assuming additional responsibilities such as monitoring students' use of the proposed course, tracking their learning progress, reviewing their performance in exercises and activities, and providing ongoing support and answering their questions.

12. EXPERIMENTAL RESULTS

In order to validate the research questions and hypotheses, a practical experiment was carried out on the original study sample, followed by the use of the study instruments.

Below, both parts will be explained in more detail:

12.1 Study experiment

The current study's main experiment was performed in the following two phases:

A) Pre-test phase

This phase included the following procedures:

A.1) Pre-application of the achievement test

The achievement test was pre-applied on the study sample, for both the experimental and control groups to gauge the cognitive aspect of software user interface design. For the control group, the achievement test was pre-applied on the paper, and the researcher manually calculated each student's overall score. For the experimental group, the achievement test was pre-applied electronically via an option within the Proposed AI-Powered Learning Course, and the overall score for each student was automatically calculated.

A.2) Pre-application of the observation card

A practical test was pre-applied on the study sample, both the experimental and control groups to gauge the performance aspect of software user interface design using the same method of pre-application of the achievement test. Utilizing an observation card, the test was scored according to the software user interface design skills listed above.

A.3) Homogeneity assurance

To guarantee homogeneity, the results of pre-application of the achievement test and the observation card test on the control group and the experimental group were analyzed to determine the differences between the two groups. The results of homogeneity were as follows:

A.3.1) Homogeneity of the pre-application of the achievement test

After the achievement test was pre-administered to the students in both groups, the "T" value was computed to ascertain the differences between the experimental and control groups' students' average scores. The results were presented in Table 8 and were depicted in Figure 7.

Table 8: Results of the homogeneity of the achievement test before application

Instrument	Group	No	AVG	STD	T Value	DF	SL
Achievement Test	Experimental	30	14.37	1.956	0.199	58	0.843 Not Significant
	Control	30	14.27	1.929			

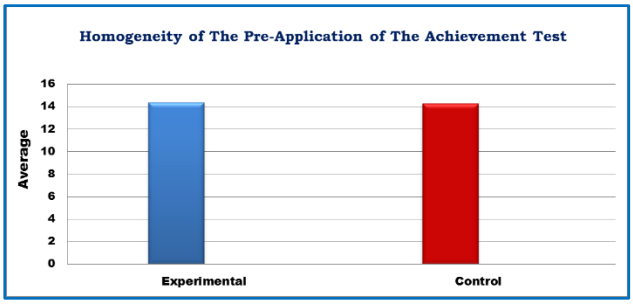

Figure 7: The average homogeneity scores of the pre-application of the achievement test

The aforementioned table's results demonstrated that there were no statistically significant differences between the average scores of the students in the experimental and control groups in the achievement test before the application as a whole, because the T-Score for the achievement test before the application was (0.199), denoting the experimental and control groups were homogeneous and equivalent on the pre-application of the achievement test.

A.3.2) Homogeneity of the pre-application of the observation card test

After the observation card test was pre-administered to the students in both groups, the "T" value was computed to determine how the average scores of the students in the experimental and control groups differed. The results were presented in Table 9 and were depicted in Figure 8.

Table 9: Results of the homogeneity of the observation card before application

Main Skill	Group	No	AVG	STD	T Value	DF	SL
UI Design	Experimental	30	1.40	1.940	0.570	58	0.571 Not significant
	Control	30	1.13	1.676			
UI Implementation	Experimental	30	8.03	4.013	0.297	58	0.767 Not significant
	Control	30	7.73	3.796			
UI Documentation	Experimental	30	10.77	6.213	0.106	58	0.916 Not significant
	Control	30	10.60	5.986			
UI Development	Experimental	30	10.90	7.703	0.017	58	0.987 Not significant
	Control	30	10.87	7.523			
Overall Card Score	Experimental	30	31.10	18.378	0.165	58	0.870 Not significant
	Control	30	30.33	17.602			

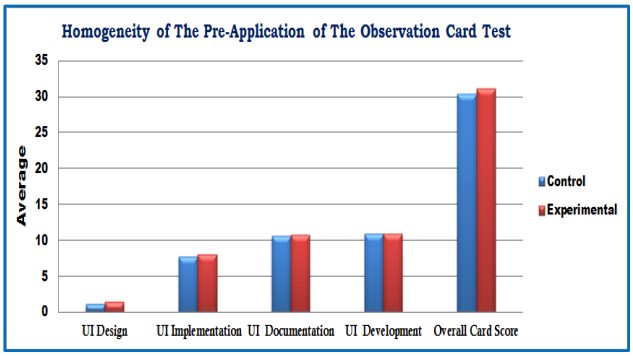

Figure 8: The average homogeneity scores of the pre-application of the observation card test

Because all T-Scores in the previous table were not statistically significant, indicating that there were no statistically significant differences between the average scores of the students in the experimental and control groups in the observation card test prior to the application as a whole. These results show that the experimental and control groups were homogeneous and equivalent on the pre-application of the observation card test.

B) Testing phase

Following the completion of the pre-tests, the main experiment was carried out in the following three procedures:

B.1) Experiment preparation and students notification

The preliminary processes for preparing the experiment and informing students of the targeted course involved various tasks, including: providing students with a quick overview of the Proposed AI-Powered Learning System structure, providing students with mechanism of use the Proposed AI-powered Learning System, ensuring students' ability to use the Proposed AI-Powered Learning System and browse the Internet, introducing students to the required activities involved in each chapter, providing students with downloadable files for the exercises due at the end of each semester, motivating pupils to learn and complete the activities expected of them to build their skills in programming interface design. After that, the researcher told the students of the experimental

group with the start date of the main experiment, and then provided students with the username and password of the proposed course, allowing them to access the targeted course anytime, anywhere.

B.2) Observation the control group

The instructor taught the educational material of the User Interface Design course to students of the control group using the conventional manner in college classrooms, and the researcher observed on the ground their learning process and their reactions and responses to the instructor.

B.3) Observation the experimental group

The instructor taught the educational material of the User Interface Design Course to the students of the experimental group using the Proposed AI-Powered Learning System, and the researcher through a specialized control panel remotely monitored all student activities in as soon as the student logged in to the proposed web-based system, where the researcher functions as an admin of the system.

12.2 Application of the study instruments

After the main experiment was finished, the researcher applied the post-test study tools (achievement test - observation card test) to the original study sample in order to evaluate the effectiveness of the Proposed AI-Powered Learning System in promoting the development of various Software User Interface Design skills by comparing the cognitive and performance achievement of skills between students in the experimental and control groups before and after the proposed course.

To ensure the validity of the study hypotheses, the results of the post-tests were documented and statistically analyzed in the following sub-sections:

12.2.1 Testing the validity of the first hypothesis

To confirm the first hypothesis's validity, which stated, "The average scores of the students in the experimental group and the control group on the post-application of the achievement test differ statistically significantly in favor of the experimental group," the "T" value was computed for the differences between the average scores of students in the experimental and control groups after the achievement test was administered, and the results were presented in Table 10 and depicted in Figure 9.

Table 10: Results of the validity of the first hypothesis

Instrument	Group	No	AVG	STD	T Value	DF	SL
Achievement Test	Experimental	30	32.13	2.240	16.176	58	0.01
	Control	30	20.23	3.350			

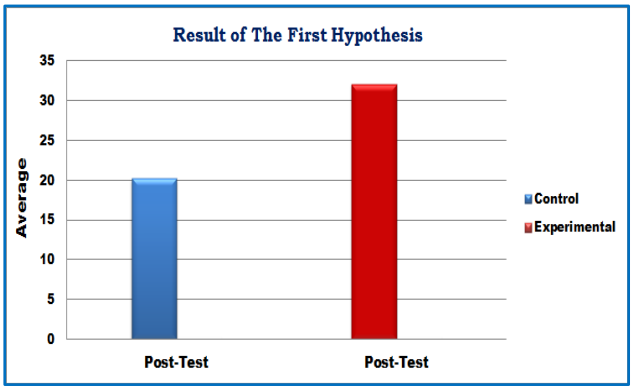

Figure 9: The average scores of students in the experimental and control groups in the post-application of the achievement test

The aforementioned table's results showed that, overall, the experimental group's average scores on the post-application of the achievement test differed statistically significantly from those of the control group's students. Furthermore, the results showed that the T-Score = 16.176, which is a statistically significant value at a significance level of (0.01) and a degree of freedom of (58); denoting the first hypothesis is valid.

12.2.2 Testing the validity of the second hypothesis

To confirm the second hypothesis's, which stated, "The average achievement test scores of the experimental group students before and after the application differ statistically significantly, favoring the post-application," the "T" value was computed for the differences between the average scores of students in the experimental group before and after the achievement test was administered, and the results were presented in Table 11 and depicted in Figure 10.

Table 11: Results of the validity of the second hypothesis

Instrument	Application	No	AVG	STD	T Value	DF	SL
Achievement Test	Pre-Test	30	14.37	1.956	-34.452	29	0.01
	Post-Test	30	32.13	2.240			

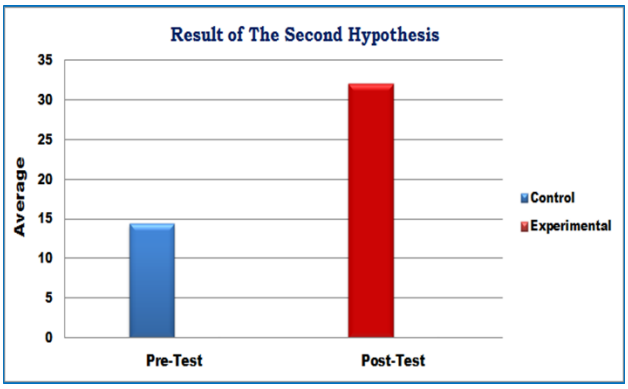

Figure 10: The average scores of students in the experimental group in pre- and post-application of the achievement test

The aforementioned table's results showed that, overall, the experimental group's average scores on the pre- and post-application of the achievement test differed statistically significantly from those of the control group's students, favoring the post-application. Furthermore, the results showed that the T-Score = -34.452, which is a statistically significant value at a significance level of (0.01) and a degree of freedom of (29); denoting the second hypothesis is valid.

In this context, to determine the effect size of the Proposed AI-Powered Learning System on the development of the cognitive achievement aspect of first-level students in the English language computer program, the value of (η2) was computed and presented in Table 12.

Table 12: The value of "η2" and the effect size of the proposed course on developing the cognitive aspect of the study sample

Instrument	η2 Value	Effect Size
Achievement Test	0.98	High

The aforementioned table's results demonstrated that the high effect size of the Proposed AI-Powered Learning System on enhancing the cognitive aspect of the study sample, as the (η2) value for the achievement test was 0.98, which indicates that the Proposed AI-Powered Learning System is responsible for 98% of the achievement test's total variance. This outcome shows how these variations have a substantial impact on the cognitive achievement of several UI design elements for first-level students in the English language computer program, proving the effectiveness of the suggested AI-Powered Learning System.

12.2.3 Testing the validity of the third hypothesis

To confirm the third hypothesis's, which stated, "The average scores of the students in the experimental group and the control group on the post-application of the observation card (skills-total score) test differ statistically significantly in favor of the experimental group," the "T" value was computed for the differences between the average scores of students in the experimental and control groups after the observation card test was administered, and the results were presented in Table 13 and depicted in Figure 11.

Table 13: Results of the validity of the third hypothesis

Main Skill	Group	No	AVG	STD	T Value	DF	SL
UI Design	Experimental	30	10.43	1.006	11.861	58	0.01
	Control	30	5.17	2.214			
UI Implementation	Experimental	30	34.00	4.410	11.065	58	0.01
	Control	30	21.77	4.150			
UI Documentation	Experimental	30	30.57	3.910	9.001	58	0.01
	Control	30	19.03	5.828			
UI Development	Experimental	30	33.60	2.908	12.530	58	0.01
	Control	30	22.53	3.866			
Overall Card Score	Experimental	30	108.60	11.464	12.095	58	0.01
	Control	30	68.50	14.083			

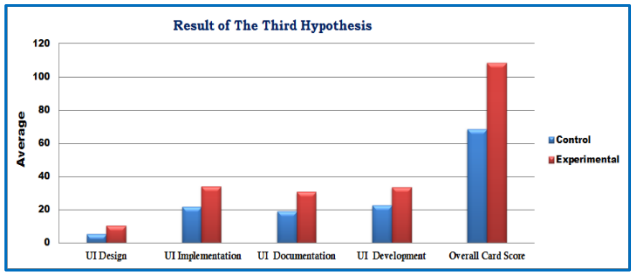

Figure 11: The average scores of students in the experimental and control groups in the post-application of the observation card test

The aforementioned table's results showed that, overall, the experimental group's average scores on the post-application of the observation card (skills - total score) test differed statistically significantly from those of the control group's students. Furthermore, the results indicated that the T-Score were statistically significant at a significance level of (0.01) and a degree of freedom of (58); denoting the third hypothesis is valid.

12.2.4 Testing the validity of the fourth hypothesis

To confirm the fourth hypothesis's, which stated, "The average scores of the experimental group students on the observation card (skills-total score) test before and after the application differ statistically significantly, favoring the post-application," the "T" value was computed for the differences between the average scores of students in the experimental group before and after the observation card test was administered, and the results were presented in Table 14 and depicted in Figure 12.

Table 14: Results of the validity of the fourth hypothesis

Main Skill	Application	No	AVG	STD	T Value	DF	SL
UI Design	Pre-Test	30	1.50	2.047	-21.382	29	0.01
	Post-Test	30	10.43	1.006			
UI Implementation	Pre-Test	30	8.57	3.892	-23.542	29	0.01
	Post-Test	30	34.00	4.410			
UI Documentation	Pre-Test	30	9.33	5.768	-16.589	29	0.01
	Post-Test	30	30.57	3.910			
UI Development	Pre-Test	30	8.83	5.925	-21.094	29	0.01
	Post-Test	30	33.60	2.908			
Overall Card Score	Pre-Test	30	27.70	16.440	-21.714	29	0.01
	Post-Test	30	108.60	11.464			

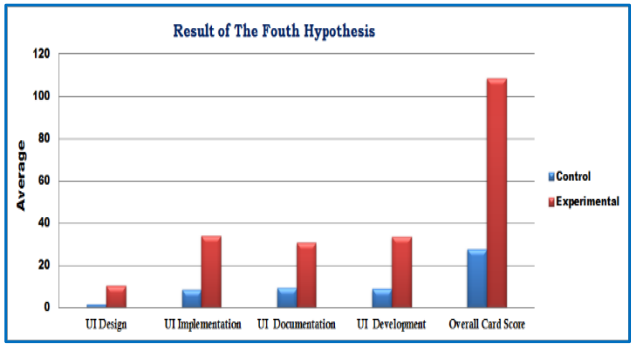

Figure 12: The average scores of students in the experimental group in pre- and post-application of the observation card test

The aforementioned table's results showed that, overall, the experimental group's average scores on the pre- and post-application of the observation card (skills - total score) test differed statistically significantly from those of the control group's students, favoring the post-application. Furthermore, the results indicated that the T-Score were statistically significant at a significance level of (0.01) and a degree of freedom of (58); denoting the fourth hypothesis is valid.

In this context, to determine the effect size of the Proposed AI-Powered Learning System on the development of the performance aspect of first-level students in the English language computer program, the value of (η2) was calculated and presented in Table 15.

Table 15: The value of "η2" and the effect size of the proposed system on developing the performance aspect of the study sample

Main Skill	η2 Value	Effect Size
UI Design	0.94	High
UI Implementation	0.95	High
UI Documentation	0.92	High
UI Development	0.93	High
Overall Card Score	0.93.5	High

The aforementioned table's results demonstrated that the high effect size of the Proposed AI-Powered Learning System on developing the performance aspect of the study sample, as the value of "η^2" for the main skills of UI design ranges between (0.90 - 0.95) and the overall (η^2) value for the observation card test was (0.93.5), which indicates that the Proposed AI-Powered Learning System is responsible for 93.5% of the total variance of the observation card test. This outcome shows how these variations have a substantial impact on the practical achievement of several UI design elements for first-level students in the English language computer program, proving the effectiveness of the suggested AI-Powered Learning System.

13. STUDY RECOMMENDATIONS

The suggestions presented in Table 16 can be taken into consideration in light of the prior findings, as the following:

Table 16: The study recommendations

No.Study Recommendation	Recommendation Description
SR1	The need to use contemporary technology, successful tactics, and innovative programs to help students at different educational levels develop their UI programming skills while keeping up with worldwide technological advancements.

SR2	The need to focus on using modern technological approaches and practical techniques when teaching a variety of courses, particularly computer courses, due to its beneficial effects on the growth of cognitive and performance aspects, as well as the overall level of academic success.
SR3	The need to activate student activities in the fields of computer science, information technology, multimedia labs and distance learning.
SR4	The need to held a series of hands-on training sessions for computer and information technology teachers both prior to and during service utilizing contemporary technology and educational theories to develop their abilities to acquire and transfer knowledge for students, whether in classroom or via Internet platforms.
SR5	The need to integrate programming knowledge and skills into the curriculum, particularly in the computer field, to attain a more profound comprehension and practical applications.

14. CONCLUSION and FUTURE WORK

Since the Covid-19 crisis, distance education has become an important issue for the education sector in general and the university in particular, where many research papers have proposed synchronous and asynchronous E-Learning technology supported by artificial intelligence as a magic solution to education problems during and after the global pandemic crisis.

Accordingly, the current research paper proposed an AI-Powered Learning Course to develop the cognitive and skills needed to design software user interfaces for first-year students in the English-language program at Mansoura University's Faculty of Specific Education.

The evaluation plan's primary goal was to compare the results of the experimental group, which used the proposed AI-Powered Learning Course to learn, and the control group, which used a conventional method.

The obtained findings demonstrated that, on both achievement tests and observation card tests, the experimental group's average student scores are statistically significantly higher than those of the control group. This indicates, the ability to design an optimal software user interfaces of first-year students in the English language program was thus successfully fostered by the AI-Powered Learning Course.

Future additions to the Proposed AI-Powered Learning System will include further AI services, leading to a more sophisticated and engaging learning environment.

❖ *Authors' Contribution*

The authors were involved in the study design, data collection, statistical analysis, and data interpretation. In addition, they helped write the manuscript, performed changes requested by reviewers, and then prepared the final version for publication.

❖ *Funding*

The authors did not receive any financial support to conduct this research.

❖ *Ethics Declaration*

Institutional permission to conduct this study was granted by committee on scientific ethics of Mansoura University's Faculty of Specific Education in Mansoura, Egypt.

❖ *Declaration of Interest*

The authors did not reveal any conflict of interest with others.

❖ *Data Availability*

The authors stated that the data generated or analyzed during this study is available upon request.

❖ *Acknowledgment*

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