Designing a smart learning environment based on (synchronous and asynchronous) e-learning and its impact on students' acquisition of computer application skills

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Abstract:

The current research aims to design a smart learning environment based on the two types of e-learning (synchronous and asynchronous) and reveal its impact on students' acquisition of computer application skills by verifying two hypotheses.

The first states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart learning environment based on synchronous electronic learning and the control group students who study according to a smart learning environment based on asynchronous e-learning in the theoretical computer applications test)

The second states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart learning environment based on synchronous e-learning and the students of the control group who study according to a smart learning environment based on asynchronous e-learning in the practical computer applications test)

The research community has been chosen by the law department students at the University of Science. A semi-experimental design was employed with the experimental and control groups, and randomly, group (A) was chosen to be the first experimental group and group (B) to be the second experimental group, with (20) students for each group. A smart learning environment based on synchronous and asynchronous e-learning, preparing the necessary requirements, such as establishing an educational platform and providing various digital learning resources and teaching plans. A test was built to measure theoretical achievement, and a note card to measure practical achievement.

The study experiment lasted twelve weeks and was conducted during the first semester of the academic year 2021–2022. After teaching the whole curriculum, the two groups completed an in-person theoretical and practical accomplishment exam. Students in the first experimental group did better on the theoretical and practical accomplishment exam than students in the second experimental group, according to statistical data analysis using the t-test for two independent samples.

Keywords: Smart learning environment design, synchronous e-learning, asynchronous e-learning, computer applications.

تصميم بيئة تعلم ذكية قائمة على نمطي التعلم الالكتروني (متزامن وغير متزامن) وأثرها في اكتساب الطلبة لمهارات تطبيقات الحاسوب

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الخلاصة:

يهدف البحث الحالي تصميم بيئة تعلم ذكية قائمة علي نمطي التعلم الالكتروني (متزامن وغير متزامن) والكشف عن اثرها في اكتساب الطلبة لمهارات تطبيقات الحاسوب ،من خلال التحقق من فرضيتين هما :

الاولى : تنص على انه (يوجد فرق ذو دلالة إحصائية عند مستوى دلالة (0.05) بين متوسطي درجات طلبة المجموعة التجريبية الاولى الذين يدرسون وفق بيئة تعليمية ذكية قائمة على التعلم الالكتروني المتزامن و طلبة المجموعة الضابطة الذين يدرسون وفق بيئة تعليمية ذكية قائمة على التعلم الالكتروني غير المتزامن في اختبار تطبيقات الحاسوب النظري) .

و الثانية : تنص على انه (يوجد فرق ذو دلالة إحصائية عند مستوى دلالة (0.05) بين متوسطي درجات طلبة المجموعة التجريبية الاولى الذين يدرسون وفق بيئة تعليمية ذكية قائمة على التعلم الالكتروني المتزامن و طلبة المجموعة الضابطة الذين يدرسون وفق بيئة تعليمية ذكية قائمة على التعلم الالكتروني غير المتزامن في اختبار تطبيقات الحاسوب العملي) .

استعمل التصميم شبه التجريبي ذو المجموعتين التجريبية والضابطة ، وتحدد مجتمع البحث بطلبة قسم القانون في كلية مدينة العلم الجامعة ، وعشوائيا تم اختيار المجموعة (أ) لتكون المجموعة التجريبية الاولى، والمجموعة(ب) لتكون المجموعة التجريبية الثانية ، بواقع (20) طالب لكل مجموعة .

تم تصميم بيئة تعليمية ذكية قائمة على التعلم الالكتروني المتزامن وغير المتزامن، وتهيئة المستلزمات الضرورية وهي(انشاء المنصة التعليمية ، توفير مصادر التعلم المتنوعة الرقمية، الخطط التدريسية).

وتم بناء اختبار لقياس التحصيل النظري، وبطاقة ملاحظة لقياس التحصيل العملي).

طُبقت تجربة البحث في الفصل الدراسي الأول من العام الدراسي 2021– 2022 ، وبعد الانتهاء من تدريس كامل المحتوى التعليمي ، تم تطبيق اختبار التحصيل النظري والعملي على المجموعتين حضوريا، واستغرقت تجربة البحث (12)اسبوعاً.

تم معالجة البيانات إحصائياً باستخدام (t–test) لعينتين مستقلتين اتضح تفوق طلبة المجموعة التجريبية الاولى على طلبه المجموعة التجريبيه الثانيه في اختبار التحصيل النظري والعملي.

الكلمات المفتاحية: تصميم بيئة تعليمية ذكية ، تعليم الكتروني متزامن، ، تعليم الكتروني – غيرمتزامن، تطبيقات الحاسوب.

Introduction

Information and communication technology represents one of the biggest challenges faced by educational institutions in our time, which has had a significant impact on educational institutions, affecting the goals and orientations of those institutions, despite all that technological means of education can offer in our modern era, except the tremendous development in the field of communication technology. It forced educational systems to open up new dimensions, thus leading them to fundamental transformations that made their task more difficult than ever (Al-Issawi, 2012: 89). Furthermore, putting it in front of new responsibilities and tasks is how to benefit from this technology through the use of software and devices that allow the teacher and student a larger space that is not determined by time or place through e-learning in communication via the Internet or local networks, and provide non-traditional learning and teaching through curricula and educational technologies in their electronic form. (Attia, 2009: 274). Hence the emergence of the so-called e-learning (E-Learing) or e-learning E-Instruction, which means the use of modern electronic technologies in the process of preparing curricula and presenting them in a way that helps the student to learn through interactive scientific content based on multimedia (texts, graphics, still images, video clips, sound). It is provided through computers or smart devices through which it is possible to connect to the information network. In addition, communication is made between the student and the content, the student with another student, and between the student and the professor in interactive electronic images and in the place he wants and at the time he prefers without the obligation to attend the classrooms at specific times (Al-Saud, 2008: 277). The smart learning environment, which is the clearest picture of e-learning, is an educational system based on providing educational material to students in different and varied forms and formats.

Aloia & Vaporciyan (2019) state that the e-learning environment is an interactive virtual environment centered on the learner and should be flexible to allow educational content to be exchanged anywhere or anytime. Students can also take electronic tests as well as receive

feedback after registering their grades and judging their level of achievement (Aloia & Vaporciyan.2019.288). It is an environment that enables teachers to publish educational content, develop tasks and activities, and communicate with learners synchronously or asynchronously through electronic interactive tools and using written texts, images, videos and audio. Also, it allows learners to share applications, transfer files, and actively interact in discussion areas, which are educational environments rich in multiple learning resources. (Parker& Martin2010 ,132**)**

Which is commensurate with the needs and abilities of learners, helps in reformulating roles in the way in which the learning process is carried out, encourages communication between the elements of the educational system, and modeling education and presenting it in a standard form, where multimedia technology is used, including written texts, spoken language, sound effects, moving and static images, and graphics with their different specifications in an optimal manner (Osman, 2016, 205). The researcher believes that smart learning environments are easy to develop and update. Furthermore, rather than requiring an expert in programming to use them, they need a set of skills that users of these environments can easily acquire, as they provide a control interface that facilitates the process of managing the environment and publishing educational content electronically, modifying it. Therefore, it allows the teacher to perform assessments for learners easily and provides various support tools for both teacher and learner. It also enables the learner to achieve educational objectives by interacting with various sources and media. It allows him to communicate with his colleagues and teachers with the least effort and cost while ensuring high education efficiency and quality (without being restricted by spatial or time limits). Through e-learning environments, the problems of traditional environments are overcome, contribute to continuing education processes, and support new learning methods that depend on the learner, focus on developing his abilities and potentials, and can also be employed in developing learners' skills in information and communication technology, and making the most of teaching and learning resources available on the Internet (Juma Ibrahim, 2010, 52).

Providing a learning environment that supports communication and interaction between users and supporting competitive learning through the tools found in distance learning methods across different platforms are among the most important pedagogical advantages of using the Internet in education (Azmi, 2008: 76)

The process of designing a smart learning environment based on synchronous and asynchronous e-learning is the practical application of planned e-learning based on actual participation between students and their teachers.

The style of synchronous e-learning takes place through direct communication with students in audio and written forms, video chat, web conferences, audio conferences, or instant messaging.

As for the asynchronous style, it takes place indirectly, without the presence of students simultaneously, and is done through e-mail, blogs, collaborative web editors (Wiki), and collaborative writing tools.

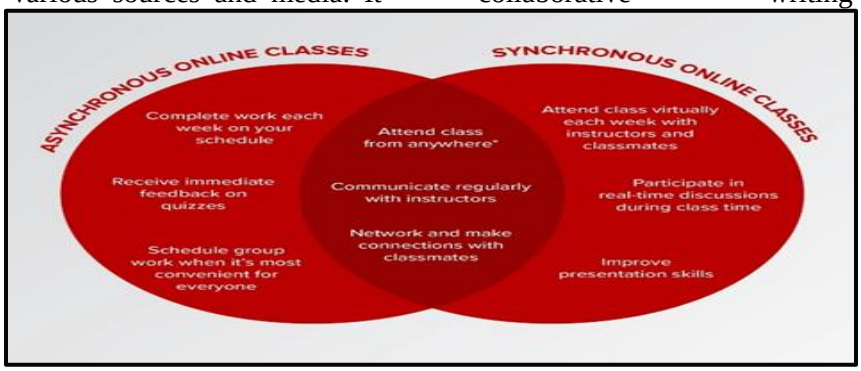

Figure (1):A comparison between the two types of e-learning (synchronous and asynchronous)

Achievement is of great importance to the student. It is not only to obtain grades that qualify him to pass the successive academic stages, but he has other important aspects in his life as a compulsory way to choose the type of study and profession to determine the social impact that the student has in society and the social status that he will achieve, and his self-view, sense of success and the level of his ambition. (El Bawi and Karim2022, 85) The concept of theoretical and practical academic achievement does not refer to the degree of success achieved by students in their field of study and level only but represents the acquisition of skills and knowledge and the ability to use them in current or future situations and academic achievement is one of the indicators of the final output of learning (Allam, 2006: 122)

Research problems-

The study of computers is one of the requirements of universities in Iraq, as it is taught to students of the first and second grades in all colleges. Because the researcher is a teacher at the University College of Science City and has experience teaching computers for more than 12 years, he sensed the problem of this research.

-1-The direct observation of the researcher for the poor performance of students for computer applications in laboratories, and because teaching the course of spy applications aims to acquire theoretical and practical information about computer applications, which makes him able to employ them in the field of his study and his career in the future, so the researcher felt the urgency of students to learn these skills accurately

2-The lack of local research on smart learning environments based on synchronous and asynchronous e-learning in teaching computer applications.

3-Recommendations incompatibility of previous research and studies on the virtue of synchronous and asynchronous e-learning patterns (e.g. studies Wang (2011), Hsieh and Ji Khodaparats &Ghafoumia(2015)).

It was shown that there was no statistically significant difference between the synchronous and asynchronous e-learning patterns in learning. While the studies of Perera & Richardson (2010), Downey & Schetzls (2012), and Mossa (2020) showed that the e-learning style (asynchronous) contributed to increasing achievement rates because it allowed students the freedom to learn promptly. Other studies confirmed that the synchronous e-learning style proved its preference for developing programming skills and learning compared to the asynchronous education pattern, such as the study of Tsuei (2014). Moallem (2015). This created confusion for the researcher and thinking to search for the effect of either style on the learning of students of the Department of Law for computer applications.

Therefore, the research problem was represented in the poor performance of students in skills for computer applications, so the formulation of the research problem was determined in the design of a smart educational environment based on the two types of e-learning (synchronous and asynchronous) in the acquisition of students of the Department of Law for computer applications.

- Research objectives

The research aims to:

1-Designing a smart learning environment based on synchronous and asynchronous e-learning styles.

2-Detecting the impact of a smart learning environment based on synchronous and asynchronous e-learning patterns on students' acquisition of computer applications.

-Research questions and hypotheses

The second research objective can be expressed by the following question:

How does a smart learning environment based on synchronous and asynchronous e-learning patterns impact students' acquisition of computer applications?

Which can be answered by verifying the following:

1-The first hypothesis states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart learning environment based on synchronous e-learning

and the students of the control group who study according to a smart educational environment based on asynchronous e-learning in the theoretical computer applications test.)

2-The second hypothesis states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart educational environment based on synchronous e-learning and the students of the control group who study according to a smart educational environment based on asynchronous e-learning in the test of practical computer applications)

-Research limits :

Research is defined by:

A- Students of the Department of Law at the University College of Al-Elm City 2021-2022 .

B- Computer Applications

-The importance of research

The importance of the current research stems from:

1-Investing in modern technology through the design of smart electronic learning environments. 2- The significance of striving to enhance and elevate students' proficiency in computer application acquisition as a measure of academic achievement of their learning objectives.

3- gaining knowledge from this research to assist educators and anyone looking to create electronic teaching strategies.

-Research terms:

1-Smart learning environment (SLE)

The International Association of Smart Learning Environments "IASLE" knows it.

A smart learning environment is an environment characterized by the use of innovative technologies and elements that allow more flexibility, effectiveness, adaptation, participation, motivation and feedback to the learner .

Hwang et al. (2015) define it as "a learning place or activity space that can capitalize on learning scenarios, identify learner characteristics, provide appropriate learning resources and convenient interactive tools, record automatic learning learning and evaluate learning outcomes in order to enhance learning effectiveness".

Wan & Niu defined it (Wan & Niu, 2011) as: "It is a learning system based on electronic resources through computers and the Internet to transfer knowledge and skills to the largest number of beneficiaries at the same time or at different times (Hamdi and Faten, 2011: 13) .

2-Electronic learning pattern (synchronous): A student-centered educational strategy that depends on the presence of the student and teacher during the learning process at the same time in front of electronic devices via the Internet, and adopts the tools of synchronous interaction on Lin represented in (synchronous chat rooms, and synchronous interaction through the performance of those skills applied on lin) Between students among themselves, and between students and teachers among themselves, with the aim of carrying out educational tasks related to computer applications.

3-E-learning style (asynchronous): an educational strategy centered on the student, and does not depend on the reason for the presence of the student, and the teacher during the learning process at the same time directly, but in the times available to each of them, and depends on the tools of asynchronous interaction Off Lin between students among themselves, and between students and teacher, with the aim of implementing educational tasks with computer applications .

4-Acquisition:(acquisition) is the process of acquiring scientific knowledge represented by the cognitive and skill aspect

According to Tamimi et al., 2018a: 32, achievement is defined as "the set of knowledge and skills acquired and developed during subjects, usually indicated by test scores or grades assigned by teachers, or both"

Procedure-wise, the researcher defines it as follows: the amount of theoretical and practical knowledge about computer applications that the Department of Law students (research sample) acquire, as determined by their performance on tests the researcher created specifically for this purpose.

-Search Procedures:

The process of conducting the research required the following steps

***Selection of research methodology**

The descriptive and analytical research method was used to prepare and design a smart learning environment based on the two types of e-learning (synchronous asynchronous), and the semi-experimental research method to measure the impact of the independent variable on the acquisition of computer application skills by students of the Department of Law, The semi-experimental technique is the research method that comes closest to solving issues in a scientific fashion since it is suited for the nature of the investigation.

***Design of the smart educational environment based on two types of e-learning (synchronous and asynchronous)**

To achieve the two objectives of the research, and after reviewing the literature related to the design of educational environments, theoretical framework and earlier study, it was discovered that there are differing viewpoints about the phases involved in creating them. Therefore, the researcher used the following stages to construct his educational-learning design.

-Analysis stage

This stage includes:

A- Examination of the educational goals: The learning goals for the first semester of the 2021–2022 academic year can be obtained from the overall objectives of teaching computer applications.

B- Academic content analysis involves identifying the vocabulary (main headings and subheadings) in the content as well as the facts, concepts, terms, generalizations, principles, theories, and skills that are taken out of each subject and arranged logically within the subject's cognitive structure.

C - Analysis of the characteristics of students: during the process of equivalence between the two research groups in the variables chronological age and level of intelligence.

Table (1): Equivalence of the two search groups

Group / Variable	Experimental-1		Experimental-2		t-value		Statistical significance
	Average calculation	Standard deviation	Average calculation	Standard deviation	calculated	table	
Age	188.4	7.3	190.3	6.9	0.862	2.02	No Sign
level of intelligence	38.2	6.5	38.4	5.6	0.104		No Sign

D- Estimating educational needs: The needs were estimated from the point of view of the students of the Department of Law by asking exploratory questions to identify the difficulties of acquiring computer application skills, as well as through the exchange of opinions with teachers. Also, the most significant problems and needs they faced in teaching this subject were identified and adopted

-Preparation stage

It included- :

A - Identify and organize the academic content represented in the first three chapters of the book Fundamentals of Computer and its Office Applications 2016, Part 2, 1st Edition,(2)

Table (2): The subject of computer applications

The part	Title	page number
the first	Introduction to Microsoft Word 2020	13-65
the second	Insert objects in Microsoft Word 2010	71-110
the third	Additional tasks for Microsoft Word 2010	113-145

B- Formulation of behavioral purposes:

cognitive (44), skill (36) and emotional behavioral purposes (13) were formulated, supplement C- Defining methods of instruction: C.

Based on synchronous and asynchronous e-learning, where students are actively engaged in the learning process and serve as the center of attention, various digital learning methodologies were considered to be appropriate for smart

learning environments. In addition to creating and debating stories online, which are electronic platforms, electronic knowledge journeys, and participatory learning, all of which are strategies based on the Internet, and depending on the specifics of the educational setting and the subject matter, one or more of these tactics have been used in combination or alone.

D- Identification of educational activities and techniques: Several educational activities have been identified represented in the practical applications of the scientific material, writing reports and solving various cases of abuse, Appendix(4)

-Preparing the educational scenario: It includes the distribution of educational content and including still images, video clips, visual and written instructions on multiple screens displayed in the form of PowerPoint or documents

-Digitization of educational content elements: links were produced, the navigation system was defined, basic and sub-screens were defined, electronic activities were designed, previous and subsequent links were identified, and educational content was uploaded to the smart learning environment site (Google Classroom platform) and this platform was chosen because it works to achieve appropriate learning for students, through the ease of registration and management of lessons quickly and directly, and can be used through smartphones and tablets in addition to computers (Albawi, Majida & Ghazi 2019:P160)

E - Evaluation tools preparation: Electronic assessments are ready to be used after every online lesson, and students are tasked with researching new subjects by watching videos, summaries, and images on websites like Google and YouTube.

The final evaluation to find out the amount of what has been achieved from the objectives was through the application of achievement and practical tests were applied to the research sample at the end of the experiment

-Implementation stage

The smart learning environment based on the two types of e-learning (synchronous asynchronous) was used through the application of specific strategies and the use of a variety of tasks and activities that are relevant to the lesson's subject and connected to real-world events, situations, and applications by the researcher, who serves as the subject teacher and is capable of implementing the design in all of its details. The lesson plans were carried out in accordance with the timetable that was assigned to them via the Google Classroom electronic platform.

-Evaluation stage

As part of the initial assessment, a panel of arbitrators and experts in computer education were shown the lesson plans and the procedures for putting them into practice (Appendix 3).

And structural evaluation through the completion of student examinations and weekly electronic lectures. Final evaluation using the accomplishment exams designed for this purpose, both theoretical and practical. In order to guarantee that each step was well-prepared, appropriate for the kids' mental ages, and accurately represented scientific material, it was produced and presented to specialists.

-Experimental design selection:

For gauging achievements, a semi-experimental design with two comparable sets and a post-test was used, As shown in Table (3).

Table (3): Experimental design

Group	Equivalence variable	the independent variable	The dependent variable
Experimental -1	1-Age 2 -level of intelligence	synchronous e-learning	acquisition of computer application skills
Experimental -2		asynchronous e-learning	

- **Research community and sample**:

The research community was determined by the students of the Department of Law at the University College of Elm City for the academic year 2021-2022 AD, while the research sample was randomly selected with two groups, group (A) experimental and consisting of (19) male and female students, and group (B) consisting of (21) male and female students.

And the statistical equivalence procedure for the variables that may have an effect in the dependent variable with the independent

variable and adopt that the members of the two groups are equivalent .

Preparation of experience requirements

To accurately conduct the experiment, the following information was configured:

A - Making lesson plans: ten) lesson plans were created, one for the experimental group and one for the control group. They were produced using the techniques and strategies of teaching that went along with them, and their validity was verified by showing a model of them to the Committee of Experts.

B - Open a special channel for each group to communicate with students through the program (Telegram) to communicate with students and send assignments and study materials either through paper summaries printed or video clips.

C - Establish virtual classes for each group on the platform (Google Classroom) so that the researcher and students can communicate and use the app on their computers, smart devices, and the Internet to watch lectures, assignments, and academic content posted there. You can also use the Google Meet application to deliver lectures.

-Building two research tools (achievement test and observation card) :

The test aims to measure the extent to which the research sample acquires the skills of computer applications scheduled for the first semester of the academic year.(2021-2020)

Since the skills of computer applications include a theoretical aspect and a practical side, the researcher has:-

-Building the achievement test for the theoretical subject

Stages of building the collection choices

Two dimensions have been added to the table of specifications (test map): the first is the relative weight of the behavioral goals of the forty-four cognitive behavioral goals spaced across the domains of Bloom's categorization of the six cognitive goals (remembering, comprehension, application, analysis, composition, and evaluation). Also, the number of weekly lectures and the proportional weight of the academic material indicate the second, while the test map was appropriately utilized to distribute the test paragraphs. As prepared, this is a multiple-choice objective paragraph (20) with four alternatives to the answer. The test's total score runs from 0 to 20 degrees, with an average hypothesis of 10 degrees. One of them symbolizes the correct response, and the standard of correction for it is (0.1). Zero is assigned for the incorrect and abandoned answer, and one degree is assigned for the correct answer. The virtual exam's authenticity is confirmed by putting it in front of a panel of experts with computer-based teaching expertise, and the content's validity is confirmed by creating a test (map-test) that represents the study material's paragraphs in terms of their content and behavioral objectives.

Using an application to a community sample that is representative, the following

The discrimination coefficient for each of the substantive paragraphs in the styles of the two extreme groups was found to vary between 0.59 and 022. The difficulty coefficients were also calculated for each of the substantive paragraphs and were found to range between 0.74-0.33.

According to several measurement and assessment experts, the difficulty coefficient should fall between 0.20-0.80 (Odeh, 1998, p. 297).

The decision was made to maintain the alternatives in their original form after determining that all of the false alternatives' efficacy for the objective test paragraphs was negative.

-Stability of the test: The test's stability coefficient was determined using the Alpha Cronbach equation, which is best suited for achievement tests with essay and objective questions. The stability coefficient's value was thus 85%, indicating that the test is ready for application to a research sample in its final form.

-Building a practical performance appraisal tool (note card)

For the purpose of evaluating the student's performance directly during his performance of each skill of computer application skills, the researcher prepared an observation form, which is the final practical performance evaluation tool, and the observation form included the conversion of each performance activity into specific and sequential behavioral steps and actions developed by descriptions on a descriptive assessment scale graphical (five dimensions) to help determine the level of performance and increase the clarification of the

dimension to be measured, Thus, the assessment process will be facilitated, and for the purpose of designing a note card through which the main skills are divided and converted into sub-skills to facilitate the process of observing and measuring them for the purpose of evaluating students while using the computer inside the laboratory, and the maximum score of the evaluation tool was calculated by finding the product (the number of activities in the highest degree of the quintuple scale).

i.e. (five activities * the highest score of the pentatonic scale (4))

Thus, the score of the practical final exam on the observation form ranges (20-0) marks.

The credibility of the tool was calculated in the manner of virtual honesty, and the observation form was presented in its initial form with the vocabulary of the study to the group of arbitrators in teaching computers, measurement and evaluation Appendix (4). The researcher has taken an agreement rate (80%).

More criteria for accepting each paragraph of the note card was calculated stability through observation of five students and re-observation after two weeks. Pearson's correlation coefficient was calculated as a correlation coefficient between the degrees of the first and second observations. It found that the coefficient of stability is (0.86), which is statistically significant.

-Procedures for applying the experiment:

The following actions were taken by the researcher to guarantee the experiment's success: In order to facilitate communication between the researcher and students as well as to help with assignment organization and management, two independent classes were established on the Google Classroom platform: one for the experimental group and the other for the control group. The classes are based on the Internet, smart devices, and computers, and students can watch and view lectures, assignments, and academic content that are published on the application. In order to facilitate student subscription, students were invited to join the classes by entering their email address.

Using the application (Google Meet) through the virtual class of the first experimental group through the application (Google Classroom) to give lectures simultaneously.

The scientific content was taught in accordance with the two groups' weekly schedules, if the first group is taught directly through direct explanation, which is interspersed with a presentation of PowerPoint slides, videos and still images, and simultaneous communication between students and teacher and between the student and his colleagues, and what has been presented is reviewed, and activities are discussed electronically by Google Meet.

As for the second group, the same educational material is taught by sending a lecture video, PowerPoint slides, paper summaries, and following up on activities and duties through the application (Google Classroom) and according to the weekly schedule as well as the student is left free to study and see his time and asynchronous communication with the teacher and with his fellow students. It is required to attend the tests on time only .

C. Establishing two dedicated channels for student communication using the Telegram software.

The following was carried out following the completion of the course instruction for the two research groups: -

-Applying the theoretical achievement test to the two research groups (experimental and control) in attendance at the college, on Sunday, 16/1/2022, and the exam date was disclosed to the kids ahead of time when it was acceptable.

-The practical test was applied in person to the two research groups and with the help of the teachers in the computer laboratory after training them on the use of the observation card on the days (17, 18 and 19/1/2022)

-Presentation and interpretation of results

The results will be presented according to the two research objectives as follows

1. The initial goal, which was to create an intelligent learning environment based on synchronous and asynchronous e-learning patterns, has been accomplished.

The previously stated processes and steps involved in the design phases were used to provide the specifics of accomplishing this aim.

2. The influence of the smart learning environment, which is based on synchronous and asynchronous e-learning patterns, on students' acquisition of computer applications was revealed by verifying the second aim.

By verifying:
* The first hypothesis: which states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart educational environment based on synchronous e-learning and the control group students who study according to a smart educational environment based on asynchronous e-learning in the theoretical computer applications test.)

The outcomes were as follows: the achievement test was administered to the research sample, the answer sheets were corrected, the grades were tracked, the arithmetic mean and standard deviation of the experimental and control groups were computed, the T-test was used for two independent samples, and the statistical program Spss was utilized. (4)

Table (4): The average of the two groups on the theoretical achievement test

Group	The number	Average calculation	Standard deviation	t-value		Statistical significance
				calculated	table	
Experimental -1	20	15.85	1.38	5.09	2.04	Statistical significance function at level Significance (0.05) and degree of freedom (38)
Experimental -2	20	13.55	1.46			

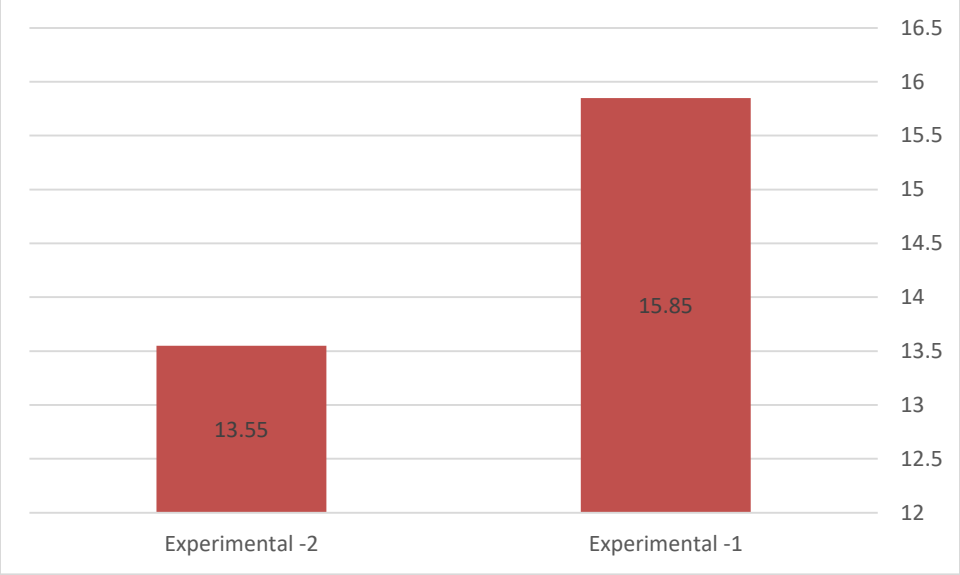

Figure (2): The theoretical achievement test mean for each of the two groups

According to Table (4) and Figure (2), the students in the first experimental group had an arithmetic mean of 15.85 and a standard deviation of 1.38, whereas the students in the second experimental group had an arithmetic mean of 13.55 and a standard deviation of 1.46.

Accordingly, the first experimental group's scores were more homogenous than the second experimental group's degrees, and there is a discernible difference between the values of the two averages.

, furthermore, it appears that the calculated T value equals (5.09), which is higher at the significance level (0.05) and degree of freedom (38) than the tabular T value of (2.04). This supports the first research hypothesis by demonstrating that the difference between the two averages is significant and favors the average of the first experimental group.

* The second hypothesis: which states that (there is a statistically significant difference at the level of significance (0.05) between the average scores of the students of the first experimental group who study according to a smart educational environment based on synchronous e-learning and the control group students who study according to a smart educational environment based on asynchronous e-learning in the practical computer applications test)

Through the application of the practical test using the observation card and the total score for each student from the research sample, and the arithmetic mean and standard deviation of the two groups (the first experimental group and the second experimental group), as well as the T-test (t-test) for two independent samples. The findings were then shown using the statistical application Spss (5).

Table (5):Average of the two groups on the practical test

Group	The number	Average calculation	Standard deviation	t-value		Statistical significance
				calculated	table	
Experimental -1	20	14.251	1.585	5.09	2.04	Statistical significance at level Significance (0.05) and degree of freedom (38)
Experimental -2	20	11.250	1.831			

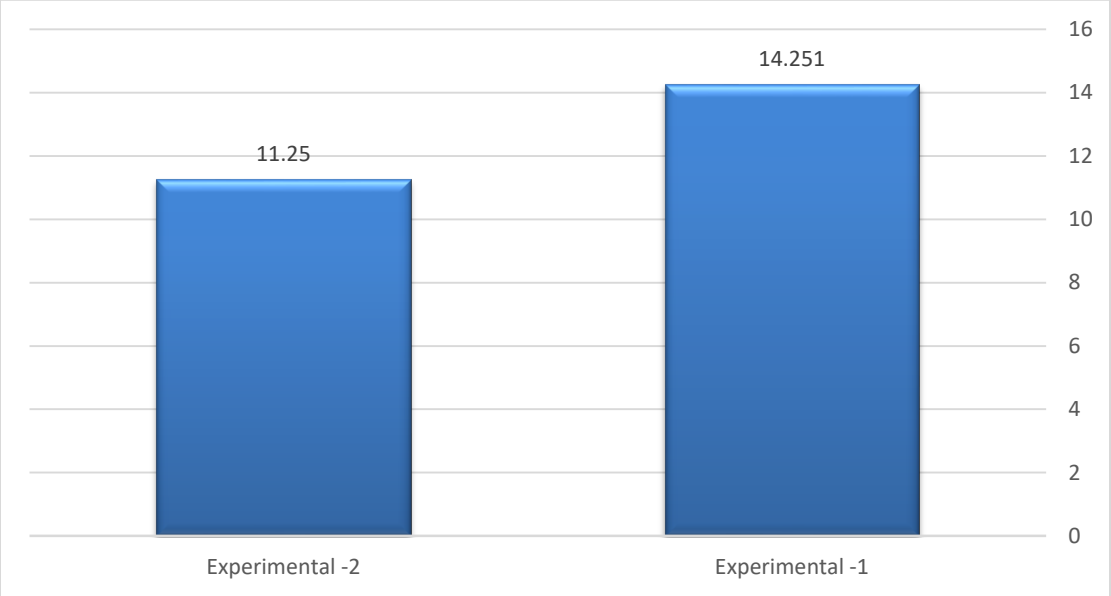

Figure (3):the two groups' average on the practical exam.

The arithmetic mean of the student scores for the first experimental group is equal to (14.251) with a standard deviation of (1.585), while the arithmetic mean of the student scores for the second experimental group was (11.250) with a standard deviation of (1.831). This indicates that there is a discernible difference. These results are shown in Table (5) and Figure (3). The first experimental group's degrees were more homogenous than the second one between the values of the two averages.

Additionally, it appears that the calculated T value equals (5.538), which is greater than the tabular T value of (2.04) at the degree of freedom (38) and the significance level (0.05). This supports the second research hypothesis by demonstrating that there is a significant difference between the two averages that are in favor of the first experimental group's average.

This indicates that compared to the achievement of the second experimental group, the students in the experimental group perform better in the smart learning environment built around synchronous and asynchronous e-learning patterns.

The magnitude of the difference resulting from the use of the T-test is due to the effect of the smart learning environment based on synchronous and asynchronous e-learning patterns and not on other variables.

This finding is consistent with those of Tsuei (2014) and Moallem (2015).

Based on the above, the researcher believes that the results of the first experimental group and the second experimental group in the theoretical test and the practical test in the achievement are good, and more than the average may be attributed to the smart learning environment based on the two types of synchronous and asynchronous e-learning:

A - has been created with the needs of students' education in mind. The educational content has been presented in a way that is somewhat different from how students are used to it in terms of time and space. Additionally, the variety of educational activities and the use of different digital information sources, along with the student's active participation in the exchange of information and the qualitative and quantitative search for information, have all contributed to the student's motivation to learn and acquire knowledge.

B. By incorporating activities that connect students' prior knowledge with the new knowledge they are to learn, as well as their current knowledge with their prior knowledge, you can put them in mentally taxing situations that stimulate their thinking, push them to comprehend the material, and ultimately increase their knowledge of the subject.

C: It gave students the chance to interact electronically via the learning platform outside of the scheduled class, which helped them comprehend, come up with more ideas, freely express them, share them with others, and be open to hearing what others have to say.

D. Putting the students at the center of the learning process and encouraging them to engage with the material through blogs, websites, and specialized groups. This will facilitate their access to rich and engaging learning opportunities that will break through their feelings of boredom and frustration and grow their spirit of enjoyment and joy.

F - Provide diversity in the use of digital learning strategies that contributed to giving students independence and self-reliance in the search for information from many sources of information via the Internet. It also encouraged students to continue learning, communicating and integrating into learning networks and active participation in them without being restricted by the factors of time and place.

-Recommendations:

In light of his findings, it can be recommended:

A - Providing infrastructure represented by the necessary supplies for electronic learning environments, represented by laptops and smartphones at subsidized prices for students and teachers, as well as providing the Internet for all students.

B - Establishing rehabilitation courses for teachers to train them on e-learning techniques and designing e-learning environments.

-propositions

To complement the findings of this research, the researcher proposes

1-Designing smart learning environments based on the two types of e-learning (synchronous asynchronous) in teaching other subjects

2-The effect of using a smart learning environment based on the two types of e-learning (synchronous and mixed) in teaching other subjects.

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