African Journal of Advanced Studies in Humanities and Social Sciences (AJASHSS)
المجلة الإفريقية للدراسات المتقدمة في العلوم الإنسانية والاجتماعية
Online-ISSN: 2957-5907
Volume 4, Issue 1, January - March 2025
Page No: 93-102
Website: https://aaasjournals.com/index.php/ajashss/index
Arab Impact factor 2024: 0.81 **SJIFactor 2024: 6.856** **ISI 2024: 0.846**

Proposed strategy effectiveness Imams on collaborative learning Electronic In developing social intelligence among student teachers Mathematics major

Muneara Shaili A Saki *
General Department, College of Engineering Technology, Zuwara, Libya

فاعلية استراتيجية مقترحة قائمة على التعلم التشاركي الإلكتروني في تنمية الذكاء الاجتماعي لدى الطلاب المعلمين تخصص الرياضيات

منيرة شعيلى صاكى *
القسم العام، كلية التقنية الهندسية، زوارة، ليبيا

*Corresponding author: moniabdo2024@gmail.com

Received: December 01, 2024	Accepted: January 15, 2025	Published: January 22, 2025

Abstract:
The current research aims to know the effectiveness of using the e-collaborative learning strategy in developing social intelligence among student teachers specializing in mathematics. To achieve this, the researcher chose a research sample consisting of seventy-two male and female students in the third year at the Faculty of Education, divided into two groups: the experimental group, which includes (36) male and female students, and the control group, which includes (36) male and female students. The researcher also prepared a set of tools represented in: the social intelligence scale, the list of criteria for designing the e-collaborative learning strategy, the educational design of the e-collaborative learning strategy, an electronic teacher's guide for using the e-collaborative learning strategy, and an electronic booklet to guide students when using educational content related to social intelligence using the collaborative learning strategy. After applying the research tools, the results of the application showed a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the social intelligence scale at the levels of (social skills - social etiquette - social communication - leadership behavior) in favor of the experimental group. The researcher recommended the need to pay attention to using electronic teaching methods such as the e-collaborative learning strategy in Teaching mathematics.

Keywords: Electronic collaborative learning strategy, social intelligence, student teachers, mathematics specialization.

الملخص
يهدف هذا البحث إلى معرفة فاعلية استخدام استراتيجية التعلم التشاركي الإلكتروني في تنمية الذكاء الاجتماعي لدى الطلاب المعلمين تخصص الرياضيات, ولتحقيق ذلك اختار الباحث عينة بحثية تكونت من اثنان وسبعين طالبًا, وطالبة بالفرقة الثالثة بكلية التربية, قسمت إلى مجموعتين: المجموعة التجريبية وتضم (36) طالبا وطالبة, والمجموعة الضابطة تضم (36) طالبا وطالبة, كما أعد الباحث مجموعة من الأدوات تمثلت في: مقياس الذكاء الاجتماعي, وقائمة معايير تصميم استراتيجية التعلم التشاركي الإلكتروني, والتصميم التعليمي لاستراتيجية التعلم التشاركي الإلكتروني, ودليل معلم إلكتروني لاستخدام استراتيجية

التعلم التشاركي الإلكتروني, وكتيب إلكتروني لإرشاد الطلاب عند استخدامهم للمحتوى التعليمي المرتبط بالذكاء الاجتماعي باستخدام استراتيجية التعلم التشاركي, وبعد تطبيق أدوات البحث أظهرت نتائج التطبيق وجود فرق دال إحصائيا عند مستوى دلالة (0,01) بين متوسطي درجات طلاب المجموعة التجريبية والضابطة في التطبيق البعدي لمقياس الذكاء الاجتماعي في مستويات (المهارات الاجتماعية- اللباقة الاجتماعية- التواصل الاجتماعي- السلوك القيادي) لصالح المجموعة التجريبية, وأوصى الباحث بضرورة الاهتمام باستخدام طرق تدريس إلكترونية مثل استراتيجية التعلم التشاركي الإلكتروني في تدريس الرياضيات.

الكلمات المفتاحية: استراتيجية التعلم التشاركي الإلكترونية، الذكاء الاجتماعي، الطلاب المعلمون تخصص الرياضيات.

Introduction

The development in the field of information technology and network and communication systems has clearly reflected on all fields in general, and the field of education in particular. Educational institutions are no longer able to provide education and learning services in light of this development, which has prompted educators to search for the best ways and means to present educational content in an interactive manner and in an educational environment that attracts the attention of learners and encourages them to exchange opinions and experiences, and obtain and exchange information without A Commitment to a specific place or time to receive the learning process.

The environment plays Educational An important and major role in raising the quality and efficiency of the process. education, and most Instructional Designers They do not give the environment Educational Their right when designing and implementing their programs Educational Which directly affects the effectiveness of the program. Educational In terms of achieving its short-term goals, the environment as a general concept is everything that surrounds us, and when we link it by education It means everything that surrounds us during the process. Education This includes the place, its material equipment, and consideration of the psychological aspects and physical comfort of the participants.

Collaborative learning represents one of the most important modern systems, as it gives learners the opportunity to interact socially and participate collectively in order to build a new cognitive structure in a way that allows for continuous learning based on the use of modern technologies and means of communication [1].

Reham Al-Ghoul [2] says that education has been affected by the development of modern technological services, applications and tools that have added a new dimension to it, which is called collaborative training, as it is considered one of the types of group training based on groups that participate to achieve goals or carry out specific tasks. It is designed in light of the needs and characteristics of learners, as participation takes place in the context of the training content provided, the training process and its outcomes. Many countries in the world and educational and teaching institutions have moved towards expanding the e-training process and benefiting from information technology in this field, and e-training has become one of the most important and modern methods in the professional development of learners.

Universities have sought to create a generation of students who are well-prepared scientifically and morally. Therefore, it has become necessary to pay attention and focus on their social side so that they can work in various professions in the future and achieve success in them, through their ability to build successful and capable relationships with others, and encourage the spirit of work. This is called social intelligence [3].

Young people need someone to guide them and inform them of their abilities and readiness so that their planning for the future is realistic. Therefore, many studies have confirmed the existence of a strong relationship between social intelligence and the academic success of the individual [4].

By using the individual's social intelligence, he can interact with others easily and smoothly, through his ability to understand others and deal with them effectively. The individual affects society and is affected by it, and each individual has his own behavioral methods. Therefore, scientists try to develop the levels of social intelligence among individuals because of its great importance to them [5].

- **Research problem:**

The research problem can be summarized in that many student teachers specializing in mathematics find difficulty in social intelligence and its use. This difficulty is represented in: their lack of social interaction with learners in practical education, the inability to communicate, and the inability to adapt socially with students, in addition to the ineffectiveness of the prevailing teaching methods in developing their social intelligence. The phenomenon of the weakness of student teachers in social intelligence is unmistakable to the eye of the seer, and what confirms this are the results of the exploratory study conducted by the researcher, which was represented in applying a exploratory study on a sample of (40) students from the third year students at the Faculty of Education, specializing

in mathematics at the University of Zawia. The results showed that there was a weakness among students in social intelligence, as (80%) of the students obtained low scores in the test, which prompted the researcher to use the strategy of electronic collaborative learning in an attempt to treat the weakness of third year students specializing in mathematics in social intelligence.

The solution to this problem can be found in answering the following main question:

- What is the effectiveness of the e-learning collaborative strategy in developing social intelligence among student teachers specializing in mathematics?

The following sub-questions arise from this main question:

1- What is the level of social intelligence among student teachers majoring in mathematics?
2- What are the criteria for designing an e-learning collaborative strategy to develop social intelligence?
3- What is the appropriate educational design for a collaborative learning environment to develop the level of social intelligence among student teachers specializing in mathematics?
4- What is the effectiveness of the e-learning collaborative strategy in developing social intelligence among student teachers specializing in mathematics?

- **Research hypotheses:**

1- There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the grammatical concepts test (social skills level) in favor of the students of the experimental group.
2- There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the grammatical concepts test (social etiquette level) in favor of the students of the experimental group.
3- There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the grammatical concepts test (social communication level) in favor of the students of the experimental group.
4- There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the grammatical concepts test (level of leadership behavior) in favor of the students of the experimental group.

- **Research objectives:**

The research aims to:

1- Design of a collaborative e-learning strategy.
2- Measuring the effectiveness of the e-learning collaborative strategy in developing social intelligence among student teachers specializing in mathematics.

- **Importance of research:**

This research may be useful:

1- Students: (research sample) in treating their social intelligence deficits.
2- Those in charge of the educational process: In directing the attention of those in charge of the educational process and curriculum development to the importance of collaborative e-learning as an educational method that depends on participation in performance, which is the desired learning.
3- Other researchers: To conduct further educational studies on social intelligence using other teaching strategies.

The researcher followed the developmental research method as defined by [6] It is an integration of: a) The descriptive approach: to answer the first and second sub-questions. 2) The approach to developing learning systems ISD The researcher uses it to answer the third sub-question by applying the educational design model to the learning environment. Participatory For development Social intelligence3) The experimental method: This is when measuring the effect of the independent variable. and, Collaborative learning on the variable the follower and heand, social intelligence among student teachers majoring in mathematics; and the answer to the question Sub Fourth.

- **Research limits:**

1- Human boundaries: A sample of third-year students in the Faculty of Education, specializing in mathematics, was divided into two groups: an experimental group and a control group.
2- Spatial boundaries: Faculty of Education, University of, Zawiya Municipality.
3- Objective boundaries are: social intelligence of student teachers specializing in mathematics.
4- Time frame: Second semester of the academic year 2023/2024.

- **Search procedures:**

To answer the research questions, the following procedures were followed:

1- Reviewing previous Arabic and foreign literature and studies related to the research topic, in order to benefit from them in preparing research tools and the theoretical framework for the research.
2- Preparing the educational design for the e-learning collaborative strategy.
3- Show the search tools to the referees.
4- Selecting the research sample and dividing it into two groups (control and experimental).
5- Applying the social intelligence scale pre-tested on the experimental and control research groups and monitoring the results.
6- The experimental group was taught using the e-learning collaborative learning strategy, while the control group was taught using the usual teaching method.
7- Applying the social intelligence scale to the two research groups and monitoring the results.
8- Conducting appropriate statistical processing of data and verifying the validity of hypotheses.
9- Display and interpret search results.
10- Providing recommendations and suggestions in light of the results.

- **Search terms:**

- **Collaborative e-learning**

It is known procedurally as: It is the educational process carried out by learners through their carrying out of many collaborative activities so that they participate together in completing them and achieving collaborative educational goals, through which higher levels of social intelligence are acquired among student teachers specializing in mathematics.

- **Social intelligence:**

It is the ability to understand men, women and boys and the ability to deal with them and act wisely in human relations [3].

It is procedurally known as: It is the ability of student teachers to adapt socially and understand others by performing many behaviors that help in understanding those around them.

Material and methods

- **Experimental design of the research:**

This research used the experimental design known as the pre-post measurement for the experimental and control groups. This design in the current research includes one experimental group and one control group.

- **Research groups:**

- Experimental group: studied using e-collaborative learning, and the group numbered (36) students.
- Control group: studied using the traditional method, and its number was (36) students.

- **Research variables defined and controlled:**

A. The independent variable: In this research is e-collaborative learning.
B. Dependent variable: In this study is social intelligence.

- **Research community and sample:**

Description of the research sample: The research sample consisted of third-year students at the Faculty of Education at Zawiya University, in the Zawiya Municipality, in the second semester of the academic year 2023/2024 AD. Students from the third year were selected and divided into two groups, one experimental and the other control. The number of students in the experimental group was (36) students, and the number of students in the control group was (36) students.

- **Exploratory test experience:**

The research tool (Social Intelligence Scale) was applied to a survey sample of (30) third-year students at the College of Education, on Sunday 2/4/2024 AD, and the application was repeated on 2/11/2024 AD, with the aim of controlling and standardizing the research tool by calculating the validity and reliability of the research tool.

- **Procedures for implementing the experiment:**

The researcher taught the educational content to third-year students in the Faculty of Education, specializing in mathematics, using the previously prepared collaborative e-learning strategy. The researcher preferred to teach the experimental group, in order to be assured that the teaching procedures were carried out accurately, while the teacher of the control group taught the same topics to the students, but using the usual procedures in social intelligence.

The researcher noticed the following while applying his research:

- Students accepted the e-collaborative learning strategy, as they expressed their great admiration for the strategy's electronic portal.
- Students' enthusiasm to interact and participate through the electronic portal of the collaborative strategy.
- Students' interest in undertaking educational activities included in the electronic portal of the participatory strategy.
- Students praised the multiple stimuli contained in the collaborative strategy portal, which stimulated more than one sense at the same time.
- Students want to have their courses delivered to them in this electronic manner.
    - **Statistical methods used:**
- For statistical analysis of the research data, the researcher used the Statistical Package for the Social Sciences known as 18.V (SPSS).
- The researcher used descriptive statistical analysis, arithmetic means, standard deviation, and the largest and smallest degree.
- The researcher used correlation coefficients to study the validity and reliability of the tools.
- The researcher used the Mann-Whitney test to determine the significance of the difference between the scores of two independent groups.
- The researcher used the (t) test to indicate the difference between the average scores of the two groups.
- The researcher used the post-test analysis to measure the effect size and eta square.

Results and discussion

Testing the validity of the first hypothesis: It states:

"There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the social intelligence scale (social skills level) in favor of the students of the experimental group."

To test the validity of this hypothesis, the research data were described and summarized by calculating (arithmetic mean, standard deviation, highest score, and lowest score) for the scores of the experimental and control groups in the post-application of the social scale (level of social skills), as shown in the following table:

Table (1) Descriptive statistics of the scores of the two groups in the post-application (social skills).

Scale	The group	Number	Arithmetic mean	Standard deviation	lowest degree	highest degree	Above average	Final grade
Social skills	Empiricism	36	8.51	1.33	5	10	2.88	10
	The officer	36	5.64	1.29	4	9		

It is clear from the table above that the average scores of the experimental group in the social intelligence scale (social skills) level reached (8.51) of the final score and its value is (10) points, which is higher than the arithmetic average of the scores of the control group, which reached (5.63) points of the final score, with a difference of (2.88) points, which indicates the existence of a difference between the average scores of the experimental and control research groups in the post-application in favor of the experimental group. It is also clear that the homogeneity of the experimental group scores is greater than the control group scores = (standard deviation / arithmetic mean) as a result of their exposure to the experimental treatment (teaching with the e-collaborative learning strategy).

To verify the statistical significance of the difference between the two means, the t-test was used for the two independent groups. By applying the t-test for the difference between the means to measure the significance of the difference between the means of the scores of the two research groups, the following became clear:

Table (2) Results of the "t" test for the difference between the average scores of the two groups in social intelligence (social skills).

Scale	The group	Arithmetic mean	Standard deviation	T value	Degree of freedom	Significance level
Social skills	empiricism	8.51	1.33	9.41	71	Function at 0.01 level
	The officer	5.64	1.29			

It is clear from the previous table that the calculated "t" value reached (9.41) and exceeded the tabular "t" value at a degree of freedom of (71) and a significance level of (0.01), which indicates the existence of a real difference between the averages of the scores of the experimental and control groups in the post-application in favor of the experimental group (with the larger average).

It is clear from the above that there are statistically significant differences and results at the level of (0.01) between the averages of the scores of the experimental and control groups in the post-application of the social intelligence scale for student teachers specializing in mathematics (social skills level) in favor of the experimental group. Statistical significance alone is not sufficient to test the research hypotheses. It is a necessary condition, but it is not sufficient. Necessity is achieved by the presence of statistical significance, and sufficiency is achieved by calculating the effect size and the degree of importance of the result that has been proven to exist statistically. Therefore, statistical significance tests must be followed by some procedures to understand the morality of the statistically significant results and determine the importance of the results that have been reached. Among these methods appropriate for the current research are the effect size and Eta square methods.^{2}N.
Therefore, the current research relied on calculating the practical significance of the results that were reached by applying the Eta Square measure, which is used to determine the degree of importance of the result that was proven to exist statistically, as shown in the following Table (3): Results of applying the Eta Square measure (^{2}N) and the effect size:

Table (3) Eta square scale (^{2}N) and the effect size.

Variable	value "T"	Degree of freedom	Significance level	Eta square	Effectiveness	Effect size	Impact level
Social skills	9.41	71	Function at 0.01 level	0.54	Highly effective and educationally important	2.21	big

It is clear from the table that the value of the square measure of eta (^{2}N) For the results of the experimental and control groups in the post-application scores (0.54), and this result exceeded the value indicating the educational importance of statistical results in psychological and educational research, and its amount is (0.14) [7].
It means that (54%) of the variance between the average scores of the experimental and control groups is due to the variable of educational treatment, i.e. (54%) of the variance between the two groups in social skills can be explained by the difference in educational treatment to which the two research groups were exposed. Also, the effect size = 2.21 exceeded the correct one, which means that the effect is very large: i.e. there is a great effect and effectiveness, and an educational mission for using the e-collaborative learning strategy in developing the level of social intelligence (social skills).

Testing the validity of the second hypothesis: It states:
"There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the social intelligence scale (level of social etiquette) in favor of the students of the experimental group."
To test the validity of this hypothesis, the research data were described and summarized by calculating (arithmetic mean, standard deviation, highest score, and lowest score) for the scores of the experimental and control groups in the post-application of the social scale (level of social etiquette), as shown in the following table:

Table (4) Descriptive statistics of the scores of the two groups in the post-application (social etiquette).

Scale	The group	Number	Arithmetic mean	Standard deviation	lowest degree	highest degree	Above average	Final grade
Social etiquette	Empiricism	36	3.30	0.68	2	4	1.20	4
	The officer	36	2.15	0.71	1	3		

It is clear from the table above that the average score of the experimental group in the social intelligence scale (social etiquette) level reached (3.30) of the final score and its amount is (4) points, which is higher than the arithmetic average of the scores of the control group, which reached (2.15) points of the final score with a difference of (1.20) points, which indicates the existence of a difference between the average scores of the experimental and control research groups in the post-application in favor of the experimental group. It is also clear that the homogeneity of the experimental group scores is greater than the control group scores = (standard deviation / arithmetic mean) as a result of their exposure to the experimental treatment (teaching with the e-collaborative learning strategy).
To verify the statistical significance of the difference between the two means, the t-test was used for the two independent groups. By applying the t-test for the difference between the means to measure the significance of the difference between the means of the scores of the two research groups, the following became clear:

Table (5) Results of the "T" test for the difference between the average scores of the two groups in social intelligence (social tact).

Scale	The group	Arithmetic mean	Standard deviation	T value	Degree of freedom	Significance level
Social etiquette	empiricism	3.30	0.68	7,10	71	Function at 0.01 level
	The officer	2.15	0.71			

It is clear from the previous table that the calculated "t" value reached (7.10) and exceeded the tabular "t" value at a degree of freedom of (71) and a significance level of (0.01), which indicates the existence of a real difference between the average scores of the experimental and control groups in the post-application in favor of the experimental group (with the larger average).
Therefore, the hypothesis was accepted, which states that there are statistically significant differences and results at the level (0.01) between the average scores of the experimental and control groups in the post-application of the social intelligence scale for student teachers specializing in mathematics (social tact level) in favor of the experimental group.
As shown in the following table (6), the results of applying the Eta Square measure (^{2}N) and the effect size:

Table (6) Eta square scale (^{2}N) and the effect size.

Variable	value "T"	Degree of freedom	Significance level	Eta square	Effectiveness	Effect size	Impact level
Social etiquette	7,10	71	Function at 0.01 level	0.40	Highly effective and educationally important	1.66	Big

It is clear from the table that the value of the square measure of eta (^{2}N) For the results of the experimental and control groups in the post-application scores (0.40), which means that (40%) of the variance between the average scores of the experimental and control groups is due to the variable of educational treatment, i.e. (40%) of the variance between the two groups in social skills can be explained by the difference in educational treatment to which the two research groups were exposed: Also, the effect size = 1.66 exceeded the correct one, which means that the effect is very large: i.e. there is a great effect and effectiveness, and an educational mission for using the e-collaborative learning strategy in developing the level of social intelligence (social etiquette).

Testing the validity of the third hypothesis: It states:
"There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the social intelligence scale (social communication level) in favor of the students of the experimental group."
To test the validity of this hypothesis, the research data were described and summarized by calculating (arithmetic mean, standard deviation, highest score, and lowest score) for the scores of the experimental and control groups in the post-application of the social scale (level of social communication), as shown in the following table:

Table (7) Descriptive statistics for the scores of the two groups in the post-application (social communication).

Scale	The group	Number	Arithmetic mean	Standard deviation	lowest degree	highest degree	Above average	Final grade
Social Media	Empiricism	36	23.45	5.30	5	30	8.88	30
	The officer	36	16.10	3.20	10	25		

It is clear from the table above that the average scores of the experimental group in the social intelligence scale (social communication) level reached (23.45) of the final score, which is (30) points, which is higher than the arithmetic average of the scores of the control group, which reached (16.10) points of the final score, with a difference of (8.88) points, which indicates the existence of a difference between the average scores of the experimental and control research groups in the post-application in favor of the experimental group. It is also clear that the homogeneity of the experimental group scores is greater than the scores of the control group = (standard deviation / arithmetic mean) as a result of their exposure to the experimental treatment (teaching with the e-collaborative learning strategy).
To verify the statistical significance of the difference between the two means, the t-test was used for the two independent groups. By applying the t-test for the difference between the means to measure the significance of the difference between the means of the scores of the two research groups, the following became clear:

Table (8) Results of the "T" test for the difference between the average scores of the two groups in social intelligence (social communication).

Scale	The group	Arithmetic mean	Standard deviation	T value	Degree of freedom	Significance level
Social etiquette	Empiricism	23.45	5.30	8.80	71	Function at 0.01 level
	The officer	16.10	3.20			

It is clear from the previous table that the calculated "t" value reached (8.80) and exceeded the tabular "t" value at a degree of freedom of (71) and a significance level of (0.01), which indicates the existence of a real difference between the averages of the scores of the experimental and control groups in the post-application in favor of the experimental group (with the larger average).

Therefore, the hypothesis was accepted, which states that there are statistically significant differences and results at the level (0.01) between the average scores of the experimental and control groups in the post-application of the social intelligence scale for student teachers specializing in mathematics (social communication level) in favor of the experimental group.

As shown in the following table (9), the results of applying the Eta Square measure (^{2}N) and the effect size:

Table (9) Eta square scale (^{2}N) and the effect size.

Variable	value "T"	Degree of freedom	Significance level	Eta square	Effectiveness	Effect size	Impact level
Social etiquette	8.80	71	Function at 0.01 level	0.50	Highly effective and educationally important	2.01	Big

It is clear from the table that the value of the square measure of eta (^{2}N) For the results of the experimental and control groups in the post-application scores (0.50), which means that (50%) of the variance between the average scores of the experimental and control groups is due to the variable of educational treatment, i.e. (50%) of the variance between the two groups in social communication can be explained by the difference in educational treatment to which the two research groups were exposed: Also, the effect size = 2.01 exceeded the correct one, which means that the effect is very large: i.e. there is a great effect and effectiveness, and an educational mission for using the e-collaborative learning strategy in developing the level of social intelligence (social communication).

Testing the validity of the fourth hypothesis: It states:

"There is a statistically significant difference at a significance level of (0.01) between the average scores of the students of the experimental and control groups in the post-application of the social intelligence scale (level of leadership behavior) in favor of the students of the experimental group."

To test the validity of this hypothesis, the research data were described and summarized by calculating (arithmetic mean, standard deviation, highest score, and lowest score) for the scores of the experimental and control groups in the post-application of the social scale (level of leadership behavior), as shown in the following table:

Table (10) Descriptive statistics for the scores of the two groups in the post-application (leadership behavior).

Scale	The group	Number	Arithmetic mean	Standard deviation	lowest degree	highest degree	Above average	Final grade
Leadership behavior	Empiricism	36	35.80	4.40	28	44	13.50	44
	The officer	36	22.25	3.40	16	30		

It is clear from the table above that the average scores of the experimental group in the social intelligence scale (leadership behavior) level reached (35.80) of the final score, which is (44) points, which is higher than the arithmetic average of the scores of the control group, which reached (22.25) points of the final score, with a difference of (13.50) points, which indicates the existence of a difference between the average scores of the experimental and control research groups in the post-application in favor of the experimental group. It is also clear that the homogeneity of the experimental group scores is greater than the scores of the control group = (standard deviation / arithmetic mean) as a result of their exposure to the experimental treatment (teaching with the e-collaborative learning strategy).

To verify the statistical significance of the difference between the two means, the t-test was used for the two independent groups. By applying the t-test for the difference between the means to measure the significance of the difference between the means of the scores of the two research groups, the following became clear:

Table (11) Results of the "T" test for the difference between the average scores of the two groups in social intelligence (leadership behavior).

Scale	The group	Arithmetic mean	Standard deviation	T value	Degree of freedom	Significance level
Social etiquette	empiricism	35.80	4.40	14.60	71	Function at 0.01 level
	The officer	22.25	3.40			

It is clear from the previous table that the calculated "t" value reached (14.60) and exceeded the tabular "t" value at a degree of freedom of (71) and a significance level of (0.01), which indicates the existence of a real difference between the averages of the scores of the experimental and control groups in the post-application in favor of the experimental group (with the larger average).

Therefore, the hypothesis was accepted, which states that there are statistically significant differences and results at the level (0.01) between the average scores of the experimental and control groups in the post-application of the social intelligence scale for student teachers specializing in mathematics (level of leadership behavior) in favor of the experimental group.

As shown in the following table (12), the results of applying the Eta Square measure (^{2}N) and the effect size:

Table (12) Eta square scale (^{2}N) and the effect size.

Impact level	Effect size	Effectiveness	Eta square	Significance level	Degree of freedom	value "T"	variable
big	2.50	Highly effective and educationally important	0.70	Function at 0.01 level	71	14.60	Leadership behavior

It is clear from the table that the value of the square measure of eta (^{2}N) For the results of the experimental and control groups in the post-application scores (0.70), which means that (70%) of the variance between the average scores of the experimental and control groups is due to the variable of educational treatment, i.e. (70%) of the variance between the two groups in leadership behavior can be explained by the difference in the educational treatment to which the two research groups were exposed: Also, the effect size = 2.50 exceeded the correct one, which means that the effect is very large: i.e. there is a great effect and effectiveness, and an educational mission for using the e-collaborative learning strategy in developing the level of social intelligence (leadership behavior). These results (the results of the first, second, third and fourth hypotheses) are consistent with the findings of many studies that specialize in researching the effectiveness of collaborative e-learning, including: the study of [8, 9, 10 and 11].

This is due to the following reasons:

1- The ability of collaborative e-learning to enable communication, sharing, dialogue, and the exchange of opinions and ideas and their diversity, which leads to enriching the teaching and learning processes.
2- Exchange of ideas and views among students through the e-collaborative learning strategy; contributed to achieving a good understanding of the topics to be learned.
3- Student control over the display of module content elements, and the ability to revisit any part of the content as needed; leads to understanding the topics presented.
4- Use multimedia (texts, still and moving images, still and moving graphics, sound and sound effects...) to help students interact with them, which leads to attracting students' attention.
5- The availability of educational activities within the learning modules, each separately, helped students apply what they learned in a scientific way.
6- Training and reinforcement method for answers in the e-learning collaborative strategy; helped develop many skills for learners.
7- Adopting the e-learning strategy based on self-learning enables students to learn inside and outside the educational environment, and takes into account individual differences among learners.

- **Suggested research:**

In light of the results of the current research, there appears to be a need to conduct further research in this field, which would add depth and richness to it. Among these research and studies are:

1- Re-applying the current study to learners at various educational levels, such as secondary or preparatory school.
2- Studying the effect of training student teachers specializing in mathematics on collaborative e-learning on their teaching performance.

3- Evaluating the benefit of teachers and students from using the Internet as one of the modern information technology applications in teaching and learning mathematics at other levels.

Studying the effectiveness of using collaborative e-learning in developing visual mathematical thinking among secondary school students.

Conclusion

In light of the results of the current research that were reached through this research, as well as in light of what was stated in the theoretical framework on e-collaborative learning, the researcher recommends the following:

1- Benefit from the current study in implementing activities and training in a manner similar to the activities and training implemented in the electronic portal for the e-collaborative learning strategy.
2- The necessity of building educational curricula on the basis of developing social intelligence.
3- Focus on training mathematics teachers to employ technological methods and innovations in teaching learners.
4- Working on computerizing educational curricula, putting them on CDs, and distributing them to students with the prescribed book at the beginning of each academic year.
5- Working to provide universities with good internet service.
6- Holding training courses for student teachers in the Ministry of Education, so that they are trained on how to implement the e-collaborative learning strategy.
7- The necessity of providing the infrastructure and technical personnel to support e-learning.

.

References

[1] El Sarsi , Mahmoud (2021). The effectiveness of the e-collaborative learning strategy in developing grammatical concepts among middle school students. Journal of the Faculty of Education - Menoufia University, 1 (4), 133-158.

[2] AL ghoul,Reham Mohamed (2012). Differentiated Participatory Training, Education Magazine.*Electronic*,(14)E-Learning Unit, Mansoura University.

[3] Wadaa, Zahraa Abdul Wahid (2023). Social Intelligence among University Students. Journal of Psychological Sciences at Al-Mustansiriya University, 47 (103), 421- 442.

[4] Nasrallah, Omar Abdel Rahim (2004). Low level of school achievement and attainment: its causes and treatment, Cairo: Dar Wael.

[5] Al-Desouki, Mohamed Ghazi (2008). Social intelligence of educational activity supervisors and the superior ability in professional success. Cairo: Dar Al-Maktab Al-Jami'i Al-Hadith.

[6] Al-Jazzar, Abdul Latif Al-Safi (2014). The effectiveness of using two feedback patterns using computer simulation programs in developing learning tasks to solve computer operating problems among students of the Educational Technology Department. Journal of the College of Education, 25(100), 59-75.

[7] Murad, Salah Ahmed (2000). Statistical Methods in Psychological, Educational and Social Sciences, Cairo: Anglo Egyptian Library.

[8] Ismail, Aya Talaat (2014). The effect of designing a collaborative e-learning environment in light of the communication theory on developing achievement and personal knowledge management skills among learning technology students, unpublished master's thesis, Faculty of Specific Education, Tanta University.

[9] Nassar, Murtadha Jabbar (2015). The effectiveness of the e-learning collaborative strategy in developing the writing skills of secondary school students in the Republic of Iraq. Unpublished master's thesis, Faculty of Education, Mansoura University.

[10] Zawahra, Lara Ibrahim (2016). The effectiveness of using the e-collaborative learning strategy in developing the motivation of seventh grade students towards learning English. Unpublished master's thesis, Faculty of Education, Yarmouk University, Jordan.

[11] Abdel Aziz, Sahar Ali (2017). The effect of a program based on collaborative learning via web editors on developing some small business management skills and the tendency towards self-employment among technical commercial education students. Unpublished master's thesis. Faculty of Education, Suez Canal University, 170-176.