



## THE EFFECTIVENESS OF A CLOUD-BASED LEARNING PROGRAM IN DEVELOPING REFLECTIVE THINKING SKILLS IN ISLAMIC EDUCATION AMONG STUDENTS IN UAE

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### ABSTRACT

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It has been observed that students still lack understanding of the Shari'a concepts and principles and how to deal with them. Also, a lot of students deal with the Islamic Education superficially, with the absence of applying critical, reflective and creative thinking, on top of that, if the Islamic Education studies remain mainly dependent on memorization and reciting, it will not leaving tangible effects on students or their lifestyles, which necessitates forming modern educational models that help students develop the skills of reflective thinking of the Islamic Education. The study investigated the impact of a cloud-based learning program in developing reflective thinking skills in Islamic education among UAE students. The sample consisted of 94 students from tenth grade, who were divided into two equal groups: an experimental group that studied the course using a cloud-based learning program and a control group that studied the same course in the usual way. To achieve the study objectives, reflective thinking (pre/post-testing) was applied. The results showed a significant difference in reflective thinking as whole and all its skills, due to the teaching method in favor of the experimental group. The results also showed no significant difference between the mean of the experimental group's students on the post-test due to the gender variable This study contributed in developing an educational program based on cloud-based learning and educational techniques in educational curriculum and Islamic educational teaching methods, and revealed its effectiveness in improving reflective thinking skills. According to these findings, the study recommended the use of cloud-based learning strategies, especially in the future shifting towards the digital curricula.

**Contribution/Originality:** The most important contributions of this study were to develop an educational program based on cloud computing in teaching Islamic education that was proven effective. This study is one of the first studies that taught the Islamic education curriculum using cloud computing. This study also encourages schools to provide technology infrastructure and devices, tools necessary to activate cloud computing services, in a manner compatible with the numbers of students and their needs and calls for the preparation of various programs in the light of modern technological teaching strategies, especially in light of the future trend towards computerizing curricula.

### 1. INTRODUCTION

Advances in technology offer new opportunities in promoting teaching and learning new technologies enables individuals to customize the environment in which they work or learn with a range of tools to meet their needs and

interests (Masud and Huang, 2013). Education is now fully linked to information technology in content delivery, communication, sharing and collaboration, and the need for servers, storage and software is a key requirement for universities, colleges and schools. Cloud learning is one of the most important technological applications offered by cloud computing and is one of the latest technology solutions to improve learning and education, and to raise students' thinking skills. It uses virtualization technology and cloud computing extensively in the "infrastructure as a service" model, helping to save energy, cost and space in data centers. Virtualization is the cornerstone of cloud learning (Bandar, 2013). Development of critical thinking skills is one of the most important educational goals, which the school seeks to achieve among young people; out of its necessity to enable them to become thinkers and decision makers personal and community properly. The curriculum of Islamic education is one of the most prominent sources of learning which focuses on the development of thinking skills through learning the facts and concepts, principles, and values and using them in solving life problems.

The Holy Quran called for a direct call for reflection and contemplation of the universe. National standards for curriculum and evaluation in the UAE have emphasized the need to use modern teaching strategies, to develop thinking in all its forms, creative, critical and reflective, to invest technology through the Smart Learning program and to integrate into education through the effective integration of technology in all curricula, in addition to providing strong evidence supporting technology as an effective learning tool to enhance student learning and learning outcomes (Ministry of Education, 2016). This study was designed to demonstrate the effectiveness of a cloud-based learning program in the development of reflective thinking skills in Islamic education for students. Cloud computing is unified in form and content, and all users have easy-to-use interfaces and easy access. The process of maintenance, modernization and management is a reliable and reliable entity. All contents were reviewed and verified to match the original paper content in terms of health and completeness.

### *1.1. The Study Problem*

The teaching of Islamic education is characterized by different characteristics from the teaching of other subjects. The teaching of this subject is considered the most important link in the formation of the Muslim personality and its formulation from all mental, psychological, physical and social aspects (Aljallad, 2011). In the teaching of Islamic education, the weakness of students in understanding and dealing with jurisprudential and Shari'a rulings has been observed. Many of them have dealt with the concepts of Islamic education superficially in the absence and practice of thinking of various types: critical, creative and reflective, and the survival of Islamic concepts promoted by the curricula of Islamic education in the context of memorization without leaving a tangible impact on students. The researcher felt that there is an urgent need to find modern educational models to help students develop the skills of reflective thinking in Islamic education.

However, the results of the School Monitoring and Evaluation Standards Program show that nearly half of the schools in the Emirate of Abu Dhabi offer an acceptable level of education. About a quarter of schools offer a low level of education due to the low standard of quality. The results indicate that the poor performance of schools results from the fact that most of the teachers in these schools do not use technology and its applications, as they find themselves more comfortable with traditional teaching methods, and do not invest in the educational learning process (Department of Education and Knowledge, 2016) which reduces the importance of information received by students, and their ability to obtain grades, without paying attention to the cognitive outcome that will enable them to form intellectual capacity and the practice and use of reflective thinking in their daily lives.

Based on this, and in line with the global and local trends towards the use of computers in the field of education, it is necessary to deal with modern teaching and technical models that help students to learn as active thinkers who build their knowledge of their own efforts and internal motivation. Hence, the study investigated the effectiveness of a cloud-based learning program in developing the thinking skills of Islamic students.

### 1.2. The Study Objectives

The study sought to reveal the impact of the effectiveness of a cloud-based learning program in the development of reflective thinking skills in Islamic education among students.

The study attempted to test the following hypotheses:

- There were no significant differences in the level of ( $\alpha= 0.05$ ) in the development of reflective thinking skills among the tenth grade students in Islamic education in the UAE due to the teaching method.
- There were no significant differences at the level ( $\alpha= 0.05$ ) between the experimental group in the results of the reflective thinking posttest due to gender variable.

### 1.3. The Study Importance

This study drew on the importance of the subject matter: learning through cloud computing applications. The theoretical and scientific importance of the study is a theoretical addition to educational and research literature in the design of an educational model based on cloud computing and its impact on the development of students' thinking skills. It is also the basis for other similar studies on segments and variables.

In practical terms, the study aims to provide teachers, students and those interested in technology with a cloud-based learning model in Islamic Education, in addition to benefiting from its tools and results in conducting similar future studies. It drew the attention of officials and decision makers in the Ministry of Education to the role of applications of cloud computing in raising the level of educational output, academic, psychological and social alike.

### 1.4. The Study Terminology

Cloud Learning: Learning through a suite of tools and applications on the Internet, accessible from anywhere and any device. These tools and applications are assembled in a virtual cloud platform used by the experimental group of students on Islamic education. Reflective Thinking: It is procedural knowledge that the student hopes to analyze the situation before him and analyze it to its basic elements, then find the relationships between these elements, and give meaning to or interpretations of these relations, and then develop solutions proposed to solve the existing problem and test that solution. The level of reflective thinking is measured by the degree to which the student receives a response to the test prepared for this purpose.

### 1.5. The Study Limitations

The results of this study are determined as follows:

Time limitations: This study was conducted in the third semester of the academic year 2017/2018.

Spatial limitations: This study was used in a group of schools affiliated to the Department of Education and Knowledge in Al Ain in UAE.

Human limitations: The study was limited to tenth grade students.

Objective limitations: The generalization of the results of the study will be determined by the tools of the study, the extent of its validity and consistency, and the implementation procedures.

## 2. THEORETICAL FRAMEWORK

According to the National Institute of Standards and Technology (NIST), cloud computing is: "A model for providing timely and appropriate access to the network to share a wide range of computer resources that can be deployed and deployed with minimum effort or interaction with the service provider" (Mell and Grance, 2011).

Masud and Huang (2013) divided cloud computing services into three levels, namely: software as a service (SaaS), platform as a service (Paas) and infrastructure as a service (IaaS). In SaaS, cloud computing service is provided to customers. As is different from traditional software, users use software via the Internet, don't need a one-time purchase for software and hardware, and don't need to maintain and upgrade and simply pay a monthly

fee. Cloud computing has many applications, such as cloud storage, cloud software, social networking sites, conversation, search engines, and integrated reality. Cloud storage is one of the most important applications, which refers to the storage of user data on the Internet, so that this data is stored on servers of the service provider, through which the user can retrieve, delete, add to, modify or share it with others with ease (Nawawi, 2015).

Using Digital Clouds - like online platforms and educational websites - and its applications can create an environment that supports the learning experience and creates more motivation towards learning, since these new methods are filled with excitement and suspense from the students' perspective, especially nowadays, in a world filled with the advanced means of social media and communication. Furthermore, there are many researches and papers that emphasizes that using the new technological means in the learning process increases students' interest and motivation towards learning. Reflective thinking represents the top of the mental operations. The educators should make all efforts to develop this skill as it helps the individual in planning in following the processes and steps to make the right decision, in facing problems and changing phenomena and events. The person who thinks has the ability to realize relations, work and summaries of information in strengthening his point of view, to analyze the introductions, and to review alternatives and search for them (Alwahab, 2005).

Saa'deh (2011) recognized that the style of thinking related to self-awareness, self-identification or self-interest, which is based on self-observation. Ryan (2012) defined it as the individual reviewing their position, analyzing its elements, and drawing the necessary plans and then the assessing the results.

The practice of reflective thinking makes the individual possess a set of characteristics and features that appear in their later behavior. These characteristics often include: a reduction in impulse or recklessness, listening to others with understanding, emotional empathy, flexibility in thinking, auditing and control (Al Thagafi, 2013). In addition, the practice of reflective thinking helps students develop certain skills, like recalling previous knowledge and applying it in new situations, as well as encouraging them to keep trying to figure out unique innovative solutions even when problems are difficult to solve, as reflective thinking creates extra-motivation for students through instilling positive qualities like originality, creativity, comprehension, curiosity and innovation. The reflective thinking also strengthens the students in literary subjects and helps them study them in a systematic way, so that they can evaluate them personally, especially in the basic stages of education, because the junior students need to be able to meditate upon and engage in it and make a connection between theory and practice (Khawaldeh, 2012). There have been many opinions of researchers in defining the stages of reflective thinking but there are summarized below:

- Awareness of the problem - feeling that it is difficult.
- Understanding the problem - determining the actual difficulty.
- Evaluation and organization of knowledge (data classification, relationship discovery, hypothesis formation).
- Evaluating assumptions - accepting or rejecting hypotheses.
- Apply the solution - accept or reject the result (Obaid and Afaneh, 2003).

Abu (2010) stated is that reflective thinking includes a set of skills, each of them with a purpose and function, as follows:

- Critical visualization skill, which develops students' higher thinking skills, and activates the realization of the reflective visual thought of linking and analysis.
- Access to conclusions skill and working to develop the skills of higher thinking and the development of the work of the thinking of the intellectual critic.
- Reaching conclusions skill, which helps students to stimulate the work of deductive thought.
- Giving convincing explanations skill, which develops the students' higher thinking skills, and activates the interpretative thought.

- Developing proposed solutions skill, which develops the students' higher thinking skills, and activates the conceptual thought abstract thought.

Several studies have addressed cloud computing applications and their impact on the development of reflective thinking skills. AlHamid (2011) conducted a study aimed at designing a strategy for strategic learning based on the synthesis of active learning methods across the web and self-organizing learning skills and their impact on student acquisition (in the second year (mathematics and chemistry) of the educational technology course at Mansoura University in Egypt. The results showed the effectiveness of the proposed strategy in activating the skills of interaction, participation and electronic cooperation among students and the development of their reflective thinking skills. AL-Jamal (2016) determined the effectiveness of cognitive trips on the Internet to accommodate and develop conceptual thinking skills through the study of jurisprudence for secondary students Al-Azhar. The sample consisted of 61 students from Kafr El-Sheikh in Egypt. They were divided equally into two groups: a control group that was studied in the usual way and a pilot that was studied using web-based cognitive trips. The teacher's guide on purity was developed in the use of jurisprudence trips on the web. The data were collected through the test of conceptual preservation and the testing of reflective thinking skills. The results pointed to the effectiveness of the use of knowledge trips on the Internet in the teaching of jurisprudence and enhancing the skills of reflection thinking. Alsuh and Nasur (2016) identified the impact of using the Web Quest strategy in teaching social studies to develop the thinking skills of first grade students. The sample consisted of 140 students distributed into two equal groups: an experimental study using the knowledge flight strategy and a group that studied in the usual way. A test of reflective thinking skills was used before and after the experiment. The results showed that there were statistically significant differences in the thinking skills between the control and experimental groups.

Al-Saidi (2017) studied the degree of inclusion of the thinking skills in the book of Islamic Education for the ninth grade in the State of Kuwait from the point of view of teachers of Islamic education and educational supervisors, in the light of several demographic variables. The sample consisted of 111 teachers and 9 educational supervisors and supervisors who used the questionnaire to collect the data. The results showed that the degree of inclusion of reflective thinking skills in the book of Islamic education for the ninth grade in the State of Kuwait from the point of view of teachers of Islamic education and educational supervisors came to a high degree.

Ali (2018) studied the degree of the practice of the teachers of Islamic education for the reflective thinking skills of the students of the basic stage in Jordan from the point of view of educational supervisors. The study sample consisted of 46 supervisors answering a questionnaire consisting of 41 questions divided into five areas. The results showed that the teachers of Islamic education (of both genders) practiced the skills of reflective thinking with middle school's students in Jordan, and showed that the views of educational supervisors on how well Islamic education teachers used such thinking skills with their students did not vary according to their personal variables.

There are a lack of studies on the applications of cloud computing, especially in Islamic education, and a lack of studies that have examined cloud computing and its impact on the development of reflective thinking. This study designed a cloud-based learning program and measured its impact in the development of reflective thinking skills in Islamic education. It is also unique for using tenth grade students in the UAE.

### 3. METHOD AND PROCEDURES

#### 3.1. Study Methodology

A semi-experimental approach was used to reveal the effectiveness of a cloud-based learning program in the development of reflective thinking skills in Islamic education to suit the nature of the study and its objectives. The following diagram illustrates the design of the study:

Experimental Group	$EG R O_1 \times O_2$
Control Group	$CG R O_1 - O_2$

Where, (EG): Experimental Group; CG: Control Group;  $O_1$ : Reflective Thinking Pre-test,  $O_2$ : Reflective Thinking Post-test,  $\times$ : Treatment.

### 3.2. Study Individuals

Four schools were selected from secondary schools in the Emirate of Al Ain: two schools for males and two for females based on the proximity of these schools from the work place of the researcher and cooperation with the administration in providing facilities, in addition to the availability of technological possibilities. A division of each of the tenth grade students was chosen randomly and then distributed randomly to two groups: one group who studied the scheduled semester in the usual way, and a pilot group who studied the same course through cloud computing. Table 1 shows the distribution of the study sample.

**Table-1.** The distribution of the Individuals of the study due to (gender & treatment) variables.

Group	Gender		Total
	Male	Female	
Experimental	23	24	47
Control	25	22	47
Total	49	45	94

The source of the data from study sample.

### 3.3. Study Instruments

After studying the educational and research literature related to the subject of the study, two tools were used, as follows:

#### 3.4. The First Instrument: the Educational Model Based on Cloud Computing Applications

- A. The objectives of the proposed program were taken into consideration in formulating the educational objectives. It described the expected behavior of the student and could be measured and it reflected the learning output.
- B. After defining the general and educational objectives, the researcher identified the content of the proposed program and organized it in proportion to the nature of the students, their level and the nature of the scientific material.
- C. The researcher proposed a set of educational activities for each unit of the program, which could be divided into three groups: between oral and written classroom activities, behavioral activities, and homework. The more the student learns the theoretical aspect of the scientific material, the more of its applications and work was in his mind, and became part of his knowledge, values, beliefs and behavior, and the more he became able to employ them in his daily life correctly; so the researcher suggested a variety of activities and practical exercises.. If the student failed an exercise, the teacher explained the rule in another way.
- D. The appropriate teaching strategies to teach the teaching material, namely teaching according to the usual method, and teaching according to the proposed program based on cloud computing were identified.
- E. Evaluation strategies and tools, namely pen and paper evaluation strategy (test), communication assessment strategy (monitoring lists), observation strategy, narrative record, self-revision strategy (score scale), learning process description log, performance-based assessment strategy) as well as assessment strategies using software, tablets, digital, smart phones, and the Internet were used.
- F. The proposed model was set up in its initial form.
- G. The proposed form was presented to a group of 14 specialized and relevant arbitrators in the field of Islamic education curricula and teaching methods, and computer engineering arbitrators, in order to verify its validity. The arbitration criteria were: the relevance of program topics and vocabulary to tenth grade students, the relevance to program objectives, the relevance of teaching strategies, teaching aids and techniques to teaching educational content, the relevance of activities to achieve their objectives, and the relevance of S Evaluation strategies and tools to achieve their objectives, and the integrity of language, in addition to the technical issues related to electronic devices, software, and the Internet. The preliminary picture of the proposed model

distributed to the arbitrators included a letter indicating the recording of any other comments that we believe contribute to the development and enrichment of the program.

- H. The proposed form was amended in the light of the notes of the arbitrators, and finally the researcher took it out in its final form after taking all their notes.
- I. The teacher's guide to teaching the scientific material according to the proposed model was prepared in its initial form. The teacher's guide contained two parts: the theoretical aspect which included the general planning of the proposed educational material, the introduction of the guide, the guide to dealing with the guide, the definition of the most prominent terms in the article, as well as general guidance to the teacher. The implementation of activities and classroom management, the steps taken to implement them and their management, the evaluation strategies and the proposed tools for each lesson, and the teacher's awareness of the vertical integration of the subject studied. If any, some common mistakes that students may make, some typical examples of the evaluation and its tools, as well as how the platform is used and its accessories, software and associated educational software.
- J. The teacher's guide was presented to a group of arbitrators specialized in the field of Islamic education curricula and teaching methods, and the Arabic language and amended in the light of their views.

### *3.5. The First Instrument: Reflective Thinking Test*

After reviewing the educational and psychological literature and previous studies on the subject of the study, the researcher built the test of the reflective thinking, which is a test that consists of (25) essay questions based on main five skills of reflective thinking, in order to measure the skills of reflective thinking in Islamic education for tenth grade students, in order to create this test, the study followed the following steps:

- A. The objective, at the measuring of the careful thinking and skills of the tenth grade students in the UAE, was determined.
- B. The reflective thinking skills were identified:
  - 1. **Critical Visual Vision skill:** The ability to present the aspects of the problem and identify its components, whether through the nature of the problem or give a drawing or shape shows its components so that the relationship can be discarded visually.
  - 2. **Reaching Conclusions Skill:** Reaching certain logical relationships by seeing the content of the problem and to reach suitable results.
  - 3. **Giving Convincing Explanations Skill:** The ability to give sense of logical or association relationships, this meaning may be accredited to previous information or on the nature of the problem and its characteristics.
  - 4. **Detecting Fallacies skill:** The ability to find gaps in the problem through determining the wrong step in the problem's solution.
  - 5. **Developing Proposed Solutions Skill:** The ability to reach certain logical relationships by seeing the content of the problem and reaching suitable results.
- C. The content of the Islamic Education of the second separation (part II) of the tenth grade and the reflective thinking skills that were included in it were analyzed.
- D. The reflective thinking test in its initial form with 25 items distributed on the reflective thinking skills above was prepared.

### *3.6. Validity of the Test*

In order to verify the content validity, the test was presented in its preliminary form to twelve arbitrators from university professors specializing in the fields of psychological and pedagogical sciences, measurement, evaluation and Islamic education in order to determine the extent of representation of the items to the attribute to be

measured. Some of the items of the test of reflective thinking were modified, in addition, (10) items were removed as follows: one item from the skill of developing proposed solutions, two items from Critical Visual Vision skill, two items from the skill of giving convincing explanations, two items from the skill of detecting fallacies, three items from the skill of reaching conclusions. Therefore, the test now consists of fifteen items distributed among the five skills mentioned above. The construct validity of test was verified by a sample of twenty students from outside the study sample. Pearson correlation coefficients were calculated between the items and the total degree and dimensions of the scale as shown in Table 2. This meant that the test instrument was honest, measured the aspects that were developed to measure it, and had a good degree of internal consistency, which assured the researcher in using it in the experiment.

**Table-2.** Pearson correlation coefficients between the items and the total score of the test.

Item no.	Correlation with test	Item No.	Correlation with test
1	0.58*	9	0.53*
2	0.79*	10	0.49*
3	0.68*	11	0.43*
4	0.48*	12	0.49*
5	0.77*	13	0.86*
6	0.47*	14	0.44*
7	0.90*	15	0.80*
8	0.59*		

\*Significant at ( $\alpha \leq 0.01$ ).

### 3.7. Reliability of the Test

To verify the persistence of the reflective thinking test, the internal consistency method was used by calculating the  $\alpha$ -Cronbach on the scores of the survey sample for the instrument as a whole and for each of its dimensions. The total stability coefficient was 0.93 as shown in Table 5. Thus, the instrument had an acceptable degree of stability.

### 3.8. Stability of the Test

The significance of the stability of the test was verified in two ways: the researcher used the Cronbach Alpha equation on the scores of the survey sample, with a stability coefficient of 0.93. In addition, the Severman-Brown correlation equation for half-division was used by dividing the test items into two parts: individual items and matrices. The result was that the correlation coefficient between the individual and marital scores of the test scores was 0.90. These results indicated that the test was acceptable for consistency, and was free of errors that changed the performance of students on the same test. It reassured the researcher in using it in the experiment.

The researcher calculated the difficulty and discrimination coefficients for the test items. The difficulty coefficients for this test ranged between 0.27 to 0.70, while the discrimination coefficients ranged between 0.41 to 0.88 as shown in Table 3. These values were acceptable for research purposes according to the A'odah (2010).

**Table-3.** Difficulty and discrimination coefficients values for the test items.

Item no.	Diff.	Disc.	Item No.	Diff.	Disc.
1	0.27	0.76	9	0.51	0.58
2	0.67	0.60	10	0.58	0.42
3	0.57	0.45	11	0.60	0.47
4	0.50	0.83	12	0.37	0.41
5	0.58	0.51	13	0.57	0.83
6	0.67	0.76	14	0.62	0.79
7	0.32	0.71	15	0.46	0.85
8	0.45	0.42			

The source of the data from study sample.

After the identification of the validity of the test and its stability, and time, and the difficulties and discrimination, was found valid for the application, the researcher produced the final version, which consisted of fifteen item distributed on the five reflective thinking skills mentioned above.

### 3.9. Standard of the Test Correction

The researcher prepared the sample answer for the test and the correct key, so that the student was given two marks in the case of the correct answer, one for the partially correct or incomplete answer and zero for the incorrect answer or empty answer. Thus, the total score of the test ranged between 0 to 30 marks, because the test contained fifteen items divided into five skills with each skill worth six marks.

## 4. RESULTS AND DISCUSSIONS

### 4.1. Group Equivalent

The equivalence of the control and experimental groups in the reflective thinking pre-test was verified by group and gender variables using the paired samples T-Test for two independent samples as shown in Table 4.

**Table-4.** T- test for the equivalence of the control and experimental groups and gender.

Variable	Variable level	No.	Mean	Std. Deviation	T-Value	Sig.
Group	Control	47	9.62	4.436	0.218	0.762
	Experimental	47	9.13	3.943		
Gender	Male	45	9.49	4.344	0.489	0.601
	Female	49	9.25	4.018		

The source of the data from study sample.

Table 4 shows that the values of (t) were not statistically significant at ( $\alpha \leq 0.05$ ) in students' performance on the pre-test of the reflective thinking according to the variables of the group and gender. The value of (t) for the group variable was 0.218 and the significance level was 0.762, which indicated a homogeneity between the students in the control and experimental groups in the reflective thinking pre-test. The value of (t) for the gender variable 0.489 and the significance level was 0.601, which indicated a homogeneity between the students in the reflective thinking pre-test. Thus, there was parity between the two groups (control and experimental) and gender parity in students' performance on reflective thinking pre-test.

The first hypothesis stated: "There are no significant differences ( $\alpha \leq 0.05$ ) in the development of reflective thinking skills among students in the 10<sup>th</sup> grade in Islamic education in the UAE due to the teaching method".

To verify this hypothesis, the means and standard deviations of the students' responses on the reflective thinking pre-test and post-test were calculated according to the group variable as shown in Table 5.

**Table-5.** The means and standard deviations of students' responses to the reflective thinking pre-posttest according to the group.

Group	No.	Pre- Test		Post- Test	
		Mean*	Std. Deviation	Mean*	Std. Deviation
Control	47	9.62	4.436	12.77	4.970
Experimental	47	9.13	3.943	21.11	4.305
Total	94	9.37	4.181	16.94	6.242

\*Higher degree = 30.

Table 5 shows that there are apparent differences between the means in the reflective thinking pre-test and post-test according to the group variable. To find out if these apparent differences were statistically significant, One Way ANOVA was used for the reflective thinking post-test by group variable after neutralizing the effect of their pre-test as shown in Table 6.

**Table-6.** One way ANOVA analysis of reflective thinking post-test according to teaching method.

Source of variance	Sum of squares	df.	Mean squares	F- Value	Sig.	Eta square ( $\eta^2$ )
Post-test	1619.761	1	1619.761	535.071*	0.000	0.913
Teaching method	865.044	1	865.044	285.758*	0.000	0.849
Error	275.457	91	3.027			
Total	2760.262	93				

\*Significant at ( $\alpha \leq 0.05$ ).

Table 6 shows a significant ( $\alpha \leq 0.05$ ) difference in the means of the two groups' performance on the reflective thinking posttest due to the teaching method, in favor of the experimental group, which refers to the effectiveness a cloud-based learning program in developing reflective thinking had on tenth grade students. To check the extent of this effectiveness, the Eta Square ( $\eta^2$ ) was found, for measuring the size of the impact, to be 0.849, which means 84.9% of the variance in the performance of students was attributable to the cloud-based learning program while 15.1% was due to other factors. To determine which differences were attributable, modified means were extracted according to the group as shown in Table 7.

**Table-7.** Modified means and standard errors of the total reflective thinking posttest.

Group	Post modified mean	St. Error
Control	13.05	0.335
Experimental	19.96	0.335

The source of the data from study sample.

The results in Table 7 indicate that the difference in the means of the performance of the two groups on reflective thinking post-test was in favor of the experimental group compared to the control group. This indicated the effectiveness of the cloud-based learning program in the development of students' reflective thinking.

The result of this hypothesis was the positive effect of the teaching method using the cloud-based learning program in the level of reflective thinking for tenth graders. This result could be because the teaching strategy using the cloud-based learning program helped students to think and realize the concepts. The student is no longer according to the constructivist theory from which the active learning strategy emerged but receives the information as it is and keeps it memorized. His mind takes in all the information presented to him and links it to his previous knowledge. This teaching strategy has helped, and through its various examples and activities, the student developed visual vision skills, identification of incorrect relationships, and an ability to reach conclusions and to make proposed solutions which are the same skills that represent reflective thinking

This result is due to the nature of the activities and tasks involved in the cloud-based learning program, which is based on the realization of reason, thinking and giving students a wide range and experience in learning how to overcome the literal preservation of information, which encourages the development of the structure of knowledge for students, as well as their scientific thinking skills, because it allows them to use and develop their investigative and discovery skills, and it is important to create questions in a precise and purposeful manner that captivates students minds; to encourage them to research well and take enough time to contemplate and reflect, which is in return reflected positively on their reflective thinking skills.

Also, these results might be due to the fact that these digital clouds provide positive opportunities like creating situations that students can interact with, or participate in actively, furthermore, organizing the contents of the educational program in the form of tasks that consist of smaller problems and sequenced subjects, in order to be presented to students, so they can follow the proper sequence easily, thus allowing them to develop useful skills like observing, explaining, predicting, drawing, classifying and understanding. All of these skills positively affect students' general thinking skills, especially their reflective thinking skills.

This result might be due to the fact that the cloud-based learning program has helped to identify individual strengths and differences among students, their involvement in learning, enjoyment and satisfaction, and improved

collaborative learning skills, responsibility, self-direction, and independence that will develop their reflective thinking.

Cloud computing in general provides a learning environment based on the fun and thrill through the use of digital devices in their implementation and full of illustrations, graphics, shapes and videos included in the educational aids (LCD), which helps to the development of visual literacy skills and the detection of students' fallacies.

This result was partially in agreement with the results of the studies (AlHamid, 2011; Al Jamal, 2016) which pointed to the effectiveness of teaching strategies based on computer applications and the Internet in general, in the development of reflection thinking among students.

In addition, the means and standard deviations of the reflective thinking skills pre-test and post-test were calculated according to the group variable as shown in Table 8.

Table-8. Means and standard deviations of reflective thinking skills pretest and posttest according to the group.

Skills	Group	No.	Pre-Test		Post-Test	
			Mean*	Std. Deviation	Mean*	Std. Deviation
Critical Visual Vision	Control	47	1.93	0.997	2.11	1.188
	Experimental	47	1.74	1.130	4.04	1.870
	Total	94	1.83	1.060	3.07	1.831
Reaching Conclusions	Control	47	2.00	1.144	2.15	1.167
	Experimental	47	2.04	1.055	3.89	1.553
	Total	94	2.02	1.090	3.02	1.619
Giving Convincing Explanations	Control	47	1.93	.997	2.07	1.072
	Experimental	47	2.33	1.240	4.37	1.822
	Total	94	2.13	1.133	3.22	1.880
Detecting Fallacies Developing	Control	47	2.00	1.144	2.15	1.167
	Experimental	47	2.04	1.055	3.89	1.553
	Total	94	2.02	1.090	3.02	1.619
Proposed Solutions	Control	47	2.22	1.155	2.30	1.203
	Experimental	47	2.30	1.171	4.78	1.783
	Total	94	2.26	1.152	3.54	1.959

\*Higher degree = 6.

Table 8 shows that there were apparent differences between the means in the pre-test and post-test of the reflective thinking skills between the two groups (experimental and control). In order to verify the intrinsic differences, One Way MANOVA was applied on the independent variables as shown in Table 9.

Table-9. One Way MANOVA analysis.

Effect	Multiple Test type	Multiple Test Value	Total (F)	Hypothesis df	Error df	Sig.	Eta- Squared $\eta^2$
Teaching Method	Hotelling's Trace	4.214	47.403	5.000	83.000	0.000	0.741

The source of the data from study sample.

Table 9 shows that the calculated "F" value was significant ( $\alpha \leq 0.05$ ), indicating that there was an effect of the teaching method on the combined reflective thinking skills pre-test. To determine which skills were the cause of this effect, ANOVA was performed for each skill separately according to the group variable after neutralizing the effect of their pre-test as shown in Table 10.

Table-10. ANCOVA analysis according to the teaching method on reflective thinking skills posttest.

Variance source	Skill	Sum of squares	df	Mean squares	F-Value	Sig.	Eta-squared $\eta^2$
Critical Visual Vision (Pre)	Critical Visual Vision (Post)	0.006	1	0.006	0.025	0.874	0.001
Reaching Conclusions (Pre)	Reaching Conclusions (Post)	3.238	1	3.238	18.538	0.000	0.279
Giving Convincing Explanations (Pre)	Giving Convincing Explanations (Post)	4.530	1	4.530	16.788	0.000	0.259
Detecting Fallacies (Pre)	Detecting Fallacies (Post)	2.689	1	2.689	13.892	0.001	0.224
Developing Proposed Solutions (Pre)	Developing Proposed Solutions (Post)	3.632	1	3.632	14.299	0.000	0.237
Teaching Method	Critical Visual Vision	20.423	1	20.423	89.975	0.000	0.652
	Reaching Conclusions	21.444	1	21.444	122.781	0.000	0.719
	Giving Convincing Explanations	31.310	1	31.310	116.023	0.000	0.707
	Detecting Fallacies	32.839	1	32.839	169.620	0.000	0.779
	Developing Proposed Solutions	29.706	1	29.706	116.953	0.000	0.738
Error	Critical Visual Vision	19.749	87	0.227			
	Reaching Conclusions	15.225	87	0.175			
	Giving Convincing Explanations	23.490	87	0.270			
	Detecting Fallacies	16.878	87	0.194			
	Developing Proposed Solutions	22.098	87	0.254			
Corrected (Total)	Critical Visual Vision	177.704	93				
	Reaching Conclusions	138.981	93				
	Giving Convincing Explanations	187.333	93				
	Detecting Fallacies	203.426	93				
	Developing Proposed Solutions	161.862	93				

\* Significant at ( $\alpha \leq 0.05$ ).

Table 10 shows significant differences ( $\alpha \leq 0.05$ ) according to the effect of the teaching method in all reflective thinking skills. To determine which of the two study groups were affected by the significant differences, modified means of the skills and standard errors were calculated according to the group variables as shown in Table 11.

Table-11. Modified means and standard errors of reflective thinking skills posttest according to group.

Independent variable	Group	Modified main	Std. Error
Critical Visual Vision	Control	2.311	0.103
	Experimental	3.837	0.103
Reaching Conclusions	Control	2.237	0.091
	Experimental	3.800	0.091
Giving Convincing Explanations	Control	2.277	0.113
	Experimental	4.167	0.113
Detecting Fallacies	Control	2.569	0.095
	Experimental	4.505	0.095
Developing Proposed Solutions	Control	2.529	0.108
	Experimental	4.558	0.108

The source of the data from study sample.

It is clear from Table 11 that the significant differences between the modified means of the post-test in all reflective thinking skills were for the benefit of the experimental group compared to the control group. This finding confirms that there was a positive impact on the effectiveness of the cloud-based learning program in the development of reflective thinking skills.

This can be explained in the light of the teaching strategy using the cloud-based learning program, which includes a wide range of different activities and applications implemented through three phases to implement the lesson, which will enhance the thinking skills of the students: current examination of experience, judging by past experience and knowledge. In the presentation of the lesson, the student moves from the stage of reflective observation to the crystallization of concepts and knowledge through reflection and reflection. In the final stage, the student moves to uncover the fallacies and provide convincing explanations to reach conclusions and propose solutions through various and varied assessments of what was learned in the classroom.

More specifically, the effectiveness of the cloud-based learning program can be explained and justified in the development of reflective thinking skills individually as follows:

#### *4.2. Critical Visual Vision Skill*

The effectiveness of the cloud-based learning program in developing students' visual literacy skills can be traced back to the program's wide range of illustrations, illustrations, drawings, forms and educational films to present key concepts and knowledge, to raise diverse questions about them as brainstorming questions, and to justify the right direction towards the solution, especially at the beginning of each lesson, all of which gave the opportunity for students to observe, follow up and reflect more.

#### *4.3. Reaching Conclusions Skill*

The effectiveness of the cloud-based learning program in developing this skill can be explained by the fact that cloud-based instruction emphasizes the need for students to understand the relationship between new knowledge concepts introduced at the beginning of the classroom and to relate them to preconceived concepts and knowledge in their knowledge structure. In addition to emphasizing access to the solution themselves, and not just answering yes or no, but deepening the knowledge in order to reach the correct answer. The implementation of tasks, asynchronous and non-classroom activities, and through the educational platform, and the preparation of abstracts and conceptual maps in the active and tangible phases of experiential experimentation, increased their motivation for learning and the understanding of the relationships between new knowledge and their connection to prior knowledge.

#### *4.4. Giving Convincing Explanations Skill*

The effectiveness of the cluster-based educational program in the development of this skill has been attributed to the teaching procedures focusing on positive learners through learning in small groups, both within the classroom or outside the educational platform, which led to encouraging students in interacting with classroom's different situations and boost their desire to learn the curriculum contents, then perform a variety of classroom's activities to understand and process new knowledge and information, then perform purposeful discussions among themselves through the used learning platform about the results of these activities and provide explanations and justifications regarding any answer that each student provide.

#### *4.5. Detecting Fallacies Skill*

The effectiveness of the cloud-based learning program may be useful in developing the skill of student detecting misconceptions, since this skill requires deep understanding of the answers through justifying the removal of ambiguities and overlaps, and students shall have a broad and comprehensive knowledge of the subject

to determine the correct answers, then exclude all wrong answers. This included various educational tasks, activities and assessments, including as well collective assessment, self-assessment, discussion and judgment of students' answers, and continuous feedback. This in turn contributed to the refinement and development of this skill.

#### 4.6. Developing Proposed Solutions Skill

The effectiveness of the educational program that is based on digital clouds platforms can be shown in the development of "developing proposed solutions skill", bearing in mind that this skill is a multi-step process, that the student work through by combining his logical approach with his imagination. It is not easy in an easy and direct manner, but need to realize the mind, unreachable to the imagination; so this skill is more important for the human mind. This skill is not a mechanism of the course of the solutions, the learner shall not be resolved, the problem of the intellectual resulting in the unlearning solutions (Zaiton, 2003). However, the educational program that is based on digital cloud platforms worked on developing this skill through providing an opportunity to students to submit various answers then criticize these answers and justifiably refute the wrong ones. He presented non-routine problems involving authentic and realistic positions derived from the student environment, as well as expanding topics through the files attached to their types of educational platform.

These results were in partial agreement with the results of studies (AlHamid, 2011; Al Jamal, 2016) that referred to the effectiveness of the teaching and online strategies in general in the development of most meditation reflective thinking skills.

The first hypothesis stated: "There are no significant differences ( $\alpha \leq 0.05$ ) between experimental group in the results of the of the reflective thinking post-test attributable to gender variable".

To validate this hypothesis, the means and standard deviations of the experimental group performance on the reflective thinking post-test were calculated according to the gender variable as shown in Table 12.

**Table-12.** Means and standard deviations of the scores of the experimental group on reflective thinking posttest according to gender variable.

Group	Gender	No.	Mean	Std. Deviation
Experimental	Male	23	23.52	7.117
	Female	24	23.42	6.661
	Total	47	23.47	6.889

The source of the data from study sample.

Table 12 shows that there were apparent differences between the means of the performance of the experimental group on the reflective thinking post-test according to the gender variable so in order to verify the intrinsic differences, the Paired Samples T-Test for two independent samples was used as shown in Table 13.

**Table-13.** T-test on the mean of the experimental group on reflective thinking posttest according to the gender variable.

Group	Mean	Std. Deviation	Variance	t- value	Sig.
Experimental	23.52	7.117	50.65	0.066	0.965
	23.42	6.661	44.37		

The source of the data from study sample.

Table 13 shows no significant difference ( $\alpha \leq 0.05$ ) in the means of the experimental group on the reflective thinking post-test due to the gender. This is due to the validity of the teaching strategy using the cloud-based computing program for both genders.

Any male and female students can equally benefit from these teaching strategies using cloud computing. This result agreed with the results of studies (Lou and Wang, 2013; Al Sayed, 2014) that pointed to the effectiveness of using cloud computing applications in promoting motivation to males and females and suggests that the teaching

method using the cloud-based learning program has promoted the reflective thinking of all students, both male and female.

The teaching strategy using the cloud computing-based program is valuable, in the sense that male and females can benefit from this strategy in the development of their meditation thinking skills. The means of genders was not crucial in the process of increasing students' performance to test careful thinking, but the strategy variable led to those differences in performance among students.

As both sets of students have received the same type and degree of learning (similar educational conditions and were living in a similar social and cultural environment, this result indicates that all students can be assumed, regardless of gender to benefit from using the cloud computing applications.

The method of teaching using cloud computing applications in terms of means of activities in the genders in a capacity, as well as both male and females were presented to the same conditions that were suitable for this study. This also might partially be the result of creating a homogenous learning environment in both males and females schools, and the students (of both genders) interest in the subject of the study through the learning program and the modern strategies that accompanies this program.

This result was partially agreed with the results of studies (AlHamid, 2011; Al Jamal, 2016) that referred to the effectiveness of teaching and online training strategies in general in the development of male and female reflective thinking.

## 5. RECOMMENDATIONS

According to these findings, the researcher recommends the following:

- MOE officials encourage teachers to use educational software based on cloud computing.
- Hold specialized courses for teachers in schools to train them to use existing cloud computing teaching strategies.
- Dissemination of technical awareness among students and training them in the use of modern techniques in the teaching of Islamic education, and other materials, through the Internet, search engines, virtual dialogue rooms, discussion, educational forums.
- Further studies on the quality of existing education on the application of computer applications in teaching Islamic education, especially cloud clouds in the development of careful and creative thinking, promoting recreation, and dealing with other variables and samples.

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