The Impact of Using E -Formative Assessment on Critical Thinking

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ABSTRACT

This study aimed to identify the impact of using E- formative assessment in teaching on critical thinking among 10th-grade students in Islamic Education subject in Jordan. To achieve the study's goal, the quasi-experimental approach with two groups was followed. The researchers developed an e-formative assessment-based teaching program and used the California Critical Thinking Skills Test. The sample of the study consisted of (100) male students selected intentionally and assigned randomly to two groups; the control group including (48) students taught with the regular teaching method and the experimental group including (52) students taught based on the e-formative assessment method. The results indicated the superiority of the experimental group over the control group, which is indicated by the value of the Eta square for the for the induction skill (48.20%), for the Inference skills (46.60%), for deduction skill (40.10%), for evaluation skills (37.80%) & for the analysis skill (35.40%).

Keywords: critical thinking, e-assessment, formative assessment, Islamic education.

أثر التقويم التكويني الإلكتروني في التفكير الناقد

الملخص

هدفت الدراسة إلى معرفة أثر التدريس باستخدام التقويم التكويني الإلكتروني في التفكير الناقد لدى طلاب الصف العاشر الأساسي في مبحث التربية الإسلامية بمحافظة الرصيفة في الأردن، ولتحقيق أهداف الدراسة تم بناء برنامج تدريسي باستخدام التقويم التكويني الالكتروني، كما تم استخدام اختبار كاليفورنيا للتفكير الناقد، وتكونت عينة الدراسة من (100) طالبا تم اختيارهم بطريقة قصدية من مدرسة الحسن ابن الهيثم الثانوية للبنين توزعوا على مجموعتين، وقد تم التعيين العشوائي للمجموعتين، حيث تكونت المجموعة الضابطة من (48) طالبا تم تدريسهم بالطريقة الاعتيادية، والأخرى تجريبية بلغت (52) طالبا درست باستخدام التقويم التكويني الالكتروني. وأظهرت النتائج وجود فروق ذات دلالة إحصائية عند مستوى الدلالة (0,05=α) تعزى لمتغير المجموعة في جميع المهارات الفرعية وفي مهارات التفكير الناقد ككل. حيث كان حجم الأثر الذي تدل عليه قيمة مربع ايتا الناتج من استخدام استراتيجية التقويم التكويني الالكترني في رفع مستوى مهارة الاستقراء (48.20 %)، ولمهارة الاستدلال (46.60٪) وبلغت مهارة الاستنتاج (40.10 %) وبلغت مهارة التقويم (37.80٪) أما مهارة التحليل فجاءت في المرتبة الأخيرة بقيمة (35.40٪)، وفي ضوء تلك النتائج أوصت الدراسة باستخدام التقويم التكويني الالكتروني في تدريس التربية الإسلامية.

الكلمات المفتاحية: التفكير الناقد، التقويم الالكتروني، التقويم التكويني، التربية الإسلامية.

1. Introduction

Islamic education has always been inviting for thinking and learning; it came calling mankind to think about themselves, those around them, and in the universe. For this, it was necessary for Islamic education teachers and those interested in transferring Islamic knowledge to use various teaching methods to achieve the goals and objectives of Islamic education.

The interest in employing technology in various aspects of the educational, administrative, and teaching processes has increased, as a result, it was necessary to keep developing teaching methods to keep pace with the requirements of the times, most importantly the role played by the teacher as an essential element that greatly impacts the learning process and influences the students' achievement, progress, and motivation toward learning and developing their thinking (Alhashimi et al., 2016; Park,2019).

Formative e-assessment is considered a broad range of techniques used by teachers to assess student understanding, learning requirements, academic achievement as they occur throughout a lesson, unit, or course and to adjust lessons, instructional strategies, and academic support. Formative assessments help teachers identify concepts that students are having trouble understanding, skills they are having trouble picking up, or learning requirements they have not yet attained. (Khawaldeh, 2015; Dabas, 2018; Ali et al., 2019).The learner today needs a learning method that provides broad and advanced educational horizons that help to enrich information, develop various mental skills, and help learner to be creative, by providing the appropriate resources and interest through targeted programs and different teaching strategies, so the subject of developing education and critical thinking among learners has become a matter of interest for many scholars and educators in the world (Suryanti & Nurhuda, 2021; Qatami, 2001). Therefore, contemporary educators have emphasized that education in its current form is not sufficient to develop thinking skills among students, as thinking skills must be taught in schools as part of the educational curriculum, and this has been confirmed by many studies such as the study of Edward De Bono, (1989) and John, (1991)

2. Statement of the Problem

The world is currently experiencing a massive scientific and technological revolution, from which several domains are benefiting, including education. Islamic education particularly should benefit from this revolution because of its specificity in deriving legal Shareaa rulings from its detailed evidence, which necessarily needs critical thinking skills to reach correct judgments and transfer the text from the theoretical side to the practical side, therefore, it was necessary for teachers to use all the methods that help in achieving this.

In fact, e-assessment is much more than just a substitute for what we presently do. A growing body of evidence shows that formative assessments that are well-designed and well-implemented can promote more effective learning for a larger variety of learners. The best way to determine a student's needs is probably through assessment, which can also motivate learners to progress if they are given access to the right materials, receive timely, high-quality feedback, and find engaging ways to demonstrate their knowledge and abilities. The technology used wisely can make a big difference in this situation.

Studies addressing the e-formative assessment in Islamic education are rare, so this study investigated the impact of the formative e-assessment on critical thinking among 10th-grade Male students in Islamic education.

2.2. Questions of the Study

- What is the impact of the formative e-assessment at (0.05 =α) on critical thinking among 10th-grade Male students in Islamic education?

- What is the impact of the formative e-assessment at (0.05 =α) on critical thinking sub-skills (analysis, induction, conclusion, reasoning, and evaluation) among the 10th-grade students in Islamic education?

2.3. Significance of the Study

The significance of the study lies in:

- It may offer a practical model on how to use the formative e-assessment in teaching Islamic education because of its vital role in developing Islamic education at the basic stage in line with technological development.

- It may contribute to directing the interest from passive learning which is based on leading questions and the quantity of the information offered, to critical education, which is based on critical thinking, solving problems, and offering solutions for them.

2.4. Objectives of the Study

- Identify the impact of using the formative e-assessment on critical thinking among 10th-grade male students in Islamic education.

- Knowing the impact of the formative e-assessment on the sub-skills of critical thinking (analysis, induction, conclusion, reasoning, and evaluation) among 10th-grade students in Islamic education.

2.5. Limitations and Delimitation of the Study

- This study was limited to 10th-grade male students at Jordanian public schools in Al-Rusaifa district in Jordan for the first semester of the academic year (2020/2021)

- The results of this study are delimited by the validity &reliability of the study tool

2.6. Procedural Definitions

Formative e-Assessment: Electronic assessment that gives a learner feedback on how to improve their knowledge and abilities. It offers operations include creating and delivering individualized assessments suitable for each student, marking (either manually or with the aid of computers, scanners, and internet tools), and all reporting, storing, and transferring of data related to both internal and external assessments.

Critical Thinking: A mental process through which a specific situation is examined, understood, and then analyzed. It's a method that allows the students to find links between elements to reach a judgment about certain situation. (Alsawae, 2004). Procedurally, critical thinking is assessed by the participants' total scores on the scale developed for this purpose.

Elementary Stage: the first stage in education in Jordan; it starts from the first elementary grade and ends with the 10th grade.

3.Theoretical Framework &Literature Review

3.1. Formative E-Assessment

The momentum of scientific and technological innovations and their applications placed upon education great responsibilities in providing students with information, knowledge,

skills, attitudes, tendencies, values, and ways of thinking so that they can solve the problems facing them.

Popham (2011: 270) defined formative assessment as "a planned process in which assessment-elicited evidence of student's status is used by the teacher to adjust their ongoing instructional procedure or by students to adjust their current learning tactic", while Alghareeb (2009: 393) defines computerized assessment as "a process of employing information networks, computer equipment, educational software, and multi-source educational material by using evaluation methods to collect and analyze students' responses in a pattern that assists the teachers to discuss and determine the effects of programs and activities on the educational process to reach an existing ordered judgment based on quantitative or qualitative data related to achievement".

Elmahdi et al., 2018; Wu, 2017) indicate that it is a continuous assessment throughout the educational process directed to improve the different aspects of the learning process. Exerting effort in formative e-assessment shows direct results and leads to improving the entire educational process, this type of assessment is conducted via the teacher's use of the following methods: short tests, asking students what they have learned in their online course interaction, Online discussion, and Observing students' performance electronically.

One of the most important advantages of using the computer as an assessment method is that it provides specific attention to each student based on his or her abilities, readiness, and educational level; it assists in clarifying the concepts and diagnosing weaknesses for every student. (Ajlouni, 2001; Ajlouni, et al., 2007; Pfefferová, 2015). It also assists in increasing students' provocation to work by liberating their fear of making mistakes, in addition to helping learners to respond and exhibit greater motivation for the materials, reducing fear and shame caused by various factors among children (Almousa et al., 2022; Kefalis, 2020).

3.2. Critical Thinking

Critical thinking is one of the key subjects since it helps students developing fundamental abilities for learning. The basic objective of critical thinking learning and education is to help students develop their critical thinking abilities, which will help them excel in a variety of areas of their lives (Chang, 2020). Additionally, it fosters a sense of curiosity and investigation. Questioning, and not accepting facts without study or research, pushes students toward entering broader scientific domains, which serves to enhance their knowledge structures and increase their qualitative learning, and it broadens their knowledge frontiers. (Qura'an et al., 2017; Gerdts-Andresen, 2022).

Critical thinking is a natural activity that is not indispensable for humans in daily life (Jarwan, 2002), it is based on analyzing, sorting, testing, and selecting the information exhibited by individuals to distinguish sound ideas and thoughts from the wrong ones (Mahanal, et al.2019; Qatami, 2001).

Beyer (1987) mentions that critical thinking includes a group of processes that are used individually or by a group of people that is more complicated than main thinking skills, it starts with questioning a specific claim and its reliability, relevance, importance, and accuracy. Ennis (1989) sees that critical thinking is reflective or inferential thinking focusing on decision making. Paul (1995) indicated that critical thinking means correcting your own thinking to find the ultimate truth, while Sternberg (2004) points out that critical thinking

includes a set of mental processes, strategies, and representations that learners employ to solve problems, work on decision-making, and learn new concepts.

A group of experts used the Delphi Method to reach a definition for critical thinking.The importance of this method lies in that it offers an opportunity for each participant in the research process to propose an argument, evidence, and information that would enrich the research process, they concluded with the following comprehensive definition: Critical thinking is a self-regulated judgment that aims to interpret, analyze, assess, and infer (Facione, 2011). Based on the experts' definition of critical thinking, Facione & Facione (2002), five skills of critical thinking were determined as follows:

- Analysis Skill: Analysis is intended to define the relationships between phrases, questions, concepts, characteristics, and other formulations to express a belief, judgment, experience, information, or views. The experts suggest that Analysis skills have sub-skills under which 6 statements.

- Induction Skill: refers to the validity of the results connected to the validity of the introduction. A very good example of this process is practical scientific experiments, and this skill includes (6) statements.

- Inference Skill: this skill indicates practicing a group of processes that rely on generating arguments and claims, looking for evidence, reaching results, and identifying correlations and casual relationships. This skill includes (6) statements.

- Deductive Skill: indicates determining and providing the necessary elements to derive logical results for the intended or actual inferential relationships among phrases, characteristics, questions, or any other form of expression. The deductive sub-skills are the skill of examining evidence, the skill of guessing alternatives, and the skill of reaching conclusions, and this skill included (4) statements.

- Assessment Skill: assessing the reliability of phrases or any other expressions will describe the individual's understanding, experiment, judgment, belief, and opinion, thus, the assessment of the logical power of the intended or actual inferential relationships among phrases, characteristics, questions, or any other form of expression. Assessment skill includes two sub-skills: assessing claims and assessing arguments, including (6) statements.

The importance of critical thinking lies in that it encourages learners to practice a great group of thinking skills such as: resolving problems, accurate comparison, discussion, originality in producing ideas, analysis, assessment, deduction, research, inference, safe decision making, regulation, flexibility and communication, intelligent negotiation with the self and the others (Alkhawaldeh, 2015), and leads students to observe their thinking and control, which assists them in making their life decisions (Enciso et al., 2017). Also, critical thinking transforms the process of acquiring knowledge from an inert process into a mental activity that leads to a better mastery of the cognitive content, and a deeper understanding of it, given that learning is essentially a thinking process. By that, students will acquire correct and acceptable explanations for a wide range of daily life problems, and work to reduce false allegations. Nugroho, et.al., 2018)

4. Literature Review

After reviewing a group of studies that relate to the current one, it was found that they have addressed e-learning, blended learning and their effect on critical thinking, also it was

apparent that there is a lack of studies addressing the impact of using the formative e-assessment strategy on critical thinking in Islamic education. The review below for the related studies that are chronologically listed from the recent to the earliest:

Zulhamdi, et, al., (2022) aimed to determine the effect of students' critical thinking skills through the application of the blended learning model of the flipped classroom. The quasi-experimental approach was used, the pretest-posttest non-equivalent control group design. Sampling used a total sampling technique from the entire population of 102 students of class XI IPA at SMAN 1 Peulimbang. The instrument used to measure critical thinking skills is in the form of essay questions accompanied by an assessment rubric. The results showed that there was an effect of students' critical thinking skills among the blended learning model of the flipped classroom on the respiratory system material

Alshaye (2021) study explored the impact of online Digital Storytelling (DTS) on developing critical reading skills, critical thinking, and self-regulated learning skills of prospective teachers of Arabic. To reach such ends, a standardized pre-posttest in critical reading skills, critical thinking skills scale and self-rating scale of a self-regulated learning questionnaire were used. The quasi-experimental research design has been used. The results revealed that the critical reading skills, critical thinking skills, and self-regulated skills improved significantly in comparison to the control group.

Hasanah (2020) investigates the effectiveness of the blended learning model in improving the critical thinking and communication skills of students at university. The quasi-experimental research design has been used. The research population comprised students sitting in the Entrepreneurship class at the Department of Electronic Engineering Education, who were selected purposively. The data were about critical thinking skills that were gathered using a test, while the data about communication skills were obtained through observations. The findings show that the blended learning model effectively increases critical thinking skills; improves students' communication skills, and according to the independent sample t-test, students critical thinking skills and communication skills in the experimental group had a significant difference from those in the control group.

Jou et al., (2016) study, therefore, proposed a blended learning environment that incorporated useful web applications within a knowledge transformation model to create an educational environment capable of improving CT and knowledge transformation for student users. A semester-long experiment was then conducted to evaluate this learning environment. Results revealed that the proposed approach was effective in improving student CT and knowledge transformation. Students were also satisfied with the courses and teaching methods used by the proposed learning environment which also effectively improved their learning motivation

The study of Alkhawaldeh (2015) aimed to identify the effect of teaching using the multimedia strategy on achievement and developing critical thinking skills among 10th graders in Islamic education in Amman Second Directorate of Education/ Jordan. The study used the semi-experimental approach, and the sample consisted of (62) students who were randomly assigned into two groups (experimental and control) results of the study indicated the superiority of the experimental group in achievement and critical thinking.

Most relevant studies referred to the impact of computer programs on the variables related to the student. The positive impact on students' achievement was noted in the

various subjects in which the computer was used in teaching. Some of them indicated the positive impact on students' critical thinking, attitudes, understanding of concepts, and ability to solve problems. Most of the studies recommended the use of computers in teaching different subjects, as it may have a positive impact on improving students' critical thinking, motivation, and attitudes toward the subject. The current study differs from related studies in the following:

- It investigates the effect of computerized formative evaluation in teaching Islamic education, due to the lack of studies that explored it within the knowledge of researchers.

- It's designed for the jurisprudence unit for the 10th grade in accordance with the electronic formative evaluation strategy.

- Focusing on an important variable in teaching and learning, which is critical thinking.

5. Methodology

5.1. Methodology and Procedures

The study used the experimental approach (quasi experimental design) with two groups.

5.2. Study Sample

The sample of the study consisted of (100) students from the 10th grade, who were intentionally selected from the Al-Hassan Bin Al-Haitham school for boys at the Directorate of Education in Al-Rusaifa District. The sample was randomly assigned into two groups: an experimental group with (52) members, and a control group with (48) members for the academic year 2021-2022.

5.3. Study Tools

5.3.1. First: The Critical Thinking Scale

The modified version of the California test for critical thinking skills for the Jordanian environment by Alrabadhi (2004) was used. The test consists of (34) items that measure five sub-skills of critical thinking skills: analysis, induction, inference, deduction, and evaluation.

5.3.2. Scale Reliability

In its modified version for the Jordanian environment, the scale has a high internal consistency (Cronbach alpha) that reached (0.858) for the total test, and the internal consistency (Cronbach alpha) coefficients for the sub-skills ranged between (0.81 - 0.72). In the current study, the internal consistency stability coefficient (Cronbach alpha) for the total test was (0.82), and the values of the internal consistency stability coefficients for the sub-skills ranged between (0.79 -0.74), these values indicate that the scale has an acceptable level of stability.

5.3.4. The Critical Thinking Scale Correction

The scale consisted of 34 multiple-choice items. One point was assigned for each question of the test; thus, the maximum score for the test was (34), and the minimum score was (zero).

5.3.5. Preparing the e-Formative Assessment Software for Islamic Education Teaching

First: selecting the jurisprudence material from the Islamic education assigned for the 10th-grade students in Jordan. While preparing the assessment the researchers took the following in consideration: the clarity of lesson titles, defining learning outcomes, defining students' roles, educational activities, and reinforcement.

Second: selecting flexible, dynamic computer programs that enable students to interact with.

Third: Determining the teaching procedures divided into two sections: theoretical, which includes a direct presentation of the educational material using software done by the teacher, and practical, which includes the students' role in work and interaction with the program; where the teacher exposes them to formative training questions on the material presented, and the students save their work in special files so that they can refer to and enable the teacher to follow them up. Finally, each student checks his understanding of the concepts mentioned in the lesson through his or her exposure to the e-formative evaluation and practice of enrichment activities and referring to an enrichment material to enable the learner to reach the correct answers for new questions from the question bank that has been prepared and then obtain immediate feedback and appropriate reinforcement.

5.3.6. E-Formative Evaluation Program's Validity

The educational program's validity included two types of arbitration; the first is technical, to verify that the educational program meets the educational and technical specifications. To confirm this, an evaluation sheet for the educational software attached to a CD that included the educational program and an analysis of the content were used; so that the referee could view the educational program and to closely study it closely. The reviewers of the educational software were interviewed after studying and reviewing it, and they identified the improvements that should be included in it; to achieve technical and educational specifications in the educational software. The second is educational software validity, it was presented to a group of arbitrators represented by a specialist.

5.4. Procedures of the Study

The researchers followed the following procedures:

First: The jurisprudence unit was selected from the 10th grade Islamic Education book to be taught using the formative e-assessment, and the following procedures were followed:

- Analyzing the content and defining the lessons' objectives, the concepts, and sub-concepts for each lesson, and the relationships between them.
- Determining the general steps, preparing a manual for the unit that includes the basic steps for each lesson, and writing the learning material according to these steps, including the selected activities and questions.

Second: Dividing the students into two groups, control and experimental.

5.4.1. *The Study Design*

This study is following the quasi-experimental design for two groups (control and experimental) with pre- and post-assessment.

5.4.2. Statistical Treatments

To answer the research question, means and SDs for participants' responses on the pre- and post-assessment on the critical thinking skills scale were calculated based on the teaching method variable in addition to using ANCOVA and MANCOVA.

6. Results and Discussion

To answer the 1st question " What is the effect of the e-formative assessment on 10th-grade students critical thinking skills in Islamic education?", means and SDs for participants' responses on the critical thinking skills scale in both the pre- and post-assessments were calculated for both the experimental and the control groups as indicated in table.1.

Table.1: Means and SDs for participants in both the experimental and the control groups on the critical thinking skills' scale in both the pre and post-assessments based on the group variable

Group	Number	Pre-Assessment		Post Assessment	
		Mean	SD	Mean	SD
Control	48	14.65	5.37	19.71	4.59
Experimental	52	15.46	6.81	27.31	4.54

Table (1) indicates the apparent differences between 10th-grade students' responses in both the experimental and control groups on the critical thinking skills scale. To verify the core of these differences, ANCOVA was used after taking the pre-assessment scores on the critical thinking skills scale into account for the experimental and the control groups, as shown in table (2).

Table.2: ANCOVA analysis associated with the critical thinking skills' scale for the post-test among 10th-grade students based on the group variable

Contrast Source	Sum of squares	Freedom scores	Squares' mean	F value	Sig	η^2
Pre assessment	23.165	1	23.165	5.624	0.000	
Group	65.883	1	65.883	15.995	0.000	0.412
Error	399.561	97	4.119			
Total	488.609	99				

Effect size according to Cohen: weak 0.1-0.24), medium (0.25-0.39), large (0.40 and above).

Table (2) indicates a statistically significant difference at the level (α= 0.05) between the two means for the post-assessment of the 10th-grade students' response on the critical thinking skills scale based on the group variable (experimental, control) in favor of the experimental group. The impact size resulted from using the e-formative evaluation strategy in increasing the critical thinking level indicated by the value of the Eta square (η^2) and reached (41.20%). This value is considered high according to Cohen's classification for the impact size.

To answer the second question "What is the effect of the electronic formative evaluation on the sub-skills of critical thinking (analysis, induction, conclusion, reasoning, and evaluation) among 10th grade students in Islamic education" ,the arithmetic means and SDs for the pre and post-assessments for the 10th-grade students in both groups, control and experimental, and responses on the critical thinking sub-skills were calculated based on the group variable as shown in table (3).

Table.3: Means and SDs for 10th-grade students' responses in the experimental and the control groups on the critical thinking sub-skills (dimensions) on the pre and post-test based on the group variable

Dimension	Group	Number	Pre		Post	
			Mean	SD	Mean	SD
Analysis	Control	**48**	2.02	1.00	2.42	0.85
	Experimental	**52**	2.00	1.35	3.71	1.14
Induction	Control	**48**	2.57	1.13	2.73	1.28
	Experimental	**52**	2.65	1.04	5.65	1.04
Inference	Control	**48**	1.60	0.86	2.44	1.11
	Experimental	**52**	1.70	0.78	4.29	1.04
Deduction	Control	**48**	2.60	1.44	3.68	1.43

	Experimental	**52**	2.42	1.75	5.12	1.75
Evaluation	Control	**48**	2.05	1.13	2.95	1.03
	Experimental	**52**	2.03	1.45	4.23	1.26

Table (3) indicates apparent differences among the means of the experimental and the control groups members' scores on the critical thinking sub-skills. To verify the significance of the apparent differences, one way MANCOVA was used to determine the e-formative assessment strategy effect on each of the critical thinking skills after taking the scores of the pre-measurement on the skills of the critical thinking scale into account for each of the two groups as an accompanying variable, as shown in table (4) below:

Table.4: One-way MANCOVA for the critical thinking skills in the post test among 10th grade students based on the group variable

Contrast source	Dimension	Squares' Sum	Freedom Scores	Squares Mean	F Value	Sig	η2
Analysis (pre)	Analysis	7.289	1	7.289	4.866	0.030	
Induction (pre)	Induction	0.742	1	0.742	0.491	0.485	
Inference (pre)	Inference	10.216	1	10.216	6.287	0.014	
Deduction (pre)	Deduction	5.212	1	5.212	4.069	0.047	
Evaluation (pre)	Evaluation	5.645	1	5.645	4.866	0.030	
Method Hotelling's Trace= 15.491 F= 21.098 Sig=0.000	Analysis	18.092	1	18.092	12.078	0.000	0.354
	Induction	23.905	1	23.905	15.815	0.000	0.482
	Inference	21.760	1	21.760	13.390	0.000	0.401
	Deduction	18.894	1	18.894	14.753	0.000	0.466
	Evaluation	14.980	1	14.980	12.915	0.000	0.378
Error	Analysis	139.304	93	1.498			
	Induction	140.568	93	1.511			
	Inference	151.136	93	1.625			
	Deduction	119.104	93	1.281			
	Evaluation	107.872	93	1.160			
Total	Analysis	157.792	99				
	Induction	164.565	99				
	Inference	174.073	99				
	Deduction	138.329	99				
	Evaluation	123.248	99				

Effect size according to Cohen: weak (1.0-0.24), medium (0.25-0.39), large (0.40 and above).

Table (4) indicates significant statistical differences at α=0.05 between the arithmetic means of the post-assessment of the participants response on critical thinking according to the group (experimental, control) in favor of the experimental group.The resulted impact size from using evaluation strategy in increasing the level of critical thinking in each skill of the scale indicated by the value of the Eta square (2η); for the skill of analysis (35.40%), for the skill of induction (48.20%), for inference skill (40.10%), for deduction skill (46.60%), and for the evaluation skill (37.80%).These values considered high according to Cohen's world

classification for the effect size and this might be attributed to the teaching method used using the e-formative assessment that expands students' perception, improves their ability to remember, imagine and understand, and directs students' focus to the main points in the subject. Moreover, the formative assessment provides immediate computerized feedback to students during the teaching and learning process through which students can determine their strengths and weaknesses, and attempts to overcome them. Also, the e-formative assessment goes side by side with the educational process, it continuously tracks the student's cognitive growth and follows up on the weaknesses on an ongoing basis.

The e-formative assessment can organize teaching so that the transition from one stage to another is directed towards achieving the goals through student's active participation, and this may interpret its positive impact on the sub-skills of induction, deduction, and conclusion as the e-formative assessment connect previous learning with post learning, helps developing a program for remedial and enrichment education by considering the learner's ability and self-speed. It also considers the preferences of the members of the experimental group. Perhaps this strategy, as it allows students to interact, increases their motivation towards learning, enthusiasm, and suspense, which improves their skills in analysis and evaluation. In addition, the use of an e-formative assessment has also made it easier for students to learn, as it has become based on finding meaning instead of memorization since the computerized program presented topics in a regular and sequential manner, and presented them in a visual manner, explaining the relationship between its components, so that they appear interconnected and integrated, which had a clear impact on the development of critical thinking skills. In view of the other studies such as the study of Elmahdi et al., (2018); Alkhawaldeh's study (2015); Zulhamdi, et al. (2022) study; Alshaye's (2021) study; Hasanah's (2020); & the study of Jou & Wu (2016).

That addressed the training programs or different teaching methods in developing critical thinking among students, their results revealed a positive impact of the e-formative assessment and multimedia in developing critical thinking and other variables

7. Conclusion & Recommendations

The formative e-assessment is one of the multimedia tools that leads to meaningful learning, it contributes to arranging scientific concepts related to a specific topic or knowledge, organizing them, and highlighting the relationships between different information. In turn, it makes learning a coherent and connected process and it develops the learner's higher-order thinking and critical thinking skills.

Considering the results, the researchers recommend the following:

- Providing training for Islamic education teachers on employing formative e-assessment and multimedia tools in the teaching process as it will positively impact the development of students' critical thinking.
- Providing training courses for Islamic education teachers to enable them dealing with electronic programs and keep pace with the requirements of the technology era.
- Incorporating electronic-based lessons and activities in the Islamic education book.

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