The effectiveness of the *Mawhiba* program for the development of critical thinking skills among gifted female students at the secondary levels

Amani K. Hamdan Alghamdi PI, PhD[1*], Neama AbdulSalam, PhD[2]

[1] *Associate Professor, Vice Dean, College of Education,*
University of Dammam, Dhahran, Saudi Arabia
[2] *Lecturer, College of Education, Educational Psychology department,*
University of Suez, Suez, Egypt

ABSTRACT

This study explores the effectiveness of the *Mawhiba* (Giftedness) program in developing critical thinking skills in students in Saudi Arabia. This quantitative study involved the assessment of gifted 30 female secondary school students in the Eastern Province of Saudi Arabia who participated in the *Mawhiba* program. The Critical Thinking test used in this study, prepared by Jabir Abdulhameed Jabir and Ahlam Al-Baz [39], is designed to measure critical thinking skills. The results indicate that these students were becoming able to think critically after attending the five-week intensive training course. Furthermore, this study illustrates how critical thinking could be developed to supplement academic programs with reasonable levels of success. Saudi policymakers, teachers, and faculty members should consider how to improve critical thinking skills in female students as part of the university environment to support and capitalise upon the learning that happens beyond the conventional classroom. The results indicate that these Saudi Arabian female students were becoming able to think critically after attending the five-week intensive training course. Furthermore, this study illustrates how critical thinking could be developed to supplement academic programs. Saudi policymakers, teachers, and faculty members should consider how to improve critical thinking skills in female students as part of the university environment to support and capitalise upon the learning that happens beyond the conventional classroom.

Keywords: Effectiveness critical thinking, Critical thinking skills, Development of critical thinking, Mawhiba, Gifted students, Saudi Arabia.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

1. INTRODUCTION

Education in Saudi Arabia has progressed tremendously over the last half century and particularly in the last two decades. The higher education system, in particular, has changed primarily to advance the country and its citizens in several aspects. Change has been influenced by an increase in the student population, demands of the job market and the influence of international higher education (Al-Anqari, 2014). Saudi Arabia started following global trend focusing on exploring its talents especially young students. In the past decade there is an interest in gifted students and their thinking abilities.

Teaching critical thinking, an educational goal widely discussed in the last 30 years (Halpern, 1993), is an essential element of professional and higher education as it promotes reasoned judgments under 'conditions of uncertainty,' a hallmark of professionalism (Levine, 2010; Shulman, 2005; Perry, 1970 as cited in Hamdan Alghamdi & Deraney, 2011). Critical thinking became the buzz word at global level and many studies connect it to talents and giftedness. Same trend seemed to appear for Saudi Arabia.

Although the Kingdom of Saudi Arabia has started paying attention to talented students with special abilities, there are relatively few studies that discuss the effectiveness of giftedness programs on improving skills. This study explores the effectiveness of the *Mawhiba* (Giftedness) program on developing Saudi students' critical thinking skills. A recent study by Batterjee [1] explores the nature of gifted education in Saudi Arabia in the context of this long tradition of educational programs and philosophies for the elite. "Since Plato, many modern scholars have promoted the development of the intellectual elite, their cognitive abilities, and their contributions to the technical, economic, political, and cultural development of society" [1].

The aim of this research paper is to explore how female Saudi students attending the summer *Mawhiba* giftedness program develop and improve their critical thinking skills. "These programs aim at providing the circumstances and opportunities enough to take the learners to their utmost potentials and capabilities" [2].

In the following sections the paper will start with an overview for gifted education, critical thinking skills, an overview of the Summer Talent Program Mawhiba, Research problem and questions, then study results and discussion, and implication for practice.

2. PROBLEM STATEMENT/DESCRIPTION

2.1 Objectives

This study had two main objectives:

- Assess and measure critical thinking skills among gifted middle and secondary school female students in the Eastern Province of Saudi Arabia.
- Check/verify the effectiveness of the activities of the *Mawhiba* program in developing critical thinking skills.

2.2 Research Questions

The research problem can be identified by answering the following questions:

1. Are there any differences in critical thinking skills resulting from the impact of the *Mawhiba* program training on gifted students?
2. Is there a relationship between critical thinking and academic achievement among gifted students?
3. Are there any differences in critical thinking skills due to the specific characteristics of the school stage (middle or secondary)?

This study followed a quasi-experimental approach and used an experimental design with one group (pre- and post-measurement). It assessed the effectiveness of the training program (the

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

Talent Program), the independent variable, on the development of critical thinking skills among gifted students, the dependent variable.

3. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Gifted children offer special challenges when it comes to developing critical thinking skills. This is particularly due to their possession of talents and gifts that require special effort from the teacher to ensure that they are not left behind in the program [3]. The gifted and talented students are considered to be those pupils whose intellectual ability and related needs are more advanced compared to other pupils [4].The concept of giftedness, and the task of identifying which students fall into this category, is subject to a lot of debate and many scholars have provided their interpretations of the term. It was in 1972, however, that the concept of giftedness was laid out in a comprehensive manner in the Marland Report, which stated that gifted children are those who by virtue of outstanding abilities are capable of high performance. These abilities may include general intellectual ability, creative or productive thinking, particular academic aptitude, visual or performing arts, or psychomotor ability [5].

Stoeger [6] suggests that in the past the concept of giftedness was associated primarily with high IQ: gifted students were those born with high intellectual ability and who could be identified by their high grades in examinations. It was suggested that they were the ones who excelled in all areas of life and of school [6]. These assumptions are still held, but nowadays there are a number of ways in which a person could be considered as gifted.

A review of the literature related to gifted education yields a variety of other characteristics that indicate advanced skills in gifted students. Research has identified the following characteristics:

- Gifted students process information faster, for both simple and complex tasks, compared to their non-gifted peers [7].
- Gifted students are generally more thorough problem solvers, employing a wider variety of strategies for problem solving [8].
- Gifted students appear to make use of more metacognitive strategies during learning than their non-gifted peers [9].
- Gifted students are able to sustain attention towards a task or problem in a manner that non-gifted students are not able to do [10].
- Gifted learners, or those with higher cognitive abilities, have superior memories and their retrieval system is more efficient when compared with their non-gifted peers [7].
- Gifted students have different instructional needs than their non-gifted peers: they require minimal instruction for learning and understanding [11].

Thus their superior analytic ability, insightful and complex higher-order thinking, and greater metacognition make it challenging for teachers to teach gifted students in inclusive classrooms. These characteristics serve as the basis for using differentiation of instruction in gifted education or initiating a separate program for the development of critical thinking in gifted students or learners [12].

3.1 Critical thinking skills

In recent years, development of critical thinking skills has increasingly been considered a worthy and important educational goal. In this age of globalization, critical thinking is considered one of the most essential skills needed for the 21st century [13]. Not only this, but it is also increasingly associated with educational outcomes. Studies have found that critical thinking has significant impact on students' learning ability and academic achievement [14, 15]. This implies that critical thinking is directly related to students' academic success, which makes it an important area in today's educational world. Many written works have surfaced from educators highlighting the importance of developing critical thinking skills, and it has been increasingly incorporated into the curricula of educational programs.

Critical thinking is considered an important life skill for all learners, and its development is linked with making learners adept at handling challenging and complicated life situations [16]. Hence, considerable attention is now being directed to fostering critical thinking skills in learners. As a

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

result, critical or higher-level thinking processes have been an important component of the curricula of gifted programs as well as regular instruction provided in classrooms.

Despite the widespread recognition of the importance of critical thinking skills, there is no consensus on its definition. Some researchers define critical thinking in terms of theories of psychology and philosophy, while others have explained it from educational perspectives. The underlying assumptions differ to some extent, with each providing valuable insights related to what the concept constitutes. In this regard, Benjamin Bloom and his associates in 1956 presented taxonomy for information processing skills, which remains one of the most widely, cited sources by educational practitioners when it comes to assessing and teaching these skills. The taxonomy is in the form of a hierarchy, with 'comprehension' at the bottom and 'evaluation' at the top, and the three highest levels (analysis, synthesis, and evaluation) are related to the concept of critical thinking [17].

The educational approach has its basis in years of observing student learning and the experience of educators in the classroom. There are some specific abilities encompassed in the definition of critical thinking. Lau [13] is of the view that a critical thinker is someone who is able to understand the logical connections between ideas; identify, construct, and evaluate arguments; evaluate the pros and cons of a situation; analyse problems in a systematic manner; reflect on and evaluate their own thinking skills; and detect inconsistencies and common fallacies in reasoning. A closer look at these characteristics reveals that the definition of critical thinking has two major components, i.e., skills and attitudes.

Other scholars have associated critical thinking with other skills such as metacognition and creativity. Magno [18] suggests that metacognition plays an important role in the development of critical thinking skills, while Ku and Ho [19] think that the use of metacognitive strategies is crucial to the thinking process. Apart from metacognition, critical thinking is also associated with creativity and scholars suggest that some amount of creativity is essential for critical thinking [20].

3.2 Giftedness and critical thinking

Nowadays, critical thinking is one of the goals of schooling. It has been acknowledged that critical thinking skills are not an innate ability—through education, practice, and training they can be acquired [21]; however, many still believe that gifted children are innately critical thinkers. Many researchers have advocated for teaching critical thinking skills explicitly to all learners (even gifted children) and consider such an approach to be more effective at fostering critical thinking [21]. Just because gifted children have better intellectual abilities does not mean they will have critical thinking skills without being provided with an understanding of the strategies to think critically [22]. The basic assumptions and concepts largely suggested in the research literature that critical thinking skills should be taught explicitly to average students should also be taught to gifted students through differentiation of instruction. The only difference will be the pace at which they learn the skills. This is true particularly because the foundations of critical thinking are similar and do not differ on the basis of the cognitive abilities of the learner [23]. Also, since gifted students learn at a faster rate and are typically better at skills necessary for critical thinking, instruction should involve tasks or activities that they find challenging; i.e., those that require a higher level of expectation from them with regard to process and content demands [24]. Many of the critical thinking tasks are performed better by gifted learners than students having average abilities [23], but this does not mean that gifted students do not require critical thinking to be taught to them.

Vygotsky's theory of zone of proximal development (ZPD) is particularly relevant. ZPD is directly related to differentiation of instruction, a central premise for gifted education. This is because the teacher is required to provide students with activities that are challenging for them. For learning to take place, there is a need that students employ a more advanced way of thinking [25]. Since there are differences amongst gifted students themselves, and also between other students, the teacher not only has multiple cognitive characteristics to focus on but a range of social and emotional needs to address. Thus, in accordance with the ZPD theory, instruction needs to fall

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

within the ZPD of each of the gifted students in order for instruction of critical thinking skills to be effective [26].

There is debate surrounding whether teaching critical thinking to gifted students would lead to better results within a homogenous or heterogeneous learning environment. However, researchers broadly agree that there needs to be differentiation of instruction for both types of learning environment. Hence, programs have been initiated in all parts of the world that are aimed at teaching gifted students critical thinking skills.

3.3 Educational programs

Teaching critical thinking has become the focus of many educational institutions, not only for students with average intelligence but also for those who are identified as gifted students [27]. Educational decision makers in recent years have favoured inclusion to address, through modifications in curricula and instruction, the needs of gifted students in a heterogeneous classroom [28]. However, Hertberg-Davis [28] has identified that effective differentiation of the curriculum, addressing the specific and special needs of gifted students in a mixed-ability classroom, is a difficult task. Within the field of gifted education, differentiated learning is considered a foundational idea and defined both heterogeneous grouping as well as separate programs, especially for gifted learners.

Educational reforms in the mid-1920s saw the emergence of many educational programs and curricula tailored to the gifted and talented population of many developed countries [27]. Over the years, many enrichment programs for children with special abilities came to be regarded as having significant influence. The structure of these programs allowed for flexibility in meeting the different needs of these gifted learners and providing them with different kinds of learning environments.

A review of the literature reveals that there is little research on the subject of gifted education; however, researchers have looked at the teaching of thinking skills and prioritized critical thinking skills for gifted students [29]. Despite the availability of many studies on the subject of fostering critical thinking, only two key strategies are considered for the specific development of critical thinking in gifted students: the Dixon-Hegelian method [30] and the use of online technologies [31]. The dearth of studies related to the strategies that can be employed for fostering critical thinking in gifted students is still present, which makes it difficult for those teaching gifted students to employ effective strategies. Another barrier is that many of these gifted students are part of heterogeneous classrooms [32] and not special classes.

Although the significance of critical thinking in many aspects of professional and academic life is mentioned in the literature [33], the literature also shows that schools often fail to effectively promote critical thinking [34]. The field of gifted education has regarded critical thinking to be a desirable goal for gifted programs. Research studies surrounding gifted education have reported attempts at improving gifted students' critical thinking skills, but despite the attention that is directed at the development of critical thinking skills among this population, the literature does not provide details with regards to the strategies employed and the extent to which the programs are effective.

The literature, in general, focuses on the critical thinking of older students or learners and usually of college-level student populations; there are only a few studies that have examined critical thinking skills among elementary-level student populations, including some populations of gifted students. VanTassel-Baska et al. [35] measured growth in critical thinking and reading comprehension of high-ability learners in an instructional intervention as part of Project Athena, a set of curriculum units for developing and enhancing students' critical thinking skills. Significant improvements were observed in the critical thinking skills of high-ability students; however, over a three-year period, the researchers observed both groups, i.e., control and experimental, make similar gains. VanTassel-Baska et al. [35] identified that those who got higher IQ scores also attained a higher score in the Test for Critical Thinking, which lends credence to the notion that gifted students are better at critical thinking than non-gifted students. Studies on the effectiveness of critical thinking programs, or those that present an evaluation of initiated

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

programs for developing and enhancing thinking skills in gifted learners, are not found in the research literature. The lack of studies is more particularly found in the Kingdom of Saudi Arabia, where this study is set.

3.4 Evaluation of the effectiveness of *Mawhiba* programs

In many countries, educational systems give considerable care to designing programs that prioritise giftedness and creativity. More specifically, the Kingdom of Saudi Arabia places a lot of attention on and provides support for gifted service and programs in a variety of pre-university education programs [36]. In the Kingdom of Saudi Arabia, while earlier gifted students went unidentified, the last two decades have seen an increased interest in this area. The surfacing of a wide range of gifted education programs all over the country by the Ministry of Education in 1998 was the first practical step in this direction, which was followed by the establishment of the King Abdulaziz and his Companion Foundation for Giftedness and Creativity for promoting gifted education and for adopting programs aimed at fulfilling the needs of this group. Since that time, many programs for gifted students in the Kingdom have been established that respond to the social, emotional, and cognitive needs of the gifted students participating in the programs [37]. Over the last decade, such programs have attained substantial acknowledgement from students, educators, and parents in the country.

Although the programs themselves are acknowledged, less attention is paid to evaluating their actual effectiveness. Program evaluation is a kind of systematic analysis for generating information that can help in making significant judgements related to a future course of action and in understanding how the program has carried out the purpose it was initiated for [38]. Therefore, program evaluation is an important area to consider for any kind of program, but more specifically for educational programs because it can help identify future courses of action for the program. Program evaluation is also significant since it may help determine the need for program changes, extending further support to a program, or whether a program should be ended [38].

The literature review identified gaps in knowledge surrounding the teaching of critical thinking skills to gifted students and evaluation of these programs to determine their effectiveness, areas to improve, where changes are needed, and where strengths exist in order to inform future courses of action.

The authors highlight the rationale of investigating secondary school female students is because of gender segregation in Saudi schools so the female researchers have accessibility to female students only to conduct the study.

4. Data Collection

A. Exploratory sample:

A pilot test was carried out to obtain the validity and reliability of the instruments used in the study. A pilot sample consisted of 40 talented students—participants in the program--from the Eastern Province of Saudi Arabia ranged in age from (12-16) years with an average (14:26) and a standard deviation (1.207).

B. The Sample

The sample consisted of 40 gifted female students in the Eastern Province of the Kingdom of Saudi Arabia. The ages ranged from 12 to 16 years with an average age of 14.26 and a standard deviation of 1.207.

The sample has been passed through several stages that depend on a variety of factors, such as the level of academic achievement (95% or higher), an aptitude test held at the National Center for Assessment in Higher Education, and the nomination by teachers and education department.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

Students were selected for the research sample according to the criteria set out by the Ministry of Education: teachers' nomination; cumulative of school's GPA of 90% or higher; passing an Aptitude test and Measurement test (Talent). All students in the Mawhiba program were tested pre the program and post it.

4.3 Tools

The Critical Thinking test, prepared by Jabir Abdulhameed Jabir and Ahlam Al-Baz [39], is designed to measure critical thinking skills and consists of 80 items distributed across five dimensions featuring 16 multiple-choice questions. The five dimensions are as follows: the evaluation of arguments, conclusions, reasoning, identification of assumptions, and the dimension profile (which represents the emotional side of the individual, such as flexibility in formulating opinions and self-esteem and accuracy).

To check the test validity (appropriateness and effectiveness) of the scale, we used the validity and reliability of test content: 60 minutes are required to apply the scale to students at the intermediate level and 50 minutes to apply the scale to students in secondary school. However, in the current study not more than 30 minutes were required to apply the measurement and this might be a reflection of the fact that the research sample was composed of talented students. Invariability was calculated using Cronbach's alpha coefficient values; the reliability coefficients for the test and its dimensions are described in Table 1.

Table 1 shows the Cronbach's alpha for each of the five dimensions of the test as well as for the whole test.

Recall that the Cronbach's alpha coefficient is a measure of internal consistency of a test. It is also considered to be a measure of scale reliability [Ref].

Note that all the alpha values calculated in Table 1 for each of the five dimensions are greater than 0.70. This proves the internal consistency of each of the test dimensions as acceptable values of alpha to confirm internal consistency of a test range from 0.70 to 0.95 [Ref].

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

Table 1: The stability of the test and its dimensions

The test as a whole	Dimension profile	Identification of the assumption	Reasoning	Conclusions	Evaluating arguments
88.0	81.0	86.0	84.0	81.0	78.0

Stability was calculated in a re-application manner using an interval of 16. Day 1, the sample equaled 40.

In order to assess the efficiency and the effect of the Mawhiba program, the mean scores of student results before and after the program are compared for each dimension using the t-test.

Table 2 shows the values of the t-test obtained from a sample of 30 students for each dimension.

4.4 Description of the *Mawhiba* training program (Talent Summer Program)

King Abdulaziz and his Companions Foundation for Giftedness and Creativity is the program provider. It is a national cultural Foundation that is honoured to be presided over by the Custodian of the Two Holy Mosques who supervises it directly and continuously. “Let us each play a part and assume responsibility with regards to the initiation of this foundation, which does not exclude anyone, but rather constitutes a partnership involving all of us, we the citizens, without exception” [36]. Female students were selected after passing a test that measures their abilities to solve math and basic science problems. The program was designed in 2013 by international staff in the Youth Talented Center and the staff of the summer program at Johns Hopkins University, yet the program is administered at the University of Dammam, a public university in the Eastern Province of Saudi Arabia. The trial period of the program (five consecutive weeks', five days per week) is about six hours of training per day.

The program consists of three scientific components: Introduction to Biomedical Sciences Engineering Design; and Electrical Engineering. The educational content of the program encompasses problem solving, creative and critical thinking, decision making, planning, time management skills, teamwork, as well as writing and public speaking skills.

The students learn through the scientific content of the program how to ask scientific questions, develop hypotheses, conduct experiments in order to interpret the medical and engineering phenomena; this gives students an opportunity to ask questions and to form their own conclusions.

Throughout the duration of the program the students have opportunities to work together. They are divided into groups at the end of each task and are asked to submit written reports describing what they learned and to present what they have designed. The program also promotes student learning through lessons that link the various activities in science. Discussions follow each subject, which enables students to interact, understand, and extract information more effectively.

4.5 Role of teachers

In the context of the *Mawhiba* Talent Summer Program, the teacher is a facilitator. She directs and provides assistance when necessary, keeps students informed on time remaining for each task to help them manage and save time, and observes student performance to make sure they carry out their duties.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

Supervisors and teachers used cooperative learning strategies, group discussions, mindmaps, meditative writings, strategic questioning usage, self-assessment and peer assessment in various activities related to learning that focuses on learning assessment and not knowledge assessment itself. By practicing such strategies, teachers contributed to providing a suitable atmosphere for the development of critical thinking skills, development of analysis, realization of contrasts, composition, and evaluation.

4.6 Evaluation method

There is an initial assessment on the first day, which serves to measure students' critical thinking skills, and formative feedback/assessment is provided throughout the program to monitor students' improvement and growth. Assessing students daily helps with planning and setting goals for the next day. A final assessment at the end of the program (in week 5) measures the students' educational growth, with the objective of also measuring the effectiveness of the program itself in developing critical thinking skills in students.

4.7 Code of Ethics

One of the key components of the program is that the teachers are keen to sign a code of conduct with the students on the first day of the training program. A set of guidelines helps to create a safe and positive learning environment.

As it is an intervention study , informed consent from the female participants were collected and it was made clear that the data collection was for research purposes and that students had the right to withdraw from the study at any time. Anonymousty was guaranteed to students and the teacher.

5. RESULTS AND DISCUSSION

One of the main questions of the study was whether there were any differences in the critical thinking skills developed as a result of the gifted training program. To answer this question a statistical T-test for the associated groups with pre and post measurements was used. The results are described in Table 3.

Table 2: Paired samples t-test comparing the mean scores in the pre-test and post-test for critical thinking.

(S = 30)

Effect size	Eta Square	P Level of significance	df.	T Value	Measurement				Critical thinking skills
					Post		Pre		
					S.D	Mean	S.D	Mean	
Insignificant		0.184	29	1.36	1.40	12.60	1.91	12.20	Evaluating arguments
Highly significant	0.167	0.02	29	2.414	1.75	14.60	2.1	13.53	Conclusions Deduction
Insignificant		0.823	29	0.226	1.06	14.6	0.93	14.56	Reasoning
Significant	0.222	0.007	29	2.88	1.81	12.40	3.79	10.63	Identification of assumptions

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

Insignificant		0.902	29	0.124	1.53	11.83	1.82	11.80	Dimension profile
Significant	0.292	0.002	29	3.46	4.8	66.60	6.5	62.7	The total score for critical thinking

From the above table and from the presence of statistically significant differences among the median scores within the experimental group in the pre and post measurements of critical thinking skills like deduction, the identification of contradiction, the total score for critical thinking in which the T-value for each is 2.414, 2.88 and 3.46, respectively. These values are function at the level of significance of 0.05.

The program appeared to have an impact on the development of skills and critical thinking more than finding the conclusion skills (0.16). The values for assumption identification (0.222) and total score for critical thinking (0.292) were high, which indicates the effectiveness of the training program on developing critical thinking skills. This value is high, which indicates the effectiveness of the training program for the development of critical thinking skills among talented students.

Another key research question was whether there is a relationship between critical thinking and academic achievement among female gifted students. To answer this question a Pearson correlation coefficient was used. It found a correlation at a level of significance between academic achievement of gifted female students and their critical thinking skills (the total score); the value of the correlation coefficient was 0.372.

The question also arose around whether there were any differences in critical thinking skills due to grade level (secondary versus intermediate- for instance).

Table 3: Results of the T-test for significant differences among the medians of talented students' scores in terms of critical thinking skills and the overall degree of critical thinking depending on the school level

(S = 30)

The level of significance	df.	T value	Grade level				Critical thinking skills
			Secondary		Intermediate		
			S.D	Mean	S.D	Mean	
Insignificant	28	0.163	1.83	12.11	1.99	12.23	Evaluating arguments
Insignificant	28	0.221	2.06	13.66	2.20	13.47	Deduction
Insignificant	28	1.81	1.05	14.11	0.83	14.76	Reasoning
Insignificant	28	0.555	1.85	11.22	4.38	10.38	Identification of contradiction
Insignificant	28	1.76	1.7	11.42	1.71	11.42	Dimension profile
Insignificant	28	0.625	5.08	63.88	7.14	62.3	The total score for critical thinking

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

It is evident from Table 3 that there are no statistically significant differences among the median scores of gifted students in terms of critical thinking skills and among the total scores for critical thinking depending on the grade level.

The current study has demonstrated the effectiveness of the Talent Summer Program in the development of critical thinking skills in secondary school students [40]. Al-Hunaifi K and Al-Lizam proved that one could study the development of critical thinking skills among middle school students, but that study focused on the theory of multiple intelligences program. Al-Rashid [41], in a similar study, showed that there is a weakness in critical thinking in analysis and investigation in eighth grade science classes in Saudi Arabia. Al-Obaidi [42] showed that gifted students have some critical thinking skills in mathematics, but in a very limited way. Also, the study showed that there is a lack of talented teachers who use methods and strategies that contribute to developing critical thinking skills in students. However, teachers in the program played a key role in fostering critical thinking among gifted students in the Eastern Province of Saudi Arabia.

By using many of the strategies that have contributed to the development of critical thinking and following the stages of critical thinking through the three parts of the program—Fundamentals of Electrical Engineering, Engineering Design, and Introduction to Biomedical Sciences—which can be performed by students through searching for information, linking it, and then evaluating and resolving the contradiction between data. Moreover, the students will examine facts, observation, and data and then analyze, evaluate, and judge them. This provides students with an opportunity to practice educational activities based on problem solving, experimentation, analysis, comparison, and decision making. Students also get used to the freedom of putting forward their views and accepting the views of others. All this contributed in one way or another to the development of critical thinking skills [43].

Moreover, these activities in the training program put the students in an environment that required analysis, detection of similarities and differences, using analytical thinking skills for the engineering problems, reading and analysing data, interpreting quantitative and qualitative data, as well as practicing oral and written communication through classroom discussions and presentations. During the implementation of the program sessions, teachers encouraged students to explore scientific accuracy in expressions, as well as to raise questions and to establish dialogues, discussions, and debates.

The results of the current study have shown that the lack of statistically significant differences between the mean scores of talented students in critical thinking skills, individually as well as the overall degree of critical thinking due to the type of the school stage where there is slight differences in the age variable. In addition, it seems that talent is not affected by age, but this result differed from the results of a study [42], which showed differences in the critical thinking skills between students in the first and fifth grades, which means that the growth factor affects the development of critical thinking skills. However, in the current study, researchers noticed that the talent variable did not show these differences due to chronological age factor.

5.7 Implications for Practice

The results of this study clearly show that creating a suitable learning environment, based on interactions and communication free of anxiety and stress, is the most important contributing factor in the development of critical thinking skills. Such a learning environment encourages students to find solutions to various problems that arise in learning situations, through critically evaluating arguments and predicting the consequences of a solution to a specific problem.

The sessions were designed to allow students to practice and develop a variety of skills. There were logical discussions of scientific topics, theoretical analysis, and scientific rules in physics and electrical engineering. Students were encouraged to use critical thinking to discuss and analyse documentary films, analyse results, provide feedback, explore their strengths and weaknesses, and suggest ways to improve. All of these components encouraged students to

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

engage in conversations and actively participate in analytical thinking of scientific facts according to certain standards of assessment.

6. CONCLUSION

This study highlighted the importance of measuring the impact of the *Mawhiba* summer giftedness program on female students in Saudi Arabia. This study is the first to address the effect of a science-condensed program on students' abilities, particularly their critical thinking skills [44]. The main recommendation based on the study results is to establish a database for every group of students that participates in these programs across the Kingdom of Saudi Arabia in order to be able to identify areas of strength and weakness in the program as a whole. There should be further studies on the effectiveness of this program. One of the benefits of the *Mawhiba* program is the tailored environment it provides, where students can receive constant attention. The *Mawhiba* summer program could also potentially be offered as a camp; however, Saudi parents are not accustomed to boarding schools and might resist sending their female children to such schools. As noted by Batterjee [1], more market research to test how acceptable this would be to parents is recommended. In this respect, further research with larger and more diversified samples is also recommended. Because this study only focused on female students, the literature would be enriched if researchers also studied the effectiveness of the program on male students' development of critical thinking skills after attending such intensive programs.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

REFERENCES

1. Alghamdi Hamdan, A., & Philline, D. (2013). Effects of Teaching Critical Thinking to Saudi Female University Students Using a Stand-Alone Course. *International Education Studies, 6*(7):176-188.

Batterjee AA. The relationship between SES and giftedness in Saudi Arabia. Mankind Quart. LIII. 2013;3:1-51.

2. Al-Shehri MA, Al-Zoubi S, Bani M, Abudulrahman A. The effectiveness of gifted students centers in developing geometric thinking. Educ Res. 2011;2(11):1676-1684.

3. Le Storti AJ. Developing thinking in the gifted*.* PAGE Bulletin; 1997.

4. Sayler MF. Gifted and thriving: a deeper understanding of meaning of GT. In: Shavinina LV, editor. International handbook on giftedness. Springer Netherlands; 2009:215-230.

5. Marland SP. Education of the gifted and talented*.* Report to Congress. Washington, DC: U.S. Government Printing Office; 1972.

6. Stoeger H. The history of giftedness research. In: Shavinina LV, editor. International handbook on giftedness. Springer Netherlands; 2009:17-38.

7. Geake JG. Neuropsychological characteristics of academic and creative giftedness. In: Shavinina LV, editor. International handbook on giftedness. Springer Netherlands; 2009:261-273.

8. Tomlinson CA. Good teaching for one and all: does gifted education have an instructional identity? J Educ Gifted*.* 1996;20(2):155-174.

9. Shore BM. Metacognition and flexibility: qualitative differences in how gifted children think. Washington, DC, US: American Psychological Association; 2000:167-187.

10. Sriraman B. Gifted ninth graders' notion of proof: investigating parallels in approaches of mathematically gifted students and professional mathematicians. J Educ Gifted. 2004;27:267-292.

11. Gallagher JJ. Psychology, psychologists, and gifted students. In: Pfeiffen SI, editor. Handbook of giftedness in children: psychoeducational theory, research, and best practices. Springer US; 2008:1-11.

12. Borland JH. Gifted students. In: Good TL, editor. 21st century education: a reference handbook. Los Angeles: SAGE Publications; 2008. Accessed 2012 Jan 11. Available: http://www.uk.sagepub.com/gargiulo4emedia/study/chapters/handbook/handbook14.1.pdf

13. Lau JY. An introduction to critical thinking and creativity: think more, think better. Hoboken (NJ): John Wiley & Sons; 2011.

14. Karbalaei A. Critical thinking and academic achievement. Íkala, revista de lenguaje y cultura. 2012;17(2):121-128. Accessed Dec 2013. Available: http://www.redalyc.org/pdf/2550/255024132001.pdf

15. Bessick SC. Improved critical thinking skills as a result of direct instruction and their relationship to academic achievement. Doctoral dissertation, Indiana University of Pennsylvania; 2008.

16. Yuzainee MY, Imanina NH. Effectiveness of teaching critical thinking skills: a meta-analysis. Teaching and learning symposium. University of Wisconsin System; 2014.

17. Calodney JL. Bloom's taxonomy: utilizing its full potential as a critical thinking tool. Doctoral dissertation, Colorado College; 1997.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

18. Magno C. The role of metacognitive skills in developing critical thinking. Metacognition and Learning. 2010;5(2):137-156.

19. Ku KY, Ho IT. (2010). Metacognitive strategies that enhance critical thinking. Metacognition and Learning. 2010;5(3):251-267.

20. Padget S. Editor. Creativity and critical thinking. New York: Routledge; 2013.

21. Halpern DF. Assessing the effectiveness of critical thinking instruction. J Gen Educ. 2001;50(4):270-286.

22. Udall AJ, High MH. What are they thinking when we're teaching critical thinking? Gifted Child Quart. 1989;33(4):156-160.

23. Kaufman SB, Sternberg RJ. Conceptions of giftedness. In: Pfeiffen SI, editor. Handbook of giftedness in children: psychoeducational theory, research, and best practices. Springer US; 2008:71-91.

24. Winebrenner S. Teaching gifted kids in the regular classroom: strategies and techniques every teacher can use to meet the academic needs of the gifted and talented. Revised, Expanded. Free Spirit Publishing Inc.: Minneapolis, MN; 2001.

25. Danish JA, Peppler K, Phelps D, Washington D. Life in the hive: supporting inquiry into complexity within the zone of proximal development. Journal of Science Education and Technology. 2011;20(5):454-467.

26. Kanevsky L, Geake J. Inside the zone of proximal development: validating a multifactor model of learning potential with gifted students and their peers. J Educ Gifted. 2004;28(2):182-217.

27. Heller KA, Schofield NJ. Identification and nurturing the gifted from an international perspective. In: Pfeiffen SI, editor. Handbook of giftedness in children: psychoeducational theory, research, and best practices. Springer US; 2008:93-114.

28. Hertberg-Davis H. Myth 7: differentiation in the regular classroom is equivalent to gifted programs and is sufficient. Gifted Child Quart. 2009;53(4):251-253.

29. Newman JL. Talents are unlimited: it's time to teach thinking skills again! Gifted Child Today. 2008;31(3):34-44.

30. Dixon FA, Prater KA, Vine HM. Teaching to their thinking: a strategy to meet the critical-thinking needs of gifted students. J Educ Gifted. 2004;28(1):56-76. Accessed Jan 2013. Available: http://files.eric.ed.gov/fulltext/EJ682888.pdf

31. Eckstein M. Enrichment 2.0: gifted and talented education for the 21st century. Gifted Child Today. 2009;32(1):59-63. doi: 10.4219/gct-2009-841

32. Bangel NJ, Moon SM, Capobianco BM. Preservice teachers' perceptions and experiences in a gifted education training model. Gifted Child Quart. 2010;54(3):209-221.

33. Crenshaw P, Hale E, Harper SL. Producing intellectual labor in the classroom: the utilization of a critical thinking model to help students take command of their thinking. J College Teaching Learn. 2011;8(7):13-26.

34. Willingham DT. Critical thinking: why is it so hard to teach? Arts Education Policy Review. 2008;109(4):21-32. Accessed Feb 2013. Available: http://www.aft.org//sites/default/files/periodicals/Crit_Thinking.pdf

35. VanTassel-Baska J, Bracken B, Feng A, Brown E. A longitudinal study of enhancing critical thinking and reading comprehension in Title I classrooms. J Educ Gifted. 2009;33:7-37.

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa

36. King Abdulaziz and his Companion Foundation for Giftedness and Creativity; 2008, 2013 Accessed Jan 23. Available: http://www.kacgc.org.sa/en/pages/home.aspx

37. Aljughaiman AM, Ayoub AE. Evaluating the effects of the Oasis Enrichment Model on gifted education: a meta-analysis study. Talent Development & Excellence. 2012;5(1):99-113. Accessed Feb 2013. Available: http://aljughaiman.net/wp-content/uploads/2012/06/tde-2013-1-complete-issue.pdf

38. Payne DA. Designing educational project and program evaluations: a practical overview based on research and experience. (Vol. 38). Boston: Kluwer Academic Publishers; 1994.

39. Jabir Abdulhameed Jabir and Ahlam Al-Baz Brochure for critical thinking test instructions. (2008) Dar AlNahda AlArabia Cairo.

40. Al-Hunaifi K, Al-Lizam I. The impact of the program proposal based on the collection of multiple intelligences in science subject and critical thinking in eighth grade. 2010. [Al Rushed Publisher Riyadh Saudi Arabia .

41. Al-Rashid A. Achievement in science for students in eighth grade in public and private school in Riyadh: a comparative study. Educational and Psychological Science Journal. 2004;5(4).

42. Al-Obaidi SM. Critical thinking in mathematics in school gifted students. Unpublished Master's Thesis, Faculty of Education, University of Baghdad; 2005.

43. Al-Hwajji K, Al-Khazaelah M. Educational applications in teaching thinking. Kingdom of Saudi Arabia: Al-Rushd Bookstore; 2015.

44. Snyder LG, Snyder MJ. Teaching critical thinking and problem solving skills. Delta Pi Epsilon Journal. 2008;50(2):90-99. Accessed Jan 2014. Available: http://reforma.fen.uchile.cl/Papers/Teaching%20Critical%20Thinking%20Skills%20and%20problem%20solving%20skills%20-%20Gueldenzoph,%20Snyder.pdf

E-mail: amani.k.hamdan@gmail.com (Primary Email), akhalghamdi@uod.edu.sa