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THE EFFECT OF A PROJECT- BASED PROGRAM TO DEVELOP THE OF CRITICAL AND CREATIVE THINKING SKILLS

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Abstract

The purpose of the current study was to identify the effectiveness of a Project-Based Program in developing Critical and Creativity Thinking Skills, Self-Concept and School Readiness among Gifted Kindergarten Children. The researcher used a quasi-experimental design. The sample consisted of (22) childs and were divided into two groups as experimental and control group. Critical thinking scale Al-ferian (2013), also Torrance scale of innovative thinking in performance and movement to measure creative thinking. The results showed statistically significant differences in some critical thinking skills such as observation, similarity, difference, judgments, and overall grade between the experimental and control groups in favor of the experimental, while statistically significant differences showed some critical thinking skills such as observation, arrangement, division, division, judgment, and overall grade between the pre and posttests. For the benefit of the post test, and there were

statistically significant differences in creativity thinking skills (fluency, originality, and imagination), which indicates that the Project-Based Program was effective on critical thinking, creativity thinking skills.

Keywords

Critical Thinking, Creativity Thinking, Kindergartens, Project

1. Introduction

Education in kindergarten is moving towards the scientific development, which benefits the child, as the services provided to children have varied recently through some programs, such as the program for introducing subjects (Arabic, English and Mathematics), and the Reggio Emilia program that was recently applied to some kindergartens in the State of Kuwait. Education is not limited to motivation and response only, but it is a comprehensive process for multiple fields such as the psychomotor, emotional, and cognitive aspects. Preparing the child at this stage to meet the demands of future life is urgent, especially since the current time witnesses many developments and changes to the different levels. Children need to master a range of skills that enable them to live in this society and be prepared for the future (Bahadir, 2003).

Countries have realized the importance of the gifted in being the basis on which they should depend in building their societies and their progress, so they have been striving to identify them, solve their problems and provide the best for developing their talents and abilities, and meeting their psychological, educational, social and professional needs, due to their characteristics and thinking level that are distinguish them from their peers. (Justo, 2008).

The importance of learning with projects strategy is enhanced as the international interest in the topic of thinking increased significantly in the third millennium; this interest resulted in many classifications of thinking skills and programs. The strategy of learning in projects depends on thinking skills, and conducting many necessary experimental research and educational applications, in accordance with the principles of purposeful education in all its dimensions in order to organize the learners thinking and to benefit from their creative energies and invest them by providing programs that meet their needs and help them to grow properly (Nofal & Soaifan, 2011). The learning strategy using Projects is used in all academic subjects at school and at all levels of education from kindergarten to high school (Barton & levstik, 2011).

Critical thinking is one of the thinking types, and it is an important educational issue and an essential feature of achieving progress and success in the 21st century (Beyer, 2003). This led some scholars to consider it as a knowledge base that leads to efficient problem solving and decision-making processes (Ajwa & Al-Banna, 2000). Critical thinking is the individual's ability to closely examine the situations he is exposed to, distinguish between them, interpret and evaluate them and draw conclusions from them, committed to objectivity and impartiality (Al-Sharqi, 2005).

Al-Samadouni (2009) determines the skills that can be developed by individuals according to age groups, so critical thinking skills that he determines for the age group (4-8) years are as follows:

- A. Observation: Observation is considered one of the basic skills that we depend on to discover information. Also, using observation, we can measure the children's abilities in focusing, attention, and checking on the details and the events.
- B. Organization: the child can organize ideas, events and things chronologically through this skill.
- C. Knowing the reasons: Using this skill, we can define if whether the child is able to Give justifications and reasons for some events and happenings which happens in front of him.
- D. Similarities and differences: This skill is a compound skill that depends on other skills, like observation. The child start by observing the things details, then compare them.
- E. Judging: it is one of the most complicated and combined skills. Through this skill, the child practice giving his opinion, judging, and giving reasons for this judgment.

In addition, creative thinking is also one of the ways of thinking that suits the requirements and needs of the current age, and it includes the production of new ideas, and is represented in novelty of ideas, and intellectual, artistic and practical products, in response to changing requirements and needs (Paul & Elder, 2008). Creative thinking Enables learners to deal with the vast amount of information, and analyze, compare, compose and evaluate them to produce new ideas, and to address life problems, and devise new methods and strategies to solve (Al-Omary, 2012). The learning strategies of this current age are different from those in the past, so new ideas must keep up with rapid developments in this field.

2. Creative Thinking Skills

Al-Binali (2005) defines creative thinking skills as a purposeful new production directed towards a specific goal, it is the ability of the mind to form new relationships that change the students real state, it makes them go beyond memorization to thinking, study, analysis, and conclusion, then innovation and creativity. Creative thinking has several skills including (Fluency, flexibility, and originality: as follows:

A- Fluency

Fluency refers to an individual's ability to articulate many interconnected ideas in a specific time period when facing a problem (Arora, 2002). There are three types of fluency; verbal fluency, which means the student's ability to produce the largest possible number of words, utterances, or meanings that meet certain conditions, and is divided into association fluency, which is the student's ability to produce the largest number of words and words interconnected with one tone, a number of letters, beginnings or endings, and the fluency of shapes, which refers to the student's ability to quickly draw a number of examples, details, and modifications to a descriptive or visual stimulus (Al-Atoum, 2004).

B- Originality

Originality refers to unfamiliar production that no one has preceded, and the idea is called original if it is not subject to common ideas and is characterized by excellence (Khalili, 2005), and it is considered to be the most associated characteristic with creativity and creative thinking. Originality means uncommon production that no one has preceded, meaning novelty and uniqueness. It also refers to the individual's skill or ability to produce authentic responses, and the idea is described as being original if it is not subject to common ideas and is far-reaching ideas and is beneficial to society, and the person with original thinking is the one who gets tired of using repeated ideas and traditional solutions to problems, thus, the most uncommon the idea is, the more increased originality it is (Al-Otoum, 2004).

C- Imagination

It is the ability to imagine facts and ideas, and to arrange them in new relationships or plans. Imagination helps an individual to visualize and design plans, along with the ability to predict what results he can reach through these plans before implementing them, and the child has a strong imagination aptitude, and he has a wider imagination than adults (Al-Atoum, Al-Jarrah & Bechara, 2015).

Critical and creative thinking is one of the requirements of the learner of the 21st century, as thinking skills must be taught and included in school curricula, in order to prepare learners who are able to adapt and face the requirements of the current age (Khawaldah, 2015).

Early childhood is a beginning for the formation of the child's personality, as it affects all the life stages that follow, pre-school child education has received the attention of educators, and the interest in educational programs provided for that stage is increased in order to develop the children's different abilities, especially creative abilities, and their different thinking skills (Hashish, 2008).

Thus, the current research seeks to prepare a project-based program that serves the category of gifted pre-school children, with their different characteristics, tendencies and attitudes, in order to verify the impact of this program on developing critical and creative thinking skills for these children.

3. Research Problem

The kindergarten stage is important in a child's life, as it helps the child to grow properly and acquire many patterns of behavior and thinking that affect his future experiences and thinking skills, and raises the child's preparations for learning, because of the experiences it provides to develop the creativity of the child and enrich his thinking with many basic concepts for him. Noting that the curricula were prepared for ordinary students and do not take into account the characteristics of the gifted or help them to develop their capabilities and develop their thinking skills. The gifted children are in persistent need of other methods in teaching curricula as the current methods do not meet their needs, tendencies or desires. So Al-Kinani (2011) and Al-Surour (2002) called for the necessity of supporting the gifted children through creating the educational environment and preparing curricula that develop creativity and thinking skills and diversify educational experiences, especially in the kindergarten stage and prepare students for the primary stage.

The research problem lies in answering the following research question:

What is the impact of using a project-based program to develop critical and creative thinking skills among gifted kindergarten children?

4. Significance of the Research

The significance of the current research lies in two aspects, theoretical and practical aspects.

A- First: Theoretical Significance:

1. This study provides a theoretical framework on the importance of the contribution of project-based programs in the field of creativity development.
2. Enriching the theoretical literature related to kindergarten and the strategies that should be used with children in this age.
3. The current study comes in response to global trends that advocate the need to develop thinking skills in general in the pre-school stage, and to provide the necessary procedures and means and adopt them .
4. Employing a project- based learning strategy in teaching children critical and creative thinking skills.

B- Second: The Practical Significance:

1. The current research with its educational program and tools provides a new scientific addition, especially that it sought to design a project-based program for gifted kindergarten children to train them in critical and creative thinking skills and thus kindergarten teachers can benefit from it for later.
2. The research provides one of the modern strategies for learning in kindergarten through project-based learning and its impact on the students' different skills and their evaluation through them.
3. Providing decision makers with appropriate programs for preschool children, which helps in planning and taking this into consideration when preparing programs for the gifted.
4. The use of a newly standardized scale on the Kuwaiti environment for the identification of the gifted, prepared by Al-Jarallah (2017).

5. Research Objectives: The current research seeks to verify the impact of the project-based program on developing critical and creative thinking skills among talented kindergarten children in the State of Kuwait, and to detect the differences between males and females.

6. Search Terminology: The current research contains key concepts: the program, creative thinking and critical thinking. The following are the definitions for each of them:

1. The Program

It is an educational system that includes a group of training units, designed according to specific goals to develop a specific skill, and this scheme includes the curriculum and

educational goals, content, activities, teaching aids, teaching methods, time duration, and evaluation methods (Suleiman, 1999).

2. Project Based Learning

It is a strategy based on the learner's gaining of the knowledge through challenging questions, working on long periods, decision making learning, solving problems and working to produce a product related to the educational content (Stanley, 2012).

3. Critical Thinking

It is logical thinking and reflection that is based on decision making regarding what we should believe or do." (Ennis, 2004: 410).

4. Creative Thinking

It is the process of feeling problems and changes in information and forming ideas and hypotheses, then verifying these hypotheses and modifying them until reaching results (Torrance, 1981).

7. Research Methodology

This research relied on its design on the Quasi Experimental Design to study the problem. This method is a research design using random appointment of the groups, which fits with the objectives of the current research, which seeks to verify the effect of a project - based program to develop critical and creative thinking skills among gifted kindergarteners. This method involves verifying the independent variable impact (the project- based program) on other dependent variables (critical thinking, creative thinking). The present research used the quasi-experimental approach design of the experimental and control groups with a pre and post test for both groups, and Figure 1 shows the research design.

Table 1: Research Design

Group	Pre Testing	Intervention	Post Testing
Experimental	Creative thinking measure. Critical thinking measure	Project-based program	Creative thinking measure. Critical thinking measure
Control		Traditional teaching method	

8. The Research Sample

The research sample was selected intentionally from the Hawalli educational governorate, and two kindergartens were randomly chosen out of (29) kindergartens, for the experimental and control sample, each from one kindergarten. The gifted identification test was applied on those two kindergartens to identify the gifted children in the second level. Then the experimental and control groups were appointed. The sample was chosen from the second level of the kindergarten to suit the age stage to receive the skills that the program is interested in, and the level of mental maturity appropriate of this age group for these skills enables them to search and work as a group. The experimental group consisted of (10) children from Al-Ihsan while the control group consisted of (12) children from Al-Abrar Kindergarten. Figure 2 shows the Mann-Whitney test results of the differences between the two groups the experimental and the control in the pre- testing

Table 2: Results of the Mann-Whitney Test to Verify the Significance of Differences in Mean Ranks of the Sample in the Experimental and Control Groups in the Pre-Testing

Variables		experimental group (N=10)		control group (N=10)		U Test	Sig. level
		Total ranks	mean ranks	Total ranks	Mean ranks		
Critical thinking	observation	97.0	9.7	156.0	13	42.0	.25
	arrangement	109.0	10.9	144.0	12.0	54.0	.72
	Reasons	113.0	11.3	140.0	11.67	58.0	.92
	Similarities	111.0	11.1	142.0	11.83	56.0	.82
	Judgements	101.0	10.1	152.0	12.67	46.0	.38
	Total	90.0	9.0	163.0	13.58	35.0	.11
Creative thinking	Fluency	101.5	10.15	151.5	12.63	46.5	.38
	originality	94.5	9.45	158.5	13.21	39.5	.18
	Imagination	123.0	12.3	130.0	10.83	52	.63

9. Research Tools

A group of tools were used to achieve the study objectives.

A- First: The Gifted Rating Scale- Preschool (GRS-P) in the State of Kuwait (Al-Jarallah, 2017).

B- Second: Critical Thinking Scale

The scale aims to measure critical thinking skills to be developed in this study, prepared by Alfarian (2013), as it was applied to a sample of level two kindergarteners in the Kingdom

of Saudi Arabia, and it consists of (5) dimensions of critical thinking skills; each of which represent a skill such as: observation, Sequencing, knowledge of causes, similarities and differences, judgment.

C- Third: Torrance Test in Thinking Creatively in Action and Movement: to measure creative thinking.

This test was designed in 1981 to test the possibility of creativity in pre-school children (kindergarten)

D- Fourth: The Project-Based Program

Modern educational philosophy calls for the necessity of developing programs that focus its interest in stimulating and arousing higher-order thinking skills for ordinary students in general and gifted and talented students in particular, and in this regard we note that providing a specialized program for gifted and talented kindergarteners to teach and develop some higher-thinking skills such as critical and creative thinking is one of the trends that are related with modern educational philosophy.

10. Research Results

The results and discussion related to the first hypothesis:

The first hypothesis states that the use of the project-based program will develop critical thinking skills among gifted kindergarten children in the State of Kuwait, at a level of significance (0.05), To verify the significance of the difference between the two means on the dimensions and the total score of the scale, Mann-Whitney test was used as shown in Table 3.

Table 3: *Mann-Whitney Test Results to Verify the Significance of the Differences Between the Mean Ranks of the Experimental and Control Groups in the Post-Testing on Critical Thinking Skills*

Variables		experimental group (N=10)		control group (N=10)		U Test	Sig. level
		Total ranks	mean ranks	Total ranks	Mean ranks		
Critical thinking	observation	167.0	16.7	86.0	7.17	8.0	0.00
	arrangement	124.0	12.4	129.0	10.75	51.0	0.58
	Reasons	124.0	12.4	129.0	10.75	51.0	0.58
	Similarities	156.0	15.6	97.0	8.08	19.0	0.006
	Judgments	150.0	15.0	103.0	8.58	25.0	0.021
Total		167.0	16.7	86.0	7.17	8.0	0.00

From Table 4, it became clear that the mean ranks of the experimental group in the total score on the critical thinking scale reached (16.7), While the results showed that the mean ranks of the control group in the total score on the critical thinking scale have reached (7.17), and the results of the Mann-Whitney test indicated that the difference between the mean ranks is statistically significant, as the test value reached (8), with the level of significance of (0.000) which is less than (0.05).

With regard to the dimensions of critical thinking skills, the mean ranks of the experimental group children exceeded the averages of the control group children in all skills. The results of the Mann-Whitney test showed that the differences were statistically significant for those skill (observation, similarity, difference and judgment), while no statistical significance was found with some skills (Arrangement and knowledge of causes), at the significance level of (0.05), and through the total degree, we partially accept the hypothesis.

The overall results of the hypothesis indicate an improvement in the level of critical thinking among children in the experimental group after the application of the program, and by this we partially accept the research hypothesis that there are statistically significant differences between the pre and post testing of the experimental group on critical thinking skills, in favor of the post- testing at the level of significance (0.05.)

11. Discussion of the Results Related to the First Hypothesis

It is clear from the results of the first hypothesis that there are statistically significant differences in the post testing between the experimental group and the control group in the total degree of the scale of critical thinking and in the dimensions of observation, similarity, difference and judgments in favor of the experimental group, as well as there were no differences in the dimensions of the arrangement and knowledge of the causes. On the other hand the results of the first hypothesis indicate the presence of statistically significant differences in the total score between the pre and post application of the scale of critical thinking in the total score and some sub-dimensions in favor of post-testing, except for knowing the reasons for which no statistical significance was recorded.

These results can be explained in the light of the nature of the research sample of the gifted, where the gifted are characterized by the high ability to learn and gain experience faster (Jarwan, 2012), they are distinguished by their high learning abilities, organization and the power of observation of things around them and they are interested in important details (Tannenbaum, 2003), and the lack of statistical significance in the dimension of knowing the causes and arrangement comes to the nature of the characteristics of the child in general, as

the child learns through trial and error in his natural life, as Piaget described, this stage is the stage of physical processes that are characterized by abstract thinking, his ability to classify and arrange increases and questions arise. He has an understanding of the principle of cause and retention, so gifted children have the ability to benefit from the program offered to them.

The results of this hypothesis that there were no differences in some dimensions of critical thinking (ranking, and knowledge of the causes) agree with the study of (Al-Desouki, 2012) which concluded that there was no statistically significant difference between the mean scores of the members of the research group in the pre and post testing in the critical thinking skills test.

These results can also be explained in light of the effectiveness of the program used in the study, as the project-based program is designed based on the needs of learners (Abu Saidi and Al-Balushi, 2011), and it also helps students participate in problem solving, decision-making and investigation, which gives students the opportunity to work independently over extended time stages that lead to important products (Al-Wahidi, 2016). On the other hand, project-based learning encourages research and decision-making processes and improves students' practical thinking skills, which works to develop their various abilities. (Frank & Barzilai, 2004). It also helps to develop critical thinking among students (Al-Sayari, 2010; Lashin, 2010; Al-Desouki, 2012).

As for the presence of statistically significant differences in the dimension of observation, similarity, difference, and judgment, in favor of the experimental group, and in favor of post-testing in the experimental group by adding after the arrangement dimension, that result can be explained in light of the fact that the observation itself is the only external capacity that depends on the use of the senses, it depends on focus, attention and caring about the details (Samadoni, 2009) as it is one of the skills that is characterized by quick acquisition compared to other skills, because it is related to external realistic stimuli in the environment around the individual, and through it a distinction is made between similarity and differences in objects around the child and training in them, because it is strongly believed that these critical thinking skills help students in selecting evidence and clues, interpreting contradictions, judging and reaching appropriate solutions to different problems and situations (Boe & Hognestad, 2010). Working in a real environment, being active in the research process, and discovering problems, challenges and shortcomings in the surrounding world helps to develop making judgments in distinguishing between right and wrong (Liang & Gabel, 2005). Also, project-based learning works to develop the necessary capabilities such

as observation, attention and focus on similarities and differences (Kizkapan & Bektas 2017), Research, exploration, and arrangement of ideas (El Desouki, 2012). The current program contains home and class activities that have focused on many skills through which they were developed. Some of the activities were the Scamper strategy that focused on critical thinking by noticing the product and modifying it in any way the child finds appropriate for him. Also, the use of dialogue activities in the program had an impact in developing critical thinking by identifying the appropriate information and arranging ideas to reach an idea related to the project to be agreed upon unanimously.

On the other hand, it can be explained that there are no differences in some dimensions of critical thinking, between the experimental group and the control group, and the absence of significant differences between the pre-testing and the post-testing of the critical thinking scale, in light of the high level of critical thinking skills among the gifted as some of their personal characteristics, and therefore the program may be able to add a little value, as these children are characterized by high critical thinking skills (Jarwan, 2012), and that some skills that critical thinking requires are original characteristics of the gifted personality, as John Dewey sees. Critical thinking is related to activity and the persistence ability (Al-Rayadi, 2004), which is consistent with the personal characteristics of the gifted, as they have a high level of persistence or commitment to the task and the ability to discover the causes and the high motivation (Habib, 2000). Also, the critical thinking depends on the evaluation, analysis, and conclusion skills, these capabilities are also some of the gifted children characteristics that distinguish them from the ordinary children, and since that there is no negative degrees in the statistical analysis, and most of the scores are positive or neutral, this is attributed to the appropriateness of the activities for the level of children, and the effectiveness of the presented program on the dimensions of critical thinking, with the possibility of increasing focus to these skills as knowing the causes and arrangement.

12. Results and Discussions related to the Second Hypothesis

The second hypothesis stated that “the use of the project-based program leads to the development of creative thinking skills among gifted and talented kindergarteners in the State of Kuwait, at a level of significance (0.05). To verify the significance of the difference between the two mean scores, the Mann Whitney test was used as shown in Table 4.

Table 4: Mann Whitney Test Results to Verify the Significance of the Differences Between the Mean Ranks of the Experimental and Control Groups in the Post-Testing on Creative Thinking Skills

Dimensions		experimental group (N=10)		control group (N=10)		U Test	Sig. level
		Total ranks	mean ranks	Total ranks	Mean ranks		
Creative thinking	fluency	157	15.7	96	8	18	0.004
	originality	161	16.1	92	7.67	14	0.002
	Imagination	170.5	17.05	82.5	6.88	4.5	0.000

Through the results of the previous table that shows the mean ranks of the two groups scores' on creative thinking skills, it is clear from the table that the scores mean ranks of the dimensions of fluency, originality and imagination, of the experimental group has exceeded those of the control group, and the results of the Mann Whitney test indicated that this difference was statistically significant, at a Significance level of ($\alpha \leq 0.05$).

13. Discussion of the Results Related to the Second Hypothesis of the Research

It is clear from the results of the second hypothesis that there are statistically significant differences between the experimental group and the control group in the post-application of creative thinking skills, in favor of the experimental group. The results also concluded that the post-testing scores are higher than the pre -testing in all dimensions of the research sample.

An improvement in creative thinking skills of the research sample can be explained in light of the nature of gifted students and their high ability to learn (Tannenbaum, 2003), which made them benefit greatly from the program that was offered to them, which helped to develop their creativity.

These results can also be interpreted in the light of the nature of the program used, as it has targeted the development of creative capabilities among kindergarteners, and it also contained activities directed to developing and encouraging these creative capabilities. On the other hand, the nature of the program can be of positive impact on children's creativity, as it is a project-based program, which is a type of learning that ultimately seeks to reach something new (Al-Hashemi and Al-Dulaimi, 2008), which stimulates children's creative thinking for research, investigation and discovery, and increases creative productivity (El-Desouki, 2012), and helps to develop creative thinking as an output of project –based learning (Furtado, 2010).

On the other hand, project- based learning provides a set of skills and abilities that stimulate an children's creative thinking, and they serve as supportive aspects of it, such as motivation, as project-based learning increases children's motivation to learn (Al-Wahidi, 2016), which is one of the factors that helps stimulate creativity (Mukhtar, 2014). Project-based learning also enhances communication skills and teamwork (Harriman, 2003). Also, project-based learning motivates and supports creative thinking (Abdel-Al, 2004), as the program contains in each project a major question presented, students generate many answers that contain all creative skills (fluency, originality and imagination). The program contained some strategies such as (Think - Pair - Share) strategy, in which the child fluently finds an initial idea, refines it with the ideas of his peers and shares it with them, as a new idea characterized by originality and imagination appears.

This result can also be explained in light of the program's success in developing some critical thinking skills in children, which leads to the development of creative thinking as well. Some studies have shown a strong and clear correlation between critical thinking and creative thinking (Nabhan, 2001; Diani, 2017), And therefore the development of one of them may lead to the development of the other, and this is what Abu Shaaban (2010) points out that critical thinking is necessary for creative thinking, because a creative thinker needs to look with a critical eye to his ideas and select the most fertile and improve other ideas or set them aside, without the ability to evaluate ideas, it is not possible to get with effective creativity. Also, the skills of creative thinking (analysis, visualization, evaluation, judgment) are the same as critical thinking skills, and so are the capabilities that creative behavior includes (sensitivity to problems, intellectual fluency, mental flexibility, originality, analysis, composition, reorganizing) are similar to some of the basic capabilities involved in critical thinking, so creative thinking leads to the emergence of new ideas and critical thinking examines these ideas and studies their validity and effectiveness.

The results of the research second hypothesis concluded that there are statistically significant differences in favor of the experimental group. This can be explained in the light of the characteristics of the gifted students themselves, as the experimental and control groups of gifted students are characterized by a high level of different types of thinking, such as convergent and divergent thinking, and creative thinking, where it is considered creative ability is one of the capabilities of gifted students (Clark, 2002). Also, this age stage, i.e. the kindergarten stage, is characterized by a high level of creativity (Al-Musharrafi, 2003), and therefore they have a distinct creative ability in fluency, originality and imagination, it is a

distinctive feature of them, and the program has contributed to the development of creative thinking skills as it contained the SCAMPER strategy activities that develops creative thinking, and the brainstorming strategy that generates ideas and enhances the fluency of ideas between them and asking questions, and was used during sessions that were repeated in each project, which helped them to develop these skills and master them.

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