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Evaluating the Effects of the Oasis Enrichment Model on Gifted Education: A Meta-Analysis Study

Abdullah M. Aljughaiman[1*] and Alaa E. A. Ayoub[2]

Abstract: The current study aimed at evaluating the effects of enrichment programs based upon the Oasis Enrichment Model (OEM) on various dimensions of gifted education in Saudi Arabia. The researchers reviewed 35 studies selected according to the following criteria: (A) the enrichment programs were based upon the Oasis Enrichment Model, (B) the studies were published between 2009 to 2011, (C) the studies dealt with the primary, intermediate, or secondary grades, (D) the studies used pull-out method or summer enrichment programs for gifted students, (F) the studies included experimental and control groups or experimental groups only, (G) males and/or females, and (H) studies that reported effect sizes or provided data which allowed the researchers to calculate the effect size in their results. The studies included 2048 (1719 male and 329 female) students. Participants were from three stages: 644 students from the primary stage, 721 students from the intermediate stage, and 683 students from the secondary stage. The results indicated that enrichment programs based on the OEM had statistically significant positive effects on the variables of analytical abilities, creative abilities, thinking skills, critical thinking, future problem solving, attitude to learning, motivation, decision making, content of knowledge, classroom performance, and personal and social traits, while there was no statistically significant effect of these programs on the variable of integrated science processes.

Keywords:

enrichment programs, Oasis Enrichment Model, gifted education, meta-analysis

Educational systems in many countries give great care to designing programs that promote giftedness and creativity (Davis & Rimm, 2010). Particularly, the Kingdom of Saudi Arabia (KSA) gives great attention and support for gifted programs and services in various stages of pre-university education (King Abdulaziz & his Companion Foundation for Giftedness and Creativity, 2008). In Saudi Arabia, enrichment programs that are designed on the basis of Oasis Enrichment Model (OEM) are among the most prominent programs aimed at enhancing the educational experience for gifted students and increasing their interest in learning (Aljughaiman et al., 2009). These programs represent one of the practices that has received wide acceptance from educators, students, and parents in Saudi Arabia over the past ten years (Aljughaiman et al. 2009; King Abdulaziz & his Companion Foundation for Giftedness and Creativity, 2010). This could be due to the way the program is designed to be responsive to the cognitive, emotional and social needs of the gifted students who participate in the program.

The process of evaluating programs is considered to be a form of systematic inquiry to produce information. This process helps inform important judgments concerning a

[1] *King Faisal University, Saudi Arabia*
[*] *Corresponding author: King Faisal University, P O Box 755, Alhassa 31982, Saudi Arabia. Email: alju9390@gmail.com*
[2] *South Valley University, Egypt*

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certain program, to document the need for conducting it, its impact on the participants, and to suggest a developmental course for the program (Guskey, 2000). Therefore, program planners are keenly aware of the high importance of the evaluation process in the success of educational programs, since the aim of evaluation is not only restricted to presenting information regarding the evaluated programs, but it also extends to determining the appropriate pathways for their development (Royse, Thyer, & Padgett, 2010). This process can also be used to reveal to what extent the program aims have been achieved, the manner in which aims are achieved, and the obstacles that impede progress towards those aims. Program evaluation can be viewed as a central tool in the development process of any program as it helps determine whether the program should be supported, changed, or halted (Cannon, Broyles, Anderson, & Seibel, 2009; Davis & Rimm, 2010).

Evaluating gifted programs has not received sufficient attention in the literature even though it represents one of the basic components in the design of gifted programs (Avery & VanTassel-Baska, 1997; Callahan & Reis, 2004; Purcell & Echert, 2006). Moreover, evaluation is one of the most important processes in the success of educational programs. The evaluation of the programs by itself is not enough and cannot be considered as the ultimate goal, but it should be considered as the main ongoing process to determine the appropriate avenues for developing such programs (Guskey, 2000; Royse, Thyer, & Padgett, 2010).

Meta-analysis is a research tool for comparing, summarizing, and correcting findings of studies to get better estimates of the relationship between variables (Hunter & Schmidt, 2004). Meta-analysis can be used to analyze the synthesis of a variety of sources of statistical data. Researchers can use meta-analysis to examine a set of empirical studies that contain identifiable relationships (Lipsey & Wilson, 2001). Furthermore, meta-analysis is a statistical method that takes an all-inclusive look at the results of individual studies by aggregating the results across the studies (Borenstein, Hedges, Higgins, & Rothstein, 2009).

In education, particularly in gifted and talented education, the sample sizes tend to be small. Therefore, the generalization of these results can be limited. Results from meta-analyses help educators, who must make programming decisions, evaluate the effectiveness of ability grouping, acceleration, homogeneous classrooms, and enrichment programs. Meta-analysis combines the results of all the available experiments in an unbiased manner to arrive at the best estimate of the effectiveness of an educational procedure. Asher (1986) asserted that meta-analysis allowed researchers and educators in the area of gifted education to overcome interpretation obstacles of imprecise measurement and small samples. Meta-analysis focuses on the differences across studies by taking into account the various sample sizes used in each study and weighting the studies accordingly (Borenstein et al., 2009). Researchers have argued that statistical analysis of the p value in small sample sizes may be less meaningful than those studies with large sample sizes and that there must be evaluation of the effect size within the analysis in order to understand its outcomes clearly (Lipsey & Wilson, 2001). Psychometric meta-analysis is a tool for summarizing and correcting empirical findings across independent studies in order to get better estimates of the relationships between variables (Hunter & Schmidt, 2004). Meta-analysis accomplishes this through the use of the effect size. The value of the effect size aggregates the results of several studies into a single outcome (Lipsey & Wilson, 2001). Effect size has been defined as the degree to which the results differ from the null hypothesis (Cohen, 1994; Thompson, 2006), thus, the level of the effect size determines the strength of the results (Johnson, Mullen, & Salas, 1995). The current study used meta-analysis to study the effects of enrichment programs based upon the Oasis Enrichment Model on the cognitive, mental, emotional, personal, and social outcomes in elementary, secondary and high schools in KSA.

Enrichment Programs

During the emergence of educational reform movements in the mid-twenties, educational systems in developed countries (e.g., USA and European countries) began to devise educational programs to meet the needs of gifted students (Davis & Rimm, 2010; Ferguson, 2009). Over time, enrichment programs became the most prominent kind of school programs in the education of gifted students. Such programs have had an increasingly broad influence because of their wide adoption internationally (Feldhusen, 1994, 1997; Olenchak & Renzulli, 1989; Reis, Eckert, McCoach, Jacobs, & Coyne, 2008; Renzulli, 2005).

The structure and content of enrichment programs are flexible enough to account for the various needs of the gifted, differing environmental conditions, human and financial potentials, and a range of educational policies and administrative systems. Many researchers (Davis & Rimm, 2010; Karnes & Bean, 2009) have identified various forms of enrichment programs through which attention can be provided to the needs of the gifted, most prominent among them being gifted boarding academies, gifted schools, gifted classes, pull-out programs, summer camps, weekend programs, and afternoon programs.

Gifted Education in the Kingdom of Saudi Arabia

Interest in identifying gifted students and nurturing their abilities in KSA started in the last quarter of the 20th century. Nevertheless, this interest did not crystallize into a methodological and academic endeavor until 1990. In 1968, the educational policy in KSA stated that "[e]ach student has the right to develop his/her talent, and his/her ability". However, no programs or any kind of real educational services were adopted until 1995 when the Ministry of Education started a program called "Talent Search". In 1998, the Ministry of Education established a number of gifted education programs around the country. In 1999 the King Abdulaziz and His Companions Foundation for Giftedness and Creativity (Mawhiba) was established to promote gifted education in the Kingdom and to adopt programs to serve the needs of the gifted. Since that time, gifted education in KSA has been under the leadership of two main institutions: Mawhiba and the Ministry of Education. Many of the enrichment services that are offered in schools and summer enrichment programs in KSA have come to be based upon the Oasis Enrichment Model.

Oasis Enrichment Model

The Oasis Enrichment Model (OEM) for nurturing the gifted was designed and developed over a period of ten years (Aljughaiman et al., 2009). During that period a great number of experts and scholars in the field of gifted education participated in its development, assessment, and evaluation. During its development, the model was piloted in a large number of male and female schools. The constructs of the model have benefited from the widely known international and local models in the field of gifted education, in addition to information obtained from field experimentation and feedback from researchers and educators. The model comprised a synthesis of both the best practices and the wealth of international experience in Gifted Education, adapted to fit the setting and educational system of Saudi society.

One of the most significant goals of the OEM is to help gifted and talented students to identify their strengths, realize the fields most suitable for their scientific and professional future, and to provide these students with the various experiences necessary to nurture their capabilities and utilize their energy to achieve the highest possible level of self-assertion and excellence (Aljughaiman, 2005). Taking these goals into consideration, the OEM allowed gifted students to benefit from the pedagogical programs, instructional styles, and educational opportunities that nurture giftedness and excellence in a comprehensive, gradual, and progressive manner.

Due to the nature of the education system in KSA, the administration of the model mostly employed a pullout approach, where gifted students are gathered together outside the mainstream classes to join systematic enrichment programs either during the academic

year or during the summer vacation. During these enrichment programs, gifted and talented students have better opportunities to be in contact with other gifted students who have similar or different abilities. In this way, gifted students have better opportunities to identify, challenge, develop and enhance their various abilities and talents and to overcome their points of weakness. In this manner, the model helped students develop their learning skills, such as high order thinking skills, research skills, and self-regulated learning skills, by mastering rich content that incorporates intersecting domains of knowledge. Moreover, the model emphasizes the necessity of mobilizing the internal motivation and increasing the self-awareness of participating students.

The Concept of Giftedness in the OEM

The concept of giftedness in the OEM is viewed as a composite of the cognitive, personal and social aptitudes and skills that enables the individual to excel in one or more fields of interest as compared to his or her peers. This concept of giftedness is sufficiently flexible and expandable to incorporate the elements that contribute to excellence in a given domain, such as heritable innate abilities (intelligence), cognitive abilities, personal and social traits (including motivation), and the cultural, knowledge and experiential opportunities that the individual may have had or be involved in.

There are two dimensions of giftedness in the concept as described in the OEM. The first dimension accounts for heritable innate abilities (intelligence in its broad sense). However, since innate abilities are not viewed as sufficient to produce talented behavior, the model proposes the existence of a second dimension consisting of two parameters: cognitive skills, and personal and social skills. Both parameters are viewed as being affected by genetic contributions, and affecting one another. Cognitive skills are critical in determining the performance of mental capacity, efficiency, and the effective use of what has been learned. Hence, the OEM concept defines mental skills as the way in which they are used by the individual (consciously) in dealing with various challenges and to achieve specific goals. These processes include, for example, remembering, wondering, configuring meaning, planning, inference, reasoning, imagination, idea production, problem finding, developing criteria, decision-making, and other related skills. These operations are further categorized by the OEM concept into two types: mental skills (thinking skills) and organizational skills (research skills).

Personal and social skills contribute significantly to the formation and shaping of general performance. Motivation, attitude toward learning, the development of positive self concept, responsibility for self-learning, regulating learning, working effectively in a team, goal setting, learning strategies, persistence, self-assessment, acceptance of criticism, and other personal and social characteristics linked to high performance contribute toward achieving excellence in a specific domain.

Having a high level of natural abilities provides a better opportunity for the growth and effectiveness of cognitive skills. Enhancing personal and social characteristics helps the individual to employ the best of these capabilities toward achievement. However, the realization of true excellence comes through helping the individual to develop his or her creativity. In the OEM concept of giftedness, the formation of creative behaviors and skills comes about through enhancing a combination of personal characteristics (such as possessing positive attitudes towards imagination, change and innovation, building on the ideas of others, risk taking, and initiating behavior, and other related skills) and cognitive skills (problem finding, fluency, flexibility, originality, connecting ideas, events and things, elaboration, and other related skills) in a comprehensive manner.

Lastly, the development of talent and excellence requires that individuals get involved in real experiences using all of the aforementioned skills in an actual domain of interest. This crucial experiential element comes about by organizing learning processes around knowledge acquisition, allowing the individual to explore multiple areas of knowledge, and providing the opportunity to explore the students' interests in-depth (according to

both the students' abilities and progress). In addition, students need to experience the professional role of experts in a specific field, to feel as they feel, to be engaged in work in a professional environment, to use research and thinking skills purposefully as they do, and to gain a sense of the responsibility toward self-development and learning required by experts in a given domain.

The Framework of the Oasis Enrichment Model

The framework of the Oasis Enrichment Model consists of three axes, three stages, and four sequential phases. Deep academic content, research and thinking skills, and affective traits are the axes which form the dynamic core of the model. By focusing on the interaction between these three axes, the model aims at developing a framework of complex pedagogical experiences that suits the diverse needs of gifted students.

Any program which employs the OEM begins by selecting a main topic (theme based-topic) that functions as the umbrella for all of the activities included in the program. As the student works through each thematic unit in the program, they progress through three stages: Exploration, Perfection, and Creativity. The Exploration stage consumes approximately 15% of time, the Perfection stage consumes a further 60%, and the Creativity stage consumes the remaining 25% of time spent on each unit.

The OEM ideally contains four phases, each of which requires a year to complete. However, programming options which employ fewer phases are also possible. The four-phase structure enables thematic units to be delivered over a prolonged time, allowing tasks to be open-ended for multiple levels of skill mastery, promoting the integration of prior content knowledge and varied product development.

A literature review revealed the theoretical and practical importance of enrichment programs based upon the Oasis Enrichment Model (OEM). The current study aimed at identifying the importance of these programs, their outputs, and their positive effect on the education of the gifted students who participated in the program.

Method

Inclusion and Exclusion Criteria

Studies were selected based on the following criteria: (A) the enrichment programs were based on the OEM, (B) the studies were published between 2009 to 2011, (C) studies which dealt with the primary, intermediate, or secondary grades, (D) studies which employed either a pull-out method or summer enrichment programs for gifted students, (F) studies which included experimental and control groups, or studies that included experimental groups only, (G) males and/or female subjects, and (H) studies that reported effect size data or provided data which allowed for calculating the effect size from their results. These studies included 2048 students (1719 male and 329 female). Participants represented three stages: 644 students from the elementary stage (Grades 4-6), 721 students from the secondary stage (Grades 7-9), and 683 students from the high-school stage (Grades 10-12). Table 1 shows a summary of the studies included in the meta-analysis.

Meta-Analysis Methods

Meta-analyses were carried out using Comprehensive Meta-Analysis Software (CMA, Version 2.2; Borenstein, Hedges, Higgins, & Rothstein, 2005). The effect size for each study was calculated to measure the impact of enrichment programs based on the OEM on cognitive, and personal and social skills. Furthermore, the effect size reported within the publication (or the raw data reported by the researchers that allowed the program to compute the effect size) was entered into the program. In the current study, the researchers selected the effect size, Hedges' *g*, based on the available statistical data and reported characteristics of the selected studies (Borenstein et al., 2009). Interpretation of

Table 1. Summary of Studies Included in the Meta-Analysis

Study & Year	Gender	Groups & No.		Statistical Methods	Variables
		Experimental	Control		
Elementary School Studies					
Khammuri, 2009	Male	16	16	*t*. test	Creative abilities
Al-Bushra, 2010		24	--	Wilcoxon test	Content of knowledge Personal and social traits Thinking skills
Dar Al-Salam, 2010		36	--	*t*. test	
Dar Al-Zekr, 2010		27	--	*t*. test	
Manarat Al-Riyadh, 2010		32	--	*t*. test	
Alarfaj, 2011		220	--	Chi-squared	Attitude to learning Critical thinking Content of knowledge Personal and social traits
Aljughaiman & Ayoub, 2011		20	22	Mann-Whitney U test	Analytical abilities Creative abilities
Alogail, 2011		25	25	*t*. test	Creative abilities Integrated science processes
Alsubhi, 2011		25	25	*t*. test	Future problem solving Thinking skills
Al-Faisaliah, 2010	Female	40	--	*t*. test	Content of knowledge Personal and social traits Thinking skills
Dar Al-Fekr, 2010		28	--	Wilcoxon test	
Al-Riyadh, 2010		63	--	*t*. test	
Secondary School Studies					
Aljughaiman & Maajeeny, 2010	Male/ Female	235	--	*t*.test	Classroom performance Thinking skills
Aljughaiman, 2010	Male	88	--		Content of knowledge Personal and social traits Thinking skills
Al-Imam, 2010		32	--		Personal and social traits Thinking skills
Jubail Industrial College, 2010		60	--		Content of knowledge Thinking skills
Ministry of Education, 2010		172	--		Attitude to learning Creative abilities Motivation
Taibah, 2010		50	--		Content of knowledge Personal and social traits Thinking skills
King Faisal University, 2010	Female	38	--		
Umm Al-Qura, 2010		46	--		
High-School Studies					
Aljughaiman & Ibrahim, 2009	Male	63	--	*t*.test	Decision making
Al-Baha, 2010		21	--	Wilcoxon test	Content of knowledge Personal and social traits Thinking skills
Al-Qassim, 2010		33	--	*t*.test	
Jazan, 2010		24	--	Wilcoxon test	
Aramco, 2010a		180	--	*t*.test	Personal and social traits Thinking skills
King Fahd, 2010		47	--	*t*.test	
King Khalid, 2010		24	--	Wilcoxon test	
King Saud, 2010a		36	--	*t*.test	
Prince Sultan, 2010		60	--	*t*.test	
Specialist Hospital, 2010a		13	--	Wilcoxon test	
King Abdulaziz, 2010		38	--	*t*.test	Thinking skills
King Faisal, 2010		30	--	*t*.test	Content of knowledge Thinking skills
Aramco, 2010b	Female	40	--	*t*.test	Personal and social traits Thinking skills
King Saud, 2010b		61	--	*t*.test	
Specialist Hospital, 2010b		13	--	Wilcoxon test	

Hedges' *g* was made according to Cohen's criteria (Cohen, 1988). Effect sizes of 0.80 were regarded as large, while effect sizes of 0.50 were moderate, and effect sizes of 0.20 were small.

Pooled effect sizes and 95% confidence intervals (CI) were calculated according to the procedures implemented in CMA. The researchers used I^2 and the *Q* test of heterogeneity (Higgins & Thompson, 2002) to examine among-study variation in the meta-analysis. Significant variation was confirmed by visual inspection of the forest plots. Additionally, I^2 described the proportion of total variation in deciding the effect sizes of each study that was due to heterogeneity as opposed to sampling error, with 25%, 50%, and 75% indicating low, moderate and high heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

In determining the most appropriate analysis to report a fixed model or a random model the researchers considered several factors. Some researchers have argued that a fixed effect size model should be used only when all of the subsets are homogeneous (i.e., the *Q* statistic is found to be non-significant) and in contrast, random effects models should be used when the subsets are heterogeneous (i.e., the *Q* statistic is found to be significant; Borenstein et al., 2009). As considerable heterogeneity was found among these studies, the researchers calculated mean effect sizes with the random effects model. CMA was used to generate forest plots.

Results

Table 2 presents the results of meta-analysis on the total set of 32 studies of the primary stage. The homogeneity analysis among the overall studies indicated that there is significant and high heterogeneity (Q_{31} = 16.162, $p < 0.001$; I^2 = 86.11%). As a result, a random effects model was used. The results showed that the overall effect size using Hedges' g = 1.282 (95% CI = 1.688 to 0.876; $p < 0.001$). Across the set of included studies, Hedges' g values ranged from 0.417 to 4.662, and all the studies showed positive values. The effect sizes were (g = 1.378, $p < 0.05$; 95% CI = 2.611 to 0.146) for analytical abilities, (g = 1.315, $p < 0.05$; 95% CI = 2.411 to 0.218) for attitude to learning, (g = 1.680, $p < 0.001$; 95% CI = 2.102 to 1.258; Q_7 = 61.039, $p < 0.001$; I^2 = 88.53) for content of knowledge, (g = 2.058, $p < 0.001$; 95% CI = 2.830 to 1.286; Q_2 = 31.413, $p < 0.001$; I^2 = 93.63) for creative abilities, (g = 1.206, $p < 0.05$; 95% CI = 2.301 to 0.112) for critical thinking, (g = 1.629, $p < 0.01$; 95% CI = 2.852 to 0.406) for future problem solving,

Table 2. Summary of Meta-Analysis (Elementary School Studies)

Outcoumes	No. of studies	Effect size (95% Cl)	Effect size *p*-value	Heterogeneity		I^2
				Q	*p*-value	
Analytical abilities	1	1.378(2.611 to 0.146)	0.028			
Attitude to learning	1	1.315(2.411 to 0.218)	0.019			
Content of knowledge	8	1.680(2.102 to 1.258)	0.000	61.039	0.000	88.53
Creative abilities	3	2.058(2.830 to 1.286)	0.000	31.413	0.000	93.63
Critical thinking	1	1.206(2.301 to 0.112)	0.031			
Future problem solving	1	1.629(2.852 to 0.406)	0.009			
Integrated science process	1	0.633(1.827 to -0.560)	0.298			
Personal and social traits	8	0.871(1.272 to 0.470)	0.000	51.563	0.000	86.42
Thinking skills	8	0.883(1.283 to 0.483)	0.000	16.975	0.018	58.76
Overall	32	1.282(1.688 to 0.876)	0.000	16.162	0.040	86.11

Note. CI = Confidence Interval.

(g = 0.871,p < 0.001; 95% CI = 1.272 to 0.470; Q_7 = 51.563, p < 0.05; I^2 = 86.42) for personal and social traits, and (g = 0.883, p < 0.001; 95% CI = 1.283 to 0.483; Q_7 = 16.975, p < 0.05; I^2 = 86.11) for thinking skills.

The effect sizes and 95% confidence intervals of studies are plotted in figure 1 (Forest plot). These results indicated that the enrichment programs based on the Oasis Enrichment Model have large effects on analytical abilities, attitude to learning, content of knowledge, creative abilities, critical thinking, future problem solving, personal and social traits, and thinking skills. By contrast, the effect sizes and 95% confidence intervals of integrated science process were (g = 0.633, p = 0.298; 95% CI = 1.827 to -0.560). These results also indicted that there was no impact of the Oasis Enrichment Model on the integrated science process.

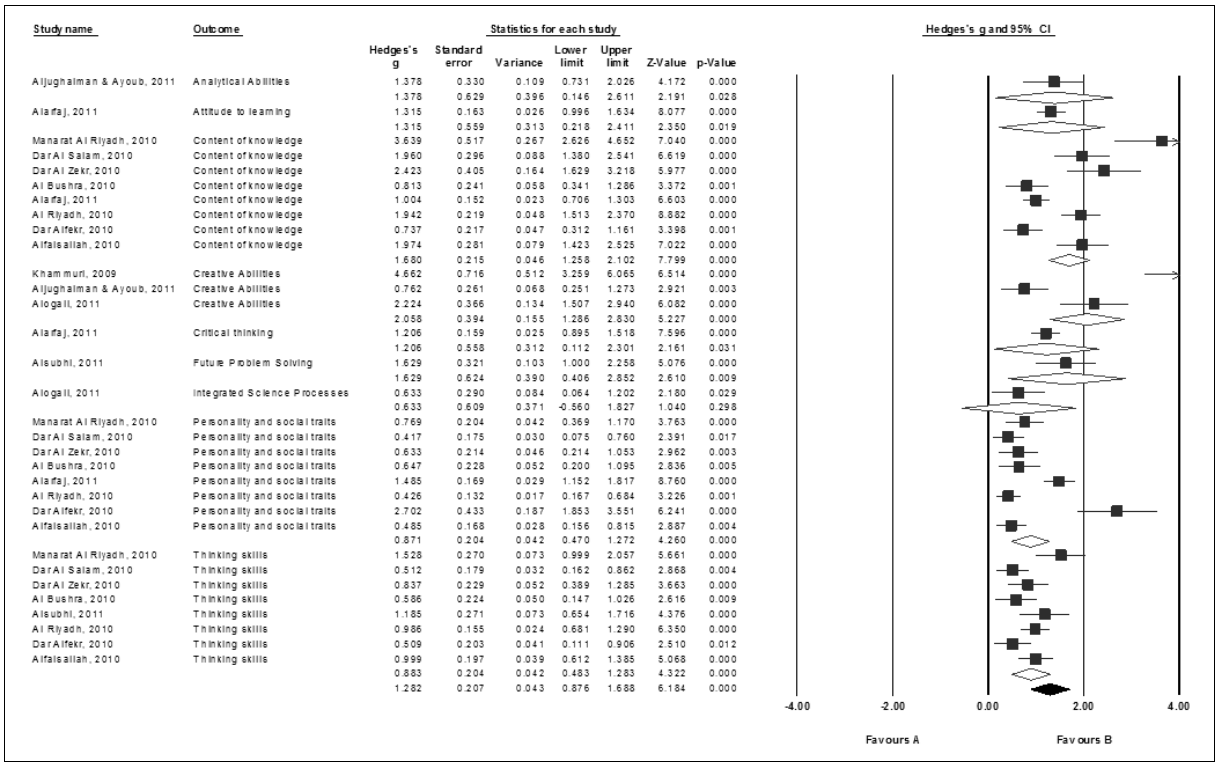

Figure 1. Summary effect sizes and 95% confidence intervals (Forest plot for elementary school studies).

Table 3. Summary of Meta-Analysis (Middle-School Studies)

Outcoumes	No. of studies	Effect size (95% CI)	Effect size p-value	Heterogeneity		I^2
				Q	p-value	
Attitude to learning	1	2.921(4.098 to 1.744)	0.000			
Classroom performance	1	2.227(3.649 to 0.805)	0.002			
Content of knowledge	5	2.708(3.277 to 2.140)	0.000	3.782	0.436	
Creative abilities	1	2.482(3.756 to 1.209)	0.000			
Motivation	1	1.697(2.913 to 0.482)	0.006			
Personal and social traits	5	1.170(1.701 to 0.640)	0.000	74.336	0.000	94.62
Thinking skills	7	1.373(1.833 to 0.912)	0.000	40.399	0.000	85.15
Overall	21	2.016(2.673 to 1.360)	0.000	23.482	0.000	93.96

Meta-analysis was used on the set of 21 middle-school studies. A random effects model used for the homogeneity analysis among the overall studies indicated that there is significant and high heterogeneity (Q_{20} = 23.482, p < 0.001; I^2 = 93.96%). Table 3 showed that the overall effect size is Hedges' g = 2.016 (95% CI = 2.673 to 1.360; p < 0.001). Across the set of included studies, Hedges' g values ranged from 0.536 to 2.921, and all the studies showed positive values. The effect sizes were (g = 2.921, p < 0.001; 95% CI = 4.098 to 1.744) for attitude to learning, (g = 2.227, p < 0.01; 95% CI = 3.649 to 0.805) for classroom performance, (g = 2.708, p < 0.001; 95% CI = 3.277 to 2.140; Q_4 = 3.782, p > 0.05; I^2 = 0) for content of knowledge, (g = 2.482, p < 0.001; 95% CI = 3.756 to 1.209) for creative abilities, (g = 1.697, p < 0.01; 95% CI = 2.913 to 0.482) for motivation, (g = 1.170, p < 0.001; 95% CI = 1.701 to 0.640; Q_4 = 74.336, p < 0.001; I^2 = 94.62) for personal and social traits, and (g = 1.373, p < 0.001; 95% CI = 1.833 to 0.912; Q_6 = 40.399, p < 0.001; I^2 = 85.15) for thinking skills.

The effect sizes and 95% confidence intervals of studies are plotted in figure 2 (Forest plot). These results indicated that the enrichment programs based on the Oasis Enrichment Model have large effects on attitude to learning, classroom performance, content of knowledge, creative abilities, motivation, personal and social traits, and thinking skills.

In middle-school studies, the meta-analysis results of the total set of 32 studies were used. A random effects model used as the homogeneity analysis among the overall studies indicated that there is a significant and high heterogeneity (Q_{31} = 13.835, p < 0.01; I^2 = 66.50%). Table 4 showed that the overall effect size is Hedges' g = 0.757 (95% CI = 1.023

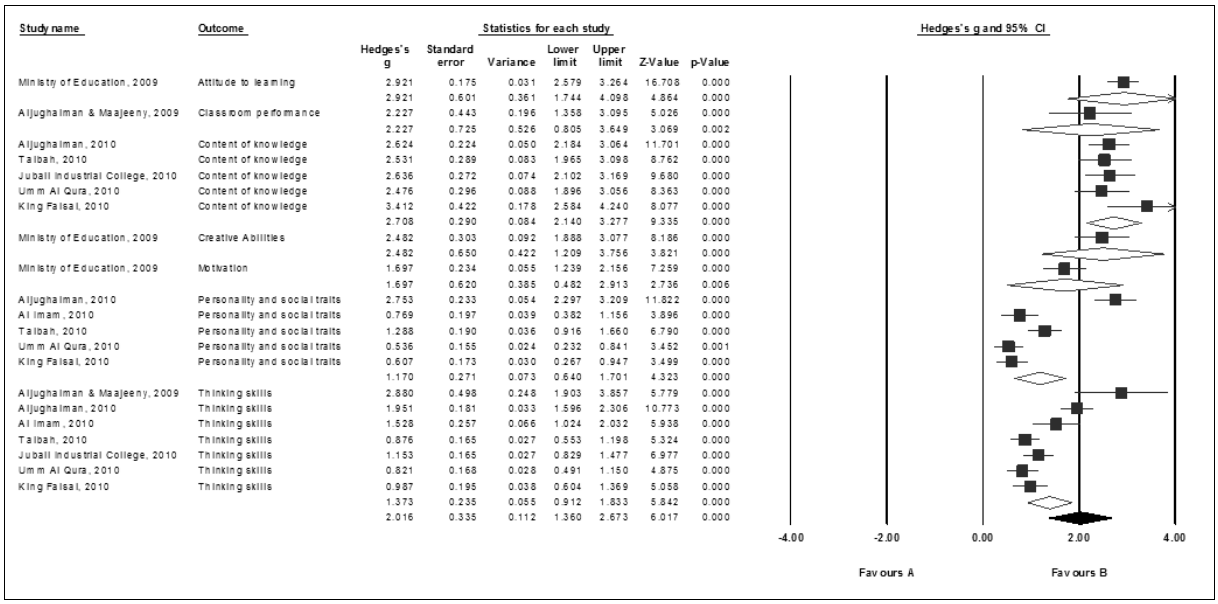

Figure 2. Summary effect sizes and 95% confidence intervals (Forest plot for middle-school studies).

Table 4. Summary of the Meta-Analysis (High-School Studies)

Outcoumes	No. of studies	Effect size (95% CI)	Effect size p-value	Heterogeneity		I^2
				Q	p-value	
Content of knowledge	4	1.026(1.335 to 0.717)	0.000	22.231	0.000	86.51
Decision making	1	0.840(1.313 to 0.367)	0.001			
Personal and social traits	12	0.496(0.645 to 0.347)	0.000	7.711	0.739	
Thinking skills	14	0.806(0.950 to 0.662)	0.000	30.334	0.004	57.17
Overall	31	0.767(1.023 to 0.510)	0.000	13.835	0.003	66.50

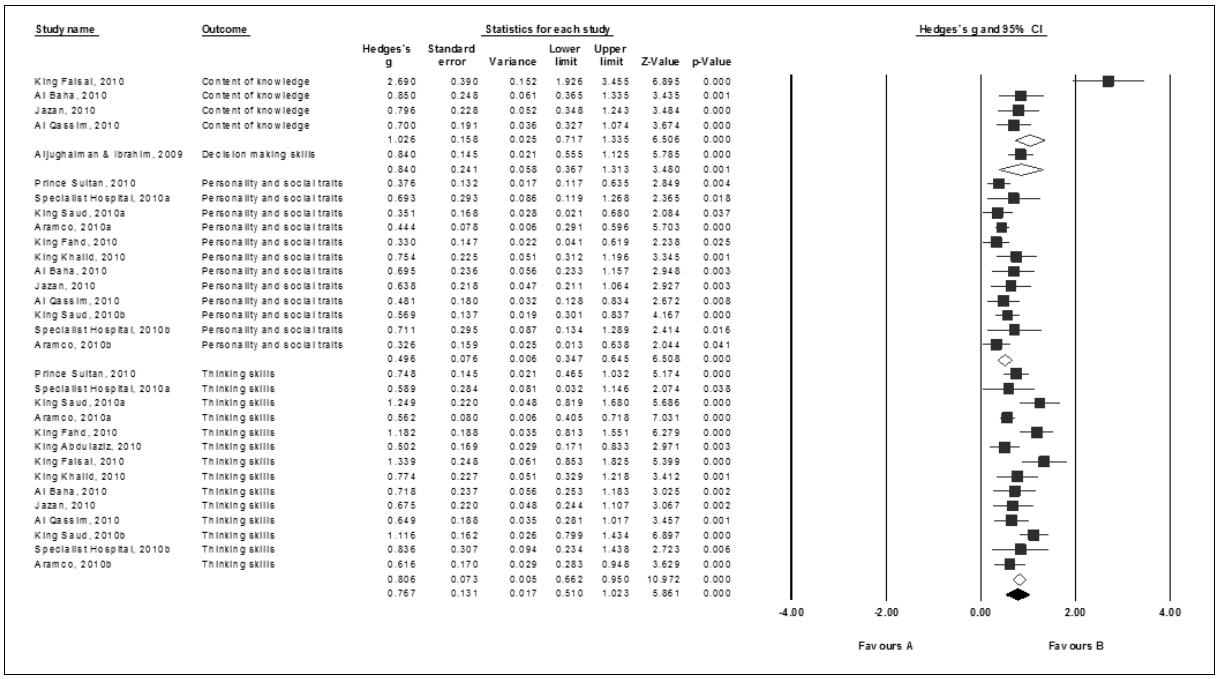

Figure 3. Summary effect sizes and 95% confidence intervals (Forest plot for high-school studies).

to 0.510; $p < 0.001$). Across the set of included studies, Hedges' g values ranged from 0.326 to 2.690, and all the studies showed positive values. The effect sizes were ($g = 1.026$, $p < 0.001$; 95% CI = 1.335 to 0.717; $Q_3 = 22.231$, $p < 0.001$; $I^2 = 86.51$) for content of knowledge, ($g = 0.840$, $p < 0.001$; 95% CI = 1.313 to 0.367) for Decision making, ($g = 0.496$, $p < 0.001$; 95% CI = 0.645 to 0.347; $Q_{11} = 7.711$, $p > 0.05$) for personal and social traits, ($g = 0.806$, $p < 0.001$; 95% CI = 0.950 to 0.662; $Q_{13} = 30.334$, $p < 0.01$; $I^2 = 57.17$) for thinking skills.

The effect sizes and 95% confidence intervals of studies are plotted in figure 3 (Forest plot) below. These results indicated that the enrichment programs based on the Oasis Enrichment Model have large effects on content of knowledge, decision making, personal and social traits, and thinking skills.

Discussion

This is the first meta-analysis study of enrichment programs based upon the Oasis Enrichment Model to evaluate the effects of these programs on the various dimensions of gifted education in Saudi Arabia. As an organizing principle, the results of the meta-analyses can be viewed through the prism of the three axes of the OEM: research and thinking skills, academic content, and affective traits.

The enrichment programs demonstrated a considerable effect on students' thinking skills. This result can be interpreted in the light of gifted students' responsiveness to higher order and open-ended questions which encourage discovery, exploration, and motivate students to think about topics with greater levels of detail and abstraction. Furthermore, this result confirmed the crucial role of enrichment programs in the development of gifted students' thinking skills through the provision of specialized activities and exercises that strengthen and broaden students' capacities and skills. Another important factor which might have contributed to this result is that most of the enrichment programs that were examined in this study focused on providing choices based on students' interests and encouraged students to be self-regulated and life-long learners. These programs also improved the abilities of gifted students to think critically, scientifically and freely. In addition, they helped gifted students to plan their work, their time, and to evaluate their learning processes and outcomes. Furthermore, the programs showed a positive effect on

the students' future problem solving skills. This is in accord with the study of Tekian and Hruska (2004) which referred to the effect of enrichment programs on developing the students' problem solving skills. Moreover, enrichment programs proved to have a significant effect on the students' attitude to learning. This reflects the nature and the characteristics of gifted students, who are interested in new topics and enjoy trying new activities. These findings confirm what has been stated in the literature that enrichment programs increase the students' attitude to learning (Davis & Rimm, 2004; Jarwan, 2002).

Moreover, the enrichment programs had a significant effect on students' analytical abilities. These programs succeeded in helping students to improve their analytical abilities, such as critical thinking, making judgments, the ability to compare and contrast, strategies for evaluation and interpretation, and the perception of self-learning strategies. This result can be explained in light of the program activities that provided ample opportunities for students to improve their thinking and research skills through helping them to understand their abilities, improve their skills, and increase their knowledge in various academic domains. Additionally, results showed that the program had a statistically significant effect on creative abilities. This result is further supported by the study of Reis et al. (2008) which indicated the important role of enrichment programs in improving creative abilities. Moreover, this result can further be explained in the light of program content, which emphasized the development of the creative abilities of the participants. Aljughaiman et al. (2009) stressed the necessity of providing sufficient opportunities for students to practice the associated activities which lead inevitably to the growth of the students' creative capabilities.

There were statistically significant differences in favor of the participants in the enrichment programs. This result corresponds with the results of Delcourt, Loyd, Cornell, and Goldberg (1994) who examined the effects of a number of gifted programs (special schools, special classes, and pull out programs), on academic achievement. The results demonstrated statistically significant differences between the mean scores of students who participated in the different enrichment programs and the mean scores of students who did not participate (in favor of the participating students).

The enrichment programs had a positive effect on personal and social traits. In interpreting this result, the effects of enrichment programs on the personal and social traits of the participating students is a good indicator of the success of such programs in developing not only students' knowledge and thinking skills, but also in developing important personal and social dimensions that help gifted students realize their full potential. This finding corresponds to what is commonly asserted in models of giftedness, that appropriate education is a key factor for the development of gifted students and that their exposure to enrichment programs is essential for the development for personal and social traits such as self-confidence, independence, perseverance and teamwork. This finding coincides with the findings of Aljughaiman et al. (2009) which indicated the positive impact of school enrichment programs on personal and social skills.

One major challenge that faces the curriculum developers is how to motivate gifted students to learn (Kaplan, 2009). Enrichment programs should provide solutions to overcome this problem. Enrichment programs present more support and opportunities for gifted students to reach their maximum potential, because they are typically designed according to the students' needs and interests (Kaplan, 2009). Harlen (2000) stressed the importance of taking the opinion of students in selecting subjects and learning activities, warning teachers to avoid choosing topics and learning activities that are higher or lower than students' level. This behavior will inevitably lead to boredom and apathy among students, as it does not satisfy their needs and their interests. This is supported by the close correlation between the educational performance of students and their desire and motivation to learn (McAllister & Plourde, 2008), so the learning tasks that are given to gifted students should evoke and challenge their abilities. These results correspond with the objectives of enrichment programs in terms of providing opportunities for students toward self-fulfillment by allowing them to raise their concerns and interests without

having to worry about negative consequences (McAllister & Plourde, 2008; Wheeler, Waite, & Bromfield, 2002).

Future directions for research on the efficacy of the OEM should focus on several areas. All of the studies included in this study were conducted over a relatively short period of time. There is a need for longitudinal studies to better explore the effectiveness of the OEM. There is a further need for studies focusing on the effectiveness of the OEM on the myriad aspects of the social and personal traits of gifted students (particularly self-regulated learning). In addition, further research efforts are needed on the effectiveness of the OEM on fostering critical thinking skills in the gifted.

Limitations

Meta-analysis can only be of potential benefit for the analysis of different trials. An important limitation of meta-analysis is that its results can only be as good as the original data are valid. Moreover, meta-analysis can only analyze the effect of independent variables on the variance in dependent variables if sufficient data are provided in the original studies. A relatively small number of studies were used in this meta-analysis study; this can be interpreted in light of lack of data bias for similar studies, which means that the results should be interpreted cautiously. A meta-analysis of such a small number of studies cannot predict the results of a large study. In the current study, meta-analysis depends on OEM which has only been used in Saudi Arabia, which means that results cannot be applied widely.

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The Authors

Abdullah Aljughaiman is a full professor at the Education College in King Faisal University, Saudi Arabia. He is currently a Member of Saudi Parliament, and the President of the International Research Association for Talent Development and Excellence (IRATDE). He was the Dean of the Research and Consulting Institute, the Director of the National Research Center for Giftedness and Creativity at King Faisal University, Saudi Arabia, The primary focus of Dr. Aljughaiman's professional activities is the development and education of gifted and talented students. He has published books, book sections, and peer reviewed articles on the identification of and services for gifted children. Prof. Aljughaiman has received multiple awards for his professional and administrative work in Saudi Arabia, United Arab Emirates, and the USA. His research and practice have been supported by funds from King Faisal University and the Ministries of Higher Education, Education, and Planning of the Kingdom of Saudi Arabia. Recently, he received a grant

from the Ministry of Higher Education in Saudi Arabia to support a research project titled "Etiology Basis of Giftedness".

Alaa Ayoub is an associate professor of educational psychology at Aswan University, Egypt, and The National Research Center for Giftedness and Creativity, Saudi Arabia. He has published many studies, and articles on the field of educational psychology and the identification of gifted students. He has made many contributions in preparing scientific scales and tests. He is also the coauthor and the translator of some specialized books. He has received multiple awards from different countries. His research interests are in the identification of gifted students and statistical programs.