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The Effect of an Enrichment Program on Developing Analytical, Creative, and Practical Abilities of Elementary Gifted Students

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Abstract

The current study investigated the effects of a school enrichment program on the analytical, creative, and practical abilities of elementary gifted students. Forty-two students ($N = 42$) from the fifth and sixth grade of the Al-Shawkany School in Saudi Arabia were randomly chosen to participate in the study according to two criteria: (a) being among the top 5% on the general ability test designed for the Saudi environment and (b) a general studies achievement test score of 90% to 100%. The enrichment program lasted 6 weeks. The Aurora Battery was administered to the participants at the beginning as well as at the end of the program. The Mann-Whitney *U* test for independent groups yielded statistically significant differences between the medians of the experimental and control groups in analytical and creative abilities in favor of the experimental group. There were no statistically significant differences in the practical abilities and the total score. Results of the Wilcoxon Signed-Rank Test showed that there were statistically significant differences between the medians of the experimental group on pretest and posttest of the analytical and creative abilities, whereas there were no statistically significant differences in practical abilities and in the total score. A multivariate Kruskal–Wallis test revealed that there were significant differences among the three abilities in favor of analytical abilities.

Keywords

enrichment program, successful intelligence theory, gifted students, analytical abilities, creative abilities, practical abilities

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Introduction

School enrichment programs represent institutional efforts toward fulfilling the needs of gifted students. Therefore, educational systems in many countries give great care to designing programs that promote giftedness and creativity (Davis, Rimm, & Siegle, 2010). In the Saudi Arabian educational environment, enrichment programs designed on the basis of the Oasis Enrichment Model (OEM; Aljughaiman, 2005) are among the most prominent programs adopted by the Ministry of Education. These programs aim at enhancing the educational experience for the gifted and increasing their interest in schooling. Studies show that enrichment programs in Saudi Arabia have traditionally focused on developing the academic and mental aspects of students but have paid little regard to the practical aspects necessary for achieving success in confronting problems of daily living (Aljughaiman et al., 2009; King Abdulaziz & His Companion Foundation for Giftedness and Creativity, 2010).

Sternberg and Grigorenko (2007) point out some people are able to apply what they have learned in real-life situations, whereas others use what they have learned to pass traditional academic tests, yet may be unable to solve problems from daily life. Hence, the essence of giftedness includes not only an individual's mental, analytical, and creative abilities but also the individual's ability to manage and utilize such abilities in particular situations, applying each or all of these abilities as required (Gottfredson, 2003; Grigorenko & Sternberg, 2001; Sternberg, Wagner, Williams, & Horvath, 1995).

During the past two decades, researchers have striven to develop comprehensive models and theories of giftedness. Modern constructs respond to new perspectives that view giftedness as a multidimensional concept that can be applied in several domains. There is an urgent need to apply such theories to fill the gap between the content learned by students and how they actually apply this content in daily life. One theory that advances a multidimensional view of intelligence is successful intelligence theory. Successful intelligence theory posits that intelligent behavior arises from a balance between analytical, creative, and practical abilities and that these abilities function collectively to allow individuals to achieve success within their particular sociocultural contexts (Sternberg, 1997, 1999b, 2003, 2005b).

Research (e.g., Stemler, Sternberg, Grigorenko, Jarvin & Sharpes, 2009; Sternberg & Davidson, 2005; Sternberg et al., 2000) indicates that individuals demonstrate a mixture of creative, analytical, and practical abilities, but to different degrees. What makes someone gifted is having high measures of these three abilities in isolation or combination, as well as the ability to use them to one's best advantage. Therefore, giftedness involves the ability to strike a balance in managing the three abilities efficiently. Students who excel in creativity can generate ideas of high quality, but they need high analytical ability that enables them to assess and evaluate ideas to be more effective. Making use of one's ideas is as important as one's ability to create new ideas. So, gifted students are equally in need of practical intelligence to translate their ideas into a practical program for action. This requires the ability to convince others of the

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worth of their ideas and skill in developing an approach for applying these ideas practically.

Successful intelligence theory highlights the importance of the integration between more than one factor in achieving giftedness. Hence, people with successful intelligence can identify their own strengths and elicit the utmost benefit from them. In addition, they can identify, evaluate, and compensate for weaknesses. People who enjoy successful intelligence can also adapt to their environment by striking a balance between the use of analytical, creative, and practical abilities (Sternberg, 1999b). In addition, the integration between the three abilities can be utilized in different domains. These abilities are flexible, so they can be promoted through training and enrichment programs (Dweck, 1999; Sternberg, 1999a, 2003; Sternberg & Grigorenko, 2007). The current study is a trial to study the effects of a school enrichment program designed by the researchers (based on the OEM) and adopted by the Ministry of Education in Saudi Arabia to develop the analytical, creative, and practical abilities of elementary students.

Through participation in evaluating gifted enrichment programs in Saudi Arabia and reviewing the studies conducted on enrichment programs in other environments (Cannon, Broyles, Seibel, & Anderson, 2009; Delcourt, Cornell, & Goldberg, 2007; Kalkan & Ersanli, 2008; Newman et al., 2009; Reis & Renzulli, 2010; Subotnik & Rickoff, 2010), the researchers noted that these studies focused primarily on the effect of enrichment programs on traditional variables such as thinking skills, motivation, academic achievement, attitudes toward learning, and the improvement of gifted behavior among participants. In addition, the research focused on evaluative and administrative aspects of the programs, such as evaluating the preparation and planning processes of such programs, the difficulties and obstacles that hinder their implementation, and the observations of stakeholders. In the view of the researchers, such indicators fail to sufficiently represent the current understanding of the nature of giftedness in its myriad aspects.

Current theories and models view giftedness as a multidimensional rather than a one-dimensional construct (Aljughaiman et al., 2009; Brody, 2003; Coleman, 2003; Gagné, 2003; Gardner, 1983; Mandelman, Tan, Aljughaiman, & Grigorenko, 2010; Perkins, 1995; Renzulli, 2005; Sternberg, 1995; Sternberg, Castejón, Prieto, Hautamäki, & Grigorenko, 2001). The integration of analytical, creative, and practical abilities represents a pivotal component in current conceptions of giftedness. Therefore, the match between the content of enrichment programs and the expected outcomes represents an essential issue in designing programs for the gifted. Educational institutions seek to promote giftedness in different domains of life. This investment must reach beyond mere academic life and extend to practical life.

Although there are many existing programs for gifted students in foreign and Arab countries in general, and in Saudi Arabia in particular, no studies have been conducted to examine the effects of such programs on developing different aspects of giftedness. The current study examines the effects of an enrichment program for developing the analytical, creative, and practical abilities of gifted students.

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Gifted Education in Saudi Arabia

The interest in identifying gifted students and nurturing their abilities in Saudi Arabia 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 Saudi Arabia stated that "Each student has the right to develop his/her talent, and his/her ability" (Aljughaiman et al., 2009, p. 35). 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. Most of the enrichment programs in Saudi Arabia are based on the OEM.

OEM. The OEM for nurturing the gifted was developed over a period of 10 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. The model comprises a synthesis of the best practices and the wealth of international experience in gifted education adapted to fit the cultural setting and educational system of Saudi Arabian society. During its development, the model was piloted in a large number of schools for males and schools for females. The constructs of the model have benefited from the most effective international and local models in the field of gifted education. In addition to the information obtained from field experimentation, feedback obtained from researchers and educationalists have contributed to the improvement of the OEM.

The most significant goals of the OEM include helping gifted and talented students identify their strengths, realize the fields most suitable for their scientific and professional future, and engage in 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 allows 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 Saudi Arabia, the administration of the OEM mainly employs a pull-out approach wherein gifted students are gathered together outside the mainstream classes to join systematic enrichment programs either during the academic year or summer vacation (Aljughaiman, 2005). The enrichment programs emphasize four main aspects of students' behavior: thinking, research, learning, and affective skills (personal and social). Thinking skills include those related to creative and analytical abilities. Creativity-related skills include fluency, flexibility, elaboration, and originality. Analytical skills include the ability to compare and contrast, relation identification, categorization, ordering, and analytical interpretation. Research skills include problem identification, data collection and data categorization, use of library and information resources, accurate observation, Internet research, and organization. Affective skills (personal and social) include the following: self-observation (self-confidence, appreciating one's

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personal traits—identifying strengths and weaknesses), conversation skills, and teamwork/cooperative work skills. The enrichment program fosters the development of the aforementioned skill areas by mastering rich content that incorporates intersecting domains of knowledge (Aljughaiman, 2005).

The framework of the OEM. The framework of the OEM consists of three axes, three stages, and four sequential phases (Aljughaiman, 2005). Deep academic content, research and thinking skills, and affective traits are the axes that 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 (Aljughaiman, 2005).

Any program that employs the OEM begins by selecting a main 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, they progress through three stages: exploration, perfection, and creativity. The exploration stage consumes approximately 15% of time, the perfection stage consumes 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 (Aljughaiman, 2005). However, programming options that use 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.

Enrichment Programs

During the emergence of educational reform movements in the mid-1920s, different educational systems in developed countries (e.g., the United States and European nations) began to devise educational programs to fulfill the needs of gifted students (Davis et al., 2010; Ferguson, 2009). 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 differ to match various needs of the gifted, environmental conditions, human and financial potentials, and the range and flexibility of educational policies and administrative systems. Many researchers (Davis et al., 2010; Karnes & Bean, 2009) identify various forms of enrichment programs through which special care can be given to the gifted; the most prominent among them are gifted boarding academies, gifted schools, gifted classes, pull-out programs and learning resources, summer camps, weekend programs, and night programs. However, school enrichment programs are the most prevalent among these alternatives (Coleman & Cross, 2005). On one hand, enrichment programs are flexible and can be easily implemented; on the other hand, they can be generalized to benefit all school students. The Ministry of Education in Saudi Arabia has adopted pull-out

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strategies to be the organizing framework for school gifted programs (Aljughaiman et al., 2009). Through this approach, gifted students are pulled out from their standard classes at specific times during the school day to practice particular activities or to study special syllabi, and then return to their ordinary classes.

Field studies illustrate gifted students achieve advanced learning outcomes through pull-out strategies and other applications of enrichment programs. A study by Olenchak and Renzulli (1989) reveals enrichment programs play a pivotal role in promoting elementary students' learning toward achieving advanced levels of creative production. In addition, students demonstrate a greater interest and desire to learn during enrichment activities and the self-directed individual work that are an integral part of such programs. Reis et al. (2008) indicate the significance of school enrichment programs in promoting reading by improving reading fluency, reading comprehension, and positive attitudes toward reading. The study further recommends the effectiveness of enrichment activities that challenge students' thinking and improve their reading fluency.

The role of enrichment programs is not only limited to developing students' cognitive outcomes. Field studies (Al-Barakat & Al-Karasneh, 2005; Reis et al., 2008) demonstrate that enrichment alternatives affect different emotional and social aspects of the personality of gifted students. In a 2002 study, Wheeler, Waite, and Bromfield state that developing different aspects of an individual's personality relies on giving them the freedom to practice activities, promoting their motivation, and encouraging them to practice self-learning. Such practices can all be promoted through enrichment programs.

A review of Arab and foreign studies on enrichment programs (Aljughaiman et al., 2009; Cannon et al., 2009; Delcourt et al., 2007; Kalkan & Ersanli, 2008) shows extant programs focus mainly on academic skills and the social and emotional characteristics of gifted students. However, these programs fail to place sufficient emphasis on teaching gifted students how to plan and evaluate to generate new outcomes, and to apply these outcomes in daily life (Reis & Renzulli, 2010).

Many studies and models relating what students learn and what they actually apply in daily life have recently emerged. One of these theories is successful intelligence theory (Sternberg, 2010). Successful intelligence theory was developed to help students make the most of their gifts and abilities in their academic and nonacademic lives. According to successful intelligence theory, there are different kinds of mental gifts: the analytical, the creative, and the practical. Giftedness cannot simply be measured by a student's score on a standardized test; rather, giftedness should be reflected in all three of these essential dimensions (Sternberg & Grigorenko, 2002).

Analytical Abilities

Analytical abilities encompass those components of intelligence that perform functions related to information processing. Analytical skill is typified by the ability to break a problem into its components and understand those components. Analytical abilities are applied to analyze, evaluate, compare and contrast, and make judgments.

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Students with high analytical ability tend to perform well on traditional IQ tests, which generally measure analytical thinking. In these tests, analogical questions require relational analysis, whereas questions testing synonymous relationships require analyzing multiple-choice items and selecting the choice that best matches the word in the question stem. Reading comprehension requires text analysis, whereas problem matrices require analyzing the internal relations between figures or numbers organized in columns or rows (Stemler et al., 2009; Sternberg, 2004).

Creative Abilities

Creative abilities are exhibited in individuals who demonstrate insight, intuition, and an ability to adapt successfully to novel situations. Creative individuals are not necessarily successful in dealing with standard IQ tests as they tend to view problems differently from test developers and may solve a problem other than the one intended on the test (Sternberg, 2010; Sternberg, Lubart, Kaufman, & Pretz, 2005). Therefore, individuals with high creative ability do not necessarily achieve high scores on standard IQ tests, but these individuals may yet contribute significant achievements in domains such as science, mathematics, arts, and technology. In addition, creative ability is of great importance in the economic growth and development of emerging regions. Gifted businesspeople are those who can view commercial phenomena in the market differently from others and realize undiscovered areas of potential. Businesspeople who amass significant wealth are those who are able to capitalize on the need for a new product or service, or are able to invent a new way of delivering an existing product or service.

Practical Abilities

Practical ability represents an individual's ability to apply analytical and creative abilities in daily practical situations. People with high practical ability can join any institution, identify what is required to succeed in their new position, and implement the required skills to achieve their desired results (Cianciolo et al., 2006; Grigorenko et al., 2004; Sternberg et al., 2000; Tan & Libby, 1997). People with significant levels of practical ability can realize the factors that lead them to succeed quickly and help them to shape and adapt to their environment. As a result, these people generally manage to achieve many of their goals. Many people have high analytical and creative ability but are unable to apply such abilities to successfully negotiate with others or to compete and succeed in their jobs. In contrast, persons with a practical gift are able to utilize their abilities to the full extent and accomplish their goals.

Integration of Analytical, Creative, and Practical Abilities

All individuals possess some combination of analytical, creative, and practical abilities (Sternberg, 2005a, 2006). What counts is the individual's ability to coordinate

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between the three abilities and to know when to apply them. For example, a person with high creative ability who is unable to apply this ability in practical situations and unable to convince others with the worth of his ideas will frequently face frustration. Giftedness is defined by the successful balance a person maintains between these three abilities, not merely by high ability in any single area. As such, successful gifted individuals can be described as good mental self-managers. The integration of these abilities changes and develops over time as intelligence develops in different domains. These abilities are similarly characterized by their flexibility, so they can be improved through education and training (Sternberg, 2010; Sternberg & Grigorenko, 2000).

Method

The current research follows a quasi-experimental design, which involves a pretest and posttest for experimental and control groups. The control group was used to explore the extent to which differences in posttest scores of the experimental group occurred due to the effect of the program. The enrichment program represents the independent variable while the analytical, creative, and practical abilities represent the dependent variables. The pretest was applied three days before the beginning of the program within the preparation phase, whereas the posttest was conducted on the final day of the program.

Participants

Forty-two students ($N = 42$) participated in the study: 20 students in the experimental group and 22 students in the control group. The study was conducted with fifth and sixth grade elementary school students with a mean age of 11.5 years ($SD = 1.07$). Experimental and control groups were randomly selected from the gifted students in Al-Shawkany School in the Al-Ahsa governorate. The samples comprised gifted students selected according to the criteria of the General Administration for Giftedness at the Ministry of Education in Saudi Arabia. The participants were selected for the study according to two criteria: (a) being among the top 5% on the ability test designed for the Saudi environment and (b) a general studies achievement test score between 90% and 100%. All participants assented to be in the study after parental permission was obtained. A total of 48 students participated in the pretest, 6 students did not complete the tests (4 from the experimental group and 2 from the control group); their scores were excluded from the final sample.

Instruments

Aurora Battery. The Aurora Battery (Chart, Grigorenko, & Sternberg, 2008) is an assessment prepared for children aged from 9 to 12 years. The Aurora is based on the theory of successful intelligence and can be used for the identification of gifted students (Chart et al., 2008). The Aurora paper and pencil battery is composed of two

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Table 1. Aurora Subtests and Item Response Formats

	Verbal	Figural	Quantitative
Analytical	Metaphors (OE): Discover how two unrelated things are alike. (9 items)	Shapes (MC): Use missing pieces to complete shapes. (10 items)	Number cards (RW): Solve equations by writing the correct digit number instead of a letter. (5 items)
Creative	Conversations (OE): Make dialogues between things that cannot talk in real life. (10 items)	Book cover (OE): Describe an abstract picture and create a story about it. (5 items)	Number talk (OE): Imagine a conversation between two numbers or more. (7 items)
Practical	Decisions (RW): Define certain reasons for making decision. (3 items)	Toy shadows (MC): Block light on a toy in a certain orientation. (8 items)	Money (RW): Solve everyday mathematical problems. (5 items)

Note: OE = open-ended (scored by rubric); MC = multiple choice; RW = right or wrong.

parts: Aurora-g-Battery, which measures general intelligence through Series, Analogies, and Classification tests; and the Aurora-a-Battery, which measures analytical, creative, and practical abilities. Both are paper and pencil assessments designed for students at the elementary-to-middle school levels where gifted programming is most prevalent (Sternberg, 2010). Table 1 demonstrates some Aurora subtests on analytical, creative, and practical abilities in all three domains (verbal, figural, and quantitative) and the pattern of response for each subtest.

The researchers translated the Aurora into Arabic and standardized the Aurora in Saudi Arabia. A total of 7,800 students were selected randomly from different areas that represent the Saudi Arabian cultural and linguistic environment. In the current study, the researchers chose 196 students from the same school that implemented the program to ensure homogeneity of the sample. The sample of 196 students was used to calculate the validity of Aurora Battery by confirmatory factor analysis with LISREL (version 8.8) to obtain factor loadings; the method of maximum likelihood supported the construct validity of Aurora. Figure 1 shows the confirmatory factor analysis model of Aurora Battery and Table 2 shows the results of the Aurora factor analysis.

As shown in Table 2, all the standardized loadings and their associated *t*-values for the analytical, creative, and practical tests were significant. The fit indices for this full three-factor model were all excellent. Specifically, this model produced a nonsignificant $\chi^2/df = 34.99$, $p = .069$. In addition, the values of the root mean square error of approximation (RMSEA = 0.048), goodness of fit index (GFI = 0.96), adjusted goodness of fit index (AGFI = 0.93), and normed fit index (NFI = 0.97) indicated the suggested model for Aurora fits with the data.

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Table 2. Results of Aurora Battery Confirmatory Factor Analysis

Ability	Loading	SE of loading	*t*-value
Analytical abilities			
Analytical-verbal	0.73	0.076	9.56**
Analytical-figural	0.64	0.076	8.40**
Analytical-quantitative	0.65	0.076	8.48**
Creative abilities			
Creative-verbal	0.85	0.061	13.88**
Creative-figural	0.78	0.063	12.48**
Creative-quantitative	0.66	0.067	9.86**
Practical abilities			
Practical-verbal	0.77	0.064	12.02**
Practical-figural	0.72	0.066	10.87**
Practical-quantitative	0.70	0.067	10.46**
χ^2/df	34.99		

**$p < .01$.

The reliability coefficient of the Aurora-a-Battery was measured using Cronbach's alpha. The Cronbach's alpha was (.71) for analytical abilities, (0.67) for creative abilities, (0.68) for practical abilities. These values were all statistically significant. Low reliability can be due to the dispersion in students' responses.

Program Application Procedures

To verify the level of professional preparation of the enrichment program executive team, the researchers established the general framework of the enrichment program and then trained the executive team on designing and implementing the program according to enrichment program quality criteria. The training continued for 4 days and involved five main aspects: management and organization, learning and teaching activities, counseling and guidance activities, creativity and learning environment, and evaluation. By the end of the training, the program executive team of Al-Shawkany School designed the program according to the criteria on which they had been trained. Then, the program was presented to the researchers to review and evaluate it. Subsequently, the program was returned to the executive team for further review. The researchers applied the tests from the Aurora Battery 3 days prior to beginning the enrichment program and again at the end of the program. In addition, the researchers supervised the activities in the program, advised members of the team, monitored the proceedings of the program, visited and conducted interviews with students and team members, and participated in many program activities, workshops, excursions, and competitions.

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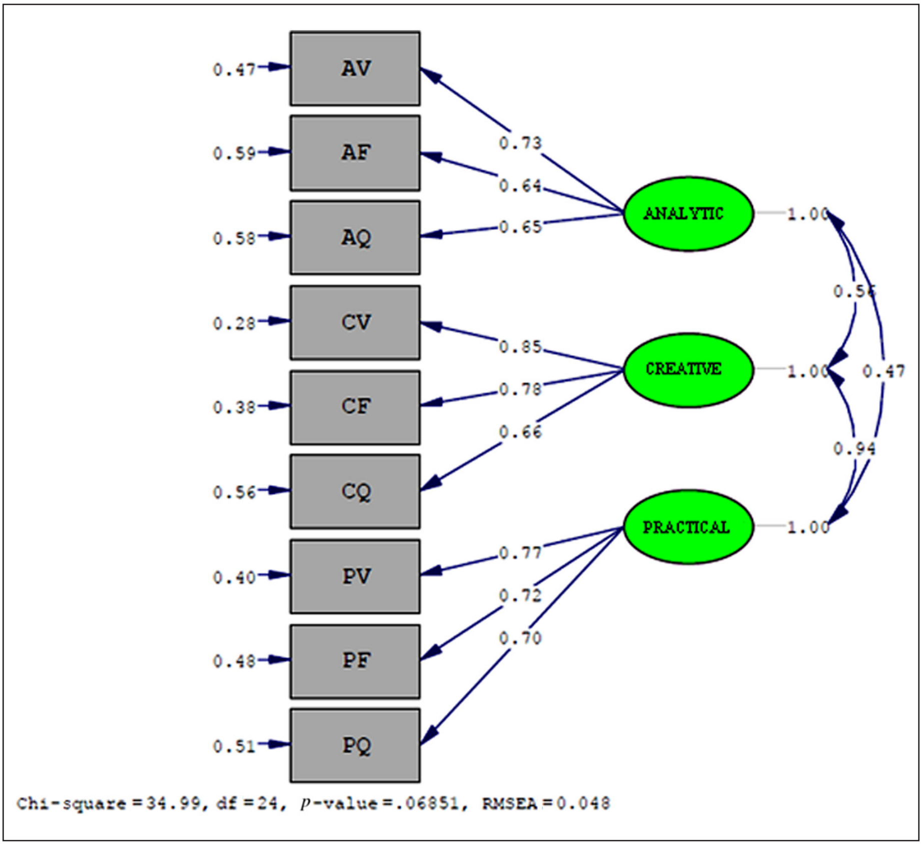

Figure 1. The Confirmatory Factor Analysis Model of Aurora Battery

Program Content

The enrichment program. The enrichment program was designed based on the OEM (described above). The program consists of 6 instructional weeks (broken down to 2 hr per day, 4 days per week) and contains three enrichment units, with each unit divided into three stages. Students meet with their teachers in the resource room of the participating schools.

In the initial week, students are exposed to the problem-based theme ("water is the source of life") during the exploration stage. During this stage (exploration), students participate in a variety of activities related to the theme to gain a sense of the nature of the problem and the specific challenges associated with it in their local environment (e.g., the drying up of wells). By the end of the 1st week, students are grouped into one of three groups based on their choice of project (related to the theme) and their choice of product (e.g., research paper, website, and video).

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In the next stage (perfection), students work in their groups for four instructional weeks, delving into their topic in greater detail. During this period, students engage in a variety of creative and critical thinking, research, and personal and social skills in the context of addressing their problem-based project. Creativity-related skills include producing novel ideas, idea generation, and mental flexibility. Analytical skills include comparison and contrast and reasoning. Research skills include problem identification, collecting information, identifying a variety of sources and verifying the authenticity of sources. Affective skills include persistence, personal responsibility, teamwork, debating, and convincing others of one's ideas. During this stage, students are pulled out from their normal class schedule to work independently (in groups) for 2 hr during the school day and subsequently meet informally after school to work as needed on their project. At the end of each week, all of the groups convene together to compare notes on their progress and discuss and debate their work. By the end of the perfection stage, most of the groups have completed their data collection, organized their ideas, and documented their findings in written form.

During the last stage (creativity), students are finalizing their projects and products and working on ways to elaborate on their ideas and present their products in a uniquely creative manner. On the final day, a symposium is convened with an audience of experts, local school administrators, teachers, parents, and students during which each group will present its project and receive and respond to feedback and questions from the audience.

Statistical Methods

To verify the hypothesis and answer the study questions, the researchers used SPSS (version 16.0). The researchers applied the Mann-Whitney *U* test, Wilcoxon Signed-Rank Test, and a multivariate Kruskal–Wallis test on the basis of nonparametric data. The researchers employed LISREL (version 8.8) to verify the factor analysis validity of the Aurora Battery through confirmatory factor analysis and to define its construct factors. Each factor in the Aurora Battery was statistically treated individually, as well as the total score, to identify the factor most affected by the program.

Results

The Mann-Whitney *U* test for two independent samples was applied. Results showed there were no statistically significant differences between the medians of the experimental and control groups in the pretest ($z = -0.40$, $p > .05$ for analytical; $z = -0.01$, $p > .05$ for creative; $z = -0.51$, $p > .05$ for practical; and $z = -0.57$, $p > .05$ for total score). The Mann-Whitney *U* test was then carried out to evaluate the differences between the experimental and control groups on the posttest. The results of the Mann-Whitney *U* test (Table 3) indicated significant differences between the experimental and control groups for posttest scores on analytical abilities ($z = 5.27$, $p < .01$) and creative abilities ($z = 2.19$, $p < .05$).

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Table 3. Mann-Whitney *U* Test for the Differences Between the Experimental and Control Groups on the Posttest

Dimensions	Groups	*n*	Mean rank	Sum of rank	z	Effect size
Analytical	Experimental	20	31.92	638.50	5.27**	0.81
	Control	22	12.02	264.50		
Creative	Experimental	20	25.82	516.50	2.19*	0.34
	Control	22	17.57	386.50		
Practical	Experimental	20	24.50	490.00	1.53	
	Control	22	18.77	413.00		
Total	Experimental	20	25.18	503.50	1.85	
	Control	22	18.16	399.50		

$^{*}p < .05$. $^{**}p < .01$.

The results revealed no significant difference between the experimental and control groups for the posttest scores on practical abilities ($z = 1.53$, $p > .05$) and total score ($z = 1.85$, $p > .05$).

The Wilcoxon Signed-Rank Test was applied to verify the effect of the program on the analytical, creative, and practical abilities of participants, as well as to identify the group of students whose posttest scores were higher than, lower than, or equal to their pretest scores. Table 4 shows the results of the Wilcoxon Signed-Rank Test. There is a significant difference between the pretest and posttest analytical and creative abilities scores of students: Wilcoxon Signed-Rank Test = −3.83, $p < .01$, for analytical abilities and Wilcoxon Signed-Rank Test = −3.55, $p < .01$, for creative abilities, both in favor of posttest scores. As for the analytical abilities, results showed 19 cases whose posttest scores were higher than their pretest scores. Posttest scores equaled pretest scores in one case only. As for the creative abilities, results showed only one case in which posttest scores were lower than pretest scores, whereas there were 16 cases whose posttest scores were higher than pretest scores. Posttest scores were equal to pretest scores in only three cases.

According to the data presented in Table 4, there was no significant difference between pretest and posttest average scores of students in practical abilities (Wilcoxon Signed-Rank Test = −1.81, $p > .05$) and total scores (Wilcoxon Signed-Rank Test = −1.44, $p > .05$). As for the practical abilities, results showed 4 cases in which posttest scores were lower than pretest scores, whereas there were 13 cases whose posttest scores were higher than pretest scores. Pretest scores equaled posttest scores in only 3 cases. As for the total scores, results showed 4 cases in which posttest scores were lower than pretest scores, whereas there were 14 cases whose posttest scores were higher than pretest scores. Pretest scores equaled posttest scores in only 2 cases.

A multivariate Kruskal–Wallis test as a nonparametric alternative of ANOVA was used. Researchers turned the total score on each of the three abilities (analytical,

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Table 4. Results of Wilcoxon Signed-Rank Test

Dimensions	Ranks	*n*	Mean ranks	Sum of ranks	*z*	Effect size
Analytical	Negative ranks	—	—	190.00	−3.83**	0.61
	Positive ranks	19	10.00			
	Ties	1	—			
Creative	Negative ranks	1	2.00	2.00	−3.55**	0.56
	Positive ranks	16	9.44	151.00		
	Ties	3				
Practical	Negative ranks	4	9.88	39.50	−1.81	
	Positive ranks	13	8.73	113.50		
	Ties	3				
Total	Negative ranks	4	1,338	53.50	−1.44	
	Positive ranks	14	8.39	117.50		
	Ties	2				

Note: Negative ranks: posttest < pretest; positive ranks: posttest > pretest; ties: posttest = pretest.
**$p < .01$.

Table 5. Results of Multivariate Kruskal–Wallis Test

Dimensions	Mean rank	*df*	χ^2
Analytical	44.45	2	19.22**
Creative	23.45		
Practical	33.60		

**$p < .01$.

creative, practical) into a *T*-score because of the variance in the number of the included items of each ability, and also there is a difference in the total score on each of the three abilities.

Results represented in Table 5 showed that there were significant differences among the three abilities (Kruskal–Wallis test, $\chi^2 = 19.22$, $p < .01$). A post hoc Mann-Whitney *U* test comparison for each pair of abilities was used.

Results in Table 6 showed that there were significant differences between analytical and creative abilities ($z = -3.94$, $p < .01$) in favor of analytical abilities. In addition, there were significant differences between analytical and practical abilities ($z = -3.64$, $p < .01$) in favor of analytical abilities. Whereas, there were no significant differences between creative and practical abilities ($z = -0.11$, $p > .05$).

Discussion

Gifted students are urgently in need of opportunities to nurture and develop their knowledge acquisition and thinking skills (Sternberg, 2005b; Sternberg & Grigorenko,

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Table 6. Results of Post Hoc Mann-Whitney *U* Test

Dimensions	Mean rank	Sum of ranks	z
Analytical	27.75	555.00	−3.94**
Creative	13.25	265.00	
Analytical	27.20	544.00	−3.64**
Practical	13.80	276.00	
Creative	20.70	414.00	−0.11
Practical	30.30	406.00	

**$p < .01$.

2007). The initial findings demonstrated that there were statistically significant differences between the medians of the experimental and control groups on analytical and creative abilities in favor of the experimental group. The effect size had a value of 0.81 for analytical abilities and 0.34 for creative abilities. These findings indicate that the enrichment program content promoted analytical and creative abilities among participants. Thus, though gifted students may already be distinguished by analytical and creative abilities, these can still be further developed and improved. The findings demonstrated that there were no statistically significant differences in the practical abilities and the total scores of the three abilities between the experimental and control groups. This may indicate that the program did not support the gifted participants in improving their practical abilities and in applying their learning to their lives. This result indicates the need to provide special attention to the development of practical abilities. Because enrichment programs as typically constructed are not sufficient to foster these abilities, such programs need to provide activities enabling students to practice metacognitive skill sets, such as planning, observation, reviewing, evaluation, goal-oriented behaviors, and so on. Students need to use these skills in a functional and integrated manner together with analytical and creative skills (Stemler, Grigorenko, Jarvin, & Sternberg, 2006).

Furthermore, findings showed the program had a statistically significant effect on analytical abilities in the pre- and posttests of the experimental group. Effect size had a value of 0.61. This value demonstrated the considerable effect of the program on students' analytical abilities, that is, that the program succeeded in helping students improve analytical abilities, such as retrieving information, 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, which provided ample opportunities for students to improve their thinking and research skills through helping them understand their abilities, improve their skills, and increase their knowledge in various academic domains. The improvement of skills related to analytical abilities could also be explained due to students' preexisting familiarity with these kinds of skills. Analytical intelligence is highly

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correlated with academic intelligence (Sternberg, Jarvin, & Grigorenko, 2011), and as most of the students who participated in this study were also high academic achievers, the program succeeded in meeting their strengths and interests.

Moreover, results showed the program had a statistically significant effect on creative abilities. The value of the effect size was 0.56 for creative abilities, which lends more support for the positive effect of enrichment programs on creative abilities (Reis et al., 2008). The emphasis of the enrichment program in this study was on developing skills needed for generating ideas and relatively novel products. The strategies used in this study to improve these skills seem effective. Most of the activities in this enrichment program encouraged students to have positive attitudes toward idea generation and new ideas. The indirect activities to foster mental flexibility were also seen to be effective as evidenced by results of the posttest. This result conformed to results from other studies (e.g., Kaufman & Sternberg, 2006; Sternberg et al., 2011). This result can also be explained in light of the program content, which emphasized the development of the creative abilities of the participants.

On the contrary, findings demonstrated that the program had no significant effect on practical abilities. This can be explained by the lack of specific activities in the program content that focused on the development of student practical abilities. Moreover, the current curricular content delivered in the majority of the schools is focused on traditional areas of academic achievement, and hence does not emphasize improving practical intelligence. Therefore, students are less able to apply skills learned at school to their daily problems. Another possible explanation for this result is that practical intelligence represents the ability to use knowledge gained from experience to successfully modify the environment (Sternberg et al., 2011), which means developing skills needed to foster this intelligence requires time and real-life challenges (Sternberg, 2010; Sternberg & Grigorenko, 2007). The structure and length of the enrichment program in this study did not successfully support this process.

As for the effect of the enrichment program on the total score of the three abilities (analytical, creative, and practical), study findings indicate that the enrichment program had no effect on the total score of the three abilities among participants. It is possible that students' low scores on practical abilities resulted in the low score on the three abilities overall (which is further supported by the statistical analysis). It is also possible that, in general, the activities of the enrichment program did not improve the analytical, creative, and practical abilities equally and sufficiently. In this regard, Sternberg asserted that what counts regarding a person's gift is his ability to coordinate the uses of the three construct abilities of intelligence and to know when to use each. Giftedness cannot be identified only by the high measure a person may attain on one of the three abilities; rather, it can best be identified by the balance a person strikes between the three abilities (Sternberg et al., 2009; Tan et al., 2008).

The findings demonstrated the program affected each of the three abilities differently in favor of analytical abilities. The researchers explain this result on the basis that enrichment program activities focused primarily on improving analytical thinking and scientific research skills. In addition, these activities failed to emphasize improving

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students' practical abilities through self-learning. The program also did not place significant importance on improving imagination, innovation, developing hypotheses, generating ideas, and applying these skills to daily problems successfully. Educational studies have placed increasing importance on the necessity of addressing practical intelligence, interest in which has increased due to the importance placed on the application of knowledge in daily life and the utilization of implicit knowledge.

The recent research indicated that there was a statistically significant positive effect on analytical and creative abilities for the program studied. In addition, the results demonstrated the absence of such effect on practical abilities, which negatively affected the total score.

As for the design of enrichment programs, it is not sufficient for such programs to merely encompass activities that promote skills (i.e., analytical and creative thinking skills) or affective elements (i.e., personal, social) without paying attention to the integration of these elements in a manner that promotes an individual's ability to make use of such abilities in real-life situations (Newman et al., 2009; Rindermann, Sailer, & Thompson, 2009; Sternberg, 2010). In addition, the fact that educational programs lead to advancement in different thinking abilities (Delcourt, 1993; Field, 2007; Gentry, Moran, & Reis, 1999; Hébert, 1993; Moon, Callahan, Tomlinson, & Miller, 2002; Reis & Renzulli, 2003; Westberg, 1999) does not mean students will be able to apply such advanced thinking skills in real practical situations, which is increasingly considered a hallmark of a program's success. These considerations point toward future directions for the development of more successful enrichment programs. It is increasingly necessary that enrichment programs be developed to include activities that focus on the use and management of various analytical and creative mental skills, together with social and personal affective aspects, in an integrated rather than separate manner.

The findings of the study demonstrate a second indicator regarding enrichment program implementation. The integrity and high quality of the program's design are not sufficient for a program to be considered effective; attention must also be given to training teachers on the mechanisms of merging practical and thinking skills through educational activities. In addition, attention must be given to the mechanisms of exposing students to real-life experiences to enable them to integrate their practical and thinking skills in an effective manner (Renzulli & Sytsma, 2008; Sternberg, 2005b). Moreover, developing students' abilities to manage their analytical, creative, and practical skills effectively takes a relatively long time. Therefore, to accommodate this process, enrichment programs should not be envisioned as a one-off program. Rather, enrichment programs can be developed to be serialized, sequential, or modified to fit the time constraints of the milieu in which they are implemented, and the time requirements needed to be effective.

The results of this study further point out the need for future enrichment programs to be developed bearing in mind three essential criteria: continuity, validity, and comprehensiveness (Alvino, 1991; Cox, Daniel, & Boston, 1985; Davis et al., 2010; Gallagher & Gallagher, 1994; Landrum, Callahan, & Shaklee, 2001; Neihart, 2006;

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Reis, 1991). Enrichment programs ought to be provided for a sufficiently long period of time, be sensitive to real-life needs, promote the cognitive and mental abilities, and be sensitive to the affective needs of participating students to achieve maximal benefits for all involved.

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