

THE RELATIONSHIP BETWEEN CRITICAL THINKING AND PROBLEM SOLVING FOR TALENTED

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Abstract

A myriad of research supports the fact that critical thinking is a crucial element for problem solving. Moreover, there is a positive correlation between the critical thinking and the ability of the individual to perform problem solving. Simply put, the critical thinking asks: What is the value and truth of the thing? On the other hand, the problem solving process starts with the existence of a problem. Therefore, the problem solving process revolves around the question: What is the mean to solve the problem? The problem solving ends in finding a solution that targets solving the investigated problem. Two differences between critical thinking and problem solving: the start and end of the processes. The critical thinking process starts with a claim, an idea, or a conclusion, and the process ends in reaching consensus on the value and truth of the claim, idea, or conclusion. This paper shows the relationship between critical thinking and problem solving.

Keywords: Problem Solving, Critical Thinking, Talented

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1.1 Introduction

Human resource is more meaningful than other resources if properly prepared and invested in the development, increase and diversification of production. The biggest proof is what Japan and South Korea have achieved, as an example but not limited to, in the fields of technology and science despite not rich in natural wealth; they reached this state because of the good preparation of the human resources and the proper investment, especially for the gifted and talented student who have the potentials to innovate, invent, and to find solutions as well as new ideas (Al-Tawwab, 1986). The future of nations and their progress, as far as science and developed technology are concerned, largely depend on the interest in and care for the gifted and talented student and on providing the suitable climate to launch their creative potentials (Mouawad, 1989).

The importance of taking care of the gifted in order to help them develop their abilities and develop their preparations on the one hand, and for the good to take advantage of their abilities and their aptitudes on the one hand and to make use of their abilities and talents so they do not wither and get extinguished on the other hand. The gifted usually represent an important human resource which exceeds the value of any other resources and the national human wealth that is not equated to anything and its investment and development is essential for the individual and the society alike and in any society that seeks to advance and construct (Clerk, 1981).

1. Developing Critical Thinking for Talented

The interest in developing critical thinking is of particular interest to the educators. The critical thinking includes five skills: (1) knowledge of assumptions, (2) reasoning, (3) discussion assessment, (4) inference, (5) and conclusion. The Watson critical thinking assessment is used a metric for critical thinking level. The education and psychology had contributed a lot to our knowledge about critical thinking processes and its elements. Now know more than ever, that the education should be tailored to its recipients according to their personal abilities. It is only then, that education is coupled to the thinking skills, and thus becomes more effective.

In the last few decades, special interest was given to teaching gifted and talented students, since the available curriculum does not provide them with the elements that appropriate the

development and excelling of their talents nor their overall education. This had triggered many countries to include of the category of gifted and talented student and gifted in the area of special education. This was further expanded by the creation of specialized disciplines, which focuses on the gifted and talented student and gifted in the many university systems. Hence, gifted and talented student and gifted students are better cared for than ever before as they are being trained by experts. Nonetheless, embarking on the field of gifted and talented student and gifted are still at its infancy, and many studies are still needed to further develop our understanding and ability to enrich the gifted and talented student and gifted students.

The communities realized the importance of identifying the individuals with high and distinguished potentials long time ago in addition to developing the capabilities and preparing the leading people qualified enough to raise their societies to the prestigious cultural levels. Perhaps what was done by the Chinese Empire in 2200 BC concerning the setting of an accurate system for the selection of gifted and talented student children and providing them with appropriate programs is a good evidence of the early efforts in this area (Abonyan and Al-Dhabyan, 1997).

The Muslims had a role, since the advent of Islam, in investigating and taking care of the special capacities among the Muslim children. Morsi (1992) stated that Islam had already preceded the modern fashions in paying attention to the importance of genius and in the induction to take care of the gifted and talented student and in stating their virtue in the prosperity of their communities socially, economically and culturally.

Rate of 2-5 % of the people representing the outstanding and the gifted and talented student. Among this percentage, emerge the scientists, thinkers, reformers , leaders, innovators and inventors on whom the humanity depended since the ancient ages in the progress of civilization due to what their thoughts and minds produced in terms of inventions, innovations and reforms (Al-Qatiee et al, 2000).

2. The Relationship between Critical Thinking and Problem Solving

The world is becoming increasingly diverse, and thus calls for more creative and complex

thinkers. It is estimated that the speed of the current discovery of information is such that the quantity of available information doubles every 10-18 months (Murgatroyd, 2010), which makes it imperative that emerging adults learn not only to recall information from schooling experiences, but also to continually incorporate new ideas into what they already know. As the complexity of society increases, the types of problems that students will face after their schooling experience will become more complex, resulting in a higher demand for proficient thinkers (Noykes, Schunn, & Chi, 2010) as well as creative thinkers (Sternberg & Lubart, 1996). Additionally, some theorists (Romer, 1994) believe that our future economy will be driven by creative and innovative products and solutions that respond to critical societal needs.

As most people expect, the schools are at the heart of the educational systems. However, it is becoming very obvious that most of the students lack important thinking skills. The educational challenges of schools were elegantly stated by Clement (1979): “we should be teaching students how to think. Instead, we are teaching them what to think”. Norman (1981) also showed his dissatisfaction with the educational system: “it is strange that we expect students to learn, yet seldom teach them anything about learning”. Since all students have differing abilities and potential, the ideal school system should undertake learning that matches the students’ abilities (Knight & Becker, 2000). This, however, is not the case as many schools still lack the appropriate procedures for identifying the talented students (Malik & Balda, 2006; Winebrenner, 2000).

Although substantial research has been concerned with identifying the characteristics of gifted students, other research has focused on pedagogical practices in the education of gifted children (Garni, & Abdullah, 2012; Abunayyan, 1994; Reis & Renzulli, 2009; Renzulli, Smith, & Reis, 1982; Silverman & Baska, 1993; VanTassel-Baska et al., 2009). Nonetheless, the majority of gifted students throughout the world spend most of their time in regular school classrooms (Hyatt, 2000; Maajeeny 1990). In the US, the National Association for Gifted Children (2011) published its annual report for 2010-2011 “State of the Nation in Gifted Education”. Their data shows that gifted students spend the majority of their time in the regular education classroom being taught by teachers who are not trained to meet their needs. In Saudi Arabia, the majority, if not all, of gifted students also spend most of their time in mainstream classrooms (Al Qarni,

2010; Maajeeny, 1990). The difficulty with this situation is that gifted students easily and quickly complete mainstream tasks and problems (Winebrenner, 2009), frequently become bored (Cohn, 2003) and frustrated (Delisle & Galbraith, 2002). Subsequently, they may lose interest and ultimately underachieve. In addition to the adverse effect on the academic process, the lack of special attention for the unidentified talented students could have negative implications on the self-esteem and motivation of talented students (Knight & Becker, 2000), Gardner (2004) suggested that to overcome the risk factors for academic achievement and motivation, the gifted students need to be provided with differentiated instruction that can match their unique abilities.

With the explosion of information technology and moving away from an industrial society to a knowledge society, the attitude or disposition to think critically is as important as other skills (Halpern, 2003; Pascarella & Terenzini, 1991) such as professional acquisition of knowledge and lifelong learning (Tiwari, Lai, So & Yuen, 2006). Understanding what critical thinking is, and how it can be acquired might help educational institutions to instill such skills in their educational strategies, and hence become more effective and efficient. This is of course of special importance to the category of talented students, as it is through the development of critical thinking skills that talented students are driven for academic and social success.

Critical thinking is considered to be a higher order type of thinking; non-algorithmic, complex mode of thinking that often generates multiple solutions. Using Bloom's classification, the lower levels of Blooms taxonomy such as knowledge could be considered to be the low-order thinking skills, while the higher levels of Blooms taxonomy such as analysis, synthesis and evaluation, could be considered to be the higher-order thinking skills. The multiple elements of critical thinking combined give rise to other skills, including but not limited to, problem solving, inferring, and estimating, predicting, generalizing, and creative thinking. Therefore, problem solving is preceded by critical thinking.

Nevertheless, critical thinking also affects acquisition and retrieval of knowledge as Concepts are acquired through abstractions and principles connect these concepts, which results in establishing a network of knowledge. Any new concept encountered has to fit in the existing cognitive structure. Such accommodation will not be possible without critical thinking. When a problem is encountered and before it can be solved it has to be analyzed in a critical way (what is the

problem? What is the given information etcetera). Therefore critical thinking is continually involved in the application of problem solving.

Problem solving is a skill that is needed in all aspect of our everyday lives. Most of people have to make daily plan, make decisions in their business and manage their budget. All of these events require logical thinking and problem solving skills (Wedemann, 1995). Problem solving is recognizes as an important life skill involving a range of processes including analyzing, interpreting, reasoning, predicting, evaluating, and reflecting (Anderson, 2009).

There are many definitions for problem solving; however, the following definitions encompass most of these definitions. For Polya (1973) a pioneer in problem solving defines it as “solving a problem means of finding a way out of a difficulty, a way around an obstacle, attaining an aim that was not immediately understandable.” Green and Gilhooly (2005) state that: “problem solving in all its manifestations is an activity that structures everyday life in a meaningful way and that problem solving draws together different components of cognition”. Stressing the importance of problem solving, Annable (2006) pointed out that problem solving skills is potentially manifested in developing students’ responsibility, increasing their motivation for learning and its retention, and is. Additionally, problem solving strategies are effective in the collaborative learning settings (Annable, 2006).

Thus far, the educational systems continually struggle to engage students in critical thinking and problem solving activities (Tempelaar, 2006), and students seldom use critical thinking skills to solve complex, real-world problems (Bartlett, 2002; Rippin, Booth, Bowie, & Jordan, 2002). Interestingly, research has revealed that gifted students cannot develop their potential on their own (Fiedler, Lange, & Winebrenner, 2002; Winebrenner, 2000, 2009). In order to unleash the potential of the talented, they must receive adequate training qualified teachers. The study of Çetinkaya (2014) confirmed such connection through the use of a problem solving program that was administered to talented students. Cetinkaya’s research indicated that problem solving is directly linked to the creative thinking skills. Therefore, there is an imperative need for the development of the institutional programs that can target the development of critical thinking and

problem solving. These programs are of special importance for the talented students to bridge the gap in their education, and to provide them with means to excel.

Teaching critical thinking became an imperative necessity for fostering talented students. It is important to include critical thinking training in the programs that target talented students (Al-Rafia'y, 2012). Critical thinking training can enable the talented students' abilities in rigorous thinking, evaluating ideas and concepts, and understanding the underline nature of things. Thus critical thinking training can sculpture the personalities of talented students and empower them to face difficult, real-life problems. Critical thinking training for talented students can also boost the self-confident and self-dependency of the students. Furthermore, the critical thinking training can enrich the cultural and ideological rational of the students. The critical thinking training can lead the students to apply the methodologies of evaluating and comparing ideas and concepts before accepting the idea or the concept, and thus, reduces the likely hood of the students in accepting a false logic or unsupported idea or concept. Another benefit for critical thinking training for the talented students is that it reduces the arrogance and tendency to underestimate others or undermine new ideas and concepts. The critical thinking can strengthen talented students' abilities in identifying contradictions and logical falsies (Al-Sukary, 2010).

The educational systems in many countries are continuously realizing the importance of fostering high-level of thinking skills, which is directly linked to high abilities of reasoning, evaluation, analysis, and conclusion (Al-Sharky, 2005). All of these abilities are also necessary to enhance the specific talent of each student (Astleitner, 2002). For these benefits, the inclusion of critical thinking training can stimulate and advance the mental abilities and skills (Al-Rafia'y, 2012). None the less, the success of the inclusion of critical thinking training in the talented students' programs contingent on educational support and on the specific environment, which can affect tailoring of critical thinking exercise and activities. Most importantly, inclusion of critical thinking training into the talented students' programs should emphasize the excitement and dynamicity of critical thinking (Halpern, 1998).

It should be mentioned that Harnadek(1967,1979) believes that every student is capable of critical thinking if he/she is administered the right, adequate training (Jarwan, 2002; Bahjat,

2005; Rawashdeh and Al-Wakfy, 2008). This is because the application of critical thinking can lead to stronger, deeper cognitive content and the ability to dynamically utilize it (Al-Hamory & Al-Wahr, 1998).

The emphasis on the importance of fostering the talented students was also evident in the conferences that were held in many countries. In 2000, Connecticut University held the Teaching and Learning Enrichment for Fostering Talented Students, and in 2005, the Fostering Talented Students is an Arabic Priority in the Globalizing Era conference was held in Amman/Jordan. The Jeddah/Saudi Arabia Forth Annual Reginal Scientific Conference that was held in in 2005 was focused on fostering talented students and that was titled: Fostering Talented Students-Pedagogy for the Future. The conference addressed the importance of teaching and enhancing the different types of thinking including the critical thinking. In general, and stemming from the consensus on the importance of advancing the thinking skills, all the conferences that were held to address fostering talented students made the recommendations that research is of a vital need to further understand and develop the programs that address teaching and learning of thinking, and particularly critical thinking (Al-Rafia'y, 2007).

Based on the current research data and on the recommendations of conferences that focused on advancing the teaching and learning of talented students, it becomes very clear that enhancing the critical thinking skills of talented students is of a vital importance. Such importance has two facets: the personal benefit, and the broader societal benefit. This research was initiated due to the scarcity of research in advancing the critical thinking abilities of talented students in the Arabic countries in general, and in Saudi Arabia in specific. Therefore, in this study we attempt to pursue the research that can shed the light on advancing thinking following the footsteps of developed countries, which have advancing thinking skills on their top agenda and social priorities. Although there was a consensus on the importance of teaching critical thinking skills, thus far the teaching of critical thinking skills is still taught within the context of other disciplines. Therefore, this study attempts to focus on teaching critical thinking skills in an interdisciplinary approach. Our aim in this study to teach critical thinking skills in a broader context in such a way that the talented students can apply their acquired knowledge and skills in real-life situations. The researcher believe that this study is of crucial importance to the Saudi

Arabia society since it is a study that focus on interdisciplinary approach for teaching critical thinking to talented students.

The ability to think is one of the distinguishing features of human beings, we think because we are human. But how do we think? The quality of our thinking is what distinguishes us from other members of our own species. Critical thinking is the cause of our species' improvement and progress. Not every natural thinking process leads to excellence. Hence, Scriven and Paul (2004) suggest its cultivation to prevent it from becoming biased, distorted, partial, uninformed, and prejudiced. That is the reason for recent enthusiasm for the development of critical thinking in education. Teaching critical thinking skills have gained attention in educational research. For instance, Glaser's (1941) seminal work reports that training programs can have beneficial effect on different aspect of critical thinking elements. McBride and Bonnette (1995) have also reported that training and education can foster critical thinking in at-risk groups. In his comment on Atkinson's (1997) article, Davidson (1998) maintains that even if critical thinking be considered as a culture-specific trait, the more reason there is for the introduction of critical thinking.

Throughout the critical thinking and problem solving, the talented student will employ a myriad of skills that will transform them to dynamic, creative, self-learners. After all, the research supports the premise that traditional methods of pedagogy, such as lecture and memorization, do not lead to long-term knowledge or the ability to apply that knowledge to new situations (Celuch&Slama, 1999; Daz-Iefebvre, 2004; Kang &Howren, 2004). Therefore, lecture and rote memorization do not promote critical thinking and its application to arising new problems. On the other hand, instructional strategies that employ students' higher-order thinking skills lead to improved critical thinking skills (Duplass&Ziedler, 2002; Hemming, 2000; Wong, 2007).

Conclusion

The critical thinking effect is multifaceted: (1) it enable the student to understand the opposing opinions to his/her own and reevaluate his/her own virtue of thinking; (2) it enable the student to maximally utilize new methodologies, technological tools, and various methods of

communication; (3) It enable the student to excel in his/her various study subjects; (4) it enable the student to perform self-learning; and (5) it enhances the ability of the student to inquire

Therefore, one could say that critical thinking is one type of thinking, which enables the student to examine the logistics and truth of the hypothesis, and to evaluate the suitability of suggested solutions. Critical thinking is not the same as problem solving, most profoundly in the purpose of the critical thinking as its aim is not to find a solution to a problem as in the case of problem solving, but rather critical thinking aims to compare the opinions, ideas, and.or possible solutions

Reference

- Abdeen, S. (2014). Theory Concurrent thinking. *Life science journals*,11(12) , USA.
- Abdeen, S. (2015). Think out the box with Concurrent thinking theory. *IPCiRE2015*,USM.
- Anderson, J. (2009). Mathematics curriculum development and the role of problem solving. In K.
- Annable, C. J. (2006). Developing critical thinking skills and mathematical problem solving ability in grade six students (Master's thesis). Available from ProQuest Dissertations and Theses database. (UMI No.MR27029)
- Atkinson, D. (1997). A Critical approach to critical thinking in TESOL. *TESOLQuarterly*, 31, 9-37
- Attawab, S. (1986). The development of the capabilities of innovativthinking from the third to the fifth grade among the primary school pupils in Alexandria. The annual book in Psychology, Volume (5), Cairo, the Egyptian Association for Psychological Studies.
- Altshuller, G. 1984. Creativity As an Exact Science: The Theory of the Solution of Inventive Problems, New York, Gordon and Breach Science Publishing.
- Altshuller, G. 1999. The Innovation Algorithm, Worcester MA, Technical Innovation Centerinc.
- Al-Sukary, E.M (2010). Some psychometric characteristics of Watson-Glaser Critical Thinking Test for a group of university students. *The Egyptian Journal for Psychological Studies*. 20(1).
- Al-Hamury, H., Al-Waher, M. (1998). The Development of Critical Thinking and its Relation to Age, Sex, and Study Specialty. *Derasat in Educational Sciences*: 25.

- Bahjat, R. (2005). Enrichment and Critical Thinking Study on Highly Achieving Students in the Fifth Grade. Alam Al-Kutub, Cairo, Egypt.
- Clark, G. A. (1981). In research of concept of talent : INSEA research Performance Rotterdam. Indiana University.
- Clark, B. (2002). Growing up gifted: Developing the potential of children at home and at school (6th ed.). Upper Saddle River, NJ: Prentice Hall.
- Clement, J. (1979). Introduction to research in cognitive process instruction. In Lochhead, J. and Clement, J. (Eds.), Cognitive process instruction. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cohn, S. J. (2003). Building brilliant sociopaths: Unintended outcomes of schooling practices on gifted boys. Paper presented at the The 15th Biennial World Conference for Gifted and Gifted and talented student Children, Adelaide, Australia.
- Gardner, H. (2004). Frames of mind: The theory of multiple intelligences (20th anniversary ed.). New York: Basic Books.
- Garni, A. L., & Abdullah, A. (2012). Attitudes of future special education teachers toward gifted students and their education.
- Halpern, D. (1998). Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. American Psychologist.
- Halpern, D. (2003). Thought and knowledge: An introduction to critical thinking (4th edition). Mahwah, NJ: Earlbaum.
- Hyatt, K. J. (2000). Meeting the needs of the gifted in the regular education classroom. (Doctoral Dissertation), University of Pittsburgh, Pennsylvania, United States. Retrieved from Proquest Dissertations and Theses database. (9985016).
- Jarwan, F. (2010). Teaching Thinking: Principles and Applications. Dar Al-Fekr Publications, Amman, Jordan.
- Knight, B. A., & Becker, T. (2000). The challenge of meeting the needs of gifted students in the regular classroom: The student viewpoint. Australasian Journal of Gifted Education, 9(1), 11-17.
- Malik, P. R., & Balda, S. (2006). Bright underachievers: Prevalence and profile. Journal of Social Sciences, 12(3), 159-161.

- Manning, S. (2006). Recognizing gifted students: A practical guide for teachers. *Kappa Delta Pi Record*, 42(2), 64-68.
- Nokes, T.J., Schunn, C.D., & Chi, M.T.H. (2010). Problem solving and human expertise. In P. Peterson, E. Baker, & B. McGaw (Eds), *International encyclopedia of education*. (Vol 5, pp. 265-272). Oxford: Elsevier.
- Norman, D. A. (Ed.) (1981). *Perspectives on cognitive science*. Hillsdale, NJ: Erlbaum.
- Reis, S., & Renzulli, J. (2009). Is there still a need for gifted education? An examination of current research. *Learning and Individual Differences*, 20(4), 308-317. doi: 10.1016/j.lindif.2009.10.012.
- Romer, P.M. (1994). The origins of endogenous growth. *Journal of Economic Perspectives*, 8, 3-22.
- Silverman, L. K., & Baska, L. (1993). *Counseling the gifted and gifted and talented student*. Denver, CO: Love.
- Sternberg, R.J., & Lubart, T.I. (1996). Investing in creativity. *American Psychologist*, 51(7) 677-688.
- Tempelaar, D. T. (2006). The role of metacognition in business education. *Industry and Higher Education*, 20(5), 291-297.
- VanTassel-Baska, J., MacFarlane, B., & Stambaugh, T. (2009). *Leading change in gifted education: The festschrift of Dr. Joyce Vantassel-Baska*. Waco, TX: Prufrock Press.