COMPUTER GAMES AND THEIR IMPACT ON CREATIVITY OF PRIMARY LEVEL STUDENTS IN TEHRAN

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ABSTRACT

Creativity is about being sensitive to dilemmas, losses, problems, and existing errors, making propositions about and examining such issues, which finally leads to innovative findings. On the other hand, it seems that games are important in this process; since they can improve creativity of the individuals. Thus, this research pays attention to the question that whether computer games affect creativity of students at primary level in schools or not? Moreover, in this study, students of 3 main districts of Tehran municipality were studied. Based on the available data of the ministry, there were 51740 students studying in these three districts. Thus, 381 students were randomly selected as the research sample. Findings revealed that all computer games, i.e. puzzle, intellectual, and enigma, affect creativity of students at primary level in schools to different extents.

Keywords: Computer games, Creativity, Students, Creative thinking

INTRODUCTION

Creativity is one of the fundamental characteristics of humankind which was highly important in evolution of civilizations and humanity. In fact, it is the basis for inventions and scientific/aesthetic achievements. Prior research reveals that creativity is not a gift for special individuals, but it is an aspect of everyone's soul. On the other hand, gaming is an integral part of any kids' life, which begins with its birth. Gaming is a natural gift granted to any humankind to become able to grow. In recent years, industrialization waves made everyone forget such an important activity, but due to its entity, it is still appearing in some ways. The world is changing and so many problems prone to appear. Innovative and creative individuals are the key players to deal with such problems. They use their imagination and creativity to answer new questions. This creativity could be improved when people are younger. Thus, students could be the focal

point for such changes. On the other hand, as mentioned, gaming significantly affects their creativity (Amory et al., 1999; Beghetto, 2007).

Creativity is variously defined by different authors as the balanced unfolding and converging of experience and entrepreneurship as the management of radical change (Nyström, 1993). In a more recent definition, creativity is defined as an idea or action that is original and useful, as well as cognitive processes and overt behaviors that result in new ideas, products or performances and that are judged by some audience to be new, original, useful and/or aesthetically pleasing (Sannino & Ellis, 2015). At the same time, it is frequently conceived of too narrowly, as exclusively concerned with aesthetics-"creativity is about art, isn't it?" creativity is also regarded frequently as simply a matter of thinking and especially free and unconstrained thinking (Cropley, 2016). Generating novel and useful ideas for specific or loosely defined problems is another notion to consider creativity (Ulrich, 2015).

In sum, as a phenomenon in the cycle of life, it begins and ends with existence of human and living beings. Life is a self-renewal process through action upon the environment. This is the essence of what is called creativity (Tan, 2015). The process of discovering new ideas that are both original and useful in their context is also called creativity (Andersen & Kragh, 2015). On the other hand, prior research shows that gaming could improve this ability and gift in children (Csikszentmihalyi, 1999). Decades ago, Vandenberg (1980) and other authors highlighted the role of games in promoting creativity of children, and this issue is still controversial. For instance, Gunawardhana and Palaniappan (2015) paid attention to psychology of digital games and their impact on creativity of youngsters. This new wave of research is emerged simultaneously with new waves of games, especially computer games.

LITERATURE REVIEW

Creativity is variously defined by different scholars of this domain. Treffinger et al. (2002) compared 120 definitions of creativity in papers exploring the 'traits', 'characteristics', and other personal 'attributes' distinguishing highly creative individuals from their peers. From these definitions they compiled a list of creative dispositions (cognitive, personality, and biographical), cited in at least three sources, clustering them into four categories: (i) Generating ideas; (ii) Digging deeper into ideas; (iii) Openness and courage to explore ideas; and (iv) Listening to one's 'inner voice'. Robbins (1997) defines creativity as combining ideas in a unique way, or creating integrity among such ideas. Parnes, S. J., & Harding (1962) defined it as what leads to a new approach, which could be interesting in some ways. To Mednick (1962), creativity was reorganizing a set of elements in a new way that meets certain needs or could be useful. On the other hand, games and play are an essential part of child development (Young et al., 2012). Moreover, prior research has shown that the primary benefit of gaming is the increased

motivation that comes with an active learning (Rosato, 1995). Gaming could be influential in some ways, such as (i) improving social status, (ii) increasing creativity, (iii) personality improvement, (iv) making people more active, and even proactive, (v) emotional improvement, etc. The interesting issue is that these two concepts are highly entangled in nature. It means that gaming and creativity both are about exploring new things, new trends, ideas, etc.

As mentioned earlier, creativity is an integral part of any humankind's life. Creativity is widely invoked in certain educational and other public discourses, and has been quite extensively theorized and investigated in some circles, but still receives little attention in primary school students who improve this gift by games (Allison, 2004). Computer games and simulators enhance learning through visualization, experimentation, and creativity of play (Betz, 1995). In some cases, it is argued that students use games to explore, discover, and question, ultimately constructing concepts and relationships in authentic contexts (Yang, 2012). Ott and Pozzi (2012) called digital games as "creativity enablers for children". As a matter of fact, their analysis of the available data showed that during the 3-year study, students' creative skills and attitudes appreciably increased, in particular those related to figuring out and enacting original solution strategies for the digital games at hand. In contrary, some studies provide initial evidence that video game play may not, in fact, influence children's general creativity levels (e.g. see Hamlen, 2009).

Prior research showed that computer simulations enhance learning through visualization and creativity, as players are able to visualize their creative actions (Amory et al., 1999). Moreover, in some cases, students treated the online learning method as taking a computer game class (Jang, 2009). Tüzün et al. (2009) investigated the effects of computer games on primary school students' achievement and motivation in geography learning. This study showed that computer games can be utilized in formal learning environments to support students in learning about geography. Students achieved statistically significant learning gains when learning about world continents and countries through the Global Village game. In addition, some studies have explored relationships between time spent playing video games in a typical week and general creativity, as measured by a common assessment (Hamlen, 2009).

Dacey (1989) studied the peak periods of creative growth across the lifespan. In his research, he developed a test for assessing the creativity of primary school students. The test did not show any significant different between male and female students; however, the test measured their creative abilities. Holt (1988) investigated the creativity of 58 students and studied that how their creativity could increase through different practices. These studies continued to appear in the literature, until more recent studies paid attention to new aspects of such issues in question. Kaufmann (2003) mentions that it is argued that the concept of creativity is too loosely defined,
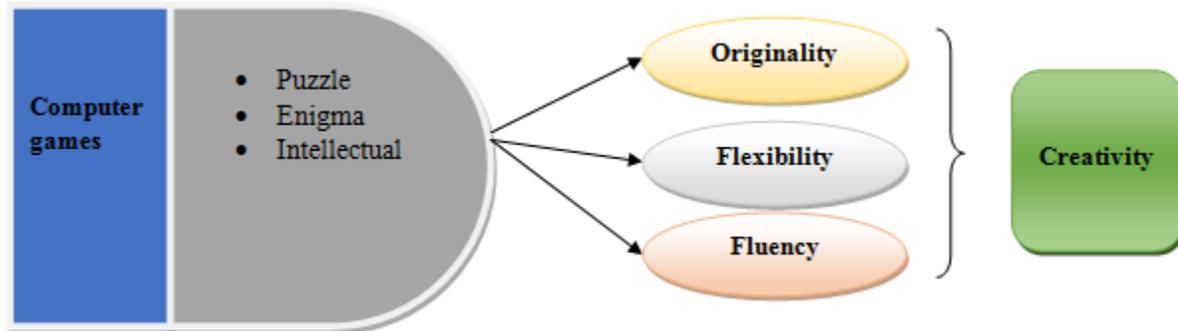
and too much driven from a bottom-up operationalist view. It is also argued that current popular definitions of creativity, by focusing on novelty and appropriateness, do not distinguish the concept of creativity in a satisfactory way from standard definitions of the concept of intelligence, which also focus on novelty and appropriateness as key defining features. Then, he provided a framework to make the conceptualization more understandable.

Also, Proctor and Burnett (2004) measured cognitive and dispositional characteristics of creativity in elementary students. They developed a measurement tool which was highly used in upcoming research papers. In more recent research papers, some scholars tried a more specific approach and concentrated on gamin and its effect on creativity. For instance, Tekin et al. (2012) investigated the effect of educational game activities on the levels of creativity of the students attending to elementary schools in Turkey. They found gaming as a critical issue to be taken into account in order to improve creativity of the students. Kafai and Burke (2015) also reached the same conclusion in their research.

CONCEPTUAL FRAMEWORK

The researchers used a combination of two recognized models, i.e. Torrance and Goff's (1990) test and Corbin's (1974) conceptualization, to form the conceptual framework. Corbin (2001) mentions the importance of lifelong skill and health-related factors in measuring physical actions [games]. Paul Torrance, "Father of Creativity"[3] was instrumental in developing tests for creative ability in individuals, as well as providing decades of research and education. In 1962, he wrote about the value of addressing creativity in schools, and of the need for teachers and parents to be guides and supporters of creative individuals. Building on Guilford's work, Torrance (1974) developed the Torrance Tests of Creative Thinking. The same test is used here in this research. He defined creativity as the capacity to detect gaps, propose various solutions to solve problems, produce novel ideas, re-combine them, and intuit a novel relationship between ideas. There are three main elements to be described in this framework.

Figure 1. Conceptual framework (self elaborated; based on Torrance and Goff's (1990) test and Corbin's (1974) conceptualization)

RESEARCH METHODOLOGY

The research design in this study was purely quantitative. This research design enabled us to investigate the research questions squeezed from standard approaches of Torrance and Goff's (1990) test and Corbin's (1974) conceptualization. Then a pretest was done, and then a test was conducted after computer gaming. A control group was also used to control the intervening variables. Moreover, in this study, students of 3 main districts of Tehran municipality were studied. Based on the available data of the ministry, there were 51740 students studying in these three districts. Thus, 381 students were randomly selected as the research sample. A cluster sampling approach was used to gather the data. Then, the students were grouped in two groups. The Kolmogorov-Smirnov test was used to check the normality of the data, and T test for Pairwise comparisons were used to test the hypotheses.

RESEARCH QUESTIONS

The main research question in this research is that whether computer games affect creativity of students at primary level in schools or not? Moreover, there are three research questions to answer this question, which are: (i) To what extent does computer games affect the originality of students' thinking?, (ii) To what extent these games affect their flexibility, and (iii) To what extent these computer games affect their fluency?

FINDINGS

The Kolmogorov-Smirnov test results are presented in the following table.

Table 1. The Kolmogorov-Smirnov test results

	Computer games	Flexibility	Fluency	Originality	Creativity
N	381	381	341	381	381
Mean	3.6831	3.9155	3.7077	3.9225	2,3287
S. D.	1.13018	1.02611	.84641	.86203	1,32
Constant	.311	.343	.385	.328	.315
Positive	.161	.171	.259	.232	.286
Negative	-.311	-.343	-.385	-.328	-.189
Kolmogorov-Smirnov statistic	.311	.343	.385	.328	.280
sig	.057	.064	.088	.073	.061

H$_1$: Computer games positively affect the originality of thinking in students.

To test the mentioned hypothesis, T test was used. Following table shows the result of the test. The results show that all the hypotheses are accepted. Then, it could be argued that computer games affect originality of thinking in students. This effect is higher in intellectual games rather that puzzle or enigma.

Table 2. Test results (n=341)

Computer games	Pre test t	Post test t	d.f.	Sig.	Result
Puzzle	0.988	24.927	340	0.000	accepted
Enigma	0.922	19.244	340	0.000	accepted
Intellectual	1.12	32.407	340	0.000	accepted

H$_2$: Computer games positively affect the flexibility of students.

The following table shows the test results for this hypothesis. All the hypotheses are accepted based on the test results. However, Puzzle games are more effective ones.

Table 3. Test results (n=341)

Computer games	Pre test t	Post test t	d.f.	Sig.	Result
Puzzle	1.21	29.927	340	0.000	accepted
Enigma	1.02	27.244	340	0.000	accepted
Intellectual	1.19	29.407	340	0.000	accepted

H$_3$: Computer games positively affect the fluency of students.

The following table shows the test results for this hypothesis. All the hypotheses are accepted based on the test results. However, intellectual games are more effective ones.

Table 3. Test results (n=341)

Computer games	Pre test t	Post test t	d.f.	Sig.	Result
Puzzle	1.21	29.927	340	0.000	accepted
Enigma	1.02	27.244	340	0.000	accepted
Intellectual	1.19	29.407	340	0.000	accepted

CONCLUSION

According to our findings, computer games affect the creativity of students at primary school level. Based on the results, computer games positively affect the originality of thinking in students. This effect is higher in intellectual games rather that puzzle or enigma. These findings are in line with the findings of Jones et al. (1978), Clemente (1990), Clemente et al. (2015), and in contrast with those of Lee et al. (2004). Moroever, computer games positively affect the flexibility of students. However, Puzzle games are more effective than other types. This argument is in line with Jones et al. (1978), Clemente (1990), and in contrast to findings of Vandenberg (1980). Also, computer games positively affect the fluency of students. However, intellectual games are more effective ones.

In sum, authors suggest that intellectual games which are less dependent on facilities and resources are better targets for improving creativity among students. Thus, enough time must be spent to achieve this goal. Although intellectual games are less prone to improve creativity of adults, these games could be more appropriate for primary level students. Since such games could increase the creativity of students at primary schools, teachers must be trained to use such games. Finally, many entities might join this trend and improve the status quo. This research might be conducted at different levels and in different provinces in order to see the results. Some intervening variables might be added to the model to increase our understanding of the matter in question.

REFERENCES

Allison, D. (2004). Creativity, students' academic writing, and EAP: exploring comments on writing in an English language degree programme. *Journal of English for Academic Purposes*, *3*(3), 191-209.

Amory, A., Naicker, K., Vincent, J., & Adams, C. (1999). The use of computer games as an educational tool: identification of appropriate game types and game elements. *British Journal of Educational Technology*, *30*(4), 311-321.

Andersen, P. H., & Kragh, H. (2015). Exploring boundary-spanning practices among creativity managers. *Management Decision*, *53*(4), 786-808.

Beghetto, R. A. (2007). Ideational code-switching: Walking the talk about supporting student creativity in the classroom. *Roeper Review*, *29*(4), 265-270.

Betz, J. A. (1995). Computer games: Increase learning in an interactive multidisciplinary environment. *Journal of Educational Technology Systems*, *24*(2), 195-205.

Clemente, F. M., Couceiro, M. S., Martins, F. M. L., & Mendes, R. S. (2015). Using network metrics in soccer: A macro-analysis. *Journal of human kinetics*, *45*(1), 123-134.

Clemente, K. (1990). Playing with performance: the element of the game in experimental dance and theater. *The Journal of Popular Culture*, *24*(3), 1-10.

Corbin, E. I. (1974). The autonomous ego functions in creativity. *Journal of the American Psychoanalytic Association*.

Cropley, D. H. (2016). *Creativity in engineering* (pp. 155-173). Springer Singapore.

Csikszentmihalyi, M. (1999). 16 Implications of a Systems Perspective for the Study of Creativity. In *Handbook of creativity* (pp. 313-335). Cambridge University Press.

Dacey, J. S. (1989). Peak periods of creative growth across the lifespan. *The Journal of Creative Behavior*, *23*(4), 224-247.

Gunawardhana, L. P. D., & Palaniappan, S. (2015). Psychology of Digital Games and Its Effects to Its Users. *Creative Education*, *6*(16), 1726.

Hamlen, K. R. (2009). Relationships between computer and video game play and creativity among upper elementary school students. *Journal of Educational Computing Research*, *40*(1), 1-21.

Holt, K. (1988). *Product innovation management: a workbook for management in industry*. Butterworths.

Jang, S. J. (2009). Exploration of secondary students' creativity by integrating web-based technology into an innovative science curriculum. *Computers & Education*, *52*(1), 247-255.

Jones, W. H., Chernovetz, M. E., & Hansson, R. O. (1978). The enigma of androgyny: Differential implications for males and females?. *Journal of Consulting and Clinical Psychology*, *46*(2), 298.

Kafai, Y. B., & Burke, Q. (2015). Constructionist gaming: Understanding the benefits of making games for learning. *Educational Psychologist*, *50*(4), 313-334.

Kaufmann, G. (2003). What to measure? A new look at the concept of creativity. *Scandinavian Journal of Educational Research*, *47*(3), 235-251.

Lee, J., Luchini, K., Michael, B., Norris, C., & Soloway, E. (2004, April). More than just fun and games: Assessing the value of educational video games in the classroom. In *CHI'04 extended abstracts on Human factors in computing systems* (pp. 1375-1378). ACM.

Mednick, S. (1962). The associative basis of the creative process. *Psychological review*, *69*(3), 220.

Nyström, H. (1993). Creativity and entrepreneurship. *Creativity and Innovation Management*, *2*(4), 237-242.

Ott, M., & Pozzi, F. (2012). Digital games as creativity enablers for children. *Behaviour & Information Technology*, *31*(10), 1011-1019.

Parnes, S. J., & Harding, H. F. (Eds.). (1962). *A source book for creative thinking*. Scribner.

Proctor, R. M., & Burnett, P. C. (2004). Measuring cognitive and dispositional characteristics of creativity in elementary students. *Creativity Research Journal*, *16*(4), 421-429.

Robbins, S. P. (1977). Reconciling management theory with management practice. *Business Horizons*, *20*(1), 38-47.

Rosato, J. L. (1995). All I ever needed to know about teaching law school I learned teaching kindergarten: Introducing gaming techniques into the law school classroom. *Journal of Legal Education*, *45*(4), 568-581.

Sannino, A., & Ellis, V. (2015). *Learning and Collective Creativity*. Routledge.

Tan, A. G. (2015). Connecting Theory, Research, and Practice in the Psychology of Creativity: An Introduction to a Special Issue. *The Journal of Creative Behavior*.

Tekin, M., Yildiz, M., Yildirim, Y., Mutlu, O., & Sahan, H. (2012). Examination of the effect of educational game activities on the levels of creativity of the students attending to elementary

schools in Turkey. *ENERGY EDUCATION SCIENCE AND TECHNOLOGY PART B-SOCIAL AND EDUCATIONAL STUDIES*, *4*(3), 1337-1344.

Torrance, E. P., & Goff, K. (1990). Fostering academic creativity in gifted students (ERIC EC Digest No. E484). *Arlington, VA: ERIC Clearinghouse on Disabilities and Gifted Education.(ERIC Document Reproduction Service No. ED321489). Retrieved March*, *1*, 2016.

Treffinger, D. J., Young, G. C., Selby, E. C., & Shepardson, C. (2002). Assessing Creativity: A Guide for Educators. *National Research Center on the Gifted and Talented*.

Tüzün, H., Yılmaz-Soylu, M., Karakuş, T., İnal, Y., & Kızılkaya, G. (2009). The effects of computer games on primary school students' achievement and motivation in geography learning. *Computers & Education*, *52*(1), 68-77.

Ulrich, F. (2015). A Group Creativity Support System for Dynamic Idea Evaluation. In *Nordic Contributions in IS Research* (pp. 137-151). Springer International Publishing.

Vandenberg, B. (1980). Play, problem-solving, and creativity. *New Directions for Child and Adolescent Development*, *1980*(9), 49-68.

Yang, Y. T. C. (2012). Building virtual cities, inspiring intelligent citizens: Digital games for developing students' problem solving and learning motivation. *Computers & Education*, *59*(2), 365-377.

Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., ... & Yukhymenko, M. (2012). Our princess is in another castle a review of trends in serious gaming for education. *Review of educational research*, *82*(1), 61-89.