

A Study on Usefulness of Convergent Education Curriculum for Gifted Children in IT

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Abstract

In the present knowledge and information society, knowledge and use of information and communication technology(ICT) is very important for every citizen. Also, for national power of a nation, IT-related industries need to be supported since those industries can be reconstructed in a short period of time unlike other industries. In this sense, identification and education of gifted children in IT become a serious national issue.

Since 2013, gifted education has been conducted as a form of convergent education by government policy. However, there have been controversies on convergent education for gifted education. The purpose of this paper is to analyze the usefulness of convergent curriculum for gifted education in IT. For this purpose, gifted children in IT in a gifted education center are analyzed. By comparing the entrance ranking and graduation ranking, it is concluded that the current convergent gifted curriculum may not be efficient.

Keywords: *Gifted Children in IT, Convergent Curriculum, Observation-Recommendation Admission System*

1. Introduction

In the present knowledge-based society, every citizen needs to achieve some level of knowledge and use of ICT for his or her daily life. Nowadays most adults have smart device such as smart phone and tablet PC, and rely on aids of such devices for checking email and forecasting weather, etc. In addition to personal use, knowledge and use of ICT are very important for a society. SNS becomes an essential tool for exchanging ideas on social and political issues. Also, SNS is a helpful tool for making more personal connections. For national power of a nation, importance of IT-related industries is growing recently. Unlike most secondary industries such as automobile and furniture industries, IT-related industries can be developed in a short period of time. IT-related industries usually do not require tremendous labor power and investment. Many developed and developing countries have focused on development of IT industries.

Usually a few geniuses have lead IT industries. Bill Gates and Steve Jobs are representative talented persons. Especially for software industries, importance of such genius is essential since software production is based on brain-intensive work rather than labor-intensive work. In this sense, identification and nurture of gifted children in IT become a critical issue for a nation's economic growth.

In Korea, gifted education has been supported cross-nationally since 2000. In 2000, so called Gifted

Education Promotion Law was legislated and enforced. Before this law, gifted education has been enforced partially as a policy of Metropolitan and Provincial Office Education. However, since enforcement of the law, gifted education has been supported by government. Many gifted education centers have been started with government aid. Especially gifted education centers attached to universities have been established.

In the initial period, selection of gifted students was based on mainly paper test although interview and other supporting materials such as portfolio and a letter of self-introduction were also considered. Although it is clear that paper tests give objective evidence of one's academic ability, those tests incur serious side effects. Favor of private education for preparation of entrance examination is a typical side effect. Gifted children from poor family had restriction for preparation and entrance of gifted education centers against the purpose of the Gifted Education Promotion Law.

In 2009, national education curriculum was reformed. Essence of the curriculum is nurture and development of creative and convergent human resources. According to this curriculum, gifted education curriculum has also been changed to creative and convergent style. In 2013, overall convergent gifted curriculum was enforced. For yearly education contents, at least 20% of educational contents must include convergent contents. For example, gifted education curriculum in IT must include more than 20% of other subjects such as math, science, arts, and technology, etc.

The purpose of this study is to analyze the usefulness of the current convergent curriculum for gifted children in IT. For this purpose, gifted children who attended a gifted education center attached to a university in Seoul Metropolitan area are selected. In order to analyze the usefulness of the convergent curriculum, their entrance ranking and graduation ranking are compared.

The organization of this paper is as follows. In chapter 2, related work is presented. In this chapter, definition and characteristics of gifted children in IT are introduced. In chapter 3, the statistical analysis work and results are discussed. Finally, conclusions and further works are presented.

2. Related Works

2.1. Definition of Gifted Children in IT

In general, there is no agreement on the definition of the gifted child in IT. In this paper, some definitions in the literature will be introduced as follows.

In [1], the gifted child in IT is defined as "a child who understands and analyzes a given problem, and collects, refines, and recreates new information based on ICT use ability".

In [2], the gifted child in IT is defined as "a child who has above average or higher ability in general intelligence, curiosity for computers, high creativity, math-linguistic ability, task commitment for problem-solving, a child who has high potential in computer-related works".

In [3], the gifted child in IT is defined as "a gifted child in IT is, first, a child who has above average or above ability in general intelligence, curiosity on computers, high creativity, math-linguistic ability, task commitment for the given project, second, a child who is interested in applying programming and application software to the problem-solving activity, finally, third, a child who has a great potential in adaptability, creativity, and imagination power in computer works".

2.2. Conditions and Characteristics of Gifted Children in IT

In [4], conditions for gifted students in IT are defined as in Table 1.

Table 1. Conditions for gifted student in IT

Area	Contents
Comparative predominance	-Excellence in vocabulary use and linguistic expression over the same age -Possession of above-average ability for mathematics and linguistics -Enthusiastic on reading
Investigation	-Strong curiosity and high scholastic achievement for computer-related subjects -Strong will to accomplish for a specific subject -Keen observance and good memory
Analysis and planning	-Ability to grasp and generalize general facts and relationships among facts -Ability to solve problems with efficient and diverse methods
Applicability	-Excellence in applying computer knowledge to new situation
Mental state	-Possession of infinite imaginative power, applicability, and initiative power
Expression	-Excellence in expressing new ideas and creative contents with computer

On the other hand, characteristics of gifted students in IT are presented in Table 2[5].

Table 2. Characteristics of gifted children in IT

Area	Characteristics
General characteristics	-Excellence in understanding and manipulating things -Quick acquisition of basic functions -Right and quick decisive power -High curiosity -Enthusiasm about new thinking and challenge
Application Software	-High imaginative power and applicability -Ability to grasp relationships -Ability to set up hypothesis and conjecture
Programming	-Excellence in grasping and understanding main principles -Insight to cause and effect -Enjoying new way of thinking and method
Multimedia	-Infinite imaginative power -Excellent artistic sense -Composed and delicate -Excellent creative activity -Ability to observe things sharply
Digital Contents	-Tenacity -Infinite imaginative power and applicability -Desire to win a game -Desire to have control -Desire to show off -Resolute decisive power

2.3. Literature Review

In the literature, there have been some works on convergent curriculum for gifted education. In [3,6], gifted education curriculum for gifted children in IT was reviewed and analyzed. In those works, it is emphasized that the current gifted education curriculum in IT includes high portion of information subjects such as programming and algorithm analysis, etc.

Those works criticized the major-oriented gifted education curriculum for elementary gifted children. Since the current elementary curriculum is based on whole-person education, it is argued that the gifted education curriculum for gifted children in IT must include more diverse subjects such as science, math, and information ethics, etc.

3. Usefulness Analysis of Convergent Gifted Education Curriculum in IT

3.1. Sample Analysis Method

For this analysis, gifted children in IT in a gifted education center attached to a university at Seoul Metropolitan area were chosen. The following Table 3 shows a summary of information.

Table 3. A summary of samples for analysis

Item	Information
Institute	A gifted education center attached to a university at Seoul Metropolitan area
Grade	5 th and 6 th grade in elementary school Students
Number of students	20
Attending year	2014

In a given gifted education center, 20 gifted children in IT are selected every year. 3rd, 4th, and 5th grade elementary school students are eligible to apply. Instead of paper test, observation-recommendation entrance test has been adopted since 2012. The observation-recommendation system includes the following materials.

- Recommendation letter
- A letter of self-introduction
- Book reports
- Future plans
- Portfolio

They have to take total 16 weekend study schedule including summer outdoor camp and winter indoor camp. The gifted curriculum includes about 50% convergent contents. It means that the first 50% portion consists of information subjects and the other 50% portion consists of convergent subjects. The program is run under one-year basis policy. After one-year evaluation, 4th and 5th grade children can apply advanced gifted programs. Table 4 shows study contents of gifted children in IT.

Table 4. Study contents of gifted children in IT

Information Subjects: Total 6 times
Convergent Subjects: Total 10 times
Mathematics: 3 times
Biology: 2 times
Physics: 1 time
Chemistry: 1 time
Geology: 1 time
Technology: 1 time
Art: 1 time

3.2. Statistical Analysis Results

In order to analyze the usefulness of gifted convergent curriculum in IT, correlation between entrance ranking and graduation ranking is analyzed. For correlation analysis, Pearson Correlation analysis method is adopted. Also, SPSS 18.0 statistics program is used for correlation analysis.

The following Table 5 gives correlation between entrance ranking and graduation ranking for gifted children in IT. Since $r=.393$, there is no meaningful correlation between entrance ranking and graduation ranking. In other words, gifted children with higher entrance ranking have nothing to do with higher graduation ranking.

Table 5. Correlation between Entrance Ranking and Graduation Ranking for Gifted Children in IT

		Graduation Record Ranking
Entrance Score Ranking	r	.393
	p	.086

On the other hand, Table 6 shows correlation for mathematically gifted children. As we can see, $r=.482(p<.01)$. It means that there is a meaningful correlation between entrance ranking and graduation ranking. In other words, children with the higher entrance ranking shows the higher ranking in their graduation.

Table 6. Correlation between Entrance Ranking and Graduation Ranking for Gifted Children in Math

		Graduation Record Ranking
Entrance Score Ranking	r	.482**
	p	.002

Finally, Table 7 shows correlation for scientifically gifted children. Since $r=.082$, there is no meaningful correlation between entrance ranking and graduation ranking for scientifically gifted children.

Table 7. Correlation between Entrance Ranking and Graduation Ranking for Gifted Children in Science

		Graduation Record Ranking
Entrance Score Ranking	r	.082
	p	.545

4. Conclusions and Further Works

In the present knowledge and information society, knowledge and use of IT technologies are necessary for every citizen to enjoy abundant his or her daily life. For his or her competitiveness, some level of knowledge and use of IT technologies is required regardless of his or her will. Socially, understanding and use of SNS becomes the essential literacy for exchanging and sharing social and political issues in a society. Also, IT-related industries become a pivot of a nation's economy.

In this sense, identification and nurture of gifted children in IT is very important educational issue in a nation. Although academic works have not been greater than other gifted subjects such as math and science, gifted education in IT has been supported by our government. Since 2009, according to a national education reformation, gifted education as well as public education has focused on nurture of creative and convergent

human resources. Since 2013, gifted education curriculum has included convergent education contents.

The purpose of this paper is to identify the usefulness of the current convergent gifted curriculum in IT. For this purpose, gifted children in a gifted education center attached to a university at Seoul Metropolitan area were selected. Their entrance ranking and graduation ranking are compared and correlation between two rankings is analyzed. After thorough statistical analysis, it is concluded that there is no meaningful correlation between entrance ranking and graduation ranking for gifted children in IT. This means that the current convergent curriculum may not be efficient.

The further research issues are as follows. The results in this works are based on small number of gifted children with only one-year observation period. In order to get stable results, it is necessary to extend observation period and number of gifted children in IT. Second, proper ratio of convergent subjects to information subjects needs to be sought in the future. In the current national curriculum, enforcement of convergent curriculum is inevitable. It is very important to get the proper ratio between information subjects and convergent subjects in the long run.

References

- [1] S. Oh, "The Definition and Judgment System of a Computer-gifted Student", Master's Thesis, Sungkyunkwan University, Seoul, Korea, 2002.
- [2] K. Yu, "A Study on the Outlook of Computer Teachers on Gifted Education in Information Science", Master's Thesis, Hanyang University, Seoul, Korea, 2003
- [3] W. Jun, "A Study on the Current Status and Improvement Plans of Gifted Elementary Information Science Education Curriculum", *Gifted Education Research*, Vol. 20, No. 1, pp. 347-368, 2010.
- [4] K. Lee and W. Jun, "A Creativity Development Study for the Gifted Elementary School Students in Computer", *Proceedings of 2003 Winter Korean Information Education Conference*, pp. 404-412, 2003.
- [5] J. Lee and J. Lee, "A Study on the Development of the Selective Test Item for the Gifted of Elementary Information Science", *Journal of Gifted/Talented Education*, Vol. 16, No. 1, pp. 81-100, 2006.
- [6] W. Jun, "A Study on the Current Status and Improvement Plan of Gifted Information Education Curriculum for Creative Human Resource Development", *Journal of Computing Science and Engineering*, Vol. 30, No. 3, pp. 17-23, 2012.