Influence of Smart Devices on the Cognition and Interest of Underprivileged Students in Smart Education

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Abstract

Objectives: In this study, we aim to verify the influence of smart devices on the cognition and interests in the smart education of underprivileged students. Methods/Statistical Analysis: 37 students of an elementary school were employed for the study. Those students represent an underprivileged group, in which 20 students were freely accessible to Smartphone and classified as an experimental group, while the rest 17 students were not able to use Smartphone routinely and classified as a control group. The Independent Samples t-test was performed on experimental results between the experimental and control groups, and the significance level was set at 0.05. Findings: First, resulting effects of Smartphone in underprivileged students can be analyzed that learning motivation, information literacy, problem solving, learning attitude, and self-directed learning ability were listed in the order of most-significant to least-significant. Second, the Smartphone usages in underprivileged students positively affected their interest in class based on the smart education with regard to the following variables in the order of most-significant to least-significant – speaking confidence, reading confidence, writing confidence, interest in class, listening confidence. Therefore, the Smartphone usages of underprivileged students had a positive effect on their cognition and interest in class based on the smart education. The significance of this study was like followings. First, in order to adequately provide the smart education with underprivileged students, individually tailored educational curriculum that reflect their educational environments, have to be offered. Second, the smart education shall be pursued to lessen the educational disparities and served as a national policy issue in Korea. Improvements/Applications: the smart education for underprivileged groups requires not a monolithic educational support, but a tailored educational support to improve tiered learning experiences.

Keywords: Cognition, Interest, Smart Education, Smart Device, Underprivileged Students

1. Introduction

Underprivileged students have had a higher tendency to be involved with various disabilities for developmental tasks, or difficulties in their learning processes. Regardless of their enthusiasm to learn, those students have experienced educational disadvantages and disparities because of their inherent environments succeeded from their parent generation, as well as their physical and emotional lives. Even after they become adults, these environmental factors negatively affect their life. Accordingly, in this study, we analyzed cognition and interest differences in the smart education between two groups – one group with underprivileged students who have routinely used Smartphone, and the other group with underprivileged students who have not been accessible to Smartphone.

Recently, the Smartphone penetration rate of South Korea is estimated to be 86.4 percent for 2015, worthy of 40 million, and this high penetration rate enables the society of personal media¹. Paradigms in educational environments have been shifted toward the smart education that combines mobile devices and class, as information
and communication technologies develop. In South Korea, most schools have competitively equipped with smart classes in support of offices of Education. They are spending substantial budget on installing wireless networks and smart TVs and supplying table PCs such as iPad and Galaxy Tab. This effort is based on Korean government’s smart education policies. Effectively leveraging information and communication technologies and their corresponding network resources, the smart education in South Korea is now recognized as a new 21st century educational paradigm that fosters and develops all students to become global leaders by renovating the existing education system, such as educational contents, methods, evaluations, and environments. A general purpose of information technology services provided by national policies is to improve the quality of information alienated groups’ lives. Unfortunately, the spread of information and communication technologies rather increases the information disparity of information alienated groups, thereby leading to social discrimination and exclusion. This assertion lets us focus on cases in South Korea, which has driven the smart education as a national policy. In other words, ‘How does the smart education affect the information disparity, and social discrimination and exclusion?’ According to studies on educational applications of smart devices, they reported the positive influence of smart device usages on learning outcomes.

2. Experimental Procedure

2.1 Study Participants

Study participants were recruited from a city, S in South Korea. 37 students consisting of 5th and 6th graders participated in this study as experimental subjects. An experimental group was classified with 20 students (fourteen 5th graders, and six 6th graders), who have routinely used Smartphone in their daily lives. In the meantime, a control group was classified with 17 students (eleven 5th graders, and six 6th graders), who have not been accessible to Smartphone in their daily lives. The experimental subjects are shown in Table 1.

2.2 Experimental Variables

In order to investigate the cognition of the students on the smart education, self-directed learning ability, learning motivation, learning attitude, information literacy, and problem solving were set as variables. A total of 25 questions established with the Likert 5-point scale were presented, and their average reliability was 0.961. Additionally, as an investigational tool, we set interest in class, speaking confidence, reading confidence, writing confidence, and listening confidence as variables, in order to measure the level of interests in the smart education. A total of 30 questions established with the Likert 5-point scale were set as the experimental tool, and the Cronbach’s α coefficient was found to be 0.958.

Table 1. Smart Device System Classification and Contents

| Classification                  | 5th Graders | 6th Graders | Total |
|--------------------------------|-------------|-------------|-------|
| Experimental Group (G1: with smart devices) | 14          | 6           | 20    |
| Control Group (G2: without smart devices)    | 11          | 6           | 17    |
| Total                                         | 25          | 12          | 37    |

2.3 Data Analysis

SPSS Statistics was employed to analyze differences in underprivileged students’ cognition and interests in the smart education according to their Smartphone usage status. The Independent Samples t Test was performed on experimental results between the experimental and control groups, and the significance level was set at 0.05. In addition, in order to secure practical significances, effect sizes were calculated.

3. Experimental Results

3.1 Influence on Student’s Cognition in the Smart Education

3.2 Influence on Student’s Interests in the Smart Education

4. Conclusion

The total effect size of underprivileged students’ cognition on the smart education is 1.398 (U=91.90) show in Table 2 and Table 3. Each effect size per sub-vari-
able was calculated to be $ES=1.684$ and $U_3=95.40$ for learning motivation, $ES=1.329$ and $U_3=90.80$ for information literacy, $ES=1.114$ and $U_3=86.74$ for problem solving, $ES=1.040$ and $U_3=85.06$ for learning attitude, and $ES=0.746$, $U_3=77.22$ for self-directed learning ability. Resulting effects of Smartphone in underprivileged students can be analyzed that learning motivation, information literacy, problem solving, learning attitude, and self-directed learning ability were listed in the order of most-significant to least-significant. Meanwhile, the total effect size of interest in class based on the smart education is $0.977$ ($U_3=83.56$). Each effect size per sub-variable was calculated to be $ES=1.254$ and $U_3=89.52$ for speaking confidence, $ES=0.874$ and $U_3=80.89$ for reading confidence, $ES=0.840$ and $U_3=80.89$ for writing confidence, $ES=0.764$ and $U_3=77.75$ for interest in class, and $ES=0.590$, and

**Table 2. Verification results on student's cognition in the smart education**

| Sub-variables               | Classification | Cases (N) | Mean (M) | Standard Deviation (SD) | t      | p     | ES($U_3$) |
|-----------------------------|----------------|-----------|----------|-------------------------|--------|-------|------------|
| Self-directed Learning Ability | Exp.           | 20        | 20.95    | 4.41                    | 2.264* | .030  | 0.746 (77.22) |
|                             | Con.           | 17        | 17.65    | 4.44                    |        |       |            |
| Learning Motivation         | Exp.           | 20        | 21.00    | 3.64                    | 5.101*** | .000  | 1.684 (95.40) |
|                             | Con.           | 17        | 13.82    | 4.90                    |        |       |            |
| Learning Attitude           | Exp.           | 20        | 18.45    | 4.32                    | 3.147** | .003  | 1.040 (85.06) |
|                             | Con.           | 17        | 13.47    | 5.30                    |        |       |            |
| Information Literacy        | Exp.           | 20        | 20.80    | 2.67                    | 4.030*** | .000  | 1.329 (90.80) |
|                             | Con.           | 17        | 15.88    | 4.64                    |        |       |            |
| Problem Solving             | Exp.           | 20        | 19.80    | 4.09                    | 3.374** | .002  | 1.114 (86.74) |
|                             | Con.           | 17        | 14.76    | 4.99                    |        |       |            |
| Cognition (Total)           | Exp.           | 20        | 101.00   | 15.92                   | 4.238*** | .000  | 1.398 (91.90) |
|                             | Con.           | 17        | 75.59    | 20.53                   |        |       |            |

*p<.05, **p<.01, ***p<.001

**Table 3. Verification results on student's interest in the smart education**

| Sub-variables   | Classification | Cases (N) | Mean (M) | Standard Deviation (SD) | t      | p     | ES($U_3$) |
|-----------------|----------------|-----------|----------|-------------------------|--------|-------|------------|
| Interest in Class | Exp.          | 20        | 39.60    | 9.03                    | 2.316* | .027  | 0.764 (77.75) |
|                 | Con.           | 17        | 32.59    | 9.35                    |        |       |            |
| Speaking Confidence | Exp.         | 20        | 18.00    | 3.67                    | 3.800** | .001  | 1.254 (89.52) |
|                  | Con.           | 17        | 13.82    | 2.88                    |        |       |            |
| Reading Confidence   | Exp.          | 20        | 16.80    | 4.25                    | 2.646* | .012  | 0.874 (80.89) |
|                    | Con.           | 17        | 13.29    | 3.72                    |        |       |            |
| Writing Confidence  | Exp.           | 20        | 15.60    | 4.45                    | 2.548* | .015  | 0.840 (79.97) |
|                   | Con.           | 17        | 12.12    | 3.74                    |        |       |            |
| Listening Confidence | Exp.         | 20        | 17.30    | 4.18                    | 1.785  | .083  | 0.590 (72.23) |
|                  | Con.           | 17        | 14.88    | 4.01                    |        |       |            |
| Interest (Total)     | Exp.           | 20        | 107.30   | 22.43                   | 2.961** | .005  | 0.977 (83.56) |
|                   | Con.           | 17        | 86.71    | 19.36                   |        |       |            |

*p <.05, **p<.01, ***p <.001
U_1 = 72.23 for listening confidence. In other words, the Smartphone usages in underprivileged students positively affected their interest in class based on the smart education with regard to the following variables in the order of most-significant to least-significant – speaking confidence, reading confidence, writing confidence, interest in class, listening confidence. According to studies on educational applications of smart devices, they reported the positive influence of smart device usages on learning outcomes. The result of this study is concordant with the previous result from literature. In other words, the Smartphone usages of underprivileged students had a positive effect on their cognition and interest in class based on the smart education. It implies the followings.

First, in order to adequately provide the smart education with underprivileged students, individually tailored educational curriculum that reflect their educational environments, have to be offered. Students have had different levels of understanding on the smart education, depending on their family’s socio-economical statuses. Therefore, the smart education requires the individually tailored educational curriculum and strategies that reflect students’ features. Second, the smart education shall be pursued to lessen the educational disparities and served as a national policy issue in South Korea. Traditionally, underprivileged groups have been systemically excluded from educational opportunities because of various gaps of social structures. It has been emphasized whether educational opportunities are given. And there has been a tendency to neglect what kinds of educational contents are provided, what methods are used, and what environments are created to effectively support them. Therefore, the smart education for underprivileged groups requires not a monolithic educational support, but a tailored educational support to improve tiered learning experiences.

5. References

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