

Study of Producing Creative Ideas Through Thinking Disposition

(Centering on Project Class in High Schools based on IT technology)

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Abstract— IT technology based projects was conducted to implement education on producing creative ideas through on-line education and grasp thinking disposition of students in terms of creativity education efficiency. The differences in idea creation among students according to thinking dispositions were analyzed through qualitative evaluation and quantitative evaluation of project and its result was drawn. The purpose of this study was to help cultivate a man of ability who will make a great contribution to knowledge information society by proposing education model based on new method of teaching and learning.

Index Terms— Thinking Disposition, Creativity, Idea Creation, Project Class

I. INTRODUCTION

CREATIVE information received wide attention as an element that can greater added value than any other elements in production due to the advent of the information era and knowledge based society and information oriented society. Economic, social and cultural richness depends on how knowledge can be utilized creatively. Competitiveness of enterprises and countries in knowledge based society largely depends on creativity. According to these changes, by utilizing IT technology, development and utilization on how to enhance creativity are being required throughout businesses, schools and other institutions.

Accordingly, the number of enterprises and schools making an effort to develop and make good use of creativity have increased. Recently, some high schools recognized that creativity is one of the most important elements in improving competitiveness and therefore gave education that aimed to enhance competitiveness.

However, education that aims to enhance creativity which some high schools are implementing at present is limited in that the education is one sided not interactional education which has a good understanding of thinking dispositions of students[1].

This study aimed to solve this problem. To this end, thinking disposition of each student was identified by utilizing web storming contents, in order to understand the distribution of thinking disposition of students. On line and off line education that aimed to improve creative idea was given and students were encouraged to conduct a project. Differences in idea creativity according to thinking dispositions were analyzed and its result was drawn. The objective of this study was to help cultivate a man of ability who makes a contribution to knowledge information society by proposing creative project-based teaching model based on new method of teaching and learning, as shown in figure 1.

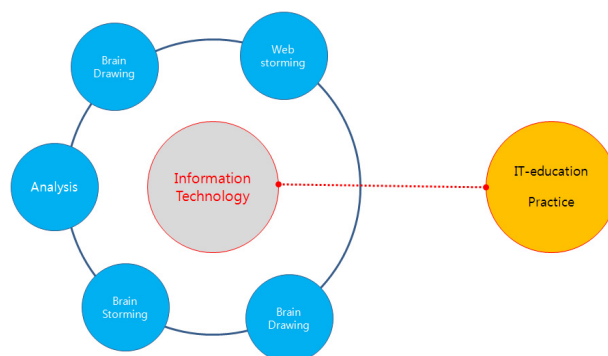


Fig. 1. IT technology Project class model.

II. RELATED WORKS

A. Definition of Creativity

Creativity means an ability to create or discover something new. Creativity is embodied as new solution to a problem, new method, new invention, new art or new type[2]. The result of psychological experiment on motivation and learning stimulation reported that disposition toward something new leads to creation or discovery[3]. The tension between disposition to keep environment and an impulse to break existing balance in order to experiment new possibility exists in human psychology.

According to research that studied the psychology of people with creativity[4], the tension exists as form of intelligence/intuition, consciousness/unconsciousness, good health/mental disorder, ordinary/extraordinary, complex/simple. Intelligence

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is not closely related to creativity beyond a certain level. In other words, intelligent person does not necessarily mean a creative one. For this reason, convergent thinking ability was distinguished from divergent thinking ability. The former is used to indicate analytical competence and the latter is used to indicate originality and diversity in thinking.

B. Idea Creation

Idea creation means that ideas are embodied concretely. A. Osborn classified human mental ability into absorptive power (observation power and concentration), grasping power (power of memory), driving force (analytical competence and judgment) and creativity (realization, reproduction and idea creation) and said creativity is 'best mental ability that only humans have' which computers can't replace. He defined 'idea creation' is the process that creates, selects and embodies ideas for work[5]. Representative methods that were closely related to idea creation are as follows.

- Gordom Method; was proposed by W.J.J.Gordon and is used to develop new products. For example, bottle opener is to be developed, association is made centering on the keyword of 'open'.

- KJ Method; was proposed by Kawagita Jiro. This method aims for comprehensive idea creation by completing collected items in card and classifying it systematically.

- Brainstorming: was proposed by A. Osborn. Brainstorming was developed to get good ideas of members through group discussion to find a proper solution to specific matter or subject.

C. Definition of Creativity

Ned Herrmann proposed 'Whole Brain Model' in his book 'The Creative Brain' in 1991 which classified the function of brain into left brain, right brain, cerebral cortex and limbic system[6].

Left brain and right brain are related to language competence and artistic ability while cerebral cortex and limbic system are related to mental function and emotional function. Cerebral cortex plays a part in high level mental function and plays a role of conceptualizing information. Cerebral cortex is objective oriented and creative. Limbic system plays a role of collecting sensory information and filtering the sensory information and transferring the result to other areas of brain. Left brain, right brain, cerebral cortex and limbic system can be defined as upper left brain, lower left brain, lower right brain and upper right brain respectively[7].

III. DESIGN OF IDEA CREATION THROUGH IDEA DISPOSITIONS

A. Experimental Testing Condition

Experimental testing condition for designing idea creation through thinking dispositions was as follows.

- Period: 2011. 3. 7 ~ 2011. 6. 29
- Place: computer lab of High School
- Subjects: third grade girl students of High School
- The number of persons who participated in experiment: total number: 40. (experimental group: A (8), B(8), C(8), D(8). control group: 8)
- Tool of experiment:
<http://sumil.webstorming.co.kr>
- The number of persons who gave education: 3
- The number of persons who evaluated: 4

Major premise of hypothesis for survey of thinking dispositions was 'each experimental group will show different qualitative and quantitative thinking according to thinking dispositions'. Minor premise was as follows: First, 'there will be individual thinking type according to whole brain model.' Second, 'subjects will realize ideas which are similar to thinking types.' Third, 'if quantitative and qualitative evaluations are made according to thinking types, priority for idea evaluation will be found'.

The same project was proposed to conduct experiment on idea creation effectively. Project was conducted as shown in figure 2 by using idea creation program (<http://webstorming.co.kr>) to make quantitative evaluation.

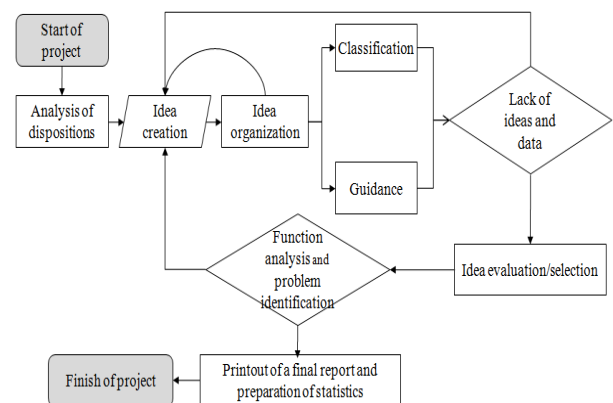


Fig. 2. Project process.

B. How to Conduct Experiments

Four quadrants were prepared to grasp thinking dispositions and each quadrant was composed of 15 items. each quadrant has 15 scores.

Experimental group was classified into four groups (A, B, C, D) and each group was composed of eight members. Control group was prepared so that thinking

dispositions of four quadrants (A, B, C, D) can be evenly distributed.

Idea creation was conducted by combining on-line and off-line. Brain-Writing, Brain-Drawing, KJ method, SCAMPER and Mind Map were used as off-line method and students were encouraged to conduct idea creation methods that were made based on creativity. Students were encouraged to conduct brainstorming and brain-writing through idea creation programs on-line in order to analyze data effectively. The subject of project was given to experimental group and control group equally. Ideas that can be created within limited time were classified into qualitative idea and quantitative idea.

C. Evaluation of Experiment

Experiment was conducted through on-line idea creation program. Qualitative evaluation and quantitative evaluation were conducted for experimental group and control group at the same time.

Thinking disposition test for survey of specific mode of whole brain model was given to 225 third grade high school students. The distribution of subjects was as follows: C(90)>D(75)>A(38)>B(19). Subjects were classified according to thinking disposition and each experimental group was composed of eight members.

Brain-writing and brain-drawing that students can use with ease were adopted as idea creation method for this experiment.

Project that was given to subjects was "products needed for a studio apartment in which singles live". Subjects were asked to come up with idea of the products needed for a studio apartment in which singles live and the ideas proposed were analyzed through qualitative evaluation and quantitative evaluation. Qualitative evaluation was conducted by four teachers who had experience of carrying out creative teaching.

TABLE I
DETAILS OF PERSONS IN CHARGE OF
QUALITATIVE EVALUATION

E v a l u a t o r	Teaching experience	Experience in education for creativity development		Understanding of thinking dispositions
	Teaching experience	Teaching experience	Hours of training for creativity development	Understanding of thinking dispositions
A	20	3 years	120	good
B	8	6 years	370	good
C	3	2 years	75	good
D	5	2 years	96	good

J. P. Guilford classified thinking types into divergent thinking that included fluency, flexibility

and originality and convergent thinking that focuses on finding best solution[8]. Evaluation items were classified into the following qualitative evaluation criteria: feasibility, beauty, rationality, economical efficiency, and originality.

IV. ANALYSIS OF IDEA CREATION THROUGH THINKING DISPOSITIONS

Creativity Excel program was used to analyze idea creation proposed through this experiment. In quantitative evaluation, relative scores were applied by converting 50% of subjects who accounted for most quantity into full mark (a hundred points). In qualitative evaluation, five evaluation items were presented as 5 point scale and it was converted into score of 50% to express sum and total score.

A. Experimental Group A

Table II shows that the number of a quantitative assessment of the A quadrant of the experimental group is 76. It is the smallest quantity of ideas among each quadrant of the experimental group. Among the items of qualitative assessments, Brain Drawing, which plays the aesthetic role was lower in the evaluation. Experimental points score is about 58.73 points. Quantitative and qualitative evaluation has shown low level overall.

TABLE II
EVALUATION GRAPH FOR EXPERIMENTAL
GROUP A

Quantitative evaluation (50%)		Qualitative evaluation (50%)		Total score
Number of ideas	76	Feasibility	6	58.73
		Beauty	3.75	
		Rationality	5.5	
		Economical efficiency	5.5	
		Originality	5.5	
Score	32.48	Sum	26.25	

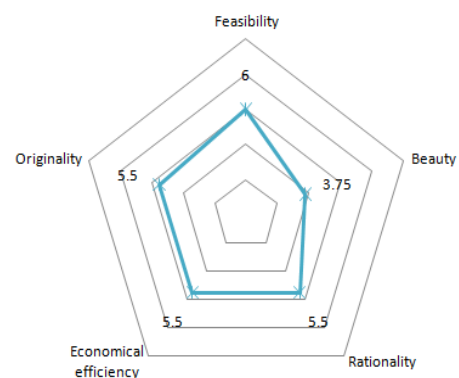


Fig. 3. Evaluation graph for experimental group A.

B. Experimental Group B

Table III shows that a quantitative idea of the experimental group of the B quadrant were 84 cases, which presented as a somewhat low. The aesthetic features of the test of a qualitative assessment were similar to the experimental group of the A quadrants. The reason why an item related to feasibility indicated a highly score is that the process of idea was progressed focusing on not only a logical but also feasible discussion. The total score is about 59.40 points and it showed a similar score of the A quadrant.

TABLE III
EVALUATION GRAPH FOR EXPERIMENTAL
GROUP B

Quantitative evaluation (50%)		Qualitative evaluation (50%)		Total score
Number of ideas	84	Feasibility	7	59.40
		Beauty	3	
		Rationality	5.5	
		Economical efficiency	5.5	
		Originality	2.5	
Score	35.90	Sum	23.5	

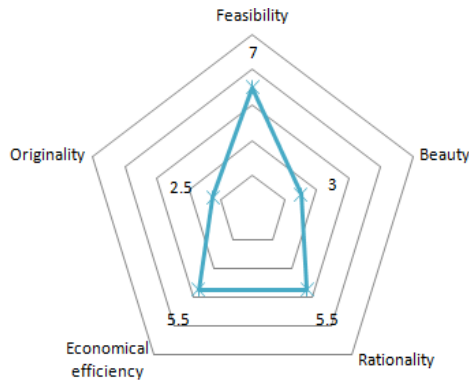


Fig. 4. Evaluation graph for experimental group B.

C. Experimental Group C

Table IV shows that the number of quantitative idea of the C quadrant is 117, which is higher than any other quadrants, especially high in the aesthetics and creativity of qualitative assessment. On the other hand, a low score appeared in economics and rationality. It shows that the students much more focused on the area of creative ideas. The total score is 76 points and it is the highest score in the whole, with the highest quantitative assessment score.

TABLE IV
EVALUATION GRAPH FOR EXPERIMENTAL
GROUP C

Quantitative evaluation (50%)		Qualitative evaluation (50%)		Total score
Number of ideas	117	Feasibility	5	76.00
		Beauty	6.5	
		Rationality	4.5	
		Economical efficiency	3	
		Originality	7	
Score	50	Sum	26	

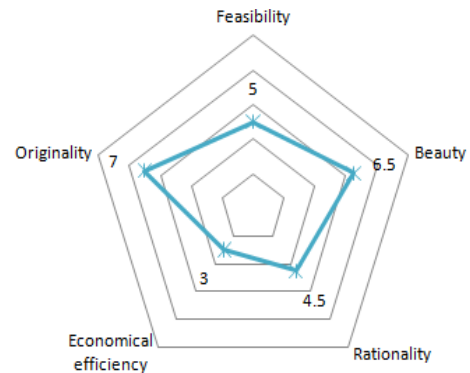


Fig. 5. Evaluation graph for experimental group C.

D. Experimental Group D

Table V shows that the number of the ideas of the D quadrant is 102. The score of originality and aesthetic of qualitative assessment was highly similar to the score of C quadrant. It also shows that the score of rationality and feasibility was relatively low. The total score is about 72 points and ranked second score in comparison to the other three quadrants. It is comparatively high score.

TABLE V
EVALUATION GRAPH FOR EXPERIMENTAL
GROUP D

Quantitative evaluation (50%)		Qualitative evaluation (50%)		Total score
Number of ideas	102	Feasibility	4.5	71.09
		Beauty	6.5	
		Rationality	4.5	
		Economical efficiency	5	
		Originality	7	
Score	43.59	Sum	27.5	

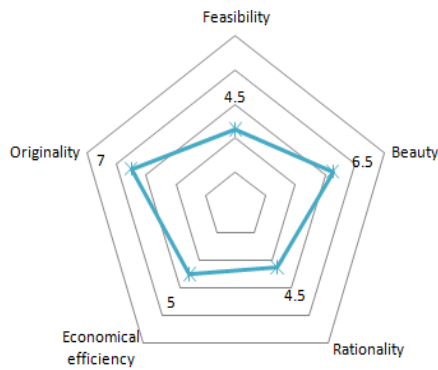


Fig. 6. Evaluation graph for experimental group D.

E. Control Group

Table VI shows that the number of the ideas of the comparison group is 91. Although it was rather lower than the number of the idea of the C and D quadrant, the number is relatively high when compared to the number of the A and B quadrant. On the aspect of the qualitative assessment, it doesn't represent a particularly high score. But it indicates that the overall scores are evenly distributed. It means that the result of a proper quality evaluation can be drawn when the dispersion of each quadrant keeps an balance. The total score is about 68 points. Despite the low quantity, the outcome is generally harmonious due to the highest score of the qualitative assessments.

TABLE VI
EVALUATION DETAIL ON CONTROL GROUP

Quantitative evaluation (50%)		Qualitative evaluation (50%)		Total score
Number of ideas	91	Feasibility	6	68.39
		Beauty	5	
		Rationality	6.5	
		Economical efficiency	6.5	
		Originality	5.5	
Score	38.89	Sum	29.5	

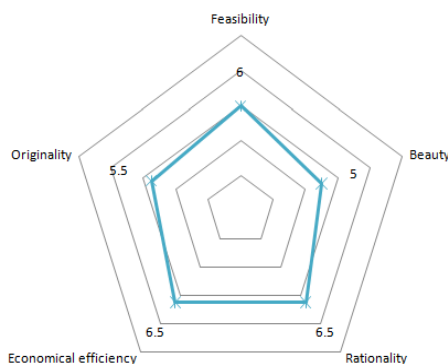


Fig. 7. Evaluation graph for control group.

V. CONCLUSIONS

This study implemented on line and off line education for creativity development to analyze qualitative difference in idea creation and method of producing creative ideas according to thinking areas by classifying thinking dispositions of students, based on IT technology.

Experiment was conducted by classifying subjects into four experimental groups and one control group. Education for creativity development was given by combining on-line education and off-line education and presentation of project result was made.

The result of this experiment showed that the number of ideas of experimental group C and experimental group D was great and the number of ideas of experimental group A and experimental group B was small. The most remarkable characteristics of control group was that the level of qualitative evaluation was higher than that of quantitative evaluation and four quadrants (A,B,C,D) kept in good harmony which reflected thinking dispositions of subjects in each quadrant were well harmonized.

Further research on evaluation of experimental group and control group is needed. In addition, research that can analyze and evaluate overall structure of project through idea creation method should be conducted in the near future.

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