

# 초등교육에서의 컴퓨터 교육 활성화 방안에 관한 연구

김 동 준

## Study on Method to activate Computer Assisted Education at Elementary Education Stage

Dong-Jhoon Kim

### 요 약

The purpose of this study is to allow all of the instructors including field instructors to understand relation between school education and computer, generalize and analyze basic data required to acquire basic knowledge to help utilizing the computer for education and seek for understanding.

This study intended to present a method to activate computer education focused on utilization education at the elementary education stage. Accordingly, those computer educations on middle/high schools and universities and through social educations have been excluded from the object of the study.

In order to conduct fruitful computer education, several supporting systems should be equipped completely such as teachers, facilities, software, etc. Especially, practical experience of using computer is the most important element in the computer education, every school should be equipped with computers to prepare for its generalization. Roles of the teachers have also very important influence on it. Research and development of education software require expert knowledge and enormous time and effort and the developed software should be followed by the systematic evaluation on its quality.

- ▶ Keyword : Computer Assisted Education, Education Software, Computer Literacy, Mastery Learning

### I. Introduction

One of the important social changes occurred on the 21st century is generalization of computer. Generalization of computer suggested needs for right understanding on the computer, learning basic

operation capability and further educating all of the peoples for computer literacy. On the information society where the computers are used for tools of living, if individual's functional illiteracy on the

computer is propagated as a nationwide phenomenon, it will result in cultural stagnation of the nation and eventually it will be progressed to the situation to loss national competitiveness. For that reason, a lot of countries including USA, Canada, UK, Germany, Japan, etc. are striving for educate the peoples to acquire capability to adapt themselves to the computer oriented technology and information society. Necessity of computer education is now strengthened as a culture education for the entire peoples to emerge from functional illiteracy. The purpose of this study is to allow all of the instructors including field instructors to understand relation between school education and computer, generalize and analyze basic data required to acquire basic knowledge to help utilizing the computer for education and seek for understanding[1,2,3].

This study established the following tasks as contents of researches in order to achieve the purposes above.

First, to analyze situations of the national/international computer educations and extract suggestions on educational utilization of the computers.

Second, to explorer methods extend utilization of the computers on our education field.

Third, to analyze areas to utilize the computers within the schools.

Forth, to analyze utilization and selection criteria for educational software.

Fifth, to explore policy scheme for utilization of computer education.

This study intended to present a method to activate computer education focused on utilization education at the elementary education stage. Accordingly, those computer educations on middle/high schools and universities and through social educations have been excluded from the object of the study.

## II. Necessity to utilize Computers on the Elementary Education

A favorite of the information is the computer industry. In using and managing the information resources, the computer has the highest potential that nothing can do. Thus, the computer will undertake pivotal roles to govern the future society. From perspective of the computer, it will be universally used first. Its uses will be widely spread out toward not only business areas but also

education and home. Computer price becomes very inexpensive so that anyone can possess and contents of information available for the personal computers become so diversified that scope of their uses are extended to general homes as well as offices. Accordingly, everyone can acquire various kinds of information, purchase goods at the department stores and shopping centers and pay the bills using the computer. Moreover, it is expected that there will be enormous changes on the entire areas including society and economy, for example, all sorts of works will be processed with computer and transactions between companies will be also handled through online systems. They are such phenomena that can be easily inferred among the present questions called implementation of national computing network and activation of its use and prospects of the future society that will reach daily use of computer eventually[4,5,6,7].

### 2.1 Effect on Contents and Methods of Computer Education

We can consider that changing trend of the future society is the information society and essential tool of the information society is the computer. As roles and weight of the computer are gradually increased and computer technologies have been remarkably developed, the computers are spread out over the whole areas of our lives today. When such trend will be further accelerated, what will have effect on the education at the era of computer? It effect might be classified into two kinds as below.

First, it will affect on the contents of education. If we consider that the education has a function to prepare the students to be the members of the future society, changing trend toward the computer society will have effect to include procedures to understand, handle with, utilize and apply computers into the contents of education. In other words, it will request to use the so-called computer cultures. For the modern peoples living in the era of electronic culture, to handle with the computer is a basic function, and to be equipped with utilization and application capabilities in addition to the function may be regarded to creation of new civilization. Daily use of the computer can be said that it has effect on education to be changed[8,9,10,11,12].

Second, it will affect on the method of education. As extended distribution of computers brings about improvement of education method, distribution of

computers onto the education fields will extend education through the computers. Innovation of education method called as Computer Assisted Instruction (CAI) enables mastery learning by controlling progressing speed and contents of learning according to need of the individual learner. Of course, it needs prior active development of high quality education courseware (computer programs for learning).

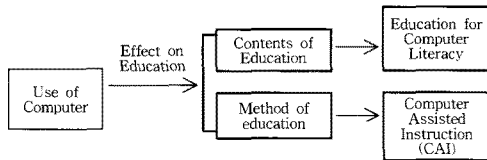


Fig. 1 Effect of Using Computer on Education

### 2.2 Expectation for Utilization of Computer on Education

Application and utilization of computer for education area suggest new possibilities of the education with different quality from those using audiovisual media till now.

Expectations from utilization of methods called as CAI (Computer Assisted Instruction), CAL (Computer Assisted Learning), CBE (Computer Based Education), CBI (Computer Based Instruction), CBT (Computer Based Training), ICAI (Intelligent CAI), CAIV (Computer Assisted Interactive Video), CMI (Computer Managed Instruction), etc. are as below.

- 1) It is available for individualized learning according to instruction individual situation and talent through tutorial method.
- 2) Drill & practice method enable repeated learning upon necessity and mastery learning.
- 3) Simulation method simulates actual situations and enables learning through indirect experience of the learner. It is possible to perform dangerous or expensive scientific experiments, etc. for actual execution by reducing cost, time and risk using this method.  
On the other hand, project oriented simulation learning has an advantage to develop skills, creativity, etc. of collaboration and it is able to lead classroom to dynamic learning field.
- 4) Modeling cultivates creativity and critical thought by realizing appropriateness of model or developing creative model.
- 5) Utilization of database is a representative example for open utilization out of CAL, which brings the students pursuing mind and pursuing

method and enables study to be progressed more efficiently.

These effects of CAI can be realized through development and distribution of high quality courseware (computer programs for learning).

Development of courseware is achieved through comprehensive decision making together with subject matter expert (SME), curriculum expert, computer expert and class designer.

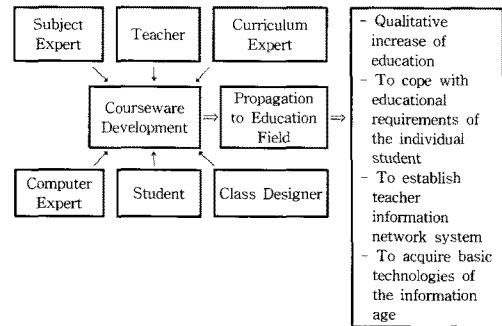


Fig. 2 Expected Effects to utilize Computer on Education

## III. Activation Method of Education Computer

The reason why utilization and application of computer are important in the elementary schools today is that target of education is not to cultivate professionals prepared for the information society but to bring up basic dispositions of all to prepare for the future society.

Under the situations, establishment of proper policy direction has very important meaning and it is further connected directly with success or failure of the computer education.

### 3.1 Computer Literacy oriented Education

Computer education can be classified into the one on the computer and the other to apply computer in general. Education on computer is to teach knowledge concerning about the computer such as principle and configuration of computer, generation of program, application areas and operation methods while education using computer means computer assisted education to use computer as tools of instruction-learning in order to increase effect of

learning. Computer education should be able to cultivate capabilities of the students to adapt with the computerized future information society as competent nationals. However, if education using computer out of two types of computer educations above is preferred, it will emphasize on increase of learning effect comparing to use capability and become difficult to achieve original purpose that the computer education seeks for. Thus, computer education on the elementary schools should be computer literacy oriented education to emphasize acquisition of experience to use computer and utilization capability including understanding computer terminologies, works suitable for computer and computer.

Even though the term, computer illiteracy, has unfamiliarity throughout our entire educations, education for computer illiteracy can be achieved within short period of time if some basic functions have been acquired through effort. Proper computer use methods will enable data processing, problem solving and mutual communication so that anyone can acquire capability not only to adapt social changes but also to understand the changes. At the moment, the important thing is to make to current students who will be the computer generation have right perspective on the computer. Since establishment of important concepts of the computer for the students will bring diverse application capabilities for the computer and logical thought so that they can apply the thought for all kinds of work processing, importance of the computer is being mentioned. The instructor shall be responsible for computer literacy education so that the students can perform proper functions in the future information society. In addition, as the computer education has been reflected into and spread out to the curriculum of the elementary schools, now the instructors need to be trained on utilization of the computer. Computer literacy education for the students can be described as below.

- 1) To understand when the computer can and cannot do, i.e. capability and limit of the computer.
- 2) To understand that the computer can be operated only with the programs made by the human beings.
- 3) To cultivate capability to communicate with the computer.
- 4) To understand various uses of the computer.
- 5) To acquire knowledge by being familiar with frequently those matters concerned with computer.

### 3.2 Expansion of Opportunity for Computer Education

It is recognized that elementary knowledge on the computer is the forth basic function including reading, writing, and calculating capabilities for the future society where the computer will be generalized for all areas of life. Accordingly, as like everyone needs reading, writing, and calculating capabilities today, capability for computer is a function required for everyone. That is why we need to further expand opportunity for the computer so that all of the students can receive the computer education through school life without exemption. Computer education should be the foundation of national take-off preparing for the future. In order to achieve the purpose, computer education should not be conducted from short term of perspective but performed generally and diversely for every elementary school from long term of perspective.

#### 3.2.1 Development of Curriculum and Education Materials

It is required to systemize education objectives, contents, methods, etc. to be achieved through computer education on the elementary schools, and develop the education materials to be invented to the school education.

- 1) Method of application and development for curriculums and materials for each level of school and grade
  - Key Point : It is required to develop and apply individual curriculums and materials to be applied to each level of school & grade.
  - Advantage
    - Education for each level of school and grade will be unified.
    - Systematic execution of education will be possible.
  - Disadvantage - It will be difficult to apply curriculums and materials to fit with situations for schools or learners.
- 2) Method of application and development for unified curriculums and materials
  - Key Point : It is required to define steps according to complexity level of education, develop curriculums and materials for each step and invest them into the schools which in turn should select steps suitable for situations and needs of them to conduct education.
  - Advantage - It will be possible to operate curriculum suitable for situations of the schools.

- Disadvantage - There will be no system and uniformity between class, grade and level of the schools.
- (Suggestion) : Since it is important to secure education opportunity first even though some problems could be presented from teachers and facilities, it is possible to develop and apply unified curriculums and materials first for a specified time period while developing curriculums and materials for each class of schools and level of grades at the same time and applying them step by step.

### 3.2.2 Security of Education Time

#### 1) Making Computer Education into Unit

- Key Point : To make computer education into unit to ensure time for the computer education.
- Advantage - Stable education time will be secured.
- Disadvantage - There will be some difficulties to increase total No. of time units a week or reduce standard time unit for other subjects in order to ensure time units for the computer education.

#### 2) Distribution of Subject Contents

- Key Point : To allow the existing subjects as many as possible to instruct computer related contents concerning about contents of the relevant subjects.
- Advantage - It will be easy to understand specific computer functions from the subject areas.
- Disadvantage
  - It may be possible to handle with subsidiary contents rather than intrinsic contents of the computer education.
  - It will be difficult to systemize the computer education.
  - Contents of educations may be duplicated.

### 3.2.3 Literacy Education using Computer

- Key Point : During the courses of using entertainment or individual learning program or learning through computer on the regular class at school, it allows knowledge, functions and attitudes on the computer to be cultivated.
- Advantage
  - It will allow elementary knowledge on the computer to be cultivated naturally.
  - It will not require separate curriculum or time unit for the computer education.
  - It will be suitable for be familiar with the computer and skilled with simple functions

and operation methods.

- Disadvantage - In case of relying upon this method entirely, the computer education may be limited to proficiency of simple functions or operation methods. In other words, it would be difficult to cultivate high level spiritual functions such as computer related thinking method.

### 3.3 Establishment of Universal Computer Education System

The most important key point to activate computer education is to establish such a system where every student can receive the computer education by expanding opportunity of education. For that, it is necessary to generalize computer education by reorganizing curriculums of each class of the schools and it would be principle for a lot of peoples to establish separate subjects within curriculums of each class of the schools for the computer education. Another approaches to generalize the computer education include a method to distribute and invest the contents to be handled by the computer education into other related subjects and the one to allow the students use the game programs or education programs during the class.

Since distribution method of computer into the several subjects has influence on the several subject and requires a lot of preparations such as reorganization of curriculums, education of teachers, development of textbooks, etc., it would be impossible to promote in a short time. Moreover, in view of urgency for the computer education according to rapid change of the age, it will be desirable method in the future, but now it cannot go beyond over the separate subject method. Since computer assisted education type computer education is considered as a possible method at the elementary school level, it is required to review the system to conduct computer education by mixing separate subject method and CAI using method.

### 3.4 Implementation of Education Software R&D System

In order for the computer education to be activated, education software should be developed and distributed. Research and development of education software requires expert knowledge and enormous time and effort and the developed software should be followed by the systematic evaluation on its quality. Therefore it is required to make the professional education institute perform this function rather than depending on the software markets. In order to allow them to

undertake the function, it would be desirable to utilize the professional institute equipped with plentiful manpower. Since research and development of software should be gradually extended and promoted, it would be also desirable to install and operate education engineering center as annex organization of the professional institutes. Even though operation fund of the organization should be supported by the government, it could be ensured by sales revenue after the software has been actively sold. In order to further increase functions of the education engineering center, it is desirable to implement a cooperation system between the several related institutes. For example, an organic research and cooperation systems should be implemented between annex research centers of the universities and education committees of individual cities and provinces.

- 1) Installation of Software Development Center
  - Advantage
    - It is easy to develop and distribute excellent software.
  - Disadvantage
    - It is difficult to secure fund.
- 2) Development and Distribution by regions of each city and province
  - Advantage
    - It is easy to develop and distribute excellent software.
    - It is easy for the teachers to participate into development.
  - Disadvantage - It is worried about that it cannot be activated at the beginning stage due to lack of experiences.
- 3) Teachers develop the required software.
  - Advantage
    - Practical software can be developed.
  - Disadvantage
    - The teachers have to bear increased burden.
    - Information interchange system is required for distribution and exchange.
    - Development of authoring language should be progressed in advance.
- 4) Supply from Software Development Market
  - Advantage
    - A lot of programs can be developed.
  - Disadvantage
    - Quality is not guaranteed.
    - In case copyright is not protected, it cannot be widely activated.

- (Suggest) It would be desirable to install the software development centers within the existing professional education institutes to undertake development of excellent software and evaluation of software to be supplied from the markets and implement cooperation systems between the software development centers universities's research institutes and education committees of individual cities and provinces.

※ Functions of the Center

- Development and distribution of education software
- Evaluation of software and distribution of evaluation data
- Implementation and operation of education database and computing network
- Training for teachers
- Development of other learning materials and methods

※ Implementation of Cooperation System

- Utilization of universities's research institutes: To attract them to participate into development of software for each dedicated subject
- Education Engineering Center: Evaluation and Distribution
- Ministry of Education, Science and Technology and education committees of individual cities and provinces: Field application and distribution to the schools

### 3.6 Reinforcement of Supporting System

#### 1) Administrative Support System

In order to efficiently support the computer education, Science and Technology, education committees and education administration offices of individual cities and provinces should clearly assign the responsible department for the computer education and allocate dedicated persons within the encouragement organization. Those teachers responsible for computer subject on the schools must undertake a lot of school works such as computing room management and computerization of school works in addition to computer class. Thus, in order to reduce their burden and allow them to play roles of a leader for the computer education, it is required to consider introduction of dedicated computer teacher for every school.

#### 2) Financial Support System

Computer education involves a task requiring a lot of investment such as distribution of equipment. Since the scale of required fund is so enormous, it

is considered that it would be difficult for the government to solely undertake the burden.

However, as the effect of the computer education will eventually produce profits of the nation and corporations, the government and corporations need to reinforce investment on the computer education as much as possible for its development. Especially, as one of method to implement a system for the corporations to support for development of the computer education, it is required to consider to establish a computer education promotion fund (Trust Fund).

#### IV. Conclusion

In order to conduct fruitful computer education, several supporting systems should be equipped completely such as teachers, facilities, software, etc. Especially, practical experience of using computer is the most important element in the computer education, every school should be equipped with computers to prepare for its generalization. Roles of the teachers have also very important influence on it. It is not too much to say that whether the innovative projects occurred from the actual education fields are successful or not depends on capabilities and attitudes of the teachers. Accordingly, every teacher should be equipped with qualification to utilize the computer for the class. For that purpose, it is required not only to improve curriculums of the colleges of education and education universities but also to reinforce education and training to reinforce qualification of the school teachers. In addition, for activation of the computer education, useful education software should be researched, developed and distributed. Research and development of education software require expert knowledge and enormous time and effort and the developed software should be followed by the systematic evaluation on its quality.

Therefore it is required to make the professional education institute perform development and distribution of education software rather than depending on the software markets.

Since everyone will need to know and use the computer in the future, it generalized computer education is required for all of the students. In order to generalize the computer education, all sorts of schools should establish computer education system and reinforce required supporting systems such as teacher education, facility security, etc. Main points of activation method to promote generalization of the computer education are as follows:

1. In order to expand opportunity of computer education, the elementary schools should reinforce special activity education for computer and increase chances to utilize computer for the curriculum.
2. In case the computer education course is content distribution method, it is required to open a 'computer education' lecture at the college of education and education university and reinforce education and training for the present teachers. In case it is separate subject, it is required to establish department of computer education and expand teacher courses on the department of computer.
3. It is required to install software education engineering centers in order to research and develop education software required for educations to utilize the computers.
4. It is required to reinforce education administration organization to support computer education and allocate dedicated persons on the education committees and education administration offices of individual cities and provinces.
5. It is required to form computer promotion fund (Trust Fund) and organize a computer education promotion committee with the Minister of Education, Science and Technology as a consultative organization.

#### References

- [1] 강정민, 전석주, "맞춤형 정보제공을 위한 RSS 기반 교육정보시스템의 개발", 한국컴퓨터정보학회논문지 제12권, 제5호, pp. 293-302, 2007.
- [2] 김성환, "방과 후 학습지도를 위한 전자멘토링 시스템 설계방안", 한국컴퓨터정보학회논문지 제12권, 제5호, pp. 303-311, 2007.
- [3] 김길준, "ICT를 통한 교수-학습 효율과 방안", 한국컴퓨터정보학회논문지 제8권, 제4호, pp. 194-204, 2003
- [4] 김윤, "U-러닝시스템의 통합교육에의 적용을 위한 제언", 한국컴퓨터정보학회논문지 제12권, 제3호, pp. 295-302, 2007.
- [5] 서인순, 김성환, 서정만, "블렌디드 학습이 고등학교 전산교육의 학업성취도에 미치는 효과", 한국컴퓨터정보학회논문지 제12권, 제3호, pp. 115-122, 2007.
- [6] 허은나, "컴퓨터의 교육 공학적 활용방안", 한국정보과학회지 제7권 제3호, 1989
- [7] 한국정보산업연합회, "한국컴퓨터교육 실태조사", 한국정보산업연합회, 1989
- [8] 이태욱 외1., "마이크로컴퓨터를 활용한 수학교육습득법 연구", 한국수학교육, 1988
- [9] 김영수, "컴퓨터 TOOL적 LEARNING- WARE적 접근", 교육공학연구 제4권 제1호, 1989

- [10] 류완영, "컴퓨터 교육의 개념", 교육공학연구, 제4권 제 1호, 1988
- [11] 이옥화, "교육용 S/W 개발 현황과 전망", 한국교육개발원, 1989
- [12] 김동수, "창업적 문제해결 훈련이 초등학생의 학업성취와 창의력에 미치는 효과", 경성대학교논문, pp8-9, 2002