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ABSTRACT

A computer curriculum guideline for Taiwan junior high schools was announced in 1994 and will be nationally implemented in 1998. Due to the specific educational system in Taiwan, the guideline will affect computer textbook writing, computer teaching and learning, computer teachers' professional development, and computer education research. This paper discusses the computer course content outline; textbook writing principles; characteristics of the guideline; possible impacts; the rationale for having computers as an independent subject at the junior high school level; programs and technology necessary to support the class; and issues related to these factors. Possible impacts discussed are on the computer market, the supply and demand of computer science teachers, computer textbook writing and publishing, students, parents, and school management. A mandatory curriculum guideline or standard is necessary for providing computer concepts and skills for following generations. A solid computer education research base should be established to provide usable and promising perspectives and strategies for computer education practices. (Contains 11 references.) (Author/SWC)

Paper

A Computer Curriculum Guideline for Junior High Schools in Taiwan: Its Impacts and Issues

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Abstract

A computer curriculum guideline for Taiwan junior high schools was announced in 1994 and will be nationally implemented in 1998. Due to the specific educational system in Taiwan, the guideline will affect computer textbook writing, computer teaching and learning, computer teachers' professional development, and computer education researches. This paper is to introduce the guideline, discuss its impacts, and describe issues. We believe that a mandatory curriculum guideline or standard is necessary for providing computer concepts and skills to all our next generations. A solid computer education research base should be established to provide usable and promising perspectives and strategies for computer education practices.

Introduction

The first official computer curriculum guideline for junior high schools (7th, 8th, and 9th grades) in Taiwan's educational history was announced (Ministry of Education 1994). It will be implemented at every junior high school in the 1998 academic year. The interim four years from 1994 to 1998 is for preparing teaching and learning materials, providing professional development to teachers, and installing hardware and software. The term "Computer" was selected as the subject/course title. The Computer course is required for all junior high students. The guideline is a symbol of the powerful influence of information technology on educational policy. It is predictable that the guideline will have powerful impact on the existing educational practices. This paper is to describe the contents of the guideline, discuss the possible impacts, describe some supporting programs, and consider the rationale of "computer as an independent subject."

The Curriculum Guideline

The guideline includes goals, content outlines, time allotments, textbook writing principles, teaching principles, and assessment principles. Among them, the content outlines and the textbook writing principles have more critical influence on the curriculum implementation. They are described below.

Content Outlines

There are twelve units, each has its own specified periods (one period is 45 minutes). The numbers in the parentheses are the allotted periods.

1. Human and computers (2): the roles of computers in everyday life, the influences of computers on society.
2. Basic hardware and software (4–6): basic terms, basic operations of hardware and operating system.
3. Word processing (6–8): Chinese character keyboarding and printing, basic operations of word processing software, everyday general applications.
4. Concepts of application software (2): concepts and software demonstration.
5. Operating environments (4–6): basic structure of computer systems, introduction to operating environments, such as the *Microsoft Windows* environment and Chinese environment.
6. Computer graphics (6–8): basic operations of graphics software, everyday general applications.
7. Computer ethics (2): intelligent property right, copyright, privacy, confidentiality, security.
8. Programming languages (4–6): concepts of languages, demonstrations of program examples.
9. Information management (6–8): concepts of database, basic operations, everyday general applications.
10. Trends of computer evolution (2): the future of computer hardware and software.
11. Multimedia (4–6): concepts of multimedia, basic operations, demos.
12. Networking and communications (6–8): concepts of networking, e-mail, file transfer, bulletin board, local area network, wide area network.

Units 1 to 6 consist of the first volume, and units 7 to 12 consist of the second volume. Writers and publishers have to follow the topics outlined in the guideline. In principle, local schools will be required to arrange the four-credits course in eighth and ninth grades with one credit per semester, but local schools can also adjust the course to be a two credits per semester course in eighth grade.

Textbook Writing Principles

There are eleven principles listed in the guideline requiring or recommending that the writers and publishers follow. The following are six of the main principles:

1. Teacher's guide: A teacher's guide is required to accompany the textbook. A student guide is optional.
2. Exercises: Exercises must be integrated into the textbook.
3. Demo disks: This is optional, but the publishers are encouraged to include demo disks into the textbook.
4. Appendix: It is recommended that new and updated materials be appended in the textbook.
5. Everyday examples: Textbook should use everyday and student understandable examples to explain the concepts and applications of computers.
6. Positive words: Negative words, phrases, and sentences should be avoided.

Although the textbook writing principles are loosely stated in the guideline, these principles will be used to evaluate the candidate textbooks. Writers and publishers will be forced to follow the principles carefully.

This national computer curriculum is a result of more than ten-year effort in exploring the possible ways to introduce computer concepts and information technology to every citizen. The establishment of an independent computer subject ends the confusion and mixture between computer science education and computer-assisted instruction, a mixture usually misleads teachers to think a computer-assisted instruction training is a computer science education training.

Characteristics of the Guideline

Application oriented—Word processing, computer graphics, information management, multimedia, and networking are very application-oriented topics.

Literacy-oriented—Only basic computer concepts and basic skills are emphasized. Programming is not a required skills for junior high students.

Hands-on oriented—The time allotment for each unit of word processing, computer graphics, information management, and networking/communications are six to eight periods respectively to give students enough time to practice practical applications.

Hardware/software independent—No specific hardware or software is listed in the guideline for the purpose of keeping the curriculum flexible and adaptive to new hardware and new software.

Civic education emphasized—The computer ethics unit is a mark of the intention to enculture the future adults with ethical judgment. It is a kind of civic or citizenship education. We believe that it is very necessary to have this unit in the curriculum to indicate the importance of computer ethical issues.

If we believe that computer education includes computer literacy education, computer application education, computer technology education, computer engineering education, and computer science education, then the computer curriculum guideline for Taiwan junior high schools must include both computer literacy education and computer application education.

The Possible Impacts

Impact on Computer Market

Computer education as a required education in junior high schools will open a new billion-Taiwan-dollar market. For the past 17 years (since the birth of the Apple II in 1978), Taiwan educational authorities have been upgrading computers from Apple II, to PC/8088, 80286, 80386, 80486, and now to Pentium PC. In the past, the hardware upgrading was not a nation-wide movement and its impact on computer market was not significant. Under the new computer curriculum guideline, every junior high has to set up at least one computer lab equipped with at least 80486 PC and a local area network. The impact on the computer market will be very significant.

Impact on the Demand/Supply of Computer Science Teachers

More qualified computer teachers are needed in junior high schools. The demands will attract some college computer science majors to take necessary teacher qualification courses for those hoping to be junior high school computer science teachers. This is a positive impact. Currently, there are 33 computer science departments in universities

and colleges as of 1993 (Ministry of Education 1994). Therefore, the amount of the supply of qualified computer science teachers will not be a problem.

Impact on the Computer Textbook Writing and Publishing

Computer textbooks should pass the evaluation procedure before they are qualified to be candidates for school textbook selection. The writers and the publishers will be driven by the curriculum guideline. This situation will be helpful for enhancing textbook quality through the publishers' competition to pass the evaluation.

Impact on Students

Junior high students will have one more required course which will affect their time scheduling. If the computer education course is not properly arranged, students will be given extra learning burdens. Currently, the national curriculum for junior high school students has more than 15 subject areas. The main subjects are: Chinese, English (American English), math, history, geography, physics and chemistry, earth science, and biology. These main subjects are very dominate due to the high school entrance examination system. Computers, as a new subject, will affect students' time arrangement.

Impact on Parents

Some parents' anxiety is expected because some of them might feel it is necessary to buy computers and related software to support their children's learning about computers. Some parents might feel their children will be far behind others if their children do not own their own computers. Under this psychological climate, the curriculum becomes a double-edged sword which has the risk to spoil the educational equality because of the gap between the haves and the have-nots.

Impact on School Management

Space, budget, maintenance, and the scheduling of computer labs will impose an extra burden onto the school management system. One of the risks is that the existing school administrators may not be familiar with the current computer technology and their anxiety toward computers might have negative influence.

To know these impacts in advance and to lessen possible negative impacts before the curriculum is implemented will be a very important task for both the central and the local educational authorities.

Rationale of "Computer as an Independent Subject"

One debatable issue is, "Why is it necessary to have an independent computer subject in junior high schools?" The advocation of computer science as a discipline in colleges is highly acceptable (Denning etc., 1989; ACM/IEEE Joint Curriculum Task Force 1991). The computer science curriculum in high schools is also favorable (ACM Task Force of the Pre-college Committee 1993a, 1993b). But "computer as an independent subject" in junior high schools is a very new and not-so-certain educational policy.

One of the most important reasons that supports computer education as an independent course is to provide equal opportunity of education, that is, to provide the equal opportunity of computer access. The argument is that the financial situations among counties and cities are quite different and it is not educationally fair to let the students in the poorer counties or cities, such as remote and geographically isolated islands and the rural areas, be left far behind the opportunity of accessing information

technology which are considered as the fundamental technology for surviving in the existing and the future information society.

But "why don't we integrate computer technology and its related concepts and skills into the existing curricula?" During the past two decades, scholars have been promoting the ideas of integrating the computer technology into the existing subjects. The salient example is computer-assisted instruction. But the movement of integrating computer technology into existing curriculum is not successful, and the conventional computer-assisted instruction strategies were not very practical and helpful. If we admit that computer technology is very important to our next generation and the national and local economical and social productivity, some alternatives should be taken to promote the computer literacy and computer application skills to homes, schools, and workplaces. Establishing a required course in compulsory education is one of the practical and efficient alternatives.

"What are the potential benefits of having an independent and required computer education in junior high schools?" One of the potential benefits is that many low social economic status students have the guaranteed opportunities to access new and advanced computer hardware and software. For example, students can navigate world wide web sites on the Internet. Another potential benefit is that the computer devices in every junior high school will provide the necessary backbone for constructing distance learning programs through computer-mediated networking. For instance, a network-based distance learning program might be established to provide junior high school teachers the professional development opportunity. It is assumed that an independent computer education will induce many important marginal benefits.

Basically and fundamentally, education is an assumption-based enterprise. Each educational policy and its related implementation should have educationally sound assumptions. Computer education, as a new field with rapidly changing character, is not exceptional.

Supporting Programs

For accomplishing the implementation of the curriculum guideline, new programs were created, and some existing programs were updated and reinforced.

Computer Equipment Requirement for Junior High Schools

This requirement is a regulation by the Ministry of Education to enforce the schools to buy qualified hardware and software. The requirement regulates that government-granted elementary, junior high, and high schools have to follow the minimum requirements in purchasing computer equipment. The governmental financial support for schools to set up computer labs will be accomplished before 1998.

In-Service Computer Training Program

The in-service computer training for junior high school teachers have been executing for nearly ten years. For supporting the implementation of the first-time ever computer curriculum guideline, the in-service training programs were expanded to recruit more teachers to participate the training.

In-Service Computer-Assisted Instruction Program

This program is not directly related to the teaching of computer subject, but it was considered that it is important to create an all-around climate in schools in order to alleviate the possible resistance to the implementation of computer education as a

subject. This is a very thoughtful consideration. The in-service computer-assisted instruction program has been existed for almost ten years.

Research Program of Computer Science Education

This is the first research program officially initiated by the National Science Council. The position paper announced by the Science Education Division of the National Science Council (NSC 1994) indicated four research directions. They are: (1) research on the cultural, social, economical, political, and technological background of computer science education, (2) research on the current state of computer science education, (3) research on the computer science teacher education and in-service professional development, and (4) research on the teaching and learning issues in computer science education. Currently there are several computer science education research projects supported by the NSC Science Education Division.

Networking Program

Junior high schools can connect to a nearby universities or colleges which have direct TANet (Taiwan Academic Network) and Internet connections. According to the Internet Society's data (Internet Society 1995, data is available at http://www.nw.com/). As of January 1995, Taiwan already had 14,168 hosts with the growth rate of 1,710% for the past three years, and Taiwan is the top 27th in domain size around the world. This data indicated that network will play an important role in the future Taiwan educational movements. Parts of Taiwan NII (National Information Infrastructure) optical fiber backbone are under testing in the hope of providing distance learning opportunity for teachers and students.

Issues

The transformational process of the computer curriculum guideline into the textbooks and then into the computer teaching and learning practices will not be a simple and linear task. There will have issues, some were discussed here.

Underlying Rationale Issue

The educational rationales/assumptions underlying the computer curriculum guideline are difficult to be presented clearly onto the content outlines. By reading the content outlines of the curriculum guideline, textbook writers and computer teachers may not catch the underlying educational rationales. Any implementation without enough understanding of the underlying rationales will have risks of wrong doing. For all students, literacy oriented, hands-on, motivational, concept oriented, not knowledge oriented, exploration, and others are the underlying rationales.

Operation-Oriented Issue

An application-oriented and hands-on oriented curriculum has the risk of misleading the textbook writers and computer teachers to emphasize too much on operational techniques.

Hardware/Software Upgrading Issue

Although every junior high school will have a well-equipped computer lab and networking, the life cycles of computer hardware and software are pretty short. Learners' needs are changing rapidly. Upgrading will be a serious issue.

In-Service Professional Development Issue

Many applications are technology-dependent (hardware-dependent, software-dependent), computer teachers need to learn new concepts and skills in order to teach their students. The in-service professional development program is definitely necessary, but budget will be an issue.

Textbook Evaluation Issue

The textbook writing principles listed in the guideline are too loose. How to establish a quality textbook evaluation procedure is an urgent event.

Learning Rationale Issue

Learning rationales like constructionism (Harel & Papert 1991; Harel & Papert 1991) and community of learners (Brown & Campione 1994; Brown & Duguid 1993; Lave & Wenger 1991) are usable for computer education in junior high schools. The curriculum guideline does not mention any learning rationale. How to integrate learning rationales into computer teaching and learning is an important issue. Constructing specific and integrated learning theories and formulating a framework for computer teaching and learning is necessary.

Effectiveness Issue

Effectiveness is always an educational issue, it is also a political and societal issue. The short life cycle of computer will hinder the gaining of high teaching and learning effectiveness in such a short period of time. How to evaluate the effectiveness of computer education in junior high schools will become a critical issue. Conventional learning issues, such as inert knowledge, decontextualized learning tasks, and others, will also appear in computer education area.

Conclusions

A curriculum is an indicator of educational policy, a guideline for textbook development, a tool for maintaining educational equality, and a bridge between educational policy and educational practices. The computer curriculum guideline for Taiwan junior high schools marks the beginning of a new educational movement for the becoming digitized information age.

Computer knowledge and skills are evolving rapidly. A computer curriculum guideline will have difficulty in keeping its pace with the evolution. Computer education researchers should try to define their research areas, know their research issues, and do authentic researches in order to lead the computer education. We believe that computer learning, computer teaching, computer teacher's professional development, computer curriculum, and computer education policy are potential research areas.

A curriculum guideline can be seen as a web that has many links to educational issues. Navigating the web will lead us to see the larger network which could present a more complete picture. Looking through the computer curriculum lens can bring us to a new and potential educational field which attracts us to cultivate the fundamental computer learning issues in order to establish the computer education research area.

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