

# An Administrative and Financial Support System for Gifted Information Science Education in Korea

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## INTRODUCTION

### a. Problems of nurturing information management professionals

Korea's 1992-1993 Information Management Industry Baiksuh elaborates that information management professionals nurturing institution faces five problems in general. First of all, the institutions have been only interested in developing theories in education and obtaining certificates rather than in developing practical applications. Secondly, educational facilities and equipments have been out-of-date. Thirdly, there are no differences and varieties in curriculum and teaching methods to meet the various educational demands. Fourthly, capable teachers are in quiet demand. Fifthly, educational institutions are only centralized in the metropolitan area.

### b. Purpose of this study

Moreover the government departments that are related to nurturing information science professionals are too uncooperative and competitive. They are the Ministry of Commerce & Industry, the Ministry of Science &

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Technology, the Ministry of Communications, the Ministry of Education, the Ministry of Labor. Therefore, in this article the problems of nurturing information science management professionals in Korea and the characteristics of foreign countries as the foundation will be discussed. Ultimately the main purpose of this chapter is to prepare for gifted information science education supporting system for the 21C.

## METHOD

### a. Research methods

This section reviews the research design, including the theoretical perspectives, variables, and the methods used to gather and analyze the data, and the field realities during the field work. The choice of methods is dependent on the type and nature of the research. Since this study focuses on social processes, two major methods used to evaluated of social-action projects are survey and case-study, which are qualitative research methods(Parashar, 1984).

Qualitative methods have distinctive methodological strengths over quantitative methods. Qualitative methods focus on the experiences of a small number of information science communities or organization's members. It allows to lead holistic analysis. It collects information about the various groups through in depth interviews about their own ordinary social lives(Katz, 1983).

A variety of specific methods were used to collect the data in this study, including analysis of official documents, field observation, and interviews during visits to schools, centers, government and public offices, industry communities, and various organizations related to information science education. Each will be discussed in turn.

#### 1) Documents:

Documents are useful sources of information. They are a stable and rich source of information which is grounded in the contexts from which they derive. Documents are legally accepted as formal statements that are accountable(Lincoln and Guba, 1985).

## 2) Field observation:

Field observation is a necessary first step in understanding the real situation from the local level (Miller, 1977). Observation allows the researcher to grasp the 'motives, beliefs, concerns, interests, unconscious behaviors, customs'. Observation provides access to the emotional reactions of the group. Observation allows the researcher to build a substantive knowledge of members of the group to be examined (Lincoln and Guba, 1985).

## 3) Interviews:

Interviews permit the interviewee to move back and forth in time - to reconstruct the past, interpret the present, and predict the future (Lincoln and Guba, 1985). This study uses the mode of structured interview. The interviews were held individually and in group by the researcher. Several visits were made to schools, centers, organizations, institutes, central and local governments, industry fields, related to information science education by the researcher.

### b. Research methods implemented

#### 1) Official documents:

At central level, documents of the Ministry of Communications, the Ministry of Education, and the Ministry of Science and Technology were collected. At local level, documents of the Boards of Education, science high schools, and other schools necessary, were collected.

#### 2) Observation schedule:

Learning activities on information science taking place in the schools, other centers, and organizations were observed. In addition several visits to individuals, especially college students who were involved in group projects on computer or multimedia.

#### 3) Interview methods:

Several college students, high school students, professors, science

teachers, government officials, policy-makers, parents who were highly interested in and closely related to gifted information science education were interviewed by the researcher. Interviewees were selected to extend or test information already obtained from previous interviewees, to obtain other information that contrasted with previously obtained information, or to fill in gaps in the information obtained(Lincoln and Guba, 1985).

4) Question format:

An open-ended question format was utilized to allow the respondent to answer in a relatively unconstrained way. Open-ended questions are considered to be more motivating to respondents. Open-ended responses are not only a function of the respondents' attitude position, but also of their intensity, knowledge about the issue, involvement, general verbal fluency, communicative style, and other factors(Kidder, 1981).

**THE ACTUAL STATES OF POLICY IN NURTURING INFORMATION  
MANAGEMENT PROFESSIONALS IN KOREA**

The policy in information industry professionals, one of the information management industrial policies, is divided into segregated departments. Thus there are many problems in nurturing information management professionals effectively. The Ministry of Commerce & Industry promotes 'Synthetic Counter-Plan for nurturing professionals' to bring up information management professionals needed in industrial communities.

It subdivides information professionals by each field and function, and it builds intermediate, long-term plans and the nurturing system of professionals. The Ministry of Science & Technology focuses on quantity-increase and quality-elevation of nurturing information industry professionals. It predicts that software specialists will be short about 77,000 to 155,000 people by the year 2001. And it is negotiating with the Ministry of Education about establishing the departments at universities related to information science.

It also plans to found an educational institutions for information techniques, to increase the quality of professionals by enlarging graduate

school of information industry, to strengthen the re-education systems of the existing personnels and experiment & field education at Bachelor, Master, and Ph.D levels. It is making efforts to carry out an international information olympic attendance and nationwide personal computer(PC) contests in order to create the base of an information-oriented society.

On the other hand, the Ministry of Communications is promoting an education and research network by granting 34,800 computers which will be diffused at 1,369 schools. It will set up community information centers, particularly in Pusan, GwangJu, WonJu, CheongJu, and so on. We are in the midst of setting up 28 computer classrooms in farming & fishing districts nationwide.

The Ministry of Education, the central educational department, is promoting computer education laying at schools from 1988 to 1996 chronologically. The most important goals of its policy are to diffuse educational computers, to develop various computer softwares, to train the computer teachers, to conduct researches of educational computer, and to manage experimental(model) schools.

As mentioned above, nurturing information industry professional of the government is sporadically divided into each division. There is no a standardized curriculum or systematic & scientific methods adopted by the educational institutions. Also, the gifted education for information science super-professionals is not nearly enforced.

## THE FOREIGN POLICIES OF INFORMATION INDUSTRY PROFESSIONALS

### a. Japan

Japan is strengthening the professionals nurturing system by promoting use of computers at school and the national qualification examination system as the Ministry of Trade and Industry's singular system. The special features of the nurturing systems for information professionals of the Ministry of Trade and Industry are as follows:

Firstly, the Minister of Trade and Industry assigns a professional nurturing institution, so that there are presently about 150 assigned institutions in Japan. The central information educational research institute

is supporting many things. For example, it offers a standardized materials and trains instructors administratively. Secondly, the computer education development center with the Ministry of Education promotes introducing educational computers at school. Thirdly, to diversify special educational institutions concentrating on metropolitan into each community, it legislated 'an extraordinary management law of community software development' with the Ministry of Labor and is supporting investments or subsidies to each community. Also it concentrates on a professional nurturing plan through information management promoting association to enlarge use of computers and to develop software industry.

#### b. Singapore

Singapore is planning the strategy of nurturing highly qualified technicians with the central focus of the Institute of Systems Science(ISS) founded in 1985. The goals of the policy in Singapore are to increase the 850 software technicians in 1980 to 10,000 in 1990. They will improve the quality of educational programs so that highly qualified technicians can be nurtured.

They will raise the expectations of their educational objectives that the technicians can apply what they have learned to the field of industry. And they will use instructional methods to improve educational quality. Subsidizing 30-70% of the educational costs for workers related to the software industry was offered by the government. It also plans to increase the department related information science at universities by a large margin.

#### c. Taiwan

In Taiwan, the government, research institutions, and private enterprises form a Trinity to promote an information-oriented industry so that they cope with the situation very effectively and efficiently. They particularly establish short, intermediate and long-term plans for supporting professional training and a computer minded focused on the Institute for Information Industry(III). It has devised a 10-year-plan to

develop the information industry and a 10-year-plan for information science techniques, while it decides the computer industry as a national policy strategy industry.

## THE ACTUAL STATE OF GIFTED INFORMATION SCIENCE EDUCATION IN KOREA

In Korea, gifted education of information science is concentrating on Science High Schools, but very few. It is not very effective or efficient because there are many difficulties in the gifted education system. The difficulties of effective or systematic information science education are as follows: First, it is an uniform education system. That is shaped by the schools, curriculum and instructional methods that are not varied. Secondly, the understanding for gifted children is lacking and teachers are short. Therefore, the responsibility to nurture teachers who teach gifted children must be settled without delay.

Thirdly, the university entrance examination is an obstacle. Because information science is not subjected to the entrance examination, the students don't study it concentratively. Fourthly, there is a problem of selection process and methods of the gifted. Systematic, rational, and realistic methods must be developed immediately. Fifthly, the students only fulfill a cramming education to go to university and become preparatory schools for universities by fast tracking methods. Sixthly, the most important difficulties are that educational facilities and conditions are out-of-date, which are a result of the shortage of funds.

Generally, gifted education can succeed when it is not alienated from the society. In doing so, gifted children must have human relations of wide acquaintance, good friendships, and good team work. It can be explained with the point of view that the objectives of gifted education are to nurture creative professionals. Therefore, higher special learning of information science must be deeply specialized in at university level, while the students learn basic concepts and theories of computers and accumulate practical experiences at high school level. Also they must foster leadership through daily life. So to speak, the conception gifted information science education have to be reconstructed.

THE SUPPORT SYSTEM OF GIFTED INFORMATION SCIENCE  
EDUCATION

a. Conditions of improvement of the support system

For effective and efficient results of gifted information science education, we must change model programs to easy gifted educational programs for planning and management. Developing model programs is one of the most important things. In doing so a plan for improvement and a policy of substitute must be preceded, and a supporting system of gifted information science education must be prepared. Various conditions of improvement will be discussed in turn.

CONDITIONS OF IMPROVEMENT	CONTENTS
educational finance	Cooperative systems in related agencies. "The fund for the improvement of information communications".
understanding of society	Cooperative systems in school, society and family.
educational systems	Flexible and standardized curriculum to meet the need or stream of industrial section.
educational facilities	Modern facilities and conditions (environment); the variety of software.
human resources	Institutions to train teachers. A counterplan to encourage excellent teachers.
supportive environments	Making concrete rules and provisions in law about exceptions of university entrance examination.
diffusion of systems	After testing model programs, we diffuse them gradually and observe community characteristics.
PR channel	PR strategies for parents in regards to their children's prospective jobs.
the agency of complete change	Institutionalization, financialization to legislate "gifted information science in laws of child upbringing.

1) educational finance:

One of the most difficulties in gifted education is financial matter. Therefore we have to utilize the existing human and material resources the most. As we discussed it in the case of Japan, a cooperative system between the government and related agencies is needed in order to re-establish functions and rules among the existing educational institutions. But the most important thing is ensuring enough educational finances, which can only guarantee its success.

In Israel's case, they are investing 8-9% of the GNP in the educational field and 37% of it is supplied to the gifted education programs. They give priority to science education among national policies. But our educational fund is just below 3.7% of the GNP. A pledge of the president's election campaign was to increase the educational finances to 5% of the GNP, but the prospective of it is gloomy. If it is impossible to secure funds for gifted information science education by the finances of the Ministry of Education alone, give consideration the cooperation from the Ministry of Communications.

2) understanding of society:

Owing to the lack of understanding of the gifted education system, there has been a lot of problems with the students. Gifted students have not contributed much to the society because they have not adapted themselves well to their social environment. Therefore the society must find where the gifted children are and give them information to utilize. It must remove the vague uneasiness about their future and maintain the intimate relations between society, families and the gifted children.

3) educational systems:

We have to sublimate education isolated from the society and industrial fields. To meet the need and demands of the modern society, we have to prepare more flexible educational systems than ever. For this to happen, we have to enact a standardized curriculum and develop updated educational contents and materials. In Japan they have already developed a standardized curriculum through CAROL(Computer Aided Revolution on Learning) in 1986. So they have put in force education corresponding to

industrial needs and the need of the times.

4) educational facilities:

The modern equipments and facilities must be ensured immediately. Without learning about new technologies, we cannot expect effective results in education. We need new educational facilities to learn lots of techniques such as downsizing, multimedia, open operating systems, network technology etc. This requires an efficient supply of many different kinds of software.

5) human resources:

We must ensure and train teachers for information science. There is a difference in teachers' levels and numbers among schools, so we must utilize a more flexible teacher employment system. The teachers who are responsible for teaching the gifted children must have higher abilities in specialization as well as educability. To utilize universities as the training agencies of teachers for gifted education, we need specially appointed faculties and have them do a systematic and specialized training. The incentives for excellent teachers are also important. We also have to make policies and surroundings that could make the teachers study voluntarily.

6) supportive environments:

An exceptional code in admission to university is needed for gifted education being active. We need to give additional scores to students who make special out-put of computers. We can see a similar code in the 5-year plan for economic development. But there are no clear statements or specific requirements for beneficiaries, specific contents in the selection methods, or an additional level and percentage of scores. Also, if the leading universities such as Seoul National University do not accept these ideas, it becomes meaningless and insignificant. So at first we have to provide some stipulated contents to the code.

These days only a restricted number of universities, such as Pohang Institute of Science and Technology, accept these ideas. We have to extend the exceptional code for the special talented students who won the contest of World Information Science Olympiad. And the areas of the beneficiaries

to other contest winners must also be broadened, which is a more reasonable and realistic way.

7) diffusion of systems:

To broaden the support system of gifted information science education, we need to experiment some new programs. After we get specific and systematic evaluation by operating pilot programs, and correct some problems of the system, then we broaden it. Especially we have to develop a variety of programs to satisfy all demands of different communities. This effort could work for equal development of gifted information science educational institutions throughout the nation.

8) PR channel:

To induce active participation of society, and to give a concrete vision to the future, we must arrange regular orientations and training courses for the parents. We should also mail or exhibit some materials containing some information about gifted information science education, for example guidelines, a list of related books and materials, a list of gifted information science education programs and so on. We have to inform the parents about general informations related to industrial and management agencies, financial and administrative aid for information management industries, actual state of tax support policies and the code of exception in military service. These PR strategies have to emphasize more on children's 'horizontal differences of personality' not 'vertical differences of ability'.

9) agencies of complete charge

The role of the government is to arrange a long-term policy. According to the policy, the government supplies professional development institutionally and financially. We need a special agency of educational-industrial complex which takes charge of gifted information science education effectively and consistently. This agency could arrange special teaching methods, supply facilities and equipment, and train teachers who are capable of developing selection procedures of the gifted and its time, a standardized curriculum, the phase of educational programs, and a variety of algorithm. To support that, the government must enact the

enforcement ordinance of laws about nurturing gifted education. This is stipulated in specific ordinance based on the code of information stimulating laws. Especially a foundation of laws for educational finance must be clearly stated in it.

For the lasting and systematic instruction, each province must run their own research teams. These teams can be composed of 12-15 people of each institution-teachers of elementary and secondary schools, professors, and research institute members related to this matter. They must take charge of research activities such as developing curriculum and text of gifted education, and special guidance for acceleration study.

### EDUCATIONAL CONDITIONS AND SYSTEMS

#### a. A support policy of nonformal education systems

If we make supporting systems of gifted information science education, it must be pointed out as follows: when we think about plans for this program, the use of existing resources(human, material, facilities and institutions) is most effective. For example, at first private institutes and enterprises should establish socio-educational institutions and educational centers. Then they should run them intensively and effectively. If these programs survive they should be given government financial aid etc. And if finances are available, foundation of regional Learning Resource Centers(LRS) would be idealistic.

To speak more specifically, we need learning space where the students can meet and get together to discuss up-dated information on journals and magazines etc. The procedure of selecting members of this program should be based on how well they can get along with one another. To stimulate curiosity by acquiring special knowledge and interests among clusters of groups is one of the important point of this program. They can get desired learning results when they share their experiences and their accumulated knowledge of references, catalogs, exhibition and computer programs. These programs need financial support from the central government, regional authorities and the private enterprises of the communities.

The concrete elements and contents of the LRS are as follows:

COMPONENTS	LEARNING RESOURCE CENTER
objectives	The students taking gifted info-science education programs. Teachers in charge of the programs.
conditions	Ultra-modern hardware, various software, related special books, lists of names and addresses of mentors.
places	To utilize space of the public building, science institutes for students, social welfare facilities, special designated buildings for this program.
functions	A place for the students to study voluntarily, to meet friends and share interests, to offer them various information through exhibited materials.
finance	Support from the central government, regional authorities, enterprises related to the information management industry and civil agencies in the communities.

b. Practical strategies of using Learning Resource Center

1) It is to utilize 28 community information centers in farming and fishing districts which the Ministry of Communications supervises. The difficulties of gifted education in agriculture areas is that the regions are spreaded out widely so that to provide facilities and teachers cannot be effective. So to utilize the community centers we should give not only students but also teachers a chance to use the facilities and materials together while sharing their ideas. We could also provide weekend seminars for gifted children and intensive summer programs to elementary and secondary level students.

(2) By supporting and upbringing public and private science education institutions and centers selectively, we can utilize science institutes as educational laboratories or exclusive facilities for youths. We can use public

spaces of the communities such as county centers, Dong offices, students science centers, or social welfare facilities etc as learning space. It is important to activate an information-oriented community. We must make plans so that students can use intensive learning programs after school.

(3) In a side view of the utilization of community resources and services, it is effective to use community-based mentors as gifted education teachers. The mentor system is formed by volunteers of the community who have special knowledges. The name, address, and phone number of volunteers are exhibited at the media centers(data room). Mentors would help students to solve their problems and to stimulate individual reports and projects. The mentor system also enforces individualized education more effectively with little cost.

If professionals of related enterprises become volunteers, a realistic and concrete education will be accomplished. Also mentor and internship programs will adopt the needs and characteristics of the community. This place could be used where information science will be taught and teachers will be trained.

#### c. The support policy of formal education - school systems

First of all, the concept of gifted information science education in school must be changed from the concept of 'training' to 'educating'. It must clearly stress the creative aspect of learning rather than the functional aspect. Liberal arts education must be stressed with the acquirement of special knowledge. Then the educational policies of each school level will be discussed below. It is known that the gifted children, teachers, and parents except administrators understood that the gifted education must be cooperated with other education (Greenman & Russel, 1977).

It is pointed out that in general ordinary students have negative opinions about gifted children. Therefore the gifted education in school is on the assumption that it should not be isolated from the society. Each stage of educational support system will be discussed in turn.

EDUCATIONAL SUPPORT SYSTEM	
pre-school age	public institutes and places: museums, science institutes, zoos, botanical gardens, children's halls
elementary school	Club Activity(C. A) or LRC, saturday seminars
middle/high school	C.A. or LRC. a short-term special courses, in mural computer exhibitions
high school for special objectives	new establishment of information science high school/ establishment of information science major in the existing science high schools
university	building 'information science institute' stressed on practice
a short-term professional nurturing	a short-term training through attendance of abroad exhibition shows/studying aboard for completion of special program

1) pre-school age:

Gifted education for pre-school children has many difficulties in selecting gifted children. Therefore, firstly we must offer children chances to be acquainted with computers as much as possible. Secondly, we stir up children's interest in computers. Thirdly, we should have children feel that computer is an equipment to help our life convenient and comfortable, not a learning object. For pre-school age children, we must give them chances to be acquainted with computers easily at public places and institutes such as museums, children's halls, children's parks, zoos, and botanical gardens. We organize and manage educational programs to fit ages and interests of children.

2) elementary school level:

At elementary school stage, it is important that children who have not revealed their latent talents should be familiar with computers. Namely we have to develop children's curiosity and imagination. The existing programs such as animations, typing education, and games are effective to children at early stage. Sometimes each school has many difficulties in budget for the cost of equipment and facilities and security of qualified super-teachers in any community. In that case, the integrated educational methods are most effective. That is, we will build LRC and carry out concentrated and

efficient educational activities based on it in collaboration with schools of the community. Also voluntary mentors can act as human resources. The concrete types of programs are as follows:

a) The first is a mini learning course. It is a summer school program for three weeks, which includes group activities, seminars, and research activities to raise children's curiosity, flexibility, and decision-making ability. And 4-6 grade students would be trained individual activities which can raise their prides and latent talents once in a week.

b) The second is 'Discovery Class' to offer various differentiated individual learning experiences. As individual learning is to investigate a matter intensively, students are responsible for learning themselves, and the program only offers learning materials and resources.

c) The third is 'Super Saturday Program' for 12 weeks. It is a special course offered to elementary and middle school students on saturday. It is a cooperative system of which facilities are offered by universities, financial support by Board of Education, and programs by teachers and specialists from several school districts.

### 3) middle and high school level:

As creativity is the most actively abundant from middle to high school days, we should teach them information science education systematically at this period of time. And efforts to couple and support students with groups interested in computer is needed. Schools and the Board of Education must support students' Club Activity(C.A.) substantially and continuously, and supply necessary conditions such as guidance teachers, computer hardware and software, maintenance of the facilities. Also they may establish a policy that students who passed a restrict standard of qualifying examination may choose courses by themselves.

Then they can reach the high level of manipulating hardware for developing software and using software for manipulating hardware, that is the capabilities to manage and analyze computer. Super-professional of a variety of fields must be put in them and practice developing creative thinking of the students. Ultimately chances should be given for the students to develop huge programs based on a project. A development of

practical and gradual program is supported by schools, communities and enterprises in the U.S. The concrete case of programs are as follows:

a) A cooperative system between schools is presented as a pilot program. 4-5 schools can develop and execute jointly program-development methods for gifted children. It is desirable that decision to diffuse the program may be made after the utility of the program is tested.

b) LRC programs offer gifted high school students individual training in a quarter of day. It is important to prepare up-dated articles, books, journals and professional magazines to get new information. Since they are full of curiosity, it is very important to set learning environments and surroundings for voluntary study.

c) 'College Academy' is a short term special course similar to olympiad education led by the Korea Information Science Association. It provides intensive special training courses to the students staying in the dormitories of universities for six weeks during summer or winter vacation. It gives them the opportunities to be involved in the programs that require full of creativity and not just accelerated study.

This program will operate centering around local national universities under the guidance of the local government and the Board of Education, local college dormitories, with the financial support of local communities. The regions where there are no national universities must choose private colleges which have enough facilities and desirable conditions. We can give these contestants who participate in these courses extra scores by rational and relevant evaluations when they enter identical or related departments of universities.

d) We can provide opportunities for intermural PR and presentation of computer club members by intermural computer exhibition. For this to happen, we need financial support from schools or educational councils.

#### 4) High schools for special objectives

It is known that the government has made positive examinations about establishing special schools such as information science high schools. We need sufficient examinations and discussions effective approaches, whether to utilize and reinforce existing science high schools or to rebuild new

special schools. But first of all it is helpful to set up the direction by examining closely and thoroughly the problems of the present science high school situations.

Firstly, the whole curriculum of information science is totally different from the university entrance examination: the elective related subject is excluded. This sometimes makes it difficult to induce interest and enthusiasm to the students. The curriculum itself is too ambiguous to meet the systematic and elaborate educational objectives of special high schools. As there is a lack of financial support they could not prepare enough modern facilities to fit the information industry field. The more accelerated study courses for entering university makes students indulgent only in preparing for the entrance examination.

So this makes lots of potential difficulties for creative studies. However, it is not certain that the new idea of founding information science high schools has lots of merits. In high school the student's creativity is most active, so that it is ideal to give them the chance to partake in special studies on information science. This age is the best time to train their way of thought to 'think in the way of computer'. As professionals in the field of information science needs lots of creativities, at this time they should accumulate various computer program experiences. Then they could easily utilize their knowledge by practicing and applying it to the society.

However to promise success on gifted information science education there is a need for some preconditioning. At first, we have to make a social atmosphere to accept and support these gifted programs. Creative autonomous education must be accomplished in elementary and secondary school. Some schools include special items such as early graduation. But these programs also are another way of preparing for the university entrance examination. So these items that adverse the natural process of education should be excluded. Above all one of the most important thing is the premise of the continuous supports and responsibilities of the government.

#### 5) Use of the science high school

Reinforcing information science majors in the curriculum of existing science high schools could be effective. After establishing small-scale information science classes in the science high schools, we could recruit separate students and bring up them as a 5:5 ratio of theory and practice. The ratio between general and major subjects could be 7:3 for the first year of high school(10th grade), 6:4 for the second year(11th grade) and 5:5 for the third year(12th grade).

By the way there is a mandatory precondition. It should be institutionalized and guaranteed that as far as there is no major fault, the students who are majoring in information science at the science high school should be admitted to the university as exceptionals. Simultaneously it should prepare modern facilities and equipment such as multimedia, work stations, graphic systems and various computer software for study.

However one of the most important factor is preparing excellent teachers. So we must support and arrange small-scale research and experimental groups for teachers. During the actual practice courses it is important for teachers to develop programs, visit research institutes, take training and participate in all kinds of contests and discussions.

#### 6) University:

Foundation of 'higher level of an information science institute' as a university course would be suggested. That is, it is the way of establishing special institutes or universities putting first in practice to accommodate the special students who have taken the gifted information science programs at high school level. For example new concepts of some special universities which are similar to the 'Art Institute' for students majoring in music could be accepted. In doing so, a curriculum putting first in practice and apply and continuous and full supports by the government should be premised.

We have to give them chances of field experiences and practice through many seminars and discussions rather than emphasizing theories. Cross registration system with other universities can be introduced for them to

take courses of theories. We must also prepare many texts in the laboratory and establish early education institutes attached by rearranging the institutes so that they can use them for early educational places.

7) Nurturing professionals in short-term:

Providing information science education by studying abroad and supporting in-service training abroad can be a practical way for short-term results. Thus we must broaden opportunities for short-term studies abroad for high school and college students. The government could use these professionals trained abroad in short-term as the practical work force by supporting studying abroad and recruiting them to industry field and research institutes.

For high school students it is effective to attend display shows abroad to experience high-densified information societies, while at college level taking particular courses or programs would be appropriate. In Japan the most up-dated courses for six months usually are taken abroad.

## THE CONDITIONS AND SYSTEMS OUTSIDE OF EDUCATION

a. Activation of Personal Computer(PC) contest:

We have to arrange various nationwide events on hardware as well as software which show off or exchange their skills and abilities. It is happening that the number of gifted children is sharply increasing as cultural and living environments change, which means we have many difficulties in selection of gifted children. Therefore these events or contests could be useful and economical if hidden talented students could be selected by these programs. It is also useful to open the events on small-scale in cities or provinces as many as possible, instead of small number of nationwide large-scale events. These events should focus more on measuring or evaluating the practical skills of the students rather than theories.

b. Activation of Public Subscription of PC

The public subscription of PC could be used to dig out the talented

students, through which they could expose their excellence without any restrictions. Generally, the PC contests are more focused on the theories that can be easily evaluated. Memorizing knowledge about computer, however, is not very important. Especially requiring creative thinking within the limits of time pose many problems. In choosing the gifted, we need creativity tests rather than testing simple knowledge since it is more important to find problem solving skills rather than memorized knowledge on computer. In realistic terms it's very difficult to evaluate creativity, but using the public subscription without a time or content restriction can be another solution.

c. Broadening the system of exception in Military Service

We have to broaden the existing exception code of military service. Military service could be a major factor of drawing back to juveniles who want to study computers. In the rapid change of the information industry, years of military service could cause a major gap after discharge. Also military courses could reduce creativities of these people. The existing code for military exceptions authorizes technicians holding Bachelor's Degree for three years and researchers holding Master's Degree for five years supported by the Ministry of Trade and Industry and the Ministry of Science and Technology. But it is more important to broaden these codes and propagate the system to the publics. Also we have to enact military service laws of exception for the winning contestants of the World Information Olympiad as soon as possible, which is known that negotiations between the Ministry of Education and the Ministry of Defense have been going in progress.

d. Rearrangement of state qualifying examinations

It has been pointed out that existing state qualifying examinations for the license of information management are superficial. We need to rearrange the dignity and role of state qualifying examinations to intensify the function of official authorization. The limits of age and academic background must be abolished and new evaluation methods of measuring

quality of those on information-engineering fields must be introduced. Major institutes and industries related to these fields should give some merits or an allowance to those who hold the certification of qualification.

### CONCLUDING REMARKS

Finally, there are several points that we must recognize in preparing the system of gifted information science education. Firstly, the agreement between experts and administrators on planning and management of successful programs must be established. Secondly, the success of program depends on successful implementation of fixed criterion. Thirdly, it is successful that the criterion of program is implemented with high level. Fourthly, the criterion won't be applied if its important elements are not considered at the planning stage. So we need more specific and accurate evaluation process to grasp the whole causes of the inside and outside matters.

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