

Current Trends and Issues in the Preparation of Science Teachers

The Problems and Issues in Pre-service Teacher Training in Universities and the Revision of the Educational Personnel Certification Law

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I. Historical Background

In 1872, in the same year that the Order of Education was promulgated, the government established Normal Schools in Tokyo where teacher training started.

After World War II, the normal schools were reorganized into four-year teacher's colleges which aimed to train teachers of elementary and lower secondary schools. Other teacher training programs were carried out in regular universities.

In accordance with the Educational Personnel Certification Law which was promulgated in 1949, teacher training in Japan has generally been carried out at the university and college levels.

In addition, in national universities, faculties of education and colleges of liberal arts and sciences aiming at teacher training for teachers of secondary schools were established. Other national, local public or private universities and junior colleges, enabled the students who have acquired the prescribed number of credits provided by the Educational Certification Law to obtain a teacher's certificate. To date, There are about 50 teacher training universities, 27 national universities, 26 public universities and 282 private universities geared to the purpose of providing teacher's certificates. In 1982, out of 92,466 teachers who have obtained teacher's certificates in junior and senior high school levels, only 25,057 were employed as teachers.

The existing teacher training in Japan is characterized by three points namely:

- (1) Would-be teachers must obtain a teacher's certificate.
- (2) Universities and colleges conduct the preservice teacher training.
- (3) It is an open system teacher training which means that graduates of specialized faculties in national, local public or private universities and junior colleges can obtain a teacher certificate if they have acquired the prescribed number of credits as provided

for by the Educational Personnel Certification Law.

Teachers in kindergarten, elementary and secondary schools must have a relevant teaching certificate granted by the prefectural boards of education and provided for by the Educational Personnel Certification Law.

II. Issues and Problems in Preservice Teacher Training:

A. Concerning Teacher Training in Non-Teacher Training Schools.

1 (a) First class certificates in secondary school levels require 40 credits of major subject studies. For example, for science teachers, these subjects include Physics, Chemistry, Biology and Earth Science.

(b) Junior high school teachers take 4 credits lecture and 1 credit experiment in all fields of science while senior high school teachers take 4 credits lecture and 4 credits experiment only in one major field of science totaling to 20 credits.

(c) Additional 20 credits can be obtained in a field which the student chooses.

(d) Subject teachers over-emphasize major subject studies.

(e) Graduates of these schools tend to be bookish in their approach to teaching.

2 (a) Fourteen credits of education related subjects are required.

(b) There is a lack of teachers to teach education subjects. Part-time teachers from teacher training schools are hired to teach education subjects.

(c) Students' orientation is geared towards major subject studies but not towards education.

(d) Short period of practice teaching does not allow student teachers to grasp real classroom situations, pupils' behavior, interaction among the different sectors of the school and other teaching-learning processes.

(e) Limited number of schools for practice teaching makes it difficult for student teachers to find placement for practice teaching.

(f) Large number of practice-teachers makes close supervision by experienced teachers in practice teaching schools impossible. This results to poor quality of practice teaching exposure.

3 Graduates can obtain certificates which will permit them to teach in secondary schools only.

B. Concerning Teacher Training in Teacher Training Schools.

1 (a) Student teachers are required to get more credits compared to those from non-teacher training schools.

(b) Minimum requirements for major subject studies are as follows:

(i) Elementary - 16 credits

(ii) Junior high schools - 40 credits

(c) Minimum requirements for education related subjects are as follows:

(i) Elementary - 32 credits

(ii) Junior high school – 9 credits

(d) Total minimum requirement for major subject studies and education related subject studies is 93 credits. At present, 63% of the students get more than 161 credits. Students of non-teacher training schools however, get only 124 credits.

2 Over-loaded curriculum makes it too difficult for students to efficiently tackle all their subjects, gain mastery of the subjects and acquire credits.

3 Graduates may obtain 2 certificates if sufficient number of credits as provided by the law is acquired. These certificates will enable them to teach interchangeably in elementary and junior high school.

General Problems and Issues:

1. Over-loaded curriculum.
2. There is no emphasis on courses about methodology and techniques of teaching, child psychology, developmental psychology and other related fields which will prepare students for their actual work after graduation.
3. Lecture method and the authoritarian approach to teaching make the students passive.
4. Practice teaching experience is not sufficient.
5. Students have low motivation.

III. Revisions in the Requirements Provided for by the Educational Personnel Certification Law:

The revision of the Educational Personnel Certification Law was initiated in 1988 which would take effect in 1990 subject to approval. The revision was primarily based on the recommendations made by the Council for Teacher Training in 1987. The objectives for the revision as recommended by the council are as follows:

- (1) To improve the quality of teachers in response to the need for relevance to the new demands of changing society and of the elementary and secondary school learners of the present and next decades.
- (2) To prepare the teachers for school activities and responsibilities to enable them to carry out the tasks of fully developing the physical and mental aptitudes of the students.
- (3) To inculcate in the teachers' minds the dedication to the thrust of the educational mission.
- (4) To enable the teachers to understand deeply human development.
- (5) To provide mastery of the subject matter.
- (6) To enhance the teaching abilities of teachers by developing their inherent potentials.
- (7) To provide general literacy to would-be teachers.
- (8) In addition, the deteriorating sense of values of the new generation students has

necessitated the upgrading of the minimum requirements for would-be teachers who are responsible for the development of students' skills, knowledge, attitudes and values.

The following are the revisions:

(1) Teacher certificates are divided into:

- (a) regular certificates which are valid for life and qualify the teachers for full time posts.
- (b) temporary certificates which are honored for a period from 3 to 10 years and qualify the teachers for assistant posts, only in a particular prefecture where the certificate was granted and
- (c) specialized certificates which are valid for life and awarded to those who have Master's degree or who have acquired 24 credits after one year study at non-degree course for graduates or its equivalent.

Regular certificates are subdivided into first and second classes. The minimum requirements for credits are specified by the Educational Personnel Certification Law.

(2) Major emphasis is given to first class certificates. As a matter of fact, in the upper secondary schools' requirements, only first class certificates are given. This encourages the graduates of junior colleges to acquire more credits in the university so that they can obtain a first class certificate.

(3) The minimum requirements for teacher certificate are shown in the Table.

(A) Major subject studies

(i) Elementary-A greater number of credits for major subjects in the first class elementary teacher certificate is required. At present, 9 subjects are required which is equivalent to 18 credits. The additional subject is called "LIFE" which is an integrated social studies and science subject. This subject primarily aims to:

- (a) cultivate in the students the ability to adapt and adjust to his environment and society.
- (b) nurture in the students, good habits and breeding.
- (c) enable the students to develop self-consciousness which will make them realize their talents and develop these talents to the fullest the improvement and betterment of the society where they live.

(ii) Lower secondary-More importance is given to laboratory classes and experimentation. Although there is no increase in the minimum number of credits required for science, there is an increase in the number of credits for experiments. The increase in credit will involve the utilization of computers in science education. Minimum requirements for credits for lecture decreased.

(iii) Upper secondary-no major revision was made except that the utilization of computers in science education is required.

(B) Education related subjects The revised law prescribes an increase in the

Table Minimum Requirements for Teacher Certificates (1988)

	Elementary School Teacher		Lower Secondary School Teacher		Higher Secondary School Teacher
	1st	2nd	1st	2nd	1st
《Major Subject Studies》					
9Subjects	18	10			
1subject			40	20	40
《Education Related Subjects》					
Educational Essentials & Objectives					
Developmental Psychology & the Process of Learning	12	6	8	6	8
Educational Management, System & Sociology					
Educational Methodology & Techniques					
Curriculum					
Method of Teaching the Subjects	22	14	6	4	4
Moral Education					
Special Activities					
Guidance & Counseling	2	2	2	2	2
Teaching Practice	5	5	3	3	3
TOTAL NUMBER OF CREDITS	59	37	59	35	59

number of credits of education related subjects. The old law required credits in Principles of Education, Educational Psychology and Child Psychology. The increase in credits required by the new law involves the teaching of additional subjects such as:

(a) Educational Essentials and Objectives. Although the contents of this subject are not yet specified, its objectives of giving total education to students is emphasized.

(b) Developmental Psychology and the Process of Learning. This is an integration of Educational Psychology and Child Psychology whose main objective is to prepare the teachers to develop the mental and physical facilities of students and help them cope with the problems of dealing with children.

(c) Educational Management, System and Sociology which will include Sociology of Education and Educational Administration and Management.

(d) Methodology of Instruction and Techniques which aims to teach the development and usage of audio-visual materials and aids and the use of computers in education.

(4) Methods of Teaching is required of all students. Elementary school teachers are required 2 credits each for the 9 subjects for a total of 18 credits and secondary school teachers are required 2-3 credits of Methods of Teaching.

The revised law requires that the total number of credits of Moral Education and

Study of Teaching Materials be equal to 22 credits. This consists of 18 credits of Methods of Teaching, 2 credits of Moral Education and 2 credits of Special Activities.

(5) Two credits of Guidance and Counseling are required of all teachers.

(6) An increase in credit requirement for Teaching Practice is required. The additional credit in all levels is for an extra subject on Guidance for Teaching Practice which aims to orient the students on the objectives and contents of the practice teaching, ways of health maintenance during the teaching practice period, lesson planning, structures of school lessons. School projects and student evaluation and others. The experienced teachers and other academic personnel in the schools where the student teacher is assigned or the academic adviser of the student teacher in the teacher training school can give the advice. Before and after the teaching practice period, the students are evaluated by the teacher. The student teacher is not required to submit a report.

IV. Recommendations:

The following are recommended:

(1) There must be a balance between education-related subjects and major subject studies in the minimum requirements for credits for teacher training.

(2) Elementary teachers' certificate must emphasize education subjects more to enable the would-be teachers to deal with children better by understanding their psychology.

(3) A1-certificate curriculum is more advisable. If two certificates are desired by the students, a longer period of study to acquire the minimum credits is necessary.

(4) Teacher training schools and other universities must have standardized pre service training for teachers.

(5) Teaching practice hours must be extended and must be uniform in all teacher training schools and universities in terms of content, methodology and structure.

(6) Exchange programs between university staff and teacher training schools' staff must be encouraged. That is, where a particular school is deficient, specialists can be invited on an exchange basis. Universities can invite education specialists and teacher training schools can invite major subject specialists to help improve each others' functions and qualities.

(7) Opening of more schools for practice teaching. At present, students are permitted to teach in the secondary schools where they graduated and attached schools of teacher training institutions. However, because of the limited number of student teachers who are accepted, students find it difficult to find practice teaching placement.

(8) The minimum requirement of 40 credits for major subject studies for junior high school teacher certificates must be increased to 50 or 60 credits. In science education,

the number of credits required for each field (Chemistry, Physics, Biology and Earth Science) can be increased to allow the mastery of the subject matter. Graduate thesis requirement depends on a particular university.

(9) Deloading of the curriculum to allow teachers to master the subject matter and give them more enthusiasm to pursue higher education is hereby recommended.

(10) Teacher training schools should stress the relationship between the major subjects and the education subjects to enable the students to become better teachers who will know how to teach the subject they will later on handle.

(11) Teacher training schools and non-teacher training universities must train their students on teaching methods and techniques.

(12) In elementary school teachers training, the relationship among the different subjects must be stressed so that, when the time comes, the teachers can establish this relationship in real classroom situations.

(13) Professors of teacher training schools must cooperatively work with elementary and secondary school teachers to be able to gain knowledge of the needs of teachers in carrying out their activities and responsibilities.

(14) Teacher training schools must develop a teachers' program that will inter-relate major subject studies with education related subjects and practice teaching.

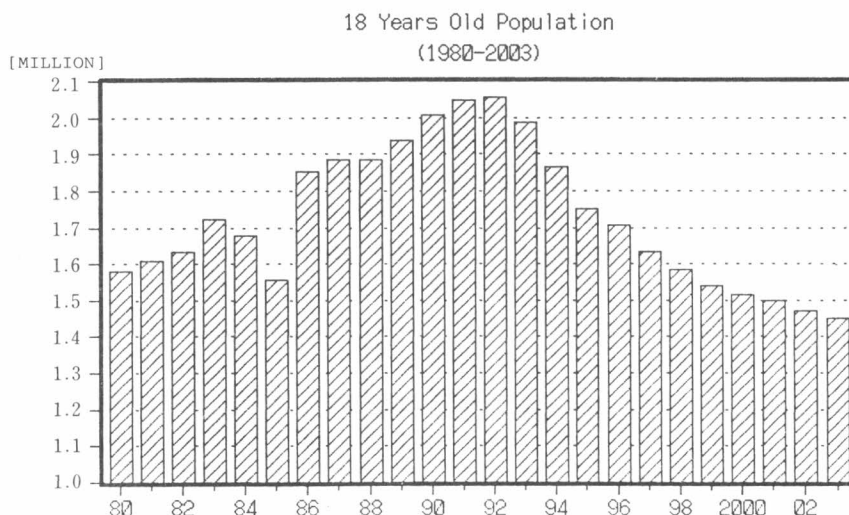
(15) Graduate schools should play an important role in teacher training. In 1966, Tokyo Gakugei University established a Graduate School for Teacher Training. In 1988, out of 50 existing teacher training universities, 22 have graduate courses. Among the big universities which provide in service training to teachers are Hyogo University of Teacher Education in Hyogo Prefecture, Joetsu University of Education in Niigata Prefecture and Naruto University of Education in Tokushima Prefecture. Also in 1988, there were about 2,128 freshmen enrolled in the graduate schools.

In non-teacher training universities, major subjects are given more emphasis as compared to educational subjects, making the students less prepared for their future tasks as teachers. In teacher training universities, graduate studies help the students acquire higher qualification such that they get training also in teacher-related work such as that of school administrators, school personnel and university staff.

(16) Graduate courses in teacher training schools must be geared towards education so that subjects such as Curriculum Development, School Administration, Teaching Materials Preparation and Development can be required to prepare students for teaching activities and other related activities as specialists, consultants and supervisors.

V. The Problem of Decreasing Number of Students in Teacher Training Schools

The Intentional Teacher Training Policy of the Ministry of Education, Science



and Culture primarily aims to control the number of students in teacher training schools. With this, the quality of teachers is expected to be upgraded and the problem of a future decrease in teachers' demand is hopefully met.

The graph shows the total number of 18 year old people who are potential freshmen in universities. Between 1991 and 1992, there will be a maximum number of probable freshmen in universities. However, it is predicted that after 1992, the population of 18-year old people will gradually decline. Also, the number of students in compulsory education schools will drastically decline. This will result to a decrease in demand for teachers. So as not to displace the experienced teachers and to give work opportunities to the new graduates of teacher training schools, a need to control teacher training school population became imperative. To control the number of teachers, the following measures are adapted:

- (1) In 1987, the number of first grade elementary pupils was maximized to 40 from the previous maximum of 45 pupils in each class. There is an expected year by year change in the maximum number of students in different grades. In 1990, lower secondary schools will have a maximum of 40 students and by 1992, all classes in the elementary and secondary levels will have this maximum number of students.
- (2) Highly qualified teachers are promoted to higher positions such as that of consultants, supervisors and administrators in educational centers.
- (3) Old teachers who have served for a long time are encouraged to retire.
- (4) Teacher training schools have opened courses in other fields like Integrated Science, Computer Science and others, to help the graduates find other work options besides teaching.

At present, out of 50 universities, 23 universities and faculties of education, have started to open such courses. Out of 19,890 freshmen, there are 2,665 freshmen enrolled

in these new courses. Graduates of these courses can be employed in industries and other companies. The flexibility of these programs makes it possible for incoming freshmen to be enrolled in either teacher training course or newly opened courses depending on the needs and demands of the situation.

The demand for teachers is influenced by many factors such as:

- (1) The number of pupils to be taught
- (2) The maximum number of pupils per class as decided by the Ministry of Education, Science and Culture
- (3) The number of retired teachers and others

When there is a big demand for teachers, incoming freshmen can be accepted in teacher training courses.

It is hoped that through the revisions and changes adapted by different teacher training schools, better qualified teachers of compulsory education will be produced. Through the able planning and guidance of the Ministry of Education, Science and Culture, and the untiring efforts of the professors in the teacher training schools, well prepared teachers are expected to be produced to meet the demands of the Japanese society in its relation to the entire world.

VI. The Decline of Science Teachers Qualification

“Good teachers produce good students.” In line with this saying, it is indeed important to make teachers good by upgrading their quality and improving preservice teachers training to produce better qualified teachers who will be able to meet the demands of the changing times. More than at any point in previous times in the Japanese history, social and environmental crises are generated because of the increasing rate of technological change. Presently, because of the citizen's inability to cope up with an exceedingly sophisticated environment, the Japanese educational system is beset with various educational and social problems. Thus the nation's education planners are given a deep thought to ponder upon a new trend in curriculum development which is relevant and dynamic for fast changing society in preparation for life in the future.

The identified problems of Japanese education namely: academic background oriented society, delinquencies, group bullying, school violence towards teachers, alarming rate of students suicide, school phobia, control-oriented education, physical punishment by the teachers, have brought about a clamor for change in curriculum and instruction in schools. It is imperative that education planners review the balance between the demands of the modern age and the state of the curriculum. Likewise, teachers must identify the strengths and weaknesses of their teaching methods and adapt better techniques to keep pace with the changes.

Teachers should ideally have characteristics such as:

1. Knowledge by his educational preparation he is able to impart knowledge.
2. Humanitarian qualities he should carry out his tasks as a teacher, not by regarding it as an income generating endeavor but, to show love, care and affection to arowing children.
3. Enthusiasm he should show eagerness in fulfilling his tasks and developing himself to become a better teacher.

These three characteristics should interactively play important roles in producing ideal teachers who will be charged with the responsibility of educating the children for the improvement of society.

Thus, ideal teachers must prepare and grow in these aspects:

1. Professional aspect:

The teacher should:

- (a) possess a wide and deep understanding of the contents of his subjects
- (b) be able to effectively plan his lessons
- (c) develop his own techniques to make his lessons easily understandable to the greater bulk of his students' population
- (d) be able to efficiently manage the classroom
- (e) show leadership in guiding students
- (f) develop interpersonal relationship with the students, other teachers, and other people in the educational milieu
- (g) develop students' process skills and creativity
- (h) help transmit culture from one generation to another

2. Humanitarian as:

The teacher should:

- (a) show affection to children
- (b) show willingness and enthusiasm in discharging his duties
- (c) show fairness in dealing with, and evaluating individual students to cultivate the faith-trust atmosphere in the classrooms
- (d) be imbued with the desire to widen his horizons to meet the needs of the student population and the demands of the times.

The importance of interpersonal relations in teaching cannot be underestimated. Teachers must make conscious efforts to regard each student positively to understand him as a human being and help him grow in every possible way. Interpersonal rapport can be developed by:

- (a) greater understanding of the pupils' need and personality
- (b) devising different tasks for different students
- (c) individual evaluation
- (d) varied questioning
- (e) effective communication, that is listening unhurriedly and responsibly
- (f) being open and natural

Talking and listening are subtle ways of recognizing the adolescents' growing need for identity. It enhances the learning relationships and increases teacher's efficiency in facilitating the students' understanding of the subjects.

In addition, with regard to science teachers' qualities, they must:

- (1) understand the essentials and objectives of science education
- (2) have a wide knowledge and understanding of the scientific fields
- (3) develop teaching materials to make lessons easily understandable
- (4) be aware of individual student's talents, skills and problems
- (5) plan his lessons well
- (6) skillfully prepare and maintain materials for experiments and other practical activities
- (7) possess general teaching and communication skills such as in
 - (a) encouraging students to actively participate in discussions
 - (b) teaching students how to interact with each other
 - (c) closely observing individual students
 - (d) developing students' problem solving skills
 - (e) questioning techniques
 - (f) using teachings materials and aids
 - (g) adapting his methods to suit his educational objectives and the students' needs
- (8) be aware of good laboratory housekeeping and maintenance techniques. In this respect, the science teachers should
 - (a) be able to prepare materials, equipments and reagents
 - (b) be able to deal with laboratory accidents
 - (c) be able to apply first aid techniques when there is an accident
 - (d) be able to maintain laboratory equipments
- (9) be able to evaluate his students
- (10) improve his lessons

The present time needs teachers who will not only impart knowledge in various fields and develop process skills but who will motivate and inspire children to learn by their guidance and affection. It is therefore the fundamental responsibility and obligation of teacher training schools to systematically plan a curriculum to make would-be teachers realize these qualities and teach them how such qualities could be developed and nurtured and effectively be used in real classroom situations.

Teachers' preparation which every teacher training school should aim must equip teachers with the qualities indispensable in teaching. Thus preservice teacher training programs must make provisions in their curriculum to

- (1) teach subjects of general education, education related subjects and major subject studies such that they will provide the teachers with:
 - (a) general knowledge
 - (b) specific knowledge related to his field

- (c) deep understanding of the principles and methods of education
- (d) an understanding of human development and behavior
- (2) motivation to make necessary improvements in the quality and duration of teaching practice.

Furthermore, to effectively pursue these ideals, teachers in preservice teacher training schools must realize that their students will have a task to fulfill in the classrooms and schools and therefore, they should prepare them to perform these tasks, not only by providing knowledge but, teaching them how they can impart this knowledge to their own students.

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