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PROPORSAL TO INTRODUCE "MEASUREMENT SCIENCE" IN EDUCATION COURSE ON ALL FIELDS AND RANKS

Komyo Kariya, and Shigeru Takayama

Faculty of Science and Engineering, Ritsumeikan University BKC, Shiga, JAPAN

Abstract - At present, there are many kind of education course corresponded to the social situation. But the foundation of education should be advanced in an education system that is enacted according to the construction of each nation. The system is for example public school education system (or national school education system). General saying, the society is going to progress according to the development of technology. Nowadays modern society has achieved by the development of electric and electronic technology, communication technology, mechanical technology, industrial chemical technology, bio chemical technology, medical technology, civil and architecture technology, and other technologies[1]. And generally it is possible to say that the modern society is going to advance demanding new technologies. Particularly, the future development of modern society will be influenced by the effect of Natural Scientific and Technological Education (after we say as NSTE) for the people live in society.

This paper shows that the "Measurement Science" is proper to the education put natural scientific and technological knowledge in to the people according to the level and the rank of education system.

Keywords: public school education, the level and rank of education, NSTE (Natural Scientific and Technological Education).

1. STATUS OF "NSTE" FOR THE PEOPLE AND POIN OUT OF INSUFFICIENCIES (as Introduction)

The foundation of education for the people is advanced by the nation educational systems of each country. And there are no difference in advance countries on the system, but big difference is found among developing countries. And when refer the footprint of the development of society in advanced countries, it is evident that the societies have been coming with the development of technologies. It goes without saying that there are natural scientific thoughts in the back ground of the development. Then the promotion of NSTE for the people will accelerate the development of modern society in particularly developing countries.

The nation education system of advanced countries is possible to show in Table 1 by an example of our country (Japan).

Table 1 National Education System (in the case of Japan)

Stage	Select(S) or Duty(D)	School	Term
Pre	S 90%	Pre school	1-3
1	D 100%	Junior school	6
2	D 100%	Middle school	3
3	S 70%	High school	3
4	S 60%	Technical school Junior college College University	2 2 4 4
5	S 20%	Graduate school Doctor Post graduate school Master+Doctor	 5 2+3

Here, Pre stage, 1st stage and 2nd stage are basic education stage, and 4th stage and 5th stage are special (or technical) education stage. And 3rd stage takes as a node position between basic education and special education.

The NSTE for the people should be done in early stage and earlier the stage, the higher the effect, so that generally the natural scientific education is practiced to bring out the interest of children and youth(young people) in 1st stage, 2nd stage and 3rd stage. The contents are selected from mainly physics, and chemistry, and then sometimes the contents are taken up from earth science, biology, mathematics and other sciences. But the contents for teaching show a marked only showing tendency the basic principles (theories, theorems, laws and so on).

Here we can take up two simple examples. The one is Ohm's Law and another one is Newton's Equation of Motion.

Example 1 Ohm's Law $V=RI$
Example 2 Newton's Equation of Motion $ma=F$

The meaning of these equations is indicated in early stage natural science education book. And also the explanation is generally politeness so that the understanding of students for the Law and the Equation themselves is got easily understand. But the education that these law and equation are serving in society dose not practiced in almost case.

The purpose of the NSTE for the people is in the rising natural scientific and technological sense of the people.

Then it becomes very important to teach the role they carry out in the society. The Ohm's Law is possible to explain by using the principle of some security sensors and social effects of the security system. And Newton's Equation of Motion is also possible to explain from the selection of standard of measurement and the importance of standard on society.

Those examples exist in our daily life and human society. Then when concern an act of measurement is basic of human activity and social activity, it will possible to use many contents of "Measurement Science" on the method of such education.

Education methods are not limited by the standard method and the rule, and various methods should be concerned and developed. We are binding an act, the theory, the technique, the role and the effect on the society of measurement by an important "Learning" remark with "Measurement Science", and we are making a point of the relation of human activities and social activities. Then several kinds of subjects, theme and items in measurement fit to NSTE to rise up the natural scientific and technological sense of the people particularly young people.

Here there are very important things in above mentioned education. It is a recognition of teachers take charge of the early stage education. They should be appreciated rightly the relation of natural sciences, techniques, technologies, sciences and a man and human society. And, in the recent, the position of hardware and software is important. Here, hardware is a technique to apply the laws, the theories and so on, and software is a technique to practice the hardware. Table 2 gives an arrangement of the relations. This is an important problem and viewpoint of the difference among "Science", "Technology", "Each Science", and "Each Technique". And then this philosophy gets through to the thought of "Measurement Engineer" and "Measurement Science"[2].

Table 2 Arrangement of the Relation Among Science, Technology and Society

SCIENCE

TECHNOLOGY

(Science)

Natural sciences---laws, theories, theorems, structures,

(Apply to)

Techniques---------- to apply the laws, theories

(Expand into)

Hardware----------to expands the

(Practice by)

Software----------to use effectively the techniques

A man and Human Society

Development of Society

2. APTITUDE OF "MEASUREMENT SCIENCE" ON THE "NSTE" FOR THE PEOPLE

The history of measurement technologies is very old and the origin is found in primitive age (hunting age and agriculture age). In this age, an act of measurement was existed to keep lower most life of a man. And the act is for eating a plant and an animal, for avoiding the quarrel in tribe and for demonstrating the time of sowing and clop. Also many balances were made in ancient age as the tool to use for various judgment Those facts in primitive and ancient age describe that an act of measurement contributes to the development of society. And until nowadays the task of measurement had been studying and practicing every time under the background of the development of many sciences and techniques having the relation with human activities and social activities. Typical example of sciences and techniques of the background is shown in the revolution age. Thus a "Learning of measurement" has been constructing had two directions, namely "Measurement Engineering" and "Measurement Science". And it is understandable that the "Measurement Engineering" is a learning to study the technical methods to grasp the information and to get the knowledge, and the "Measurement Science" is a learning to study the methodology of measurement included "Measurement Engineering". In the methodology, human activity and social activity relate with strongly techniques so that the contents of "Measurement Science" will suit very much to the NSTE to rise up natural scientific and technological sense of the people.

The points of agreement of "Measurement Science" are indicated as four items of Table 3.

Table 3 Points of Agreement of "Measure Science"

Points	Foundation	Movement
1 Thought of measurement science	Philosophy	Sociality
2 Theory of measurement	Natural science	Principle
3 Structure of measurement	Engineering	System
4 Technique of measurement	Technique	Each technique

When the four points are slotted into the NSTE curriculum according to the education level or rank, natural scientific and technological knowledge of the people live in society will rise up. And this fact will reinforce the traditional natural science education in each stage of the school on the view point of the role that the natural science and technology carry out to the human society.

Here, important problem is how construct the contents of four points correspond to each education stages (Pre school, Junior school, Middle school, ---). And in that time , the fold of the level or the rank of students in each education stage must be studied.

3. SETTING METHOD TO SLOT EDUCATION ITEMS FROM "MEASUREMENT SCIENCE" INTO EARLY STAGE EDUCATION

As like above mentioned NSTE for the people must be slotted in early stage education. The early stage education is generally practiced as duty in public school education system. And in almost countries it is collect realization that the "Native language", the "Arithmetic", the "Natural science", the "Social study (Sociology)" and "Gymnastic" as basic subjects are set on the early stage education(Junior school and Middle school in Table 1).

On these systems, elementary natural science and techniques are taught in the subject of "Natural science". But here, the relation with a man and human society is almost does not treated. Then it becomes need and important to concern the method to slot the contents according to especially No.1 of [The point of agreement of "Measurement Science"] in the subjects of traditional early stage education system. There are two methods.

1. A method to set "Measurement Science" as new subject adding on the traditional subjects (above mentioned five subjects).

2. A method to be going put the education items selected from in the contents of "Measurement Science" in to each traditional five subjects.

The former has some problems which must be get several agreements of official education organization. The latter is possible to practice in early time by the consciousness of each school and the teachers.

4. ONE OF EXPERIENCE OF THIS PROPOSAL - "Measurement Science" education for social and cultural students -

The practice of the education to rise up natural scientific and technological sense of people is pleasant in earlier stage on education system as like already indicated. On the other hand such education is particularly need for social and cultural student at nowadays natural science, technology and information oriented society.

In our University, the lecture titled "Nowadays Sciences and Technologies" has been setting on foundation education curriculum from 15 years ago. In this lecture, 6 professors take charge of each class having subtitle. The subtitles are set by each professor. and selected from the sciences and the technologies which are important on the society of that age. For example, there are computer technology, space communication, nano technology, robot technology and so on(These are applied theme, not fundamental. Because the student of University is object of the education. We have been setting "Measurement Science" for many years by the reason of the measurement act needs for all sciences and technologies and it is fundamental scientific act at every age.

We have set 10 measurement education items in the lecture which easy to takes kindly to the mind of social and cultural students and we are using many kinds of sketch remain in spirit of students. Besides, the important things are selected as the appropriate examples in consideration of the field, the level and the rank of the side takes lecture(students), that is , it means that the side to teach(professor) should be stood on the side to learn(students). For example, when teach the time series signal to student of economy course, the day change of stock price or foreign currency becomes optimum example, and when teach the prediction and estimation problem to students of cultural course, the era measurement of excavation fit very much. The 10 measurement education items are indicated in next as an references[3].

1. Position of "Measurement Science" on the learning
2. Relation with the society
3. Information and knowledge, and the method to get information and knowledge.
4. Three tasks (metrology, acquisition of information and knowledge, application of knowledge)
5. Basic of measurement (structure, scale)
6. Systematization of measurement
7. Static and active measurement
8. Sensor and signal
9. Signal analysis and grasp and acquisition of knowledge
10. Look for more sure and more wise measurement

5. GUIDE LINE OF "NSTE" ADOPTED EFECTIVELY THE THOUGHT (PHILOSOPHY) OF "MEASUREMENT SCIENCE" (as Conclusion)

In Table 4, the guideline of NSTE for the people is shown. This guideline is shown based on the above mentioned "One of Experience ------ " indicated in 4. and "Setting method to slot Education items -----" indicated in 3.. In either case of the setting method, the suitable selection of teaching items should be done on the thought of proposal early stage education method.

Here, the education items selected from among the contents of "Measurement Science" for five basic subjects ("Nation language", "Arithmetic", "Natural science", "Social study" and "Gymnastic") of early stage education are indicated. Of course the education contents and the education methods must be concerned correspond to each education stage and each education level or rank. Some of items in this table are only give the guideline and it becomes important that how early stage education to rise up natural scientific and technological sense for the people is possible by using effectively the education items selected from among the contents of "Measurement Science".

The problems indicated in here are also important assignment in "Education Science" and "Education Engineering" as "Learning", and sometimes it is main subject of our measurement scientists.

Authors would like to recommend the advancement of these educations and expect to arrange the effective education items by selecting from among the contents of

"Measurement Science". And then authors believe that the effects of these educations will affect to the development of science and technique oriented society.

Education methods are not limited by the standard and the rule, rather various methods should be developed. For example, when a teacher selected a teaching material, what kind education is possible? This is very important problem. Fig.1 is gave "Exquisite Sense of Teaching Method".

Table 4 Guideline of the Method to Select the Teaching Items from "Measurement Science"

Subjects	Education items selected from among the contents of "Measurement Science
Social study	Wisdom of a man and measurement Action of a ma and social activity Social role and responsibility of measurement History of Measurement Object of measurement Metrology and traceability in society Information and knowledge Welfare and measurement -------
Natural science	Foundation of measurement and standard Detection and sensor Foundation of sensor and Physics and Chemistry Object of measurement Sensor and signal Information and signal Knowledge and information Signal conversion Signal analysis and information and knowledge Static and dynamic measurement --------
Arithmetic	Analog and digital Signal analysis and statistics and probability Signal and stochastic process -------
Gymnastic	Body of a man and measurement Exercise of a man and measurement Object of measurement Outline of medical measurement Healthcare and measurement Aftercare and measurement -------
Native language	Composition and measurement sense -------

PRODUCTION --- Distribution structure

AGRICULTURE --- Fertilize
--- Chemical treatment
--- Weather
--- Meteorological treatment

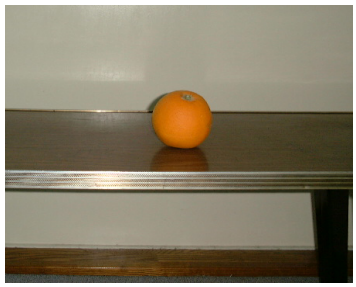

Fig.1 Exquisite Sense of Education Method

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Authors: Komyo KARIYA, Shigeru TAKAYAMA : Department of Electrical and Electronic, Engineering, Faculty of Science and Engineering, Ritsumeikan Univ. BKC, Noji, Kusatsu, Shiga 525-8577, JAPAN

E-mail : kariya@se.ritsumei.ac.jp, s-tkym@se.ritsumei.ac.jp

Phone : +81-77-561-2685, FAX : +81-77-561-2663