

ミャンマーと日本における化学教育の比較

Comparison of High School Education of Chemistry between Myanmar and Japan

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Abstract

We studied comparison of high school education between Myanmar and Japan by using the textbooks of chemistry in high school, visiting schools and study tours. In both countries, the level of curriculum contents common. The contents of the textbooks are arranged systematically in order to the laws, principles, basic concepts, examples and explanations. There is a little difference in the explanation of each topic, some are details in Myanmar, but some are details in Japan. School chemistry can teach the students about the influence of chemical knowledge on human society.

Education plays a vital role in the realization of sustainable human resource development programmes of any nation. Education is a task to help children develop their own identity and faculties from early childhood to adolescence. Basic education is compulsory in all countries.

In Japan, beginning with the 2002 school year, major curricular reform has done an attempt to make schools more flexible and responsive to individual student need. In Myanmar, plans are made to revise and reform the basic education curriculum. The fundamental aim of curriculum reform is to nurture and produce responsible and civilized citizen gaining tactical through deliberation and to disseminate social justice to all communities.

In both countries, textbooks changed into new curriculum by fostering a stronger interest in the subjects. In Myanmar, apart from three main subjects, *i.e.*, Myanmar, English and Mathematics as the core subjects, three electives among Physics, Chemistry, Biology, Economics, Geography, History, Optional Myanmar are prescribed for the free choice of students for the high school students. In addition to these subjects, Co-curriculum activities such as Moral Education, Civic, Life-skills, Physical Education, Home Economics and Aesthetic Education are also prescribed. In the high school level (Ninth Standard and Tenth Standard) English, Math-

ematics, Physics, Chemistry and Biology are taught in English while the rest of the subjects are taught in Myanmar. Textbooks are common for all schools which published by the Basic Education Curriculum, Syllabus and Textbook Committee, Ministry of Education of Myanmar. The Textbooks mainly contain explanations of each subject and generally lack experimental or observational information.

In Myanmar, teaching of chemistry is started in the Ninth Standard at upper secondary level. But students have to learn chemistry from the point of views in some chapters of teaching science at primary and lower secondary levels. Teaching science in primary and lower secondary levels is the basic of the teaching Science subjects (Physics, Chemistry and Biology) at upper secondary level. As Science is the fundamental and very important subject in national development, the teacher must be very careful in giving out the objectives of teaching of Science in each level. The course of chemistry for the Ninth Standard is a course with an emphasis to understand chemical matters and phenomena, which are closely related with our daily life. Students have to study substances and their changes, element, compound and mixture, solution, crystals, making crystals, the laws of chemical combination and the idea of atoms, arrangement of atoms and molecules in substances, masses of atoms and molecules, symbols, formulae, equations,

formula writing and the naming system, the mole concept, oxygen and its compounds, carbon and its compounds, oxides and hydroxides, hydrogen, water, acid, base and salt in details. There are altogether 15 chapters in this course.

The course of chemistry for the Tenth Standard is a course with an emphasis on understanding of the basic concepts, principles and laws by conducting with some experiments on chemical matter and phenomena. Students have to learn 15 chapters in this course. They have to study about proton, neutron, electron, and electronic structures in details. Moreover the periodic table of the elements, periodic properties, ionic, covalent, coordinates and metallic bonds are taught in chapter 1. The relationship between volumes, pressure and temperature in gaseous state, Charles' Law, Dalton's Law of partial pressure, Avocado's Theory, Gay-lussac's Law of gaseous diffusion and some problems relating with the Laws are learned in chapter 2. Students have to study how to solve the chemical equations and reaction as mathematical chemistry in the stoichiometry chapter. Conductors, electrolyte and electrical conductivity, the ionic theory and electrolysis of salt solution, Faraday's Law in electrolysis chapter, oxidation and reduction in details in chapter 5. Moreover, rates of reactions and equilibria with examples in chapter 6, Moreover, energy changes in chemical reaction, some important metals and their compounds, sulphur and its compounds. Preparation of nitrogen gas and its properties, the halogens, acids, bases and their neutralization are also can be studied widely.

For the organic chemistry, they have to study preparation of alkenes, alkanes, alkynes, alcohols and their equations as well as graphic formula, electron dot cross formula and nomenclature in details. Chemical fertilizers are the most important in the sector of modern agriculture. Production of nitrogen fertilizer and phosphate fertilizer can be learned in the chapter of chemistry in society.

Teaching of chemistry in upper secondary level of the standard number of periods is 5 periods per week for the Standard Nine and Ten. One unit school hour is a class period of 45 minutes. Generally, students have to take 180 periods per year and 135 hours for the total units of school hours.

In upper secondary level, students need to sit at least 5 chapter-end tests during the school academic year, which is from June to February. Four times chapter-end tests for the first semester (from June to

October) and one time semester end examination for the second semester. But the Tenth Standard students have to sit not only 4times chapter-end tests and one time semester end test, but also matriculation examination held by the Myanmar Board of Examinations.

25 marks for each chapter-end tests and time allowed are 45 minutes. 50 marks for the semester end examination and time allowed is 2 hours for the Ninth standard and Tenth standard.

Both of the Ninth Standard and Tenth Standard are taught from chapter 1 to 10 in the first semester, the rest of the chapters and revision exercises are taught in the second semester.

Nowadays, students can be studied chemistry not only in classroom, but also through Electronic Data Broad casting System like Japan. The Ministry of Education, in cooperation with the Ministry of Information, was made arrangements to give lectures for the respective subjects to the students of upper secondary level (10th Standard) who will enter the matriculation examination, through Broadcasting System at the Learning Centers of the basic education school.

In Japan, curriculum standards for elementary and lower secondary schools are prescribed in the Course of Study issued by the Minister of Education, Science, Sports and Culture. The minister decides the Courses of Study on the basis of recommendations from the Curriculum Council which is composed of teachers, researchers and other learned experts. The Courses of Study provide the basic framework for curricula : the aim of each subject and the aims and content of teaching at each grade. Each school organizes its own curriculum on the basis of the Courses of Study, taking into consideration the actual conditions of the community and the school itself, and the developmental level and characteristics of the students. Upper secondary school courses are classified into three categories : General, Specialized and Integrated courses. The specialized courses may be further classified into agriculture, industry, commerce, fishery, home economics, nursing, science-mathematics, physical education, music, art, English language, and others. The integrated courses provide general and specialized education in an integrated manner or the elective basis of the students. The course of Chemistry IA is a course with an emphasis on our daily human life, featuring phenomena, substances and industrial products usually observed and used in our home life. This viewpoint had not fully been

established in the former Chemistry and it is intended for the students who neither would nor pursue higher education in colleges or universities or whose future career goals are not in the scientific field. Another special feature of this course is the addition of a new sub-topic concerned with environment problems. The course Chemistry IB is a standard course to teach introductory and fundamental chemistry, reformed from the former Chemistry by eliminating a few parts (reaction rate, chemical equilibrium, and polymer chemistry) which in turn composes the main parts of Chemistry II. Chemistry II is an advanced course for the students who are interested and want to learn more about chemical science. In both courses, strong emphasis is laid on experimental work as "Project Study" (Kadai kenkyu) in Chemistry IB and as Case Study in Chemistry II. The objectives of teaching of Chemistry IA is to make students develop scientific ways of viewing and thinking as well as understand chemical matters and phenomena and the application of chemistry, through inquiring activities of chemical matters and phenomena which are closely related with our daily life, and recognize the relationship between the progress of science and technology and human life.

The objectives of teaching of Chemistry IB are to make students develop their abilities and attitude to chemically investigate as well as understand the basic concepts, principles and laws by conducting observations and experiments on chemical matters and phenomena, and foster a scientific views of nature. To make students develop their abilities and attitude to chemically investigate as well as deepen their understanding of the basic concepts, principles and laws, by conducting observations, experiments and project study of chemical matters and phenomena, and foster a scientific view of nature is the objectives of teaching of Chemistry II.

At present, the Teaching of Chemistry in Upper Secondary Schools of the standard number of credit units are; 2 credit units per week for the teaching of Chemistry IA, 4 credits units per week for the teaching of Chemistry IB, and 2 credit units per week for the teaching of Chemistry II. One unit school hour is a class period of 50 minutes. Generally, 1st Grade students of the upper secondary school, they have to take 120 credit units per year for the teaching of Chemistry IB. 40 credits for the first semester (from April to July), 50 credits for the second semester (from September to December), and 30 credits for the third

semester (from January to March). Students have to take Chapter End Test 5 times per year.

Grade I students have to learn Contents of Chemistry I, chapter 1, 2 and 3 of part I, chapter 1, and 2 of part II for the first semester. Chapter 2 of part II, chapters from part III and chapter 1 of part IV for the second semester. For the third semester, they have to learn the rest chapter of part IV to cover the courses. For the Grade II students, they have to learn contents of Chemistry II, part I for the first semester, part II and part III for the second semester and third semester to cover the study of the courses.

In Japan, numerous textbooks for schools are issued by the Ministry of Education, Science, Sports and Culture and by private publishers in accordance with provision of relevant status and course of study. Even though different schools use the different textbooks, almost all the contents are nearly the same. The presentation of textbooks can be a little difference, but the objectives of the teaching of Chemistry in each textbook are common. In stead of using Chemistry IB, some schools has been used the new textbook of Chemistry I from 2003 academic year presented by the Tokyo Shoseki Co. Ltd, Keirinkan Co. Ltd, Suken Shupan Co. Ltd and others. Some schools use supplementary textbooks for some problems in teaching of chemistry.

The purpose of this study is to compare the curriculum contents and teaching of chemistry textbooks for upper secondary level between Japan and Myanmar. In both countries, the level of curriculum contents is common. The contents of the textbooks are arranged systematically in order to the laws, principles, basic concepts, examples and explanations. There is a little difference in the explanation of each topic, some are details in Myanmar, but some are details in Japan.

For example, for the teaching of "Separation", filtration, distillation, fractional distillation, sublimation are explained with figures in Japan meanwhile the explanation of filtration, evaporation, distillation, fractional distillation, fractional crystallization, chromatography are explained in details with figures in Myanmar. And also for the teaching of "Three Phases of Substances", definition and change of states for solid, liquid and gas are in summary in Japan meanwhile definitions and change of states is explained in details in Myanmar.

But for the teaching of "Boiling Point and Melting Point", hydrogen bond and intermolecular force are explained in details in Japan, meanwhile only defini-

tion is explained in Myanmar. For the teaching of "Partial Pressure", only definition and formula are explained in Myanmar but in Japan, how to take formula and some explanations are explained in details. For the teaching of "Organic Compounds", only the introduction of aliphatic compounds, alkane, alkene, alkyne and alcohol but not in cyclo compounds in Myanmar. In Japan, many functional groups of aliphatic compounds, alkane, alkene, alkyne, alcohol, aldehyde, ketone, carboxylic acid, acid anhydride, fats and oil with cyclo compounds, aromatic compounds such as, phenol, aromatic amine, benzene, azo compound and salicylic acid, polymer compounds such as, starch, sugar and amino acid are explained in details.

There is no summary chemical experiment in the textbook of Myanmar, but some experiments and summary are given together at the end of each chapter in the textbook of Japan. Chemical Experimental textbook is separately prescribed in Myanmar.

In both countries, textbooks are changed into new curriculum according to Educational and Curriculum Reform. Textbooks of Myanmar are become wider and deeper in the contents area than the first Coordinated Science textbook. But new textbooks are easier than earlier one in Japan. In Myanmar, chemistry textbooks are written in English, so students feel the subject difficulties. Sometimes teachers need to use some explanations in mother tongue. Most of the teachers use lecture method as well as discussion method by using some teaching media. For the experimental classes, the laboratory assistant prepare for the experiments.

In Japan, textbooks are written in mother tongue, so students can understand easily and more interested in the subjects. Japan always made a great effort to build up the system of science education. With the introduction of teaching of school in science as a subject, the relationship between daily life and science was emphasized. Course contents focus the nature and natural phenomena which children can experience in

their daily life.

Students study science not learnt by heart. Their study is through many observations and experiments by groups as well as individually. They discuss their own ideas with each other as well as teachers. Teachers also try to give many facilities and resources in teaching. And then, teachers are using both active teaching techniques and active learning approach to encourage students' interest.

Other provisional opportunities are computer based active learning and science related with field trips. Therefore, students are able to get information about the science program and observing what is happening and also more positive attitude towards the subjects. They can gain a wonderful time for memorizing the subject and result in better learning. Today in Japan science teaching and learning process in elementary school emphasize more on students observations and experiments, development of student's abilities for problem solving, develop scientific way of children to viewing and thinking natural things and phenomena.

Finally, as the author N. R. is an In-service Teachers Training student, N. R. has really gained much general knowledge and many kinds of experiences about education, teaching learning processes and many others. N. R. believes that these experiences will be useful for our teaching. N. R. hopes these experiences would contribute more development and improvement of the quality of education in her country.

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