A Historical Study on the Development of Science Education in Myanmar

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Abstract：Education is essential for future development of a country. Generally, education system may be changed with respect to political and social situation in all countries. In this study, we reviewed revolution processes of Myanmar society and the science education history of Myanmar, and then we compared high school physics between Myanmar and Japan. Firstly, we reviewed the historical back ground of Myanmar. Once upon a time, Myanmar was covered by British colony policy for about 70 years. From that period, Myanmar education changed gradually until now. Before colony period, Burma (Myanmar) used mainly monastic education not similar to later school system. During colony period, the British government wanted to introduce their system of elementary education to Burma. They also figured out the western education. After departing colony, education system was formed, and according to this, primary schools and post primary schools were opened. After independence, primary schools, middle schools and high schools were opened. However, they were changed step by step along many programs. Science subject was introduced from middle school level in 1993. Science subjects were taught from primary school level to university level since 2000. Secondly, the contents of the present 11th physics textbook were compared to Japanese textbook Butsuri II. It is clarified that Almost contents are overwrapped between two textbooks but the order and dealing of contents in each textbook are different.

1. Introduction

The aim of this study is to clarify the characteristic properties of school education systems of Myanmar. Generally, education system connects closely with political and social situation in almost all countries. That is, when the regime of the country changes, educational systems are always changed. We want to focus on how to introduce the western school system after British entering to Burma (Myanmar). At first we review a brief review of Myanmar historical back ground. Then we review the education history in order corresponding to 4 periods.

2. Historical Background of Myanmar Society

Around 200 years ago, the British entered to Burma through three wars and took over the whole Burma. Then Burma was covered by British colony policy. These three wars were 1st war (1824-1826), 2nd war (1852) and 3rd war (1885). Finally Burma last king exiled to India, then Burma was ruled as one province of British India. In early 1900s, Burmese nation became second class citizens in their own country. First citizens are the British. In British 'divide and rule' policies, Burma lost traditional authority structures. The word 'divide' means that the different political rules are forced between the mountain area and the plain area in Burma. In 1920, the university students protested against the education plans. The strike marked the entry of students into national politics. In1937, the administration of

Burma was separated from India[1].

During the 2nd world war, Japanese invasion to Burma forced British rule to entirely end. After the 2nd world war, 4th January 1948, Burma gained independence and chose not to join the British commonwealth. In the struggle for independence, some Burmese leaders, including General Aung San, resisted against the policy that there was a considerable likelihood of their remaining inside the commonwealth[2]. After fifty years of independence it is clear that if Burma had chosen the commonwealth, there might have been some advantages such as educational development and economic cooperation, but some possible intervention by the British government might be occurred in political dispute and be ignored the rights of minorities. Burma showed a high sprit of self-reliance by not doing so.

Accordingly, British colonial police influenced to Myanmar education systems.

3. History of Myanmar Education Systems

Reviews of the Myanmar education system are divided to 4 periods, Before Colony, During Colony, Transitional Period and After Independence. We discuss a character of education systems at each period.

3.1 Before Colony (Monastic Education)

Myanmar society and culture developed widely by relating with their profound belief in Buddhism. As Myanmar literature also initiated by this religion and the monks who were the leaders of religion had preserved the literature.

From the initial period of Bagan era to the later period of 18 AD, Buddhist monasteries existed as being libraries where people could find education, or as being places where academic and handicrafts, manual skills could be learnt[3]. There was a monastery in every village. It is common that new village without monastery is not complete with characteristics of typical village according to the Myanmar people's ingrained belief. Even the village from the far flung area had at least one monastery. The monastic education connected tightly to religious thought.

3.2 During Colony (Foreign Missionary Education)

(1) Initiation of Missionary School

To open schools for the propagation of Christianity, foreign missionaries arrived to Myanmar before the period of Konbaung era. In 1721 Roman Catholic Barnnabite fathers started the education in Thanlyin. American Baptist missionary Judson and his wife also arrived to Myanmar in 1813, and his wife opened missionary school at Kyaikkami in 1826.

These kinds of missionary school gradually became prospered. When the three government schools were present at 1826, missionary schools had already multiplied even 204 schools[4]. While missionary school increased, new conflict between British and Myanmar occurred.

(2) Opening of Government Schools

After the 1st Anglo-Burmese war of 1826, government schools were opened with the objectives of educating the western education in Rakhine and Thnintharyi regions. The first school was opened in Tanintharyi's coastal city Mawlamyine, the second in the sea port of Kyaukphyu and the third in Sittway. After 14 years of the 2nd Anglo-Burmese war, the 4th school was opened at Pyi, Irrawaddy riverside city in Pegu region. Duing the British occupation 1826-1866, it was found that only four schools were opened[5].

(3) Opening of Education Department

British government started to organize an educational department. The establishment of the schools was originally brought to the notice of government and the education department was formed in 1866. This department consisted of one director of publish instruction and four circuit teachers. They imparted a higher knowledge of grammar, arithmetic and land measuring to majority of people in the monastery schools without hurting the prejudices of the religious inmates. The director himself and one clerk stayed in the office and 4 teachers went out to schools[6].

The principal duty of assigned circuit teachers was also to convince the monks of the basic knowledge about elementary subjects. Then the outlook of British was the requirement of primary education for Myanmar people as a priority at that time. They seemed to assume that the British government did not need to open anymore schools as Myanmar already had monasteries in towns and villages. Even if they did so, they could have some troubles with the monasteries.

Moreover, the British government figured out that if the monasteries accepted their system of elementary education, it would be more appropriate by distributing the books of arithmetic, land measuring and geography translated into Burmese. The British government also figured that it would be cost effective for them if they could introduce the western education to the elementary education by basing Buddhist monasteries.

It can be found in the annual report of British Burma administrative which was submitted in 1866-1867 that "Mr. Hough, the first director, confined his attention to the monastery schools, and did his best to remove any prejudices which might exist on the part of Buddhist priests to the introduction of a better system of education, though he was compelled very shortly after his appointment to leave Burma on account of his health. Since then, Mr. Hordern, the present director of public instruction has devoted considerable attention to the subject..."[7].

But it could be found that an approach of imparting western education encountered with failure and was not agreeable to Myanmar. Most of Buddhist priests themselves might not cooperate and accept the intervention of foreign culture. So, the British government had to find the other way. By helping and supporting the lay schools, missionary schools or school teachers, they kept trying to continue their program.

(4) Responsibility for Education

According to the British education policy, by using the experience which was practiced at India, the Myanmar education department devised the way by which the government budget as little as possible. These devised ways were following three:

i) By opening some government schools which were administered directly by the government. They were only four middle schools from 1826 to 1866, during British subjugation to lower part of Myanmar.

ii) By supporting the schools which were arraigned by private program (including missionary schools).

iii) By supporting the majority monastery schools, lay schools, and vernacular schools that were placed under the supervision of district, municipal and town committees.

As a matter of fact, the British's colonial education was not to take responsibility of the required education for all Myanmar nationals.

The education department materialized Myanmar education by the above mentioned Grants-in-aid System of the British government, thereby monastery schools and lay schools

became Vernacular Schools. And the missionary schools also gradually became Anglo-Vernacular schools at which both English and Burmese were used[8].

(5) Founding of one Government High School

As there was no government high schools until 1873, the British government became aware that it needed to found one government high school at Rangoon (Yangon). One government high school was founded on March 2nd 1874 at Rangoon. In that academic year, there were 10 high school students, and then two students passed the entrance examination of University of Calcutta[9]. The college education started from this school in 1878. When Rangoon University was founded in 1920, this Rangoon government collegiate school became one of the two constituent colleges.

(6) Founding of One Baptist College[10]

There was still another contemporary missionary school such as the above mentioned school. This was Baptist High School founded by American Baptist missionary on May 28th 1872. In 1892, father J.N Cushing was appointed as a principal of the school and initiated for the realization of college. One of the students in this school passed the entrance examination of Calcutta in 1893. The Baptist school was also called Cushing School. Afterwards, this school was changed to Baptist college and was renamed as Judson College in 1918.

3.3 Transitional Period 1945-1948

Before the 2nd world war, there were following three types of school in Burma:

- vernacular school (Burmese language only),
- Anglo-vernacular school (Burmese and English as 2nd language),
- English school (English and Burmese as 2nd language).

Total number of school was 6854 in Myanmar during the colony. 6552 (96%) of those were vernacular schools (251 High, 863 Middle and 5438 primary), 215 (3%) were Anglo-vernacular and English schools (102 High, 106 Middle and 7 Primary), and 87 (1%) were government schools (38 High, 7 Middle, and 42 Primary)[11].

Therefore, pre-war education did not guarantee an equality of opportunity in education for all children.

Soon after the return of the British government, in 1945, the department of education was formed to implement Simla Scheme of educational rehabilitation financed out of the British military budget. According to this, 42 post primary schools and 2060 primary schools were opened. In 1947, the education reconstruction committee was chaired by the Honourable Sir Htoon Aung Gyaw. He reported the review of education system of Burma[11]. The report said that the whole education system should be provided and controlled by each state. It also said that three separate types of schools must be welded in to one uniform system. This implied the abolition of state grants-in-aid, privately owned Anglo-vernacular and English schools. Also the different grades and kinds of teachers were consolidated into a more homogeneous teaching body. Not only the ordinary teacher but also the specialist teachers were embraced. Later teachers were required for the re-designed curricula and for the reconstructed school system. However, the report allowed mission bodies and private interests who wished to continue to maintain private schools with their own expense. The report also allowed monastic schools to continue. The report also emphasized the reorganized system of schools that consisted of the followings:

• primary school (standard I to V) for children aged 6 to 11,
• post primary school (standard VI to IX) for children aged 11 to 15,
• pre-university school (standard X to XII) for children aged 15 to 18.

In the primary and post primary schools, both English and Burmese regarded as important subjects from standard I to university stages. English continued to be main medium of instruction.

3.4 After Independence (1948-2008)

(1) From 1948 to 1962

On June 1st 1950, a new policy was initiated for implementation. The salient features of the scheme initiated were as follows:

• amalgamation of the post-primary and primary schools to form complete units teaching from the infant to the 9th standard,
• revival of middle schools teaching from the infant to the 7th standard,
• re-classification of primary schools' teaching from the infant to the 4th standard.

Above three schools used the vernacular as the medium of instruction. English was introduced to a post primary stage as a compulsory 2nd language.

The new policy also initiated a scheme for free education for all pupils in state schools, from primary to university level. Private schools were allowed in their own school buildings under the registration of 'Private schools Act 1951'. A pilot project for compulsory primary education was introduced in the suburbs of Rangoon for two years. In 1953, the government launched the new education plan as one of the ten 'Welfare Plans'[(11)].

The new education plan (5-3-3 system) consisted of followings:

• nursery school for children aged 3 to 5 (private provision),
• primary school (standard 0 to IV) for children aged 5+ to 10+,
• middle school (standard V to VII) for children aged 10+ to 13+,
• high school (standard VIII to X) including agriculture and technical high schools for children aged 13+ to 16+.

In the middle schools, the following subjects were introduced in the curriculum: carpentry, technical and commercial subjects for urban schools, and animals husbandry and agricultural subjects for rural schools.

In the high schools, the following subjects were introduced: pre-medical subjects for both boys and girls, general workshop for boys only, domestic science (including home nursing) for girls, and business and commercial training for boys and girls[(4)].

(2) From 1963 to 1988

In 1964, the system of education was reorganized[(1)]. The structure of the 'New System of Education' comprised: (a)basic education, (b)technical, agricultural and vocational education, and (c)higher education. In the basic education, school system changed from 5-3-3 to 5-4-2 system that consisted of:

• primary school (standard 0 to IV) for children aged 5+ to 10+,
• middle school (standard V to VIII) for children aged 10+ to 14+,
• high school (standard IX to X) for children aged 14+ to 16+.

The use of Burmese as the medium of instruction still remained. English was taught as a second language from the 5th standard. Children had to sit examinations at the end of each standard based on a 'pass- fail' system. National examinations were at standard VIII

and X. At standard IV there was a township level exam. Exam results at standard VIII were placed in two categories, A-list and B-list. A-list students could study science subjects at high school and B-list students could study only arts subjects. As a result of this policy, about 70% of students continued the science route and 30% the arts route. In the science stream, the combinations of subjects were Burmese, English, mathematics, physics, chemistry and biology. There were 2 combinations in the arts stream. The first one consisted of Burmese, English, mathematics, economics, history and geography. The second one consisted of Burmese, English, optional Burmese, Additional English, history and geography. Standard X exam selected A-list and B-list. A-list students were entitled to apply for university and science students with high marks could enter to higher level universities such as medicine. B-list students were entitled only for vocational institutes. Thus, children's examination results at an early age determined the shape of their adult life.

(3) From 1989 to 2008

A UNICEF report shows that almost 40% of children never attended school and almost three quarters failed to complete primary education in Burma about 1989-1990[12]. About in 1993, the curriculum of primary schools consisted of Burmese, English and mathematics from standard 0 to II, and Burmese, English, mathematics, history and geography for standard III and IV. Primary school curriculum was fact-oriented, overemphasizing preparation for secondary education rather than the mastery of basic skills, such as literacy, and thinking and reasoning skills, as its main objective. Science is introduced at standard V. Burmese, English, mathematics, science, history and geography are taught from standard V to VIII. There are no longer science route and arts route after the standard VIII exam in 1993. Students learn both arts and science at standard IX and X. They are Burmese, English, mathematics, science (physics, chemistry, biology) and social (history, geography, economics).

Text books of mathematics and science for standard IX and X are in English, and the medium of instruction is both English and Burmese. This was introduced since 1991. Before 1991, all text books of Basic Education were in Burmese. Arts subjects are still now in Burmese. There is a big gap between Standard VIII and IX for children who face higher level subjects with science text books in English.

In the academic year 2000-2001, high school curriculum changed to following 7 subject groups:

1) Burmese, English, mathematics, physics, chemistry, economics,
2) Burmese, English, mathematics, geography, history, economic,
3) Burmese, English, mathematics, geography, history, optional Burmese,
4) Burmese, English, mathematics, history, economics, optional Burmese,
5) Burmese, English, mathematics, history, physics, chemistry,
6) Burmese, English, mathematics, optional Burmese, physics, chemistry,
7) Burmese, English, mathematics, physics, chemistry, biology.

After finishing standard VIII, student can choose one of the above 7 groups. Now Burmese is called Myanmar. Among them, group 7) is pure science.

(4) Myanmar Education System at Present Situation

There are two main sub-sectors in the education sector, basic education and higher education.

Now we will discuss about basic education. Myanmar basic education system consists of

primary level and secondary level.

Pre-primary education is provided by schools operated by ministry of education, ministry of welfare, NGOs and the private sector. Each educational level is as follows:

- pre-primary…age 3 to 5,
- primary (lower level)…age 5 to 7…Grade I to III,
- primary (upper level)…age 8 to 9…Grade IV to V,
- secondary (lower level)…age 10 to 13…Grade VI to IX(middle school level),
- secondary (upper level)…age 14 to 15…Grade X to XI(high school level).

However, primary school have Grade I to V, middle school also have Grade I to IX, and also high school have Grade I to XI.

At the end of upper secondary level, all students sit for the matriculation examination to enter university or institute or college level.

At lower primary level, all students must study core subjects (Myanmar, English, mathematics, basic science and social study) and other subjects (life skills, natural science, morals and civics).

At upper secondary level, core subjects are Myanmar, English, mathematics, history, geography and general science. The other subjects are life skills, morals and civics.

At lower secondary level, main subjects are Myanmar, English, mathematics I and II, general science, history (world and Myanmar) and geography. The other subjects are life skills, morals and civics.

After finishing lower secondary level, students have to choose one among the following seven groups at upper secondary level:

① Myanmar, English, mathematics , physics, chemistry, economics,
② Myanmar, English, mathematics, geography, history, economics
③ Myanmar, English, mathematics, geography, history, optional Myanmar
④ Myanmar, English, mathematics, history, economics, optional Myanmar
⑤ Myanmar, English, mathematics, history, physics, chemistry
⑥ Myanmar, English, mathematics, optional Myanmar, physics, chemistry
⑦ Myanmar, English, mathematics, physics, chemistry, biology.

4. High School Physics of Myanmar

The latest industrial development in the world depended on advanced science. Myanmar people think that physics effectively contribute to the development. So we try to survey the Myanmar physics textbook, because high school students in science course are most important human resources to develop the future industrial society. Scientific talent of young power will be key to attain to a wealth of country. we list up the contents of text and we examine if the contents of physics textbook are suitable and similar to modern textbook like a Japanese text book.

4.1 Contents of Physics High School Textbook in Highest Grade XI

Table 1 shows the contents of physics Grade XI which is highest grade in school[13].

Table 1 *Contents of High School final Physics in Myanmar Textbook*

Part I Under Mechanics

Chapter 1 Work done and Power
- 1-1 Power and its Units
- 1-2 Efficiency
- 1-3 The Stretching of Threads and Strings

Summary
Exercises

Chapter 2 Pressure
- 2-1 Atmospheric Pressure
- 2-2 Pressure in a Liquid
- 2-3 Manometers
- 2-4 Archimedes' Principle
- 2-5 Pascal's Law

Summary
Exercises

Part II Under Heat

Chapter 3 Transfer of Heat
- 3-1 Heat Conduction
- 3-2 Heat Convection
- 3-3 Heat Transfer by Radiation

Summary
Exercises

Part III Under Waves and Sound

Chapter 4 Vibration of Strings, Resonance and Vibration of Air Columns
- 4-1 Stationary Waves
- 4-2 Vibrating Strings
- 4-3 Resonance Column and Organ Pipes
- 4-4 Energy and Momentum in Waves

Summary
Exercises

Part IV Under Optics

Chapter 5 Introduction to Light
- 5-1 The nature of Light
- 5-2 Velocity of Light
- 5-3 Refraction of Light
- 5-4 Laws of Refraction
- 5-5 Refractive Index

Exercises

Chapter 6 Refraction, Diffraction and Interference of Light
- 6-1 Refraction at a Curved Surface
- 6-2 The Lens Equation
- 6-3 Refraction through Lenses
- 6-4 Power of a Lens
- 6-5 Diffraction and Interference

Exercises
Additional Exercises

Chapter 7 Optical Instruments
- 7-1 The Camera and the Eye
- 7-2 A Magnifying Glass
- 7-3 Compound Microscope
- 7-4 Astronomical Telescope
- 7-5 Terrestrial Telescope
- 7-6 Slide Projector and Photograph Enlarger

Summary (optics)
Concept Map
Exercises

Part V Under Electricity and Magnetism

Chapter 8 The Electric Field
- 8-1 Coulomb's Law
- 8-2 Electric Field and Electric Field Intensity
- 8-3 Electric Lines of Force

Exercises

Chapter 9 Electric Potential
- 9-1 Electric Potential and Potential Difference
- 9-2 Electric Potential of the Earth
- 9-3 Potential between Two Parallel Charged Plates

Exercises

Chapter 10 Capacitance
- 10-1 Capacitors
- 10-2 Parallel- Plate Capacitor
- 10-3 Energy of the Capacitor
- 10-4 Capacitance of Parallel-plate Capacitors

Exercises

Chapter 11 Current and Electric Circuits
- 11-1 Current and Effects of Current
- 11-2 Ohm's Law and Electrical Resistance
- 11-3 Resistors in Series
- 11-4 Resistors in Parallel
- 11-5 Electromotive Force and Electric Circuits
- 11-6 Batteries in Series and in Parallel

Concept Map
Exercises

Chapter 12 Electrical Energy and Power
- 12-1 Electrical Energy and Power
- 12-2 Joule's Law of Electricity and Heat
- 12-3 Some Application of the Heating Effect of Current
- 12-4 Dangers of Electricity

Concept Map
Exercises

Chapter 13 Electromagnetism
- 13-1 Magnetic Field due to an Electric Current
- 13-2 Electromagnets
- 13-3 Ammeter and Voltmeter
- 13-4 Electromagnetic Induction
- 13-5 Principles of House Writing

Summary (Electricity & Magnetism)
Concept Maps
Exercises

Part VI Under Modern Physics

Chapter 14 Modern Physics
- 14-1 Thermionic Emission
- 14-2 Diode, Transistor and Integrated Circuit
- 14-3 Electronic Logic Gates
- 14-4 Radio, Television and Computers
- 14-5 Cathode Rays
- 14-6 Cathode Ray Oscilloscope
- 14-7 X-rays
- 14-8 Radioactivity
- 14-9 Models of the Atom
- 14-10 Uses of Radioactivity
- 14-11 Nuclear Energy

Exercises
Exercises: Using Radioactivity
Appendix: A Glossary of Nuclear Terms
Concept Maps
Answers to Odd Numbered Problems
Appendix

4.2 Character of Physics Textbook Contents in Grade XI

The contents of physics Grade XI are covered the main contents of physics at high school level and well designed. Those are similar to Japanese physics textbook, Butsuri I and II, but slightly different from Japanese textbook. It means that when those contents are imparted to student effectively with the experimental tools students can master the high school physics as well as students of developed country. But it is not studied in this

research to clarify that physics teaching in the Myanmar high school is performed effectively. In fact, Myanmar physics education provided the experiment handbook. But we still remain the research of the real teaching and real learning situation.

4.3 Comparison to Japanese High School Physics Textbook

In Myanmar, high school physics text books are published by only education department of ministry of education. In Japan, many kinds of high school physics text book are published by many private companies. But Myanmar text book is only one kind. Myanmar physics texts' covers have only green and white color, but Japanese physics text books' covers are colorful and can attract children. Inside pages of Myanmar text books are black and white only, but inside of Japanese texts, all pictures are colorful.

About the contents of textbook, some contents are same between Japan and Myanmar, but some are different. We described about the similarities and the differences between Japanese physics text and Myanmar physics text by comparing one title from these books as examples. We compared chapter 8 in physics Grade XI of Myanmar textbook and chapter 1 of part II in Butsuri II of Japanese textbook printed by Keirinkan Publisher. These chapters are about the Electric field.

In Myanmar physics text, main title of chapter 8 is the electric field. It's sub-titles are Coulomb' Law, Electric Field and Electric Field Intensity, and Electric Lines of Force. In Japanese physics text, main title is Electric Field and Potential. It's sub-titles are Electrostatics, Electric Field, Potential and Capacitor. Almost contents are same in both textbooks. Lightning Conductor is contained in Myanmar textbook, but not in Japanese textbook.

In Myanmar text, at first, it states Coulomb's law and later explains about electric field and electric field intensity. In each sub-title, the explanations are long and there are 10 sample problems with solutions. At the end of this chapter, there are 33 problems in the exercises. This chapter has some drawing pictures, however there is no photograph with colors.

In Japanese text book, at first, it states electrostatics and later explains about electric field. In each sub-title, the explanations are not so long and not so short, and there are 7 sample problems with solution. At the end of chapter, there are 8 problems in the exercises. This chapter has many colorful photographs and some drawing pictures, and can attract children. The main difference between Myanmar and Japanese text is that there are many experiments in Japanese text but there is no experiment in Myanmar text.

Japan and Myanmar are a little different in teaching materials. Because Japan is developed country and Myanmar is developing country. We think each physics textbook form is different in each country, but these contents in physics textbook are overlapped and almost same because physics is common in the world.

5. Discussion

Before colony period, Myanmar sustained around the axis of Buddhism, and formed own culture and education by monks. After western colonial policy attacked to Asian country and many weak countries which kept higher level culture was invaded easily. Myanmar could not avoid these waves, but tried to resist the foreign effects and tried to keep the traditional habits. We like to remark that the consistency sprit in Myanmar people was not conquered entirely though strong foreigners entered into Myanmar. Above all strong forces of British suffered to traditional Myanmar at colony period but never gave up the religious

belief of Baddish like a monastery school. Meanwhile, Myanmar has shifted old education system by monk to modern school system by own way. That is, Myanmar education system has developed in the different style from other Asian countries. Now, outline of educational system formed and still remained the room to propel to higher quality of education performance.

The other hand, we would like to point out that Myanmar Education officers make attention to science. Among the groups shown above 3.4(4), combination group⑦ is pure science. Almost all students receive this pure science, because these students can enter highest level of university such as medical university. Therefore science subjects are taught from lower primary level by Myanmar language to Grade IX. Then science subjects are taught at Grade X and XI by English language.

Physics contents of high school textbook Grade XI were well designed because common contents are taught in almost every country. Some kinds of science subject like biology are reflected with many regional materials. Meanwhile same physics materials are used in physics teaching in almost every country.

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