The Analysis of Intended Mathematics Curriculum of Primary Schools in Mongolia

0. Introduction

The general interest behind this work is to reveal the essential characteristics, expected form teachers and students, in the intended mathematics curriculum of primary school in Mongolia.
The intended mathematics curriculum gives an opportunity to educators, schoolteachers, students, parents, and people who directly or not directly related to it, to know/understand the policy of Mongolian Education, especially, mathematics education in a country. By the intended mathematics curriculum study, we can also see the overall imagination of implemented mathematics curriculum of schools in Mongolia.

1. The Concept of Curriculum

Curriculum can be considered as a multifaceted concept with each aspect linked to a context or level of educational activity (e.,g, Robitaille et al., 1993). Many educational researchers have tried to define the term curriculum. Nevertheless, they have not performed a suitable definition of term curriculum. It is still a unanimous aspect of educational research. A narrow view of the curriculum development as merely the production of new syllabuses and texts is though unhelpful for the development. Neither content nor method can be viewed in isolation-the assessment of the course and students must also be considered (Howson, Keitel, and Kilpatrick, 1981).

> Curriculum, therefore, must be more than syllabus-it must encompass aims, contents, methods, and assessment processes. One cannot truly talk, then, of a national curriculum for it depends upon individual teachers, their methods and understandings, and their interpretations of aims, guidelines, texts, etc (Howson.,et al, 1981, p.2)

In the TIMSS,as well as other studies of IEA, curriculum is considered in a broad meanings. The different levels of the curriculum are, in the IEA model, Figure 1, labeled as the intended, implemented, and attained curriculum (Robitaille., et al, 1993).

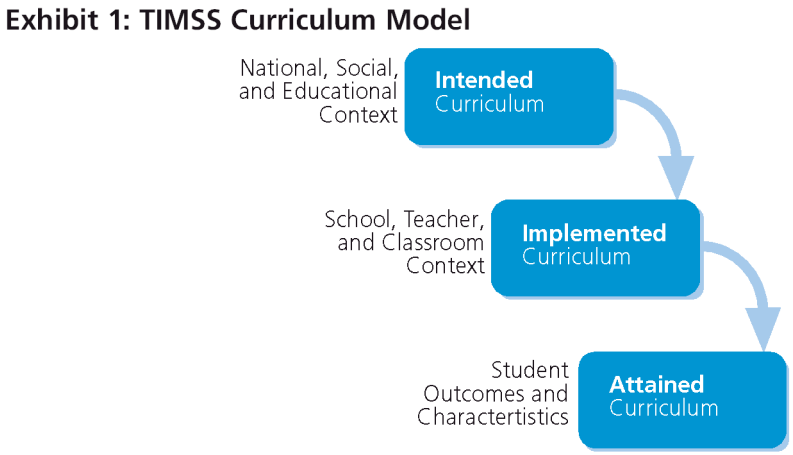

Figure 1. TIMSS Curriculum model

These represent, respectively, the mathematics that society intends for students to learn and how to the education system should be organized to facilitate this learning; what is actually taught in classrooms, who teaches it, and how it is taught; and, finally, what it is that students have learned, and what they think about mathematics (TIMSS, 2006).

The *intended curriculum* is at the educational level. It is seen in national policies and official documents reflecting societal visions, educational planning, and official or political sanctioning for

educational objectives (Robitaille et al., 1993; Schmidt et al.,). In the TIMSS curriculum study, ``…the intended curriculum is embodied in the textbooks, in curriculum guides, in the content of examinations, and policies, regulations, and other official statements generated to direct educational system`` (Robitaille et al., 1993, p.27).

The *implemented curriculum* is at the classroom level. Thus, intention and objectives at the level of teacher and classroom activity are considered as the implemented curriculum (Scmidt et al., 1997). The implemented curriculum is influenced by, but not identical to, the intended curriculum. It is the mathematics content, as it is interpreted by teachers and available to students. The implemented curriculum concerns institutional arrangement such as teaching practice, aspects of the classroom management, use of resources, teacher attitudes and backgrounds (Robitaille et al., 1993).

The *attained curriculum* is on the student level. The result what takes place in classrooms at the level of student outcomes is therefore considered as the attained curriculum. Part of these student attainments can be documented through academic achievement and student belief measures (Schmidt et al., 1997). The attained curriculum also concerns institutional arrangements students make for their own learning. At the individual level, it is about the amount of homework the student does, the effort the student expends the student's classroom behavior patterns and so on. These factors are greatly influenced by both system-and classroom-level arrangement but differ in that the individual student has some control over these arrangements (Robitaille et al., 1993).

2. General Policies of Mathematics Curriculum

Representatives for the intended curriculum in Mongolia are the official documents, offered by Curriculum Council in charge of Ministry of Education, Science, and Culture. These are two documents mathematics standards and the content framework, which is a document with lists of topics of contents grade by grade. The concept standard is introduced by the educational projects employed after 1990`s. The mathematics standards describe the overall contents, goals, and assessment standard for compulsory schools. Before 1990, in socialist era, the mathematics program/plan has used in education system of Mongolia. Relating to these two different aspects of curriculum, the national goals of education in socialist society interpreted by the center and in democratized society interpreted by the periphery. The view of knowledge differs between these two societies. In socialist society, people are expected to know deep knowledge of science and form citizen with communist behavior. Nevertheless, in democratized society, people are expected to know the method, solves the real life problems and form skilled, well behaved, responsible, and creativity citizen.

The content as well as the characteristics of mathematics program/plan has drastically changed in last twenty years based on the change of philosophy of society. The mathematics program/plan shifted to mathematics standards. Not only the contents but also the pedagogical part of mathematics program/plan has changed. Let me show the curriculum changes in Mongolia (Table 1).

The idea of curriculum was initiated in 1921 based on the rule of first primary school. The content of the curriculum included reading, writing, history of nature and world, health and history of universe. Because of lack of schools, teaching and learning materials and teachers, teachers have worked out the content of curriculum. Later, the number of schools and teachers has increased and the curricula of primary and secondary schools were made by Commission of Mongolian teachers in 1924. In 1926, the curriculum of primary and secondary schools has revised in due to the new structure of school system. In order to reflect polytechnics education in curriculum and school activities, the primary and secondary school curriculum was modified in 1963 and 1965. After that the structure of school system was re-changed from 4+4+3 to 3+5+2. Taking into account the structure change, development of Mongolian society, economics, and students' cognitive ability, the curriculum of primary and secondary schools has modified in 1972. According to this curriculum, practical works done by students were included. By the curriculum renovation of 1982, the ministry of education has made several changes in curriculum. In order to sophisticate the education system, the government of Mongolia has changed the education structure and children started to enroll primary schools from the ages of 7 in 1986. Because of this change, the curriculum improvement has been discussed in 1986.

From 1990, the features of democratization were influencing not only society but also education policy. Since the early 1990s, it has been undergoing many changes as the country shifts from a

centralized economy and one-party system to a market-oriented economy with a more pluralistic system of government. The educational system of Mongolia was modified under this changes and the standards-based curriculum reform was launched in 1998 and stiil in progress in 2003. Later the outcome-based education reform was introduced in 2003 (Gita, 2006, pp 132-133). In 2005, the school structure shifted from 10-year to 11-year and next year it is shifting 11-year to 12-year. (Table 1)

<table>
<tr><td></td><td>Basic directions and purposes of changes and modifications</td><td>Periods of didactics methodology</td></tr>
<tr><td>1924</td><td>In order to bring into conformity the Mongolian primary education with world especially European education tendency</td><td rowspan="4">1900-1930
The traditional script used to use in schools. Main instruction method was memorization, and copying. 1930-1940 new principles were introduced</td></tr>
<tr><td>1926</td><td>In order to structure the curriculum 3+4</td></tr>
<tr><td>1933</td><td>Natural science subject was divided into subjects such as biology, physics, chemistry, and geography</td></tr>
<tr><td>1938 (1940)</td><td>To bring the level of curriculum content nearer the level of USSR curriculum content</td></tr>
<tr><td>1955</td><td>To improve the science level of subjects and interconnect with practical life</td><td rowspan="3">1940-1980
The Cyrillic script was introduced. At the same time European instructional methods were imported. For instance the theory of “developing method”, programmed learning, and problem posing and solving method were initiated in Mongolia.</td></tr>
<tr><td>1963 (1965)</td><td>To increase the teaching of polytechnics education to students, concede labor discipline for students, and teach subjects of handwork such as craftsman, carpenter, and electrician</td></tr>
<tr><td>1972</td><td>To improve the science level of subjects and interconnect with practical life</td></tr>
<tr><td>1982</td><td>To improve the integration between subjects and topics, decrease the strains of content, increase the number of hours of polytechnics education, and improve the density of lesson hours</td><td rowspan="4">1981-present
Above mentioned methods have been developed and new methods like enlarging didactics units, student-centered methods were introduced. The Blooms Taxonomy method was introduced in educational evaluation. Educational experiences of developed countries were imported in the beginning of 1990</td></tr>
<tr><td>1992</td><td>To make content flexible and open, and bring the content nearer international level</td></tr>
<tr><td>1998</td><td>To introduce standards-based education system</td></tr>
<tr><td>2005</td><td>To introduce new structure of primary and secondary school 6+3+3</td></tr>
</table>

Table 1. The curriculum changes in Mongolia

Nowadays, according to the content framework of primary and secondary school, the Mongolia pursues a policy to implement educational open curriculum, founded on the standard, to improve the quality and adequacy of education. The primary mathematics is studied totally 560 hours in a year and 4 hours in a week.

3. What is the description of mathematics standards of primary school?

To consider the description, we need the components of the MoMS. The primary mathematics standards consist of a content standard, an evaluation standard, and a fundamental of developmental methodology. The main purpose of mathematics standards is to evaluate the quality of work, which plans, implements and develops the mathematics curriculum. The curriculum is made for forming skilled, well behaved, responsible, and creativity citizen in Mongolian society.

The mathematics standards meet the minimum requirements for knowledge, skills, and performances of children. These standards and a content framework are the guidelines for school curricula and textbooks.

The content standard consists of four domains; such as Number and Calculation, Algebra, Geometry and Probability and Statistics; expected skills and knowledge, objectives based on four comprehensive potentials, learning process, and continuity code of subjects. The following diagram shows the mathematics standards design.

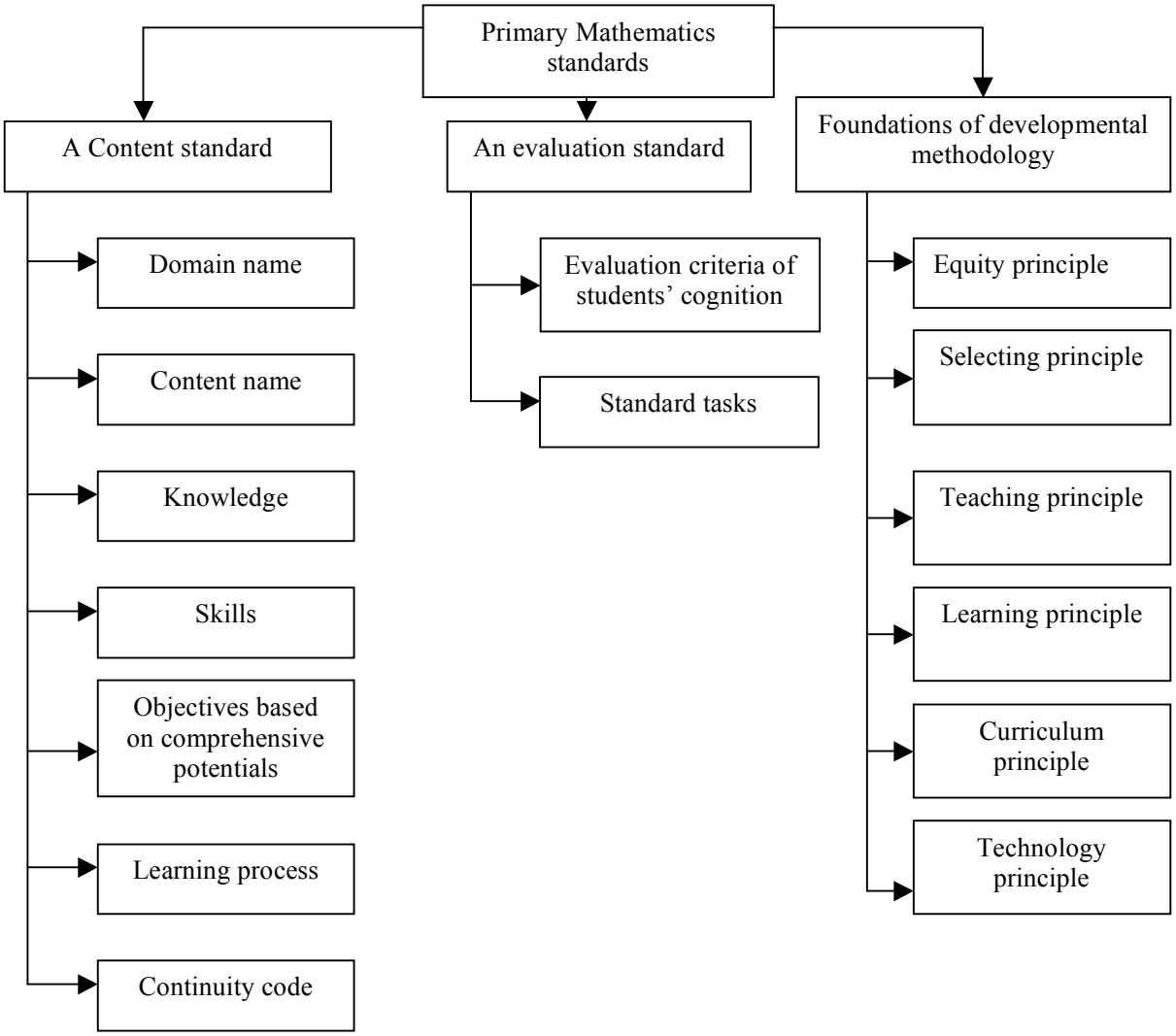

Figure 2. The design of mathematics standards of primary school in Mongolia

Each domain of mathematics standards has divided into several contents. For example, The Number and Calculation domain has divided into three contents such as number and number set, operations, and calculation. The Algebra domain has divided into three contents such as representations, functions, and equations. The Geometry domain has divided into two contents such as simple shapes and a measurement of shape and a unit. The Probability and Statistics domain has divided into 3 contents such as record and properties, experiment and occurrence, and chance and its number. Each contents has intended the expected knowledge and skills which should be acquired through students` learning process.

Every composition of primary mathematics standards has coded. For example, the 1MA1 means first domain of primary mathematics. If it is 1MA1\3, it means the third knowledge in first domain of primary mathematics. This kind of codes is used for representation of subject integration. For instance, 1MA1\3b⇔3MX4\1b means the skill to change terms without changing the result of operations integrated to b skill of Upper secondary school Mongolian language.

The most important feature of mathematics standards is the intention of four comprehensive potentials; K1-communicating mathematical language, K2- Logical Reasoning, K3- Model calculation, K4-Problem solving. The important point of the intention of four comprehensive potentials is to develop students` real life problem solving ability. All expected knowledge, skill, and learning process emphasize to develop these four potentials. By mathematics standards, these comprehensive potentials must be developed through children's learning process. Based on in which domain it has considered, each comprehensive potential includes different, knowledge, skills, attitudes, and development/form. For instance, in number and calculation domain of primary mathematics standards, the following comprehensive potentials have intended to be developed through students' learning process.

1MA1:K1- stimulates the numbers, gain knowledge of four basic operations, and use this knowledge creatively

1MA1:K2- calculates by using stimulation and operation of numbers

1MA1:K3- models the real life problems by using mathematics thinking

1MA1:K4- solves the problems by using its mathematics model

According to the mathematics standards, the formation of four comprehensive potentials is going to be evaluated in every domain based on four level of students` cognition. One of the advantages of mathematics standards is the intention of standard tasks. These tasks provide detailed information about the subject matters and the general direction of evaluation to teachers.

According to mathematics standards, needs and requirements of society, general policy of government, educational philosophy, methodology, learning psychology, didactics, sociology, and tradition of Mongolia are fundamentals of methodology development of mathematics education. The mathematics standards have determined six principles, which develop the methodology of implementation, based on above-mentioned aspects. Later we will discuss about these principles.

By the mathematics standards` design and its intention, let see the framework (Zaitin Binti, et al, 2001) of primary mathematics standards in Mongolia. The core issue of mathematics standards is to develop students` real life problem solving ability. All expected knowledge, skills, fundamental process of learning, and an evaluation standard emphasize the development of real life problem solving ability. Nevertheless, the problem solving ability is encouraged by the development of four comprehensive potentials of students. That is why; the four comprehensive potentials are the foundation of the real life problem solving development. By the MoMS, the skills, understanding of concepts, development of thinking processes, and metacognitive strategies are included in teaching and learning.

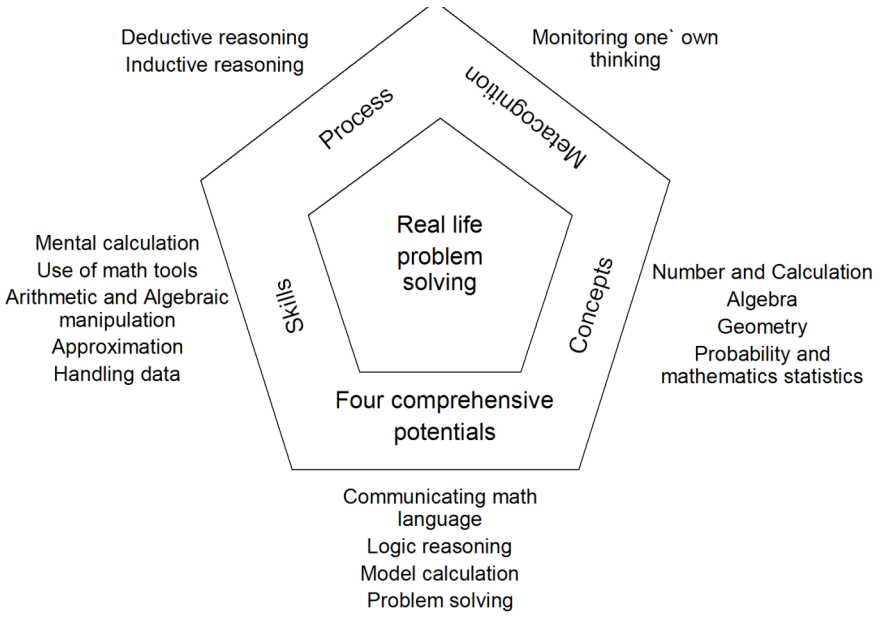

Figure 3. Mathematics standards framework of primary school in Mongolia

By the MoMS, we can see the percentage of the mathematics topics in the content framework of primary mathematics. Number of topics in the content framework draws the following chart. For instance, in grade 1, topics of the geometry are taught more than the algebra and the number and

calculation domains. The reason is here. While children enroll the primary school, even they have an experience about the length, time, and shapes before the school, now children start study them systematically, and reveal the relation each of these knowledge. Therefore, the topics of the geometry appear more than other domains.
For grade 5, the topics of the number and calculation domain are more than other domains. Actually, the number and calculation domain includes not only knowledge of numbers but also fractions and decimals.
For grade 3, the topics of the algebra domain are more than the number and calculation and the geometry domains. The topics of the algebra domain include knowledge of number and its operations, a remaining division, and knowledge about parts and its notation.
The chart shows, the topics of the number and calculation domain increase gradually.

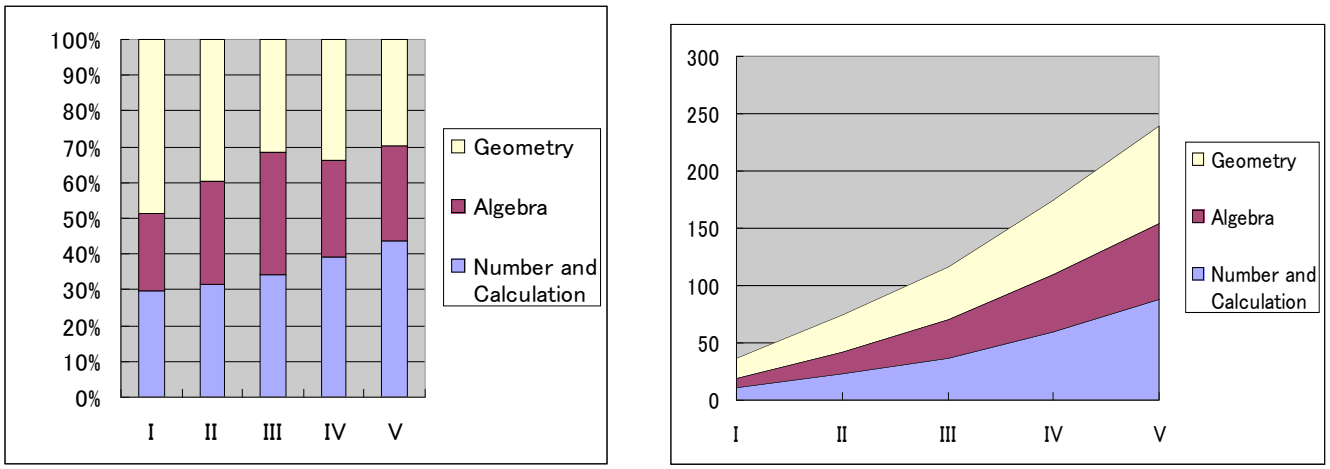

Chart 1. The percentage and the expansion of the mathematics content of primary school in Mongolia

In other hand, we can see the expansion of the mathematics contents in Primary school. The chart shows, from grade 3 the capacity of contents increase almost 2 times than that of the first and second grades.
Another important feature of the MoMS is the influence of foreign standards and curricula. To consider this aspect, I selected next curricula as main references of the MoMS except TIMSS curriculum framework.

4. The MoMS Comparison to the TIMSS Curriculum Framework, the NCTM Standards and the Japan Courses of Study

The description of mathematics standards provide the information about what knowledge, skills, and learning process are expected in a content standard, what are the main criteria in evaluation standard, and what are the expected performance, what are the principles for mathematics didactics, etc. To clarify the influences of mathematics curricula in other countries, I determined the similarities between the NCTM standards (2000), the Japan Courses of Study (1993), and the MoMS. In addition, I compared the MoMS to TIMSS curriculum framework as an international document of mathematics curriculum. First, let me compare mathematics standards in Mongolia to the TIMSS mathematics curriculum framework.

In the TIMSS curriculum study, textbooks, syllabi, curriculum guides are analyzed as representatives of the intended curriculum. Each section of every textbook, syllabus, and curriculum guide in the curriculum analysis is characterized in of terms three parameters: subject matter content, performance expectations, and perspectives or context. These are the three dimensions of the TIMSS curriculum frameworks (TIMSS, 1999).
The *content* aspect represents the content of school mathematics, partitioned into nine major categories. The *performance expectations* aspect describes the kind of performance that students will be expected to demonstrate while engaged with the content. There are five main categories, described in Figure 4.

The *perspectives* aspect has particular relevance for the analysis of documents such as textbooks. It is intended to illustrate curricular goals that focus on the development of student's attitude, interests and motivations in mathematics teaching. This aspect makes it possible to describe learning outcomes or curriculum materials that are intended to promote positive attitudes and mathematical modes of thoughts or habits of mind as well as goals are encouraging toward careers in mathematics (TIMSS, 1999).

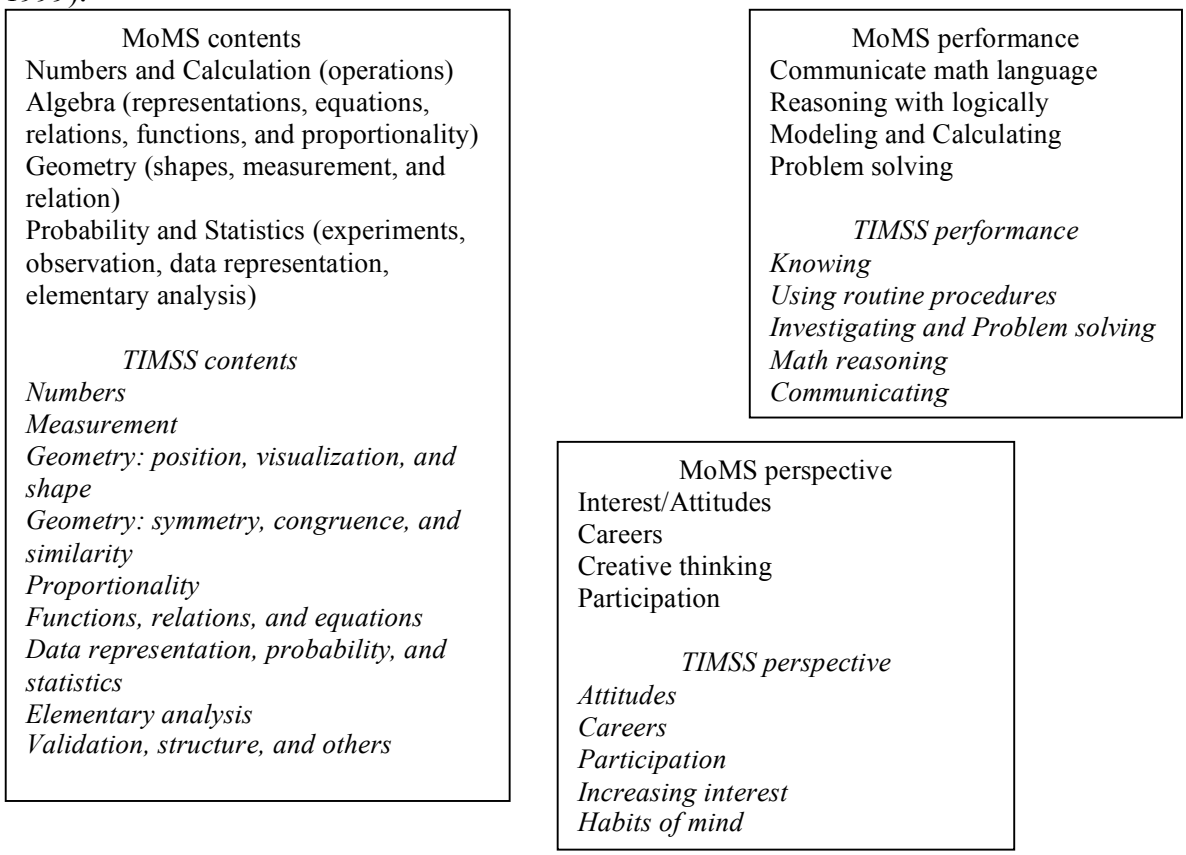

Figure 4. TIMSS curriculum framework 2006

Thus, according to the framework, described in Figure 4, the content aspect of the MoMS is fewer than the TIMSS curriculum framework. These are the *understanding about a relation such as symmetry, congruence, and similarity of shapes*, *validation, and structure*. Nevertheless, the mathematics games, puzzles, magic triangle, square, mathematics domino, etc, are emphasized in the MoMS. It has emphasized in expected knowledge and skills of algebra in mathematics standards. Each MoMS performance has included several aspects such as:

1. Communicating Mongolian and math language
    - Read, write, and speak Mongolian language systematically
    - Know and make scheme descriptions and model them
    - Read, write, and communicate math or notational language
    - Know, make, and use the notations and formulas
2. Reasoning with logically
    - Think over, and consider the appropriateness of events and stuffs
    - Recognize the reason by experiment
    - Draw conclusion and decisions logically
    - Make choice logically
3. Modeling and calculating
    - Recognize the mutual relations of properties in real life problems and situation
    - Represent mathematically above mentioned properties and model them
    - Investigate math models and conclude
    - Use the conclusions in reality
4. Problem solving

- Determine the problems
- Put forward the hypothesis about problem solving
- Intend to solve problems
- Achieve the optimal solution of problems

Being not big differences between the TIMSS curriculum framework and the MoMS means the general tendency of curriculum `rhetoric` policy in Mongolia does not lag behind the international level.

As I mentioned above, the NCTM standards (2000) and the Courses of Study in Japan (1993) are main references of the MoMS. That is why; I tried to clarify which aspects of the NCTM standards and the Courses of Study in Japan have included in the MoMS.

Firstly, *the most obvious reflection of aspects of the NCTM standards in the MoMS is the six methodological principles such as:*

1. Equity principle – makes best and responsible choice, participate in any competition fairly

2. Selecting learning content-based on needs and opportunity of individual, invariant for curriculum changes, takes into account the needs of group and society, and is scientific

3. Teaching-based on philosophy and psychology of education, learning theory、and management theory

4. Learning-is a fundamental process of cognition

5. Technology-uses the technology in teaching and learning, and uses the mathematics in technology process

6. Evaluation-assess the formation and development of students, and quality of students cognition process.

The second principle in the MoMS is not mentioned in the NCTM standards. Instead of it, a principle of curriculum has mentioned in the NCTM standards. Although both principles have almost same principles, those principles have briefly mentioned in the MoMS. Because of this brief introduction in the MoMS, *these principles are quiet difficult to understand for teachers and use in the teaching and learning process.* Other similar aspects are the involvement of expected contents except measurement content and skills. According to the MoMS and the NCTM standards, the purposes of standards are quiet different. Because of standards purposes, the intention of standards are quiet different, For instance, the NCTM standards are coexistence emphasized the teaching and learning. *The case of the MoMS, it has emphasized just learning side not teaching.*

Unfortunately, although, the Courses of Study in Japan is mentioned a reference of the MoMS, I cannot see the obvious reflections in standards. Some knowledge and skills in the MoMS are same with those of the Courses of Study in Japan. The objectives in each domain have differently intended in these two curricula.

5. Characteristics of Primary Mathematics Standards in Mongolia

Through the analysis of the MoMS, the following characteristics are observed.

I. Regarding to the structure:

1. *The primary mathematics standards consist of a content standard, an evaluation standard, and a fundamental of developmental methodology.*

2. *The mathematics standards have determined six principles to develop the methodology of implementation.*

3. *One feature of mathematics standards is the intention of four comprehensive potentials; K1- communicating mathematical language, K2- Logical Reasoning, K3- Model calculation, K4- Problem solving.*

4. *Several didactical steps should be paid more attention in implementation of the MoMS.*

To understand what structure of knowledge supports to form four comprehensive potentials through which fundamental processes of learning occurred.

To aware, any knowledge of mathematics science and its application belong to those four domains of the MoMS

To compare the MoMS of primary, secondary and high schools, identify similarities and differences of them and reveal the horizontal and vertical relationships of knowledge

5. *According to the MoMS, the constructivist approach to learning has emphasized. Therefore, teacher is a facilitator with a students-centered approach to teaching and learning.*

In 1980`s, the problem solving approach to learning and teaching considered in Mongolia (Begz, et al, 2006). Nevertheless, it did not obviously employed in classrooms. In 1995, the students-centered approach to teaching and learning imported in Mongolia through ` Danida` educational project, practically. University teachers started to introduce constructivism or constructivist approach to schoolteachers and perspective teachers and started to utilize the problem solving approach and students-centered approach coherently. The constructivist approach to learning and teaching has emphasized in the MoMS. In this case, teachers need to aware that their role is a facilitator with students learning.

6. *The students` real life problem solving ability, through four comprehensive potentials has emphasized in the MoMS*

7. *Contents of the primary mathematics is learnt by consenter manner*

First students study numbers from 0 to10, its notation, and its addition and subtraction. Next, they expand their understanding of numbers from 10 until 100. Now they can reveal the principle of place value, and can do addition and subtraction of numbers as well multiplication of numbers. After that, students study the numbers until thousand and multi digit numbers, finally. They can review their knowledge based on previous understanding about numbers, place value, and its operation. By this way, primary mathematics is learnt by four consenters such as tenth, hundredth, thousandth, and multi digit numbers. Otherwise, the knowledge of algebra, geometry, probability and mathematics statistics are learnt in every consenter. The knowledge about fraction is studied in last three consenters.

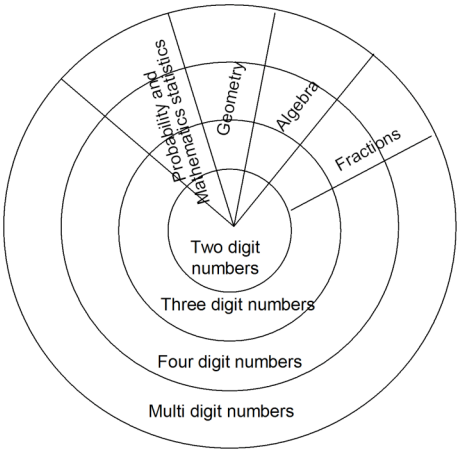

Figure 5. Consenter model of mathematics standards of primary school in Mongolia

8. *The MoMS have emphasized to develop not only content skill but also process skill of students.*

It is not difficult to observe that the MoMS have emphasized the development of content skill related to numbers, shapes, relations, and data analysis. Otherwise, the intending fundamental processes of learning and objectives, suppose to develop four comprehensive potentials, show that the MoMS have emphasized to develop a process skill of students. For instance, following content and process skills have emphasized in the number and number set content.

Content skill	Process skill
Compare an unit, a hundredth, and a thousandth of number from top of place value	Talk by observing the size and location of real things and count the things in a picture
Compare a number which means the size of one whole to a number which means the size of another whole	Communicate and calculate creatively making use of number and its comparison
	Divide a whole thing into small parties

Round a decimal	Model the real life problems related to number, number set and decimal rounding concepts by using mathematical thinking Calculate the mathematics models Draw a conclusion based on calculation of mathematics models and explain it Solve problems

Especially, I would like to consider the students` fundamental process of learning, one of the compositions, in mathematics standards. By this composition, curriculum developers want to develop students` process skills. In other hand, the standard tasks to assess the development of content and process skills are intended in the evaluation standard.

9. By the MoMS, the `rhetoric` learning model can be drawn up the following scheme.
*(*The framework was cited from the study of Zaitin and Khoon who are authors of Situated Sociocultural Mathematics Education: Vignettes from Southeast Asian Practices.)

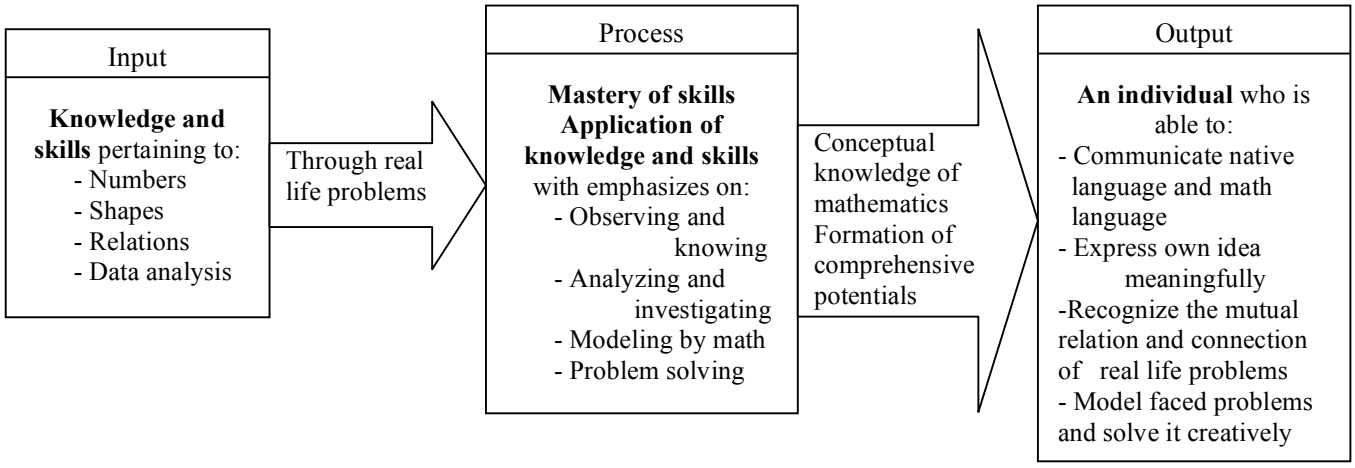

Figure 6. A `Rhetoric` model of learning process

There are factors that influence in students` learning process except knowledge and skills. Nevertheless, I considered a kind of input directly related to the MoMS. Although mathematics standards are one of the main `inputs` of education, it has own `input`, `output`, and `process` for students` learning. By the above-mentioned a `rhetorical` learning model, the knowledge and skills pertaining to numbers, shapes, relations, and data analysis are fundamental `raw` materials of students` learning process. According to the MoMS, the real life problems play important role to perform these `raw` materials in learning process. In another word, the `input` of the learning process should be posed through real life problems which contain conceptual understandings of knowledge. The `process` of a model means the activities of students in learning process and emphasizes the observing and knowing of problems, analyzing and investigating it, modeling mathematically and solving problems. In other hand, to solve these problems, students observe, investigate, analyze the real life problems, related to knowledge and skill, and model them by mathematics thinking. In this `process` students will not only mastery of skills but also apply them in learning process through solving real life problems. If `input` and `process` of this model are emphasized and developed through students` learning process uniformly, children will acquire conceptual knowledge of mathematics topics and form comprehensive potentials, expected in the MoMS. It, the `output`, means, students can be an individual who is noted in the MoMS. Nevertheless, I do not negate that a `rhetoric` model of students` learning process is quite narrow. I have considered the just expectations of learning process in the MoMS.

10. The most weakly intended concept is a fraction.

The understanding of fractions with same denominator has intended 4th grade under the topic `Operations of fractions with same denominator`. In 5th grade, proper fractions have intended to be introduced by a topic `Operations of simple fractions with different denominator and the subtraction of fractions with larger numerator than denominator`. The geometrical meaning, a part of whole, is not intended in a content framework. Nevertheless, there is a task in expected performance to draw out meaning of 7/4 fractions by using a whole thing such as a round or a rectangle. Otherwise, the MoMS has not included the understanding that a fraction can be interpreted in 2 ways except a part of whole; as

- A point on the number line, as a number that lies between 2 consecutive (whole) numbers
- The length of a segment of the real number line

11. *The following weaknesses are observed in the MoMS.*

- *The MoMS has overemphasized students' mathematics learning and omitted that it is facilitated by teachers` teaching.* The mathematics curriculum has to yield a main direction for teachers' teaching as to which knowledge and skills teachers should pay more attention; and in what way, how teachers should use MoMS principles in teaching, how the four potentials should be developed through primary mathematics; what are the subject matters of certain topics etc. Unfortunately, curriculum developers say that the MoMS are very flexible for teachers to select instructional approach. Actually, it might give the misunderstanding about mathematics standards to schoolteachers.
- According to the MoMS, the purpose of mathematics education in Mongolia is to form K1, K2, K3, K4 potentials to students through their learning process. Unfortunately, *teachers were not been provided sufficient support to employ it in lesson plan and classroom teaching*. Especially, because of those four potentials have 'dominated' or been 'polarized' in process of MoMS, teachers might encounter many difficulties in implementation stage. Because of it, some parts of MoMS are difficult to understand and implement for schoolteachers.
- One of the important points of curriculum is how curriculum materials support teaching, since curriculum is a resource for teachers' learning. However, *the MoMS has briefly mentioned about didactics 'steps', give orientation to teachers' teaching, this aspect has not sufficiently explained, especially main subject matters are not mentioned adequately*. For example, it is not clear for teachers how they should develop comprehensive potentials coherently with content knowledge and skills. If teachers omit one part of standards in teaching, some important point of subject matter will be skipped. *It causes mismatch to crop up between knowledge and skills, and performance. It means, the schoolteachers are demanded to understand the coherence of compositions of mathematics standards conceptually.* For instance, when students learn the certain topic, teachers need to facilitate them by posing real life problems, related to that topic. The problems must be as much as close to students` life and be posed in order to reveal the main characteristics/subject matters of topic. By posed problems, students need to be demanded to solve them (K4) by observing and analyzing problems (K2), communicating (K1) each other, and using prior mathematical knowledge and experience (K3). Sometimes they can use other tools such as a simple scheme; a diagram, a table, a chart, a map etc. Through these processes, students will acquire conceptual knowledge rooted on four comprehensive potentials. In this case, the process skill of students can be developed, too. One of the important points for teachers is the development of students` ability to re-analyze solved problems in reality or certain situation. Yet, teachers can ask to students whether they have encountered same problems in their daily life and how they solved it.

  - *Another main point, helps teachers to plan lesson and implement, is an understanding about children's learning process, what difficulties they encounter and what are their common mistakes.* Obviously, it has not mentioned in the MoMS, at least one sentence. Otherwise, this aspect has emphasized in NCTM standards. For instance, according to NCTM standards, when children learn the addition of two digit numbers they encounter following common mistakes.

    25 A child thought that 2+3=5 and 5+7=12 so it will be 512 and 1+2=3 and
    37 finally it is 53

53

Another child did it by following way.

25 He thought 5+7=12 and 2+3=5 so it is 125

37

125

A more ability child solved this problem following way.

25 See I know 30+20=50 and 7+5=12 so it is 50+12=62 etc

37

62

It enables to teachers to force the students 'naive' and 'smart' questions. In other hand, teachers think over the important and deep subject matters of mathematics contents. Gradually, it enables teachers to develop their content and pedagogical content knowledge (Shulman, 1987).

- *The MoMS are inadequate for subject matters of contents*. For instance, the Courses of Study in Japan have included a point about in which situation the certain mathematics concepts work and not work. At grade 2, it recommends teachers to ask a following question: in which situation multiplication used. In this case, a teacher can have deep understanding about multiplication concept. It is a good experience for teachers, For instance, children why does the rule of whole number multiplication not work in case of multiplication of decimal ask them. The 3*7=21 is true, but why the 0.3*0.7=2.1 is false. It helps teachers to develop their content knowledge (Shulman, 1986) of mathematics. Gradually teachers will be able to ask this question to them spontaneously. It is a one of the successful developments for teachers' professional development.
- *The MoMS do not include an understanding about a relation such as symmetry, congruence, and similarity of shapes that are basic understandings of secondary school geometry.*
- *The use of calculators and computers has not mentioned in MoMS*

12. Mathematics games are emphasized in an algebra domain of the MoMS

The mathematics game means a concept related to filling out a `magic` triangle, a `magic square`, a strung together task and a mathematical `domino`.

13. *In the MoMS, the integration of subjects has determined by specific code.*

For instance the ability to round the decimal by place value linked to the 2/3b ability of Mongolian language; A1/1b↔1MX2/3b.

14. According to the mathematics standards, the formation of four comprehensive potentials is going to be evaluated in every domain based on four level of students` cognition.

For example, the K1 potential will be evaluated in first domain of primary mathematics by four level of students` cognition.

1MA1:K1 1MA1:K1/1-Aware the terms, formulas, notations, and schemes of real things and communicate Mongolian language perfectly

1MA1:K1/2- Aware the terms of the operations, notations, and schemes of natural numbers, fractions, and decimals and communicate Mongolian language perfectly

1MA1:K1/3- Aware the terms, notations, and schemes of combined number operations, communicate Mongolian language perfectly, write and draw creatively

1MA1:K1/4- Aware the name of the operatins, notations, and schemes of mathematics models of real life problems and communicate Mongolian language perfectly, etc

15. The content framework is intended to abolish the discrepancy of school curricula.

16. The content framework helps to parents to monitor teachers and encourage their children' s learning.

Unfortunately, it is difficult to say, parents monitor teachers` teaching and their children's learning process through their understanding of the content framework of the primary school in Mongolia. From this point of view, this intention sounds fairly `far` from reality.

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