CHAPTER II
REVIEW OF RELATED LITERATURE

This chapter presents review of related literatures. It covers the definition of school, indicators of international standard school, mathematics English vs. general English, strategies for teaching mathematics to limited English proficiency (LEP) students, and the review of previous study.

A. Definition of International Schools

In defining international school, there is a little differentiation before and after the implementation of the government legislation (PP) 17/2010 and the regulation of minister of national education (permendiknas) 18/2009. According to Mudarwan as an education analyst which was translated by the researcher,

“Before implementing that rule, an international school is the foreign school which is established by an organization based on the regulation in Indonesia. This regulation is to be applicable especially for foreigners who do not become a member of diplomatic and consular of other country in Indonesia. It is absolutely governed by a minister of national education in Indonesia.

After determining PP 17/2010 and permendiknas 18/2009, international school becomes collective educational institution. It means that international school is corporation between accredited institutions of foreign school education unit and education unit in Indonesia that is gotten an accreditation A.”

International standard school is a school which has fulfilled and passed all indicators of national standard of education that is enriched with good qualification of OECD member (Organization for Economic Co-operation and Development). Based on the regulation of minister of national education (permendiknas nomor 78 2009), the researcher has translated those indicators into English as stated below.

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2 Direktorat Jendral Manajemen Pendidikan Dasar dan Menengah Kementrian Pendidikan Nasional, Depdiknas, Permendiknas no 78 2009, tentang penyelenggaraan SBI (http://www.kemdiknas.go.id/media.pdf, accessed on...
B. Indicators of International Standard School

Fundamentally, the implementation of international standard schools overcomes the real issues or problems of how the schools enhance the quality of their graduates. (Permendiknas no. 78 years 2009) The regulation of minister of national education guides the schools to implement the national standard of education for increasing the quality of management and learning process with the indicators of pilot project of international standard school (RSBI) which absolutely agrees with the regulations of national standard. Realizing such educational expectation, the government determined various standards as (permendiknas no. 78 years 2009) the regulation of minister of national education below:

1. Standard of Competency

To fill the standard competency, there are some indicators which are achieved, such as:

a. The candidate students of senior high school have to obtain an international standard score, the average score of students' report book and school certificate is at minimum 7,5 score

b. Fulfilling the national standard of education that is fulling of outstanding graduates and the same quality with the OECD member or other developing countries.

c. Having the high competitiveness which is proved by school local quality at the international level.

d. Teacher candidates must have TOEFL score with IBT TOEFL score at minimum 75 as low advanced level.

e. Being active in maintaining the viability and world development in economic, sociology-culture and survival perspective.

f. Using and developing the communication and information technology professionally

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2. Standard of Curriculum
   a. Applying the curriculum which is enriched with the standard of OECD member or other developed countries.
   b. Applying semester credit units (SKS)

3. Standard of Process
   a. Enriching the process standard with operating the learning model of OECD member and developed countries.
   b. Learning process is based on communication and information technology (TIK).
   c. Implementing teaching strategies that are communicative, active, creative, effective, enjoyable and contextual.
   d. Leading the learners to increase their potential optimal in academic and non-academic potential.
   e. Giving face to face act, structured and unstructured assignment, and self-development act.
   f. Enriching in competitive and collaborative activity
   g. Enriching students' competency in entrepreneur based on high morality and ethic.

4. Standard of Administration Staff and Educators
   a. Reinforcing the competency of international standard school educator with the standard of OECD member or other developed countries.
   b. Facilitating the learning process based on communication and information technology.
   c. Leading educator to improve their ability in English proficiency or other foreign languages that are used in the international forum for certain subject matter except Indonesian, Islamic education, civic education, history education, and local content.
d. Headmaster and Educators have to reach at minimum 75 of IBT TOEFL score as the level of low advanced.

e. Headmaster and educators must hold minimally master’s degree in their subject.

f. Headmaster has competence in management, organization, leadership and entrepreneur.

g. The school is equipped with other standard of education staff for example a headmaster, librarian, laboratory staff, administration staff, cleaning service staff and security staff.

5. Infrastructure

a. Fulfilling the standard of infrastructure which is enriched by the standard of OECD member or other developed countries

b. Having the International standard school classrooms that are equipped with the infrastructure of communication and information technology (TIK).

c. Having library that is equipped with e-library

d. Having the infrastructure which is able to enhance and develop potency of educational staffs and learners.

6. School Management

a. Fulfilling the standard of school management which is enriched with the standard of OED member or other developed countries.

b. Using management system of ISO 9001 and last version of ISO 14000

c. Maintaining a healthy and clean environment, safe, orderly and conducive environment.

d. Creating the habits that is aimed at enhancing in English or other foreign languages
ability, communication and information technology and transnational culture.

e. Interlacing the partnership or relationship with leading school of local area or develop country.

7. School Finances

a. The school finance fulfills the standard of educational finance and implements financial management that is transparent and accountable.

b. Accepting a helping hand from the government.

c. Accepting the finance from the society.

d. Providing the scholarship for underprivileged learners who have good quality in academic at minimum 20 percent of all the candidates

8. School Assessment

a. Fulfiling the standard of school assessment which is enriched with the standard of OECD member or other developed countries.

b. Fulfiling the authentic assessment model and developing assessment model based on communication and information technology.

c. Implementing national exam.

d. Facilitating the learners to access an approved international certification or attend school final exam which is equivalent to OECD member or other developed countries.

C. Mathematics English vs. General English

Commonly English is an international language that almost everybody around the world can speak with. However, everybody uses English in many critical aspects. Comparing between English for mathematics and English subject, it causes the different meaning concept in its word. Susie W Hakansson,PhD said that there are some words which have different meaning when they
are constructed. For example:

1. Is a straight line a curve?
   a. English: a straight line is not a curve
   b. Mathematics: a straight line is the simplest example of a curve

2. What is a line?
   a. English: any line segment
   b. Mathematics: Line is an infinitive line

3. Multiplying
   a. English: repeated addition
   b. Mathematics: bigger, smaller, or neither

4. Dividing
   a. English: dividing is cut into pieces
   b. Mathematics: dividing is same multiplication (dividing by a non-zero number is multiplying by its reciprocal)

5. …or...
   Example: Do you want to drink Coffee or Tea?
   Are you coming or going?
   Was that your father or father-in-law?
   Do it now or later!
   a. English: or is becoming exclusive meaning
   b. Mathematics: by convention or is inclusive (“A or B” is true if A or B or both

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D. Strategies for Teaching Mathematics to Limited English Proficiency (LEP) student

Mathematics teacher, who provides English instruction to Limited English Proficient (LEP) student, has to ensure that his students are able to increase their learning while they are in the process of learning English. Thus, the teacher integrates the study of English vocabulary and grammatical structure while building the mathematical concept.

Jo Lynne De Mary, Ed.D. Said that increasing comprehension and making mathematics more accessible to LEP students, teachers may want to use a variety of strategies:  

1. Variety of strategies

   a. Classroom Management Strategies

   b. Create predictable classroom routines (starting class, collecting homework, and working in groups) so that LEP students will know what to expect.

   c. Use consistent formats for assignments, worksheets, and tests.

   d. Seat LEP students purposefully (near the teacher or next to a buddy).

   e. Foster an appreciation of and respect for cultural diversity among the students in the class.

   f. Write legibly and in print. Some LEP students may not be familiar with cursive and/or the Roman alphabet.

   g. Give directions step-by-step (orally and in writing) before assigning students to do independent, pair, or group work.

   h. Give LEP students more time to process questions and formulate an answer.

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i. Allow LEP students to talk to a peer in their native language when necessary to clarify understanding and clear up misunderstandings.

j. Keep picture dictionaries in the class and allow LEP students to use bilingual dictionaries.

2. Instructional Strategies that Increase Comprehension

a. Integrate Language and Content

i. Teach mathematical vocabulary (i.e., estimate, measure) and language structures daily.

ii. Teach students strategies to learn and study new vocabulary (i.e., vocabulary section in mathematics notebooks, class word wall, student-made bilingual dictionaries, and/or flashcards on spiral-bound index cards with definition, examples, word used in a sentence, picture/diagram, or a native language translation).

Sample flashcard:

<table>
<thead>
<tr>
<th>Word</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>illustration</td>
<td>real world use</td>
</tr>
</tbody>
</table>

iii. Integrate the four language skill (listening, speaking, reading, and writing) into mathematics class.

iv. Model the process. Talk aloud while solving problems on the overhead or chalkboard to show the thinking process and common errors.

v. Have students explain their thinking process aloud to a classmate while solving a
problem.

vi. Integrate reading and writing through the use of journals, learning logs, poems, literature, etc.

vii. Give explicit instruction and practice in reading and writing word problems.

viii. Begin class with warm-up activities using mathematical language to give students practice in sentence construction.

ix. Post labels and vocabulary cards around the classroom on completed word problems, number lines, rulers, fraction diagrams, and/or objects in the class.

x. Have students paraphrase and write complex concepts in their own words (individually, pairs, or whole class).

xi. Review mathematical vocabulary and concepts using games.

b. Tap Prior Knowledge

i. Connect the students’ prior knowledge and experiences to new learning. Find out what students already know about a topic by making a semantic web on the board. Write the topic in the center of a circle and record students’ knowledge around it.

ii. Integrate the LEP students’ culture into lessons whenever possible.

iii. Begin a unit of study by eliciting students’ own questions about a topic.

c. Encourage Active Learning and Verbal Interaction

i. Design hands-on activities.

ii. Design meaningful and authentic collaborative activities to increase verbal interaction between students.

iii. Assign the roles to students in collaborative activities. Discover the strengths of LEP students and assign appropriate roles.
iv. Initiate the discussions that are based on real-world mathematical situations.

d. Teach Organizational Skills
   i. Demonstrate how to read a mathematics textbook.
   ii. Point out key sections and resources in the textbook.
   iii. Teach students how to organize notebooks and binders and record homework assignments.
   iv. Teach mnemonic devices that assist memorizing content.
   v. Teach the study and test-taking skills.
   vi. Teach note-taking skills. For beginner LEP students, copying notes is an effective way to begin learning writing conventions.

3. Assessment Strategies
   a. Before Instruction
      i. Use daily warm-up activities to assess mastery of concepts from the previous day’s lesson.
      ii. Assess the LEP students’ knowledge before beginning a unit of study to learn where students have gaps in their learning and avoid unnecessary re-teaching of concepts. Some good techniques are semantic webbing and recording students’ comments on a KWL chart. Listed below is an example of a KWL chart.

<table>
<thead>
<tr>
<th>What Do You <strong>Know</strong>?</th>
<th>What Do You <strong>Want to Know</strong>?</th>
<th>What Did You <strong>Learn</strong>?</th>
</tr>
</thead>
</table>

b. During Instruction
   i. Use a variety of assessment methods to measure English comprehension and mastery of concepts (drawings, charts, demonstrations, diagrams).
ii. Do quick checks for understanding every day (i.e., thumbs up/down, write answers on wipe boards at desks, hold up manipulative).

iii. Observe and record the LEP students’ participation in small group activities.

c. After Instruction

i. Find alternate ways other than written tests for LEP students to show their comprehension (i.e., oral tests, diagrams, drawings, demonstrations).

ii. Give LEP students (especially beginners) alternate ways to participate in whole-class discussions and respond to questions (think/pair/share, flashcards to raise over head, hand and/or body movements, individual chalkboards for solving computations).

iii. Assess whether LEP students have mastered mathematical concepts rather than their English grammar and fluency.

E. Complexity of Teaching Mathematics in English

A report prepared by an Australian Department of Education highlights the complexity of the language of Mathematics and Science. It states that the language of Mathematics is complex and is not similar to everyday language. It consists of specialist vocabulary, precisions and the use of symbols. Students learning Mathematics have to identify the word function before they are able to identify how mathematical problems can be solved. They also have to verbalize mathematics statements, putting words to symbols and graphs. They also have to work with lengthy descriptors and dense mathematical concepts.\(^5\)

The report also states that teachers tend to make a lot of assumptions that students are

\(^5\) Faizah Mohamad Nor, Ph.D ETeMS: “The Implications on Learners”, (www.iium.edu.my/ilc.pdf, accessed on July 30, 2011)
able to understand the words despite the fact that the words are too complex for the students to deal with on their own. The report also states that language used for Science subjects comprises a large vocabulary of technical terms that have to be clarified to the students. In relation to the above, ETeMS training programs should not only focus on grading teachers’ language competency but should also focus on strategies to help teachers deal with the language complexity of Mathematics and Science.  

F. Review of Previous Studies

In the research, it is necessary to enclose review of previous studies to avoid replication. Some similar studies have been conducted to find out the reasonable of using English as an instruction for teaching non English subject matter. There are four previous studies about using English for teaching non English subject matter. The first previous study is by Rhoda Staceylyn Boyd Marr entitled “Teaching the Language of Mathematics to English Language Learners”. In her research she used the following questions as guide. What are the strategies for teaching the language of mathematics to all students? Can these strategies of the language of mathematics be utilized for ELL students? The researcher found that a common language is important to teach in any classroom. The researcher also found that some strategies such as autobiographies, journals, and other writing processes are more useful than others. The second most important teaching strategy for mathematics is discourse. In this study the researcher has detailed these strategies for use in the classroom.

The second research is by Peter Hudson entitled “Learning to Teach Science Using English as the Medium of Instruction”. In his research, he explored and described Malaysian

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6 Ibid.
7 Rhoda Staceylyn Boyd Marr entitled “Teaching the Language of Mathematics to English Language Learners” Thesis. Sierra Nevada College. 2010
8 Peter Hudson entitled “Learning to Teach Science Using English as the Medium of Instruction”. Thesis.
preservice teachers’ perception about their preparation for learning to teach science using EMI (English as the Medium of Instruction) at the conclusion of their first year of a new Bachelor of Education Studies (Primary Science) degree. Fifty preservice primary teachers at a Malaysian Institute of education had completed one semester of Malaysian units that Islamic and Asian Civilization, citizenship, strategy and innovative thinking in education, English for academic studies. The second semester comprised of four units, those are: the development technology of skill in information and communication technology, primary curriculum and pedagogy in health and physical education, English for teacher, and an integrated mathematics and science foundation unit to develop scientific and quantitative literary. Even though the first semester was taught in Melayu language, the second semester was delivered in English with all lectures, readings, workshops, and assessments conducted in English. This required lectures and preservice teachers to use English as the target language.

The third research is by Theresa Perez entitled “The Learning of Mathematics for Limited English Proficient Learner.” This study focused on theoretical and applied models of teaching and learning mathematics for English as Second Language Learners. Research and current practice were reviewed with an emphasis on the design, implementation, and assessment of instruction for this population of learners. A qualitative analysis of students’ final research projects using narrative analysis methodologies showed that students (1) position issues within a larger socio cultural framework (2) advocate for the negotiation of pedagogical principles that blend language learning strategies with effective mathematics pedagogy and (3) identify assessment policies and processes that were supportive and limiting for these learners.

Queensland: Queensland of University of Technology. 2009

The fourth research is by Muhammad Islahudin entitled “Teacher – Talk in Giving Information in RSBI physics Class at SMPN 3 Malang.” This study is an attempt to answer two main questions: (1) what types of information were given by the teacher in the process of teaching and learning Physics in RSBI class at SMPN 3 Malang based on the giving-information category of teacher-talk in the FLINT model? (2) What methods were used by the teacher in delivering the information in the process of teaching and learning Physics in RSBI class at SMPN 3 Malang based on the giving-information category of teacher-talk in the FLINT model?.

The main data of the study are the utterances produced by the teacher in giving information to the students. The main data were taken during the teaching-learning process in the class. These main data were collected through observation and recording the teacher talk in giving information in four meetings. To support the main data, secondary data were also collected through an interview with the Physics teacher and a student questionnaire. The data analysis was done in four steps, namely: data collection, data reduction, data display, and conclusion drawing.

\cite{10} Muhammad Islahudin entitled “Teacher – Talk in Giving Information in RSBI physics Class at SMPN 3 Malang.” Thesis. Malang: State University of Malang. 2010