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The Improvement of Students' Conceptual Understanding and Students' Academic Language of Mathematics through the Implementation of SIOP Model

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Abstract

This study was aimed at: (1) investigating the improvement of students' conceptual understanding of mathematics, (2) investigating the improvement of students' academic language of mathematics, and (3) investigating the response of students toward the implementation of SIOP Model. This research was a classroom action research which was accomplished in three cycles. Each cycle consisted of four steps namely planning, acting, observing and evaluating, and reflecting. The subjects of this research were the tenth-grade students in bilingual class namely X MIA 2 of SMA Negeri Bali Mandara on the second semester of academic year 2016/2017. Data of students' conceptual understanding and academic language of mathematics were collected by conceptual understanding of mathematics tests using essay test on the end of each cycle, while data of students' response toward the implementation of SIOP Model were obtained by questionnaire. Data that had been collected therefore were analyzed descriptively. The results show that students' conceptual understanding and academic language of mathematics improves on each cycle. Students' response toward the implementation of SIOP Model in learning mathematics is on the positive category. This study concludes that the implementation of SIOP Model could improve students' conceptual understanding and students' academic language of mathematics.

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1. Introduction

The implementation of ASEAN Economic Community (AEC) started in 2015 enable the free flow of service and skilled labor inter-region in South East Asia. This condition requires us to improve our capability as an effort to adapt in this competitive era. To be able to compete with other people nationally and worldwide, we have to perform our competence skillfully. Proficiency in English is also becoming an essential requirement to open our perception widely to get new knowledge and information from all around the world.

The educational system has an essential role in preparing our young generation for the coming global tight competition. This role is affirmed on the core of the educational system in Indonesia, that educational system is a conscious and well-planned effort to create a learning process which enables the students to develop their potential actively to get the skill which is needed by themselves and the society (Presiden Republik Indonesia, 2003).

Nowadays, many schools in Indonesia are adopting the national plus curriculum as a tangible effort to achieve the goal. Basically, the curriculum is the same as the Indonesian national curriculum offered by the ministry of education for regular school. It is called "plus" because the school should add international value. This international value is usually interpreted as adding some aspects from foreign curricula that are internationally accepted, such as the Cambridge curriculum or other curricula of the OECD members (Setyaningrum, 2015).

The school with curriculum national plus conducts bilingual learning. It enables the teacher using English and Bahasa Indonesia together as a medium of instruction within the classroom. Bilingual learning is essentially purposed to equip students with international language skill so that they are able to communicate with people from other countries and have better job opportunities.

In Buleleng Regency of Bali, SMA Negeri Bali Mandara is the only state high school which implements national plus curriculum, so that most of the subjects in this school are delivered using bilingual. SMA Negeri Bali Mandara gives access to students graduated from Junior High School in Bali Province, especially those who are coming from poor families and remote spot but having the potential of getting good achievements, to get a better learning experience. SMA Bali Mandara is different from other national plus-schools because of the process of recruiting the fresh-students. If most of the national plus-school recruiting fresh-students based on their academic capability, then SMA Negeri Bali Mandara put the economic status of the fresh-student candidates as the most important consideration.

Considering the condition of student-input, SMA Negeri Bali Mandara implements some innovations to support students to develop their potential, so that the school's vision of creating future leaders could be achieved. In order to achieve the goal of giving assurance toward the poor students to access qualified and better education, SMA Negeri Mandara facilitates the students with dormitory and qualified educational personnel including the staff and teachers.

Teacher as the part of the educational system is the professional educator that should have the capability in planning, implementing, and solving the practical problem of the learning process in the class. The teachers in the school with national plus curriculum, especially those who teach mathematics and science, have an extra task in conducting meaningful learning. They have to be active in searching and implementing innovative learning method in order to create a learning situation which enables the students to construct their content comprehension as well as their English proficiency so they can live and compete in this global competitive era.

Regarding mathematics as one of the school subject (NCTM, 2000) said that students must learn mathematics with understanding, actively building new knowledge from experiences and prior knowledge. Conceptual understanding of mathematics is an important goal for mathematics instruction. In order for students to develop mathematics power, they must have a deep understanding of mathematics concepts and their relationship. Furthermore, NCTM (2000) describes indicators for students who master a conceptual understanding of mathematics namely (1) describing concepts in their own words, (2) identifying or give examples and non-examples of concept, and (3) using concept correctly in a variety of situations.

Related to the process of learning mathematics in the class, there are some crucial aspects of conceptual understanding, they are: (1) getting students to use manipulatives to model concepts, and then verbalize their results, assists them in understanding abstract ideas; (2) getting students to show different representations of the same mathematical situation is important for this understanding to take place, (3) getting students to use prior knowledge to generate new knowledge, and to use that new knowledge to solve problems in unfamiliar situations, (4) getting students to see connections between the mathematics they are learning and what they already know also aids them in conceptual understanding (Balka, Hull, & Miles, 2001).

Regarding the process of conducting mathematical learning in bilingual class, the teacher should consider both students' conceptual understanding of mathematics and their English comprehension. Echevarria, Vogt, & Short

(2010) said that one contributing factor to the difficulty of English learners in learning mathematics experience is that mathematics is more than just numbers. Mathematics education involves terminology and its associated concepts, oral or written instructions on how to complete problems, and the basic language used to a teacher's explanation of a process or concept. Hayden and Cuevas (in Echevarria *et al.*, 2010) give some examples, students face multiple representations of the same concept or operation (e.g., 10/2 and 10:2) as well as multiple terms for the same concept or operation. Students must also learn similar terms with different meanings (e.g., percent vs. percentage) and they must comprehend multiple ways of expressing terms orally (e.g., $(2x + y)/x^2$ can be "two x plus y over x squared" and "the sum of two x and y divided by the square of x"). These academic words which pertain to the specific subject area (such as sum, divided by, square for Math) are the part of the academic language. So, language plays a large and important role in learning mathematics. Creating authentic opportunities for students to develop academic language is critically important because as one acquires language, new concepts are also developed. Since proficiency in English is the best predictor of academic success, it seems reasonable that teachers of English learners should spend a significant amount of time teaching the vocabulary required to understand the lesson's topic (Echevarria et al., 2010).

Although conceptual understanding is considered an essential objective in learning math, students' conceptual understanding of mathematics is still not encouraging. For example, the average grade of the formative test in X MIA 2 SMA Negeri Bali Mandara shows that only 27,3% students who are able to pass the minimum criteria (i.e. 75). This problem cannot be ignored. Their causes should be found out and solved.

Based on the interview on February 6, 2017, with the teacher of mathematics subject in X MIA 2, the various background and provision of the fresh-students' mathematical concepts create a various level of their mathematical proficiency. Some basic concept in mathematics such as concepts of number and operations and algebra are not well mastered by some students. This condition gives impact to their readiness in learning the topics of mathematics for tenth-grade students which are mostly required number and operations as well as algebra as prerequisite material. Most of the time, students who are less in basic concept just imitate the example given by the teacher without knowing why it should be like that. As the consequence, most of them cannot solve the similar problems when some parts of the previous example are modified. It means that students have not grasped the concept well. Moreover, bilingual learning in mathematics makes the students face even more difficulties in understanding the new concepts.

Based on the interview with the students in X MIA 2, some students said they find difficulties in learning mathematics since mathematics is full of formulas and they are not able to remember all of the formulas. This situation shows that students' conceptual understanding is still low since they are actually just memorizing all of the formulas instead understand how the formula be obtained and what the formula implies.

Based on the interview of the mathematics learning process, there are some conditions which cause low conceptual understanding of students, namely:

First, students' habit that usually waiting for the teacher to explain the concepts. During the learning process, the teacher seldom gives students opportunities to clarify their answers towards any problems. Students just write down their answers on the whiteboard and then go back to their seat. Whenever the answer is correct, the teacher will just continue the lesson. On the other hand, whenever the answer is incorrect, the teacher will directly fix it without giving chance for students to give their opinion.

Second, in SMA Negeri Bali Mandara, materials for three years are packed in grade ten to eleven. Due to this policy, the students can focus to prepare their national examination in grade twelve. It provides limited time for the teacher to conduct the lesson, to cover the entire materials and help the students to construct their conceptual understanding at the same time. This situation is not supported by the students habitual who usually wait for the instruction by the teacher. Moreover, the abstract ideas just make them having less initiative to explore more. It is because they cannot relate the material to their daily life so that they have less motivation to learn mathematics by themselves.

Third, students usually just copy the teacher statement, memorize all of the formulas without any initiative to explore more about how the formula is obtained and what the formula actually describes. They have less exercise to state the concept by their own words so that they forget it easily in a short time.

Based on the interview and the observation result, the problem of the X MIA 2 students in learning mathematics is the low conceptual understanding of mathematics and low mastery of English as the language used in the process.

Considering the importance of both comprehension in English and content of the mathematics itself, then we need a learning model that can fulfill the requirement for assisting the students to understand the material easily. SIOP (Sheltered Instruction and Observation Protocol) is potentially a good choice. SIOP Model, derived from the SIOP Model observation protocol, includes eight instructional components and thirty features that when used in combination consistently and systematically, have been found suitable to improve English learners' academic achievement

(Echevarria, Vogt, & Short, 2008). The eight components are described briefly by Hanson and Filibert (2006) as follows. (1) preparation (both the content and language objectives are posted so that students and teacher are being focused on what should be achieved), (2) building background (teacher connect the student's background and past experience with the new learning), (3) comprehensible input (teacher using vocabulary that students understand, stating directions orally and in writing, and demonstrating what students are expected to do), (4) strategies (teachers use explicit instructional strategies, such as questioning techniques, to support higher-level thinking), (5) interaction (the teacher provides the students with continual opportunities to interact with peers through flexible grouping), (6) practice and application (using hands-on material and manipulative), (7) lesson delivery (the teacher involves the students actively in meeting the objectives), (8) review and assessment (provide the appropriate feedback so that students can continue to grow, review the key concepts to ensure long-lasting learning, and provide assessment to track student progress).

SIOP Model has been recommended for English learners due to the ideas and activities offered. The SIOP Model component of Practice and Application supports the development of conceptual understanding of the mathematical concept as the key goal of national and content standards. One of SIOP Model Feature states that students need to practice new content knowledge through the use of concrete materials and manipulative. This feature allows English learner to develop conceptual understanding of key concepts and practice with the language of mathematics (Echevarria *et al.*, 2010).

The prospect of implementing SIOP Model to develop students' conceptual understanding of mathematics, especially for bilingual class can be described by relating the three indicators of mathematical conceptual understanding by NCTM with crucial aspects for conceptual understanding by Balka *et al.*, (2001), and how these crucial aspects being accommodated by SIOP Model.

The three indicators of students mastering a conceptual understanding of mathematics by NCTM can be related to the crucial aspects of conceptual understanding by Balka *et al.*, (2001). The first indicator is describing concepts in their words, can be achieved by implementing the crucial aspect of getting students to use manipulatives to model concepts, and then verbalize their results. The second indicator is identifying or giving examples and non-examples of concept can be achieved by getting students to show different representations of the same mathematical situation. The third indicator is used concept correctly in a variety of situations, can be achieved by getting students to use prior knowledge to generate new knowledge and to use that new knowledge to solve problems in unfamiliar situations. The crucial aspect of getting students to see connections between the mathematics they are learning and what they already know also aids them in achieving the indicators of conceptual understanding continuously.

All of those crucial aspects of conceptual understanding are accommodated by SIOP Model. Besides focusing on the content objectives, the learning process in the SIOP Model is also focusing on the language objectives. Accomplished SIOP teacher modulate the level of English used with among students and make the content comprehensible through techniques such as the use of visual aids, modeling, demonstrations, graphic organizers, vocabulary reviews, adapted texts, cooperative learning, peer tutoring, and native language support (Echevarria *et al.*, 2008). This part is getting students to use manipulatives to model concepts, and then verbalize their results.

Depending on the students' proficiency levels, SIOP teachers offer multiple pathways for students to demonstrate their understanding of the content. It is very important to make the relation between the content and the students' background, experiences as and their prior knowledge, besides focus on expanding the students' vocabulary base. This assists students to see connections between the mathematics they are learning and what they already know and getting students to use prior knowledge to generate new knowledge and to use that new knowledge to solve problems in unfamiliar situations.

SIOP teachers also consider their student affective needs cultural background and learning styles. SIOP teachers engage in culturally responsive teaching and build on the students' potentially different ways of learning, behaving, and using language (Bartolome in Echevarria *et al.*, 2008). Many SIOP teachers consider the multiple intelligences of their students as well and provide a variety of assignments that might appeal to the logical/mathematical child, the musical child, the artist, and those with other intelligent. This part can assist students to show varying representations of the same mathematical situation.

Based on the above descriptions, the researcher is interested in implementing an innovative learning model within the mathematics learning process for bilingual students through a research entitled "The Improvement of Students' Conceptual Understanding and Students' Academic Language of Mathematics in Class X MIA 2 SMA Negeri Bali Mandara through the Implementation of SIOP Model".

This study was aimed at: (1) investigating the improvement of students' conceptual understanding of mathematics, (2) investigating the improvement of students' academic language of mathematics, and (3)investigating the response of students in class X MIA 2 SMA Negeri Bali Mandara toward the implementation of SIOP Model.

2. Materials and Methods

This research belongs to collaborative classroom action research which is generally aimed to improve and repair the quality of the learning process of mathematics in the class. This research was conducted within 3 (three) cycles of 4 (four) steps, namely planning, acting, observation, and reflecting. The involvement of the researcher in this study was collaborating with the mathematics teacher of class X MIA 2 SMA Negeri Bali Mandara. The collaboration here means a cooperation of the researcher and the teacher to enable the occurrence of understanding and agreement toward a problem being dealt with and a democratic decision making to create a unanimous perception of the act which should be done to give an optimal result.

This research was conducted in SMA Negeri Bali Mandara. The subject of this research was the entire students in class X MIA 2 SMA Negeri Bali Mandara of academic year 2016/2017, they were 22 students including 12 female students and 10 male students.

This research was accomplished in three cycles and each cycle was including four until five meetings depended on the main topic being discussed. Each cycle is including four steps namely planning, acting, observation and evaluation, and reflecting. These four major steps are further described as follows:

a) *Planning* based on the identification on the initial reflection; the researcher and the teacher were unanimous to design the learning activity to improve students' conceptual understanding of mathematics. Within the planning of the action, there were some steps. The first step, the researcher made an agreement with the teacher of mathematics subject in class X MIA 2 SMA Negeri Bali Mandara about the implementation of SIOP Model. The second step, researcher together with the teacher determined the topic that would be delivered on the cycle, which was planned to be done in three until four meetings and one other meeting for conducting a formative test to find out students' conceptual understanding and academic language of mathematics improvement within the cycle. The third step, the researcher compiled the lesson plan based on the syntax of SIOP Model and compiled worksheet for the students based on the supervision and consideration of the supervisor and the teacher. The fourth step, the researcher together with the teacher prepared the learning media and equipment. The fifth step, researcher compiled the instrument in a form of essay test to measure students' conceptual understanding. The validation of this instrument was done through the judgment by two experts including the teacher and the lecturer in Mathematics Education Department, Ganesha University of Education.
b) *Acting*, the teacher conducted a learning activity based on the lesson plan which had been compiled in the planning step.
c) *Observation and Evaluation,* it was done during the learning process was being conducted. The observation was aimed to find out the weakness and obstacle which appeared as well as the advantages of implementing the SIOP Model. This step was including: observing the learning activity with the observation protocol of SIOP Model*;* evaluating the data on the present cycle based on the result of the conceptual understanding test, and making a note of the obstacles and the difficulties found along the action in the current cycle to be repaired on the next cycle
d) *Reflecting,* it was done based on the result which was gained on the step of observation and evaluation. The researcher together with the teacher identified the obstacle aroused during the learning process, continued by formulating the solution of these obstacles. The result of this reflection was used to fix the upcoming cycle so that the learning process on the next cycle could be done better than the previous cycle.

If the result of the current cycle is not satisfied the indicator of the research, then the research was continued to the next cycle based on the reflection of the current cycle. At the end of the last cycle, students were given a questionnaire to detect students' response toward the implementation of the SIOP Model.

In order to make no difference interpretation about the title of this research and the terminologies used in it, then it is necessary to describe some terminologies including SIOP Model, conceptual understanding, and academic language of mathematics. SIOP Model in this study is the learning model which is purposed to assist students in bilingual class to learn the grade-level content material while developing their English, with the components including (1) preparation; (2) building background; (3) comprehensible input; (4) strategy; (5) interaction; (6) practice and application; (7) lesson delivery; (8) review/ assessment. Conceptual understanding of mathematics is a mathematics skill indicated by the ability of students in (1) describing concepts in their own words, (2) identifying or giving examples and non-examples

of concept, (3) using concept correctly in a variety of situations. Within this research, students' conceptual understanding of mathematics refers to the students' grade by the test of conceptual understanding of mathematics on the last meeting of each cycle. Academic language of mathematics involves some aspects of language, including vocabulary development (such as math terms, and process and function words), and English grammar and usage (such as using transitions properly and writing conditional sentences). Within this research, students' academic language of mathematics refers to the students' grade on the academic language used by the students to answer the test of conceptual understanding of mathematics at the last meeting of each cycle.

Data of students' conceptual understanding of mathematics were analyzed by calculating the average of students' grade of conceptual understanding of mathematics by the following formula

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n} \qquad (1)$$

in which:

$\overline{X}$ = average grade of students' conceptual understanding of mathematics,

$\sum_{i=1}^{n} X_i$ = sum of students' grade on conceptual understanding of mathematics,

n = the number of students.

The average grade of students' conceptual understanding of mathematics was then qualified based on the minimum criteria of learning mastery of mathematics subject in class X MIA 2 SMA Negeri Bali Mandara, on grade 75. The criteria of students' average grade to be said being pass on mastering the conceptual understanding of mathematics are presented in Table 1.

Table 1
Criteria of Students Mastering Conceptual Understanding of Mathematics

Number	Students' Average Grade on Conceptual Understanding of Mathematics ($\overline{x}$)	Criteria
1	$75 \leq \overline{x} \leq 100$	Pass
2	$0 \leq \overline{x} < 75$	Not Pass

Students' conceptual understanding of mathematics is said to be improved if the average grade of students' conceptual understanding of mathematics ($\overline{X}$) on the current cycle is higher than the average grade of students' conceptual understanding of mathematics ($\overline{X}$) in the previous cycle.

Within this research students' conceptual understanding also considering students' learning mastery and absorptive capacity classically. Students' classical learning mastery was calculated by the following formula:

$$LM = \frac{\text{number of students who get score} \geq 75}{\text{total number of the students}} \times 100\% \qquad (2)$$

While students' classical absorptive capacity was calculated by the following formula:

$$\text{AC} = \frac{\text{The students' average grade}}{\text{The maximum grade of the students}} \times 100\% \qquad (3)$$

The indicators of students' academic language including 1) express their thinking with a precise structure that reflects the "why, because, if, then" of their reasoning, and 2) use mathematical vocabulary to explain their thinking

and present solution. Data of students' academic language were analyzed by calculating the average grade of the students' academic language by the following formula.

$$\bar{L} = \frac{\sum_{i=1}^{n} L_i}{n} \quad (4)$$

in which:
$\bar{L}$ = average grade of students' academic language of mathematics,
$\sum_{i=1}^{n} L_i$ = sum of students' grade on the academic language of mathematics,
n = the number of students.

The average grade of students' academic language was then categorized by criteria on Table 2.

Table 2
Criteria for Grouping the Average Grade of Students' Academic Language

Number	Grade Interval	Criteria
1	$\bar{L} \geq 80$	Excellent
2	$80 > \bar{L} \geq 60$	Very Good
3	$60 > \bar{L} \geq 40$	Good
4	$40 > \bar{L} \geq 20$	Fair
5	$\bar{L} < 20$	Poor

In order to detect the students' response toward the implementation of SIOP Model, a questionnaire was given to the students on the end of the third cycle. The average score was calculated as follows:

$$\bar{R} = \frac{\sum_{i=1}^{n} R_i}{n} \quad (5)$$

in which:
$\bar{R}$ The = average score of students' response,
$\sum_{i=1}^{n} R_i$ = sum of students' response score,
n = number of students.

The average score of students' response was then categorized by the criteria in Table 3.

Table 3
Criteria for Grouping the Average Score of Students' Response

Number	Score Interval	Criteria
1	$\bar{R} \geq 63$	Strongly Positive
2	$63 > \bar{R} \geq 51$	Positive
3	$51 > \bar{R} \geq 39$	Fair
4	$39 > \bar{R} \geq 27$	Poor
5	$\bar{R} < 27$	Very Poor

The implementation of the SIOP Model is said to be successful if the following indicators are fulfilled: 1) The average grade of students' conceptual understanding of mathematics improves on each cycle and on "pass" category (conceptual understanding grade ≥ 75) and classical learning mastery is 75%; 2) the average grade of students' academic language of mathematics improves on each cycle and on "very good" category, and 3) the students' response toward the implementation of the SIOP Model in the learning process is at least in the positive category.

3. Results and Discussions

The data for this research was collected based on the research procedural and was analyzed by data analysis technique as have been described before The summary of data of the students' conceptual understanding of mathematics on the first cycle, the second cycle, and the third cycle can be seen on Table 4 below.

Table 4
Summary of data of students' conceptual understanding and students' academic language of mathematics

Indicator	1st Cycle	2nd Cycle	3rd Cycle
Conceptual Understanding of Mathematics	59,8	70,9	77,5
Absorptive Capacity	75,6%	82,1%	87,2%
Learning Mastery	36,4%	59,1%	77,3%
Academic Language of Mathematics	43,18	55,91	66,82

The optimal improvement of students' conceptual understanding and academic language was supported by the emendations which were done during the learning process. The improvement of the learning process can be described as follows.

a) The students were actively involved in the learning activity by confidently proposing their idea on the group discussion as well as in front of the class on the whole class discussion. They delivered their agreement and disagreement toward their peer's answer by reasoning their argument. So does the student who gave his/her answer in front of the class has been able to clarify his/her answer.
b) The group discussion had been done effectively since the students had been able to relate and use the previous concept to find the new concept. This helped the students to be more discipline to the time limit during the discussion. So there was enough time for them to try the exercises and discussed it on the whole class discussion.
c) The students who were less involved in the previous cycle had been involved enough and asked their peers when they had not grasped the topic being discussed well.
d) The students together with the teacher concluded the topic that had been discussed within that day by reviewing the content and the language objectives. Both of the objectives were clearly stated "achieved" by giving a mark on each achieved objective. So, the students felt satisfied and truly realized that their actions during the learning process were proposed to achieve the goal been formulated at the beginning of the meeting.
e) The students had their own dictionary containing the content vocabularies related to mathematics and some functional vocabularies.
f) The students tried their best to communicate using English, although most of them had not been able to use perfect structure within their statement. They talked with their peers and asked any problems to the teacher bilingually. They confessed that they could understand the instructions used in the worksheet as well as the teacher's instruction. However, they still had difficulties in expressing the mathematical idea in English, especially in describing the process of how they obtained something (related to the topic being discussed) with their own words.
g) The students were challenged through the exercises served in the worksheet. They took initiative to try and discuss the exercises soon after they found the concept. Their initiative also could be seen by the way they solved any particular problems in the exercise. One group might have a different way to another group but they got the same result. So they use their own way without waiting for the teacher's instruction.
h) The students explored the concept on each topic by their selves through the discussion toward the worksheet. This helped them to understand how any formula being obtained and what the formula implies.

Based on data analysis of students' grade on conceptual understanding of mathematics test, the students' average grade on conceptual understanding of mathematics improved on each cycle, so does the students' learning mastery. The improvement of students' conceptual understanding of mathematics can be observed by the result of actions which were done to solve the problems within the learning process be found on each cycle. Some actions which induced the improvement of students' conceptual understanding and academic language of mathematics are described as follows.

First, the components and steps of SIOP Model are systematically emphasized on achieving the learning objectives through the development of students' academic language and the learning activities which assist the students to relate the previous concept with the recent concept being learned. During the learning process, the students were encouraged to construct their conceptual understanding by themselves through some consecutive steps and questions in the worksheet. The students use the previous concept as the basis to build up their understanding on the next concept, and so the concept embeds on their cognitive structure for a long-lasting learning.

Second, through the component strategies and lesson delivery, the teacher gave as many as possible opportunities for the students to propose their idea, give a response to the discussion result, and clarify their answer. This strategy was efficient to improve the students' capability in describing the concept by their own words. By this strategy and interaction, the teacher could observe how the students understand the topic and give guidance as needed for any misconception, so the students have a steady understanding of their cognitive structure.

Third, through the component building background, the teacher encouraged the students to learn the topic by relating the topic to the students' daily life. The teacher used learning media to give a clear description and illustration of how the concept within the topic being applied on any field of the students' life, so the abstract idea could be embedded in the students' cognitive structure. Besides that, the teacher guided the students to focus on the learning objective by introducing the content and language objective, and the key vocabularies. The objectives and key vocabularies were reviewed and declared been achieved on the end of the meeting, so the students believe that they could construct their understanding by themselves through a meaningful activity. The students' credibility on the use of the topic in their lives, the description and illustration of the abstract idea, and their capability to solve the problems by themselves, encourage them to take initiative to learn and explore the topic more, and take exercises. These indirectly improve the students' conceptual understanding of mathematics since the students realize the depth of any concept when they use it to solve any problem.

Based on the data of the students' response to the implementation of the SIOP Model, can be obtained that the lowest score is 59, while the highest score is 68. The percentage of students with response on very poor category is 0%, percentage of students with response on poor category is 0%, percentage of students with response on fair category is 0%, percentage of students with response on positive category is 31,8% (7 students out of 22 students), and percentage of students with response on category strongly positive is 62,8% (15 students out of 22 students). The average score of the students' response to the implementation of the SIOP Model is 62,9. It can be concluded that the students' response toward the implementation of SIOP Model was in the category "very positive".

Besides the improvement of the students' conceptual understanding and academic language of mathematics, the implementation of the SIOP Model gained positive response from the student. So, the result of this research has fulfilled the indicator of success been settled within this research. It can be concluded that this research has been a success.

4. Conclusion

Based on finding and discussion which has been described before, the conclusion of this study can be described as follows.

First, the improvement of the students' conceptual understanding of mathematics in class X MIA 2 SMA Negeri Bali Mandara through the implementation of SIOP Model could be achieved through the action, reflection, and emendation done by the teacher within the learning process. The students' conceptual understanding of mathematics is on pass category and has achieved the criteria within the indicator of success.

Second, the improvement of students' academic language of mathematics in class X MIA 2 SMA Negeri Bali Mandara through the implementation of SIOP Model could be achieved through the action, reflection and emendation did by the teacher within the learning process while implementing SIOP Model effectively, in which: 1) teacher spends a significant amount of time teaching the vocabulary required to understand the lesson's topic, 2) students are provided extra support by including instructional techniques that make learning comprehensible to students.

Third, the response of students in class X MIA 2 SMA Negeri Bali Mandara toward the implementation of SIOP Model was on category positive.

Referring to the results of this current study, there are a number of suggestions which can be proposed by the researcher as the following.

First, for the teachers, it is recommended to implement the SIOP Model in teaching bilingual mathematics, especially for L2 students who use English as a second language. SIOP Model can be an alternative to improve the students' conceptual understanding of mathematics in the bilingual class.

Second, the implementation of the SIOP Model within the learning process needs a hard work and high effort by the teacher to facilitate the students learning the abstract idea through their second language. The teacher needs to use a variety of techniques to make content concepts clear. It can be through modeling, visuals, hands-on activities, demonstrations, gestures, and body language. The hardness level of any kind of topic should also be a consideration in order to adjust the teacher's speech (including consideration of slower rate, enunciation, simple sentence structure) and proportion of English and Bahasa Indonesia to be appropriate with the students' proficiency, so the abstract idea within the topic could be grasped by the students.

Third, for the other researchers, due to the limited time in this current research, it is recommended that the implementation of SIOP Model to improve the students' conceptual understanding of mathematics could also consider the students' capability to describe their mathematical idea in written expression. It is suggested that the other researcher would please to pay attention to the obstacle within this study as a consideration to gain a better result on the next research.

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The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

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