THE ADAPTATION OF LANGUAGE AND CULTURE FOR SCIENCE TEACHING EFFICACY BELIEF INSTRUMENT (STEBI) IN INDONESIAN CONTEXT

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ABSTRACT
This study was done to adapt the language and culture of STEBI (Science Teaching Efficacy Belief Instrument) to be used in Indonesia. This research used the adaptation process of language and culture developed by Beaton et al., by following 5 stages. The translation process from English to Indonesian language was done in stage 1 by two translators who have the background in Science Education. In stage 2, a deeper discussion was accomplished by two experts who have the background in Psychology and Education. This discussion was done by considering the aspect of language and culture in which every word and sentence in every item was discussed in a deeper way by reflecting on Indonesian language and culture. The step of back translation in stage 3 aims to translate back STEBI in Indonesian version based on stage 2 into English. A discussion was held in stage 4 to compare the two translations, the original version of STEBI and the back translation version. In the next step, the draft of STEBI in stage 4 then handed out to 5 volunteers who have the background in science to read the instrument. There were some modifications and refinement in this instrument based on this stage. Finally, the final version of STEBI in Indonesian language version was generated after going through these 5 stages as the process of language and culture adaptation.

KEYWORDS
Self-Efficacy, Science, Teacher, Instrument.

1. INTRODUCTION

Personal Teachers play a significant role in the educational process especially in planning, executing and evaluating the learning and teaching process (Ramdani, Amrullah, & Tae, 2019). In order to do this, teachers need to own specific competencies and responsibilities to prepare all of these learning activities to be done in the classroom. This demands the teachers to have a qualified skills in mastering the knowledge (Subject Content Knowledge) and in transferring this knowledge to the students (Pedagogical Content Knowledge) (Shulman, 1986; Magnusson et al., 1999; Tae, Ramdani, & Shidiq, 2019).

An initial survey has been done in this study to investigate how the mathematics and science teachers in Indonesia reflect on their own profession as a teacher. There were 65 respondents agreed to participate in this initial survey. The result of this survey shows that the majority of the
respondents admitted the significance of teacher’s role in the learning process by highlighting various factors. These factors were grouped into Subject Content Knowledge and Pedagogical Content Knowledge proposed by Shulman (1986) that relates to how the teachers mastering and transferring the knowledge the students. Besides these skills, the respondents also mentioned in the survey that teachers’ personal attitude is also a crucial aspect that could affect their performance in the classroom, such as the enthusiasm, motivation, discipline, confidence, creativity and self-efficacy (Tae, Ramdani, & Shidiq, 2019; Cochran et al., 1993)).

Among these personal attitudes, self-efficacy is an important aspect which gives direct or indirect effect to the teachers’ performance in the classroom (Granziera & Perera, 2019; Klassen & Tze, 2014). Bandura (1986) in his social cognitive theory defined self-efficacy as a self-assessment done by an individual to assess his own ability in organizing and executing the tasks to achieve certain goals. In other words, teacher’s self efficacy is an opinion or perception about how a teacher pictures himself in accomplishing the tasks in leading the learning and teaching process in the classroom (Klassen & Tze, 2014).

Some research has strengthen this idea about how teacher’s self efficacy directly or indirectly influences a teacher’s teaching quality (Granziera & Perera, 2019; Huang et al., 2019; Klassen & Tze, 2014). Self-efficacy has been found as the mediator in the relationship between the identity of creativity a teacher possesses and the implementation of their behaviours in the classroom (Huang et al., 2019). A longitudinal research that has involved 600 teachers in Australia also proved a reciprocal connection between teacher’s self-efficacy, the teaching process in the classroom and the satisfaction level of teacher’s performance (Granziera & Perera, 2019). A teacher with higher self-efficacy has a tendency to be more qualified in transferring his knowledge than those who have lower self-efficacy (Klassen & Tze, 2014). The other research also found that teacher’s self-efficacy also gives impact in how a teacher establishes a social relationship with his students. Those who have high self-efficacy has been proven to have better social relationship with the students which in turn could create higher psychology characteristics in predicting the self-efficacy itself (Guo et al., 2011; Van Uden et al., 2013, 2014).

The other research also showed that the level of teacher’s self-efficacy across the nations are vary depends on some factors including the culture a country possess (Campbell, 1996; Yeung & Watkins, 2000., Kahramana et al., 2014). In a more specific way, some research focused on self-efficacy of science teachers in their learning and teaching process (Kahramana et al., 2014; Isiksal & Cakiroglu, 2005). A research done by Isiksal & Cakiroglu (2005) comparing the level of self-efficacy between the pre-service teachers in Turkey and USA and found that there was a difference in how these pre-service teachers picturing their abilities in teaching science (Isiksal & Cakiroglu, 2005).

While in Indonesia, the research about self-efficacy has been focusing more on the exploration of student’s personal efficacy in accomplishing the academic tasks in the school (Hermita & Thamrin, 2015). Some research also has been done to adapt and test the validity of self-efficacy scale such as Suharsono (2014), and Suprapto (2017). However, there are only a few of research in Indonesia that has been concerning on teacher’s self-efficacy, especially for Indonesian science teachers. Moreover, there was no explanation in detail about the using of a standardized self-efficacy instrument that has been adapted for Indonesian context.

Historically, there is no Indonesian version of the instrument to measure teacher’s self-efficacy in the science education context. This results in the low accessibility of the research about science teacher’s self-efficacy in Indonesia. The most popular instrument to measure science teacher’s self-efficacy is the instrument developed by Riggs, I.M and Enochs, L.G.(1989) that has been widely used in the context of science education. This instrument is well-known by STEBI that stands for Science Teaching Efficacy Belief Instrument.

STEBI was developed for the very first time by Riggs and Enochs (1989). This instrument was made to measure science teacher’s self-efficacy who teaches in primary schools. In its beginning, the items in STEBI was discussed and assessed in a panel by some experts which then followed by a cluster of statistical analysis. STEBI was tested for the very first time in 71 pre-service science teachers in the US which was also continued by statistical analysis. In the next step, STEBI was
tested again in a bigger sample of science teachers in the US (N=331). After going through the cluster of statistical analysis process, some items in STEBI were eliminated. At the end, STEBI contains 25 items that could be used to measure science teacher’s self-efficacy in the primary schools. Hence this study is done to adapt the language and culture in the instrument of STEBI so that in the end, there will be an Indonesian language version of STEBI that has been translated by a standardized process. There is also a hope that there will be a better accessibility of the instrument in assessing science teacher’s self-efficacy in Indonesia.

2. METHOD

**Design.** This study was done to adapt the language and culture of self-efficacy instrument in the context of science learning. The instrument used in this research is STEBI (Science Teaching Efficacy Belief Instrument) that could be used to measure science teacher’s self-efficacy Riggs and Enochs (1989). To adapt the language and culture, this study referred to the process of adaptation developed by Beaton, Bombardier, Guillemin, & Ferraz (2000) in which the focus of this method is to do the adaptation of the scale or instrument based on the language and culture of a country where the instrument is used.

**Psychometric Property.** In the beginning of its development, the scale modeling of STEBI was done in the first step to determine the specific items that would be used to measure self-efficacy and the outcome of expectancy belief toward the teaching behaviour in general (Gibson and Dembo, 1984). All of the items were then modified to adapt with the science teaching process in the primary school. The two scales of Personal Science Teaching Efficacy Belief and Science Teaching Outcome Expectancy were then combined to become STEBI (Science Teaching Efficacy Belief Instrument).

All the items were examined in terms of its clarity by some experts. The total of 50 items was discussed in a panel by the judges/experts that had been chosen by their competency in relation to the refinement process of the items in STEBI. The experts were asked to classify the dimension of each item, rate each item and the total of the items. This contributed to the validity of the content of the instrument. If it was found that there were 3 out of 5 experts classified certain item inconsistently, then the item was eliminated from the instrument.

STEBI was tested for the very first time for the 71 pre-service science teachers who were registered in a university in America. The objective of this test was done as the refinement process to get a more briefly version of STEBI by going through the analysis process of the instrument. The factor analysis was done towards the two scales (Personal Science Teaching Efficacy Belief and Science Teaching Outcome Expectancy) which in turned the selection process for the items in STEBI could be done as the next step.

Means and deviation standard were also calculated for the two scales including the information of each item that has been eliminated from the instrument. Eventually, there were 24 items for the scale of Personal Science Teaching Efficacy Belief and 19 items for the scale of Science Teaching Outcome Expectancy. The reliability analysis of Personal Science Teaching Efficacy Belief gave the number of alpha 0.92 where 22 items of the total 24 items in this scale had the total of correlation of 0.42 and more. To shorten this scale, 6 items with the lower correlation had been eliminated from the instrument so that it just left the items which had the correlation 0.50 and more. In the next step, the factor analysis was done which gave alpha of 0.91 in Science Teaching Outcome Expectancy with the total correlation for all items 0.50 and more. The alpha of reliability for this scale was 0.73 with all the items had high correlation with their own scales.

The scale of Personal Science Teaching Efficacy was then tested to the bigger sample of 331 primary science teachers who taught in the rural and urban area. The reliability of the instrument was tested once again by using the procedure of internal consistency. Furthermore, the factor analysis was accomplished once again to determine the total of significant factors. The items that were found to be wrong item then eliminated.

The item analysis was done once again and found that for the scale of Personal Science Teaching Efficacy Belief, the alpha was 0.91 with the correlation of 0.53 and more, except for 2
items which then were eliminated. While for Science Teaching Outcome Expectancy, the alpha was 0.76 with the correlation of the items 0.34 and more, except for 2 items that were eliminated. Eventually, the remains item were 25 items which found to have correlation for all of the criteria by using Pearson analysis.

In terms of its reliability, the two scales that has been analyzed was proper to be used. The lower alpha in the scale of Science Teaching Outcome Expectancy showed the consistency with prior research in which this scale was difficult to be measured or defined. This might also due to many complex variables that contributed to the items such as science teachers’ background, inadequate students’ science background and low students’ motivation. Thus, respondent might give higher score to particular items but gave the lower score for another item which created inconsistency.

This also showed that the teachers had the tendency to be more consistence in giving the score for the factors that come from themselves than the factors that come from outside which could not be controlled. For example, it was easier for them to rate the score about their self-efficacy than the outcome as the result of the factor that come from outside. The factor analysis also showed that the two scales had clear differences and could be measured. This suited with the social learning theory that said that these two scales have certain relationship. So, it could be concluded that STEBI is a valid and reliable instrument to measure the belief of primary science teachers toward their beliefs in the learning and science teaching.

**Research Procedure.** The process adaptation of language and scale of STEBI in this research referred to the guidance of adaptation by Beaton et al., (2000). There are 5 stages that are explained below.

Stage 1: Initial Translation

In this stage, there were two translators who worked in different place to translate STEBI from English to Indonesian language. The Translator 1 (T1) has the background in Science Education (Physics) who finished her study in the United Kingdom. Meanwhile, the Translator 2 (T2) is a doctoral candidate in a university in Thailand and has the background in Chemistry Education.

Stage 2: Synthesis of the Translations

The result of translations from T1 and T2 were then discussed deeply by two experts who have the background in Psychology (Psychometry) and Education. This stage was done in order to combine the two versions of translation and produce one version of translation by going through the process of discussion (Ramdhani, 2012). The output of this stage was the STEBI version in Indonesian language.

Stage 3: Back Translation

In this third stage, the result of STEBI version in stage 2 was translated back into English (Ramdhani, 2012). A translator with no background in science was in charge to translate back STEBI from Indonesian version into English. The translator has the background of Teaching English to Speakers of Other Language (TESOL) and graduated from a university in the United Kingdom.

Stage 4: Discussion

The result of back translation was used to compare STEBI version in stage 3 with the original version developed by Riggs and Enochs (1989). This stage aimed to see if there is any difference of meaning from these two translations. The modification of translation is needed if there is any discrepancy of meaning between the back translation and the original version.
Stage 5: Test of Pre-final Version

The Riggs scale (STEBI) that had been going through the process of translation, back translation and discussion then produced a final version of STEBI in Indonesian language. This instrument then was given to some science teachers as the volunteer. This stage was done in order to check the clarity of the words or sentences and whether there is any item that could not be understood well by the respondents (Ramdhani, 2012). The trial process and the statistical analysis have not been done yet to the bigger sample of science teachers. So, the step of trial process and statistical analysis would be done in the next research.

Figure 1. The Stages of the Research

3. RESULTS AND DISCUSSION

Stage 1 and 2

The adaptation process of language and culture used in this research was based on the guidance of adaption developed by Beaton, Bombardier, Guillemin, & Ferraz (2000). In stage 1, two translators (T1 and T2) who have the background in science education translated the instrument of STEBI in different place. Subsequently, in stage 2, there were two experts who has the background in Psychology (Psychometry) and Education did the deeper discussion to get 1 version of STEBI translation. The discussion process was done by considering the language aspect and the culture of Indonesian people with the hope that STEBI could be used in Indonesia to measure science teachers’ self-efficacy. Table 1 in the Appendix shows the comparison of the translations among Translator 1 (T1), Translator 2 (T2) and the result of discussion (T12).

In general, STEBI has 25 items which contains 25 statements about how a science teacher assesses his ability in teaching science to the students. From 25 items, 16 items measure the science teachers’ ability with a positive view (favourable) while the 9 rest items assess their ability in a negative way (unfavourable) (Ramdhani, 2012). Therefore, the discussion will be categorized into two groups which are the positive items (favourable) and the negative items (unfavourable)

a. The Positive Items (favourable)

There were 16 positive items STEBI possesses which are item 1, 2, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, and 23. For item 1, ‘.....it is often because the teacher exerted a little extra effort”, the Translator 1 translated ‘Exerted’ as ‘Mengerahkan=exert’ while Translator 2 translated it as ‘Memberikan=give’. Based on the Big Dictionary for Indonesian Language
In item 6 ‘I am not very effective in monitoring science experiments’, Translator 1 translated it as ‘Saya tidak terlalu efektif dalam memonitor...... (I am not really effective in monitoring.....)’ while Translator 2 translated it as ‘Saya tidak terlalu terlibat efektif dalam memonitor...... (I am not involved effectively in monitoring.....)’ in which it could be seen here that translator 2 added the word ‘involved’ to describe the teacher’s role in the process of monitoring the students. When doing the discussion, it was decided to use the translation of Translator 2 so the sentence became clearer and more understandable. For item 20, Translator 1 translated the

b. The Negative Items (Unfavourable)

In item 6 ‘I am not very effective in monitoring science experiments’, Translator 1 translated it as ‘Saya tidak terlalu efektif dalam memonitor...... (I am not really effective in monitoring.....)’ while Translator 2 translated it as ‘Saya tidak terlalu terlibat efektif dalam memonitor...... (I am not involved effectively in monitoring.....)’ in which it could be seen here that translator 2 added the word ‘involved’ to describe the teacher’s role in the process of monitoring the students. When doing the discussion, it was decided to use the translation of Translator 2 so the sentence became clearer and more understandable. For item 20, Translator 1 translated the
stage into ‘Efektivitas dalam pengajaran sains memiliki pengaruh yang kecil terhadap prestasi.’ (The effectivity of science teaching has little influence to the achievement...’ while Translator 2 put two more words ‘I agree’ in the beginning of the sentence. The result of discussion selected the translation of Translator 2 to give a clearer statement in the item.

However, something different was found in item 25 in which Translator 1 translated it into ‘Bahkan, guru dengan kemampuan pengajaran sains yang baik... (Even, the teachers with good ability in teaching science.....’ Meanwhile, Translator 2 made the meaning ‘Saya setuju, jika guru dengan kemampuan pengajaran sains yang baik..... I agree that teachers with a good science teaching....’ Based on the discussion, the decision was to eliminate the word ‘Even= Bahkan’ and ‘I agree= Saya setuju’ from the statement so the sentence will be shorter yet still understandable so it became ‘Guru dengan kemampuan pengajaran sains yang baik..... (The teachers with good science teaching....)’. For item 24 ‘I don’t know what to do to turn students on to science’, Translator 1 translated ‘turn students on to science’ into ‘mengarahkan siswa pada Sains (turn students on to science)’. On the other hand, translator 2 translated it became ‘mengarahkan siswa dalam memahami sains (turn the students to understand science)’. The decision was to use the translation of Translator 2 because the context is in relation to ‘the understanding of science’ and the sentence became clearer without changing the meaning. While, some items such as item 3, 8, 17, 21 and 22 were translated relatively in the same way by Translator 1 and 2.

Stage 3 and 4

In this stage, the draft of STEBI translation in Stage 2 was translated back as the process of back translation by a translator who has no background in science but in Teaching English to Speakers of Other Language (TESOL). This stage was done in order to make a comparison between the original version of STEBI and the back translation of STEBI in Indonesian language version.

Table 2 in the appendix shows the comparison of the original and the back translation version.

In Stage 4, the result of back translation then was compared with the original version. Primarily, almost all the items in the back translation have relatively the same meaning so there is no discrepancy with the original version of STEBI. But, based on the deeper discussion, some items that start with the words ‘I agree’ in the beginning of the statement (item 13, 14, 15, 16 and 20) should be modified, in which the words ‘I agree’ should be removed from the sentence. This is because these words could lead the respondent to have the tendency to agree with that items that could contribute to the level of approval in the Likert scale. These items were re-written again to get a new version of STEBI in Indonesian language shown in table 3 in the Appendix.

Stage 5

In this stage, the STEBI version based on the result discussion in stage 4 then handed out to 5 science teachers to be read. The objective was to get the initial sense of how far the respondent could understand the statements in the items and if there is any words or sentence that could not be understood well (Ramdhani, 2012., Beaton et al., 2000). This stage was done to have initial description before testing it to the bigger sample in the next research (Ramdhani, 2012., Beaton et al., 2000). The STEBI instrument that has been read then handed in back to the researchers to be discussed further. There was a brief interview with the 5 respondents about which word and sentence they found it difficult to be understood and the reason why. Generally, the confirmation of the 5 respondents is displayed in the table 4 in the appendix.

Primarily, six items were commented by the respondents in terms of whether the words were grammarly correct in spelling, the typology and the complex sentence that needed to be re-written in a simpler way without changing the meaning of the sentence. Based on the Big Dictionary for Indonesian Language (KBBI daring, 2019), the word ‘Keefektivan’ should be written ‘Keefektifan’ (item 15 and 20) and the word ‘Ketidak cukupan’ should be written un-separated to become ‘Ketidakcukupan’. Overmore, in terms of its typology, there should be no comma in item 17. Meanwhile, item 13 and 25 were confirmed by almost all of the respondents as the sentence

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that are not too clear hence hard to be understood. Based on the discussion, item 13 with the original sentence ‘Increased effort in science teaching produces little change in some students’ science achievement’ with the first translation ‘Dibutuhkan upaya peningkatan dalam pengajaran sains agar dapat menghasilkan sedikit perubahan pada prestasi belajar sains siswa. (Increased effort in science teaching is needed to produce a little change in student’s science achievement)’ Should be modified into ‘Perlu adanya usaha peningkatan pengajaran sains untuk memberikan sedikit perubahan pada prestasi belajar sains siswa (There is a need to increase the effort in science teaching to produce a little change in student’s science achievement)’ While for item 25 with original sentence ‘Even teachers with good science teaching abilities cannot help some kids learn science’ with the first translation ‘Guru dengan kemampuan pengajaran sains yang baik tidak mampu membantu beberapa anak belajar sains dengan lebih baik (Teacher with good ability in teaching science not able to help some students learn science in a better way)’ was modified into ‘Walaupun memiliki kemampuan pengajaran sains yang baik, seorang guru tidak mampu membantu beberapa anak belajar sains dengan lebih baik (Though having a good ability in teaching science, a teacher cannot help some students to learn science in a better way)’.

4. CONCLUSION

Assessment is a significant process in helping the teachers to evaluate their teaching and learning process that has been done in the classroom. Besides giving the assessment to the students, the teachers also need to evaluate their own performance especially in making the self-assessment of how confidence they are toward their own ability in conducting science teaching and learning in the classroom. In this research, the researchers did the adaptation process of language and culture of STEBI (Science Teaching Efficacy Belief Instrument) using the guidance of adaptation developed by Beaton et al., (2000). This was done in order to gain an instrument that has been going through the standardized process of adaptation for the context of science teachers in Indonesia. The adaptation was accomplished because STEBI was developed for the very first time in different country which has different language and culture from Indonesia. After being translated, STEBI was deeply analyzed by taking into consideration every single words and statements in each item. After being translated back through the back translation process and further discussion, an Indonesian version of STEBI was gain and could be used to measure science teachers’ self-efficacy in Indonesia. Overall, this instrument could be utilized as a practical usage in assessing Indonesian science teachers’ self-efficacy. Eventually, we hope that this version of STEBI could be used widely and could positively contribute to the development of education in Indonesia.

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