The use of transformative learning in developing students’ self-efficacy

Iyan Rosita Dewi Nur¹ and Dani Firmansyah¹

¹Universitas Singaperbangsa Karawang, Jl. H.S Ronggowaluyo, Karawang, Indonesia

Email: iyan.rosita@fkip.unsika.ac.id

Abstract. The contents from process of learning are individuals changing in cognitive aspect, behaviour, ability and habitual as a product and interaction with its domain. Learning is the process to construct our knowledge by experience transformation. This research objective to analyse the students’ self-efficacy can be increased by transformative learning model. The method in this research is mix method design and the kind of this method is explanatory sequential method. The populations of this research are all of the 2nd grader mathematics education bachelor degree students in Universitas Singaperbangsa Karawang and the samples are 30 students were randomly selected. This research was done in researcher’s own class in order that the subjectivity of data processing and conclusion are maintained. Data collection methods used is the questionnaire method, learning processes observation sheet, documentation, and interview. Data analyse technique used t-test and likert scale. It can be concluded that reviewed based on the overall student and the level of student ability, the students who are given the model of transformative learning have the self-efficacy in carrying out certain tasks or actions needed to achieve desired results better and increased previous. It can be said that the Transformative Learning model can improve students’ self-efficacy.

1. Introduction

One of the most important things as an outcome from learning process is an observable change of individuals in terms of knowledge, attitude, skill, and behavior as a result from their interaction with surrounding environment. Learning is a process of building knowledge through experience transformation. In other words, a successful learning means only if an individual successfully build better and qualitatively observable knowledge, attitude, skill, and new behavior. Attitude or affective ability is related to psychological capacity. As a consequence, learner’s psychological aspect needs to be taken into account since it affects their success in learning[1].

Self-efficacy is basically a result of cognitive processes in the forms of decision, belief, or acknowledgment as to the extent to which individuals predict their capacity in accomplishing the tasks or certain actions needed to reach the intended goals [2]. He adds that self-efficacy is not related to self-capacity but individual belief as to what he can do with his ability no matter how big it is. Self-efficacy will affect some aspects of one’s cognition and behavior [3]. Self-efficacy can turn someone into different behavior among individuals with different ability in that self-efficacy affects choices, goals, problem solving, and perseverance [4].

Albert Bandura’s theory of perceived self-efficacy is based on one’s belief of their capabilities. Perceived self-efficacy influences every aspect of life. The following quote from Bandura provides a brief synopsis of perceived self-efficacy.
“We find that people’s beliefs about their efficacy affect the sorts of choices they make in very significant ways. In particular, it affects their levels of motivation and perseverance in the face of obstacles. Most success requires persistent effort, so low self-efficacy becomes a self-limiting process. In order to succeed, people need a sense of self-efficacy, strung together with resilience to meet the inevitable obstacles and inequities of life” [2].

Recent studies have reported that teachers’ sense of teaching efficacy is one of the strongest predictors of their attitudes towards inclusion [5]. Researchers also report that high teacher self-efficacy is a key ingredient in creating successful inclusive classroom environments [5–7].

A researcher conducted a preliminary research in the Department of Mathematics Education by selecting 5th semester students categorized into three different levels of mathematical ability (lower-average, middle-average, and higher-average). The researcher observed those three categories and concluded with a result that there were students who have self-efficacy on mathematics and who do not have. They were required to solve difficult mathematical problems. In each category level, students who have strong self-efficacy switch irrelevant solutions faster than those who do not. They did it better, attempting to do the unresolved problems more accurately than those who at the same level having a doubt or inferior feeling. This preliminary research indicated that positive behaviour and self-confidence on mathematics possibly give a better result compared to students’ real ability. Students’ inaccuracy in completing the task is not only due to insufficient skill to do the task but also they lack of belief and self-confidence to exploit those skill and ability.

Transformation is human basic change. Instructional or educational transformation is instructional or educational which generate learner’s basic change. Self-change often happens after one experience an unexpected, disappointed, awkward, and traumatic incident [2,8]. For example, a student has to reassign the same course. In this case, someone usually realizes his problem and be open-minded for other promising solutions. If this happens, someone then experiences a transformation. Maintaining a habit seems easier than changing it, let alone changing the established one that has been a life principle or even a belief. In this context, belief is not only related to religion, but also self-esteem, honesty, safety in certain condition, etc. However, change needs to be done [9].

Transformation is a self-changing process. Therefore, life changing is the core from transformative learning process [10–12]. In other words, transformation requires effort, awareness, and purposeful intention. This effort is termed reflection, that is, a process and monitoring skill, evaluating, and self-direction [13]. The stronger someone’s ability, the more professional someone does their task. On the other hand, the weaker someone’s ability, the less professional someone does their task. Considering the definition of transformation described earlier, it can be concluded that transformative learning is a learning process that encourages changing of learners, and is closely related to learners’ self-efficacy in mathematics education. So, the aims of this research is to analyze how students’ self-efficacy can be increased by transformative learning model

2. Method
This research employed mixed method with sequential explanatory research design, that is, quantitative data collection and analysis on the first step followed by qualitative data collection and analysis on the second step in accordance with prior quantitative result that prioritizes the quantitative process. The process of mixing the data was conducted when the quantitative result on the first step suggests a qualitative data collection. The design of sequential explanatory research is illustrated in the following diagram:

![Figure 1 Strategy of Sequential Explanatory Mixed Method](image)

Notes:
Box  : data collection and results
This research applied the use of transformative learning model. The subject was not randomly assigned, but the researcher took the subjects as they were, and this research was carried out in her own classes so the subjectivity of data processing and conclusion drawing are adjusted. In this research, the research subject was the third semester students of mathematics education program that involved 3 groups of students who have high academic achievement index (GPA) that is $3.26 \leq \text{GPA} \leq 4.00$, group of students who have GPA is $2.51 \leq \text{IPK} \leq 3.25$, and group of students who have a low GPA of $\text{GPA}\leq2.50$. Instruments used in this research were the researcher as the main instrument, and additional instruments that were students’ GPA, questionnaire, observation sheets and interview guidelines for students.

Data collections were done through questionnaires, observation sheets and interviews with students. Questionnaires were given to all samples before and after the learning process in order to know their self-efficacy level. Self-efficacy questionnaire data is ordinal data, then the data must be converted into interval data first. After data was transmitted from ordinal data to interval data, data was processed by testing the normality, testing the homogeneity, testing the hypothesis.

To know the suitability between the stages that must be done in the implementation of the transformative learning model with the real learning, the observation sheets of teacher and students’ activity were used during the learning process. The observation sheets of students and teacher’s activity were used to observe the teacher and students’ activities during learning process and it was recorded with a camera so that the observer can cross-check the results of the actual observations with recording. The observation sheet of this learning activity also serves as a tool for the assessment of the learning process that includes the criteria: The implementation of learning by the students, the students’ activity in learning and teacher-student interaction.

Observation is done by an observer. Analysis of observation data is needed to see the proportion of teacher and student activities during learning activities [14]. Therefore, data processing of observation result is done by determining the percentage of students’ activity, and the percentage of teacher’s activity during the learning activity.

To complete the qualitative data, the researcher held interviews to students. Interview results were presented in the form of interview script. The interview was conducted after the learning process ended with 3 students representing 1 person from the high-achievement group, 1 person from the medium-achievement group, and 1 person from the low-achievement group. This interview aims to determine students’ responses to the Transformative Learning model.

3. Result and Discussion

3.1 The result of Average Difference Test of student’ Self-Efficacy

| N-Gain | Sig. (2-tailed) |
|--------|----------------|
|        | 0.012          |

Based on Table 1, it can be seen that the Sig. value. (2-tailed) = 0.012, then we can get that sig. (1-tailed) = $\frac{1}{2} \times 0.012 = 0.006$. Sig. (1-tailed) $0.006 < 0.05$ indicates that $H_0$ is rejected which means that there is an increase at students’ self-efficacy after receiving Transformative Learning model based on the whole students. To see the difference in self-efficacy score increase in high-achievement group students, the difference test was done. The results of the N-gain difference test are presented in Table 2.
Table 2. The Result of N-Gain Test of Student’ Self-Efficacy of High Achievement Group

| N-Gain | Sig. (2-tailed) |
|--------|----------------|
|        | 0.005          |

Based on table 2, the value of sig = 0.005. So sig. (1-tailed) = ½ (0.005) = 0.0025. Sig. (1-tailed) 0.0025 < 0.05 indicates that H₀ is rejected. It can be concluded that in group of students with high achievement of self efficacy increased significantly.

Table 3. The Result of N-Gain Test of Student’ Self-Efficacy of Medium-Achievement Group

| N-Gain | Sig. (2-tailed) |
|--------|----------------|
|        | 0.030          |

Based on table 3, it is obtained that sig value = 0.030. So sig. (1-tailed) = ½ (0.030) = 0.015. Sig. (1-tailed) 0.015 < 0.05 indicates that H₀ is rejected. It can be concluded that in the group of students with medium achievement of self-efficacy increased significantly.

Table 4. The Result of N-Gain Test of Student’ Self-Efficacy of Low-Achievement Group

| N-Gain | Sig. (2-tailed) |
|--------|----------------|
|        | 0.0806         |

Based on table 4, it is obtained that the value of sig = 0.0806. So sig. (1-tailed) = ½ (0.0806) = 0.0403. Sig. (1-tailed) 0.0403 < 0.05 indicates that H₀ is rejected. It can be concluded that in the group of students with low achievement of self-efficacy increased significantly. Based on the grouping of students, the increase of self-efficacy of high and medium group students increased significantly while the self-efficacy of students in the low achievement group did not increase.

3.2 Observation Result of Learning Activity

Observations during the learning activities were conducted by the researchers themselves directly and assisted by recorder tool that is handicam with the aim to be more thorough in the observation. Activities observed include lecturer’s activities in explaining, facilitating students, conducting question and answer, and student’s activities that include discussion and questioning among students, asking the lecturer, reading the source book and presentation.

The observation results were recorded on the observation sheet, the observer gave a checklist on the type of activities undertaken by lecturers and students. The result of observation during learning process showed that the activities in the class were more dominated by the activeness of the students. It shows that in the class there was an active learning activity. The lecturer’s activities included making the classroom as comfortable as possible, preparing theme / topic material in accordance with the curriculum of learning, while the students’ activities were such as selecting topics from several topics that have been prepared by teachers, determine the group members selected based on the agreement of the students, concept maps, discussion, reporting, presentation sheets, presenting the results of group discussions, listening to presentations and asking questions and responding to other group presentations and evaluating the results of their group work.

Based on the observation results of the learning activities are included criteria assessment of teaching and learning process is the consistency of learning activities with the curriculum which is displayed by the delivery of learning objectives and provide teaching materials. Enforcement of lecturers is demonstrated by good student environment in the classroom, preparing tools, learning resources and equipment, providing assistance and guidance to groups or students are needed, and generalizing the learning outcomes for the next learning activity. The students' performance is demonstrated by following the instructions given by the lecturer, all the students doing the learning activities, completing the assigned tasks, and utilizing the good learning resources provided by the lecturers as well as those brought on the student's initiative. The interaction between lecturers and
students are shown by question and answer between lecturers and students, lecturers’ assistance to groups or students experiencing obstacles or difficulties, question and answer or discussion between students or between groups, and lecturers as a solution when all students get obstacles in learning.

3.3 Interview result

Researcher conducted interview to some students to know the opinion of the student about transformative learning model. From the interviews it was found that the students in the research class had never known the term Transformative Learning model. If any students in the class doing the discussion, they discuss with how to discuss the problem and answer together then the result is collected and only one course from each group. In this study, students were given the opportunity to learn by using the model of Transformative Learning, they were very excited and enthusiastic in learning because the learning model was a broad interaction, students were given the flexibility in determining their own topics to be learned, created a comfortable and pleasant atmosphere in accordance with the wishes and they are always trained and challenged to practice their thinking skills by appearing confident in explaining a topic of problems in mathematics.

Interviews were conducted to obtain information about the students’ experimental class responses on the Transformative Learning model. The result of interview as follows: (a) students have never had a learning activity by using Transformative Learning model; (b) students argue that learning by using Transformative Learning model is very fun because in this study the students are given the widest possible extent in determining the topic of learning, students are accustomed to apply persuasive words in learning, increase experience and share more deeply with colleagues outside his group without fear to answer; (c) in pursuance of students are interviewed, the Transformative Learning model has advantages because in the implementation of this learning model creates a conducive and comfortable atmosphere in learning. In addition, this learning model can improve the ability to be brave and confident in their ability that they can answer questions and have the opportunity to use different ways of completion, not worrying about the mistake of problem solving, as one of the best experiences and tools to improve self-efficacy; (d) students wish the learning model of Transformative Learning is also used in other course learning; and (e) resolving questions in various ways requires creativity from each student. With the learning model Transformative Learning students are required and accustomed to hone his brain skills [10–12,15]. This is very useful for students because the habit of self in solving mathematical problems are built by each thought can make students believe in their ability that they are able to solve the problems [4,5,16,17].

Perceptions are important. Student perceptions about their teachers influence their in class decisions about how to interact and engage in learning. From this research, the researchers can summarize there are the differences between individuals with high self-efficacy and those with low self-efficacy:

| People with High Self-efficacy | People with Low Self-efficacy |
|-------------------------------|-------------------------------|
| See challenging issues as tasks that must be mastered | Avoid challenging tasks |
| Develop more interest in activities in which they participate | Believe that difficult tasks and situations that are beyond their capabilities |
| Establish a strong sense of commitment to their interests and activities | Dwell on personal deficiencies and negative outcomes |
| Establish a strong sense of commitment to their interests and activities | Dwell on personal deficiencies and negative outcomes |

4. Conclusion

Mathematics learning is a series of teacher activities in giving instruction to students to build mathematical concepts and principles with their own ability through internalization process so that the concept or principle is built by the teaching method or approach and its application in order to improve the basic competence and ability of the students. It is generally concluded that self-efficacy of a person
has a significant influence on the learning of mathematics. This is intended that the higher one’s self-efficacy, the higher the ability in mathematics learning, and on the other hand, the lower one’s self-efficacy, the lower the ability in learning mathematics. It is very essential that in classroom learning especially mathematics learning to pay attention to any means required to create and improve students’ self-efficacy. Thus, a teacher is suggested to create a learning process that can improve students’ self-efficacy. Students who are given Transformative Learning model have a sense of self-efficacy in carrying out certain tasks or actions needed to achieve better desired results and increased previous outcomes. Therefore, it can be said that Transformative Learning model can improve students’ self-efficacy.

Acknowledgments
The author would like to thank the LPPM UNSIKA for supporting this research by providing funding to conduct research

References
[1] Nold H 2017 Using Critical Thinking Teaching Methods to Increase Student Success : An Action Research Project Int. J. Teach. Learn. High. Educ. 29 17–32
[2] Bandura A 1977 Self-efficacy: Toward a Unifying Theory of Behavioral Change Psychol. Rev. 84 191–215
[3] Tasdemir C 2016 An Examination of Vocational School Students’ Self-Efficacy Beliefs in Mathematics and of Their Achievement Levels. Educ. Res. Rev. 11 804–11
[4] Aydoğdu B and Peker M 2016 Science and Mathematics Teaching Efficacy Beliefs of Pre-school Teachers Univers. J. Educ. Res. 4 2541–50
[5] Weisel A and Dror O 2006 School climate, sense of efficacy and Israeli teachers’ attitudes toward inclusion of students with special needs Educ. Citizsh. Soc. Justice 1 157–74
[6] Sharma U, Loreman T and Forlin C 2012 Measuring teacher efficacy to implement inclusive practices J. Res. Spec. Educ. Needs 12 12–21
[7] Forlin C, Sharma U and Loreman T 2014 Predictors of improved teaching efficacy following basic training for inclusion in Hong Kong Int. J. Incl. Educ. 18 718–30
[8] Kompridis N 2000 So we need something else for reason to mean Int. J. Philos. Stud. 8 271–95
[9] Irfan M 2016 Role of Learning Mathematics in the Character Building International Conference on Education pp 599–604
[10] Kumi–Yeboah A and James W 2014 Transformative Learning Experiences of International Graduate Students From Asian Countries J. Transform. Educ. 12 25–53
[11] Kovacs H 2018 Change, Challenge, Transformation: A Qualitative Inquiry into Transformative Teacher Learning Cent. Educ. Policy Stud. J. 8 99
[12] Provident I, Salls J, Dolhi C, Schreiber J, Mattila A and Eckel E 2015 Design of an online curriculum promoting transformative learning in post professional doctoral students J. Asynchronous Learn. Netw. 19 128–43
[13] Bonanno G A 2005 Resilience in the face of potential trauma Curr. Dir. Psychol. Sci.
[14] Creswell J W 2012 Educational research: Planning, conducting, and evaluating quantitative and qualitative research vol 4
[15] John V M 2016 Transformative learning challenges in a context of trauma and fear: An educator’s story Aust. J. Adult Learn. 56 268–88
[16] Brinkmann J L 2019 Making Difference: Increasing Elementary Pre-Service Teacher’s Self-Efficacy in Mathematics Educ. Plan. 26 7–21
[17] Roth B B, Asbjornsen A and Manger T 2017 The Relationship Between Prisoners’ Academic Self-efficacy and Participation in Education, Previous Convictions, Sentence Length, and Portion of Sentence Served J. Prison Educ. Reentry 3