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Mangrove forest ecotourism: Participatory ecological learning and sustainability of students' behavior through self-efficacy and self-concept

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ABSTRACT

Self-efficacy and self-concept were deduced to be able to develop sustainable behavior in students. One potential approach is participatory ecological learning in mangrove forest ecotourism. This study aims to determine whether self-efficacy and self-concept significantly affect students' sustainability through participatory ecological learning. This qualitative study involved 128 participants and used structural equation modeling (SEM). Data were analyzed using partial least squares (PLS). The result indicated that Self-Efficacy significantly affected the sustainability of students' behavior, but Self-Concept had no significant effect on it.

Universities, regarding their functions as research and innovation centers, should develop research-based sustainable programs in order to fulfill their parts in developing science and technology for future advancement of mankind (Galang, 2010; Matloob, Sulaiman, Ali, Shamsuddin, & Mardyya, 2014; Shephard et al., 2015; Tenhunen, 2017). As understanding of the environment is incomplete and dynamic, continuous research needs to be conducted (Gough, 2009). One of which is a study focusing on education development. Education is one of the important assets that makes a person can compare and learn positive and negative things in life with the aim of forming a better future and can make better decisions (Beier & Rittmayer, 2008). There are many issues can be explored in education development, one of them is a study that is focused on students' behavior. According to Jurigová and Tucková (2016), research on students' behavior in growing economic values is necessary due to its importance for human life. However, Sugandin (2018) argued that every innovation cannot readily be accepted and implemented. Therefore, researches and studies are vital to provide knowledge and understanding, especially to students in learning how to control their behavior regarding the environment (Emanuel & Adams, 2011; Tan & Lau, 2009). According to Kazdin (1985) in (Sutherland & Oswald, 2005), disruptive behavior development is contributed from various risk factors that join together. Therefore, research needs to be conducted in order to seek the appropriate formula to eliminate or reduce the risk. In addition, Pellas (2014) mentioned that qualitative, quantitative, theoretical, and participative research is necessary to answer the issues of education discrepancy, known as "gap commitment." Next and Skill (2009) describe three sustainable pillars that should be considered in research development, namely, environment, economy, and social. Surjanti, Nugrohoseno, Budiono, and Musfidah (2018a) argued as well that designing an appropriate curriculum is important in order to achieve learning goals.

Self-efficacy and self-concept are mediators in sustainable behavior learning (Bandura & Bandura, 1997). In addition to influencing human behavior, self-efficacy also moves people's thoughts and feelings. Therefore, individuals who have weak self-efficacy tend to think that the task or issues faced seems more difficult than the actual fact. These thoughts are a breeding ground for feelings of failure and depression, tension, as well as helplessness. Conversely, strong ideas about self-efficacy create a feeling of calm and challenge on the face of difficult tasks (Clark and Button, 2011). Hence (Bandura & Bandura, 1997), argued that self-efficacy has an important role as a key in human agency. However, Ferla (2009) mentioned that although self-efficacy and self-concept are two different factors, both are good mediators in improving academic achievement. According to Urban and Ratsimanetrimanana (2015) self-efficacy is needed to evaluate social efforts. Oliveira and Rodrigues (2010) noted that participatory ecological learning is useful in developing sustainable behavior to accelerate SDGs, and Pane & Patriana (2006) found that 91% of students agreed to participate in environment-based learning. This study is purposedly conducted in order to answer issues on ecological learning especially

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related to success the sustainable developmental program at education point of view (Gould, 2018; Huang, 2015; Pellas, 2014). As previously seen, implanting environmental sustainability program into educational curriculum, especially Economics, has been one of major issues in many nations. Most Economics learnings focus on economic aspects and rarely consider environmental aspect. However, economy and environment cannot be easily seperated as both highly related one to another. Therefore, this study as aiming to test the students' perception of ecological learning and sustainable behavior through self-efficacy and self-concept to support a prior study conducted by Reunamo and Pipere (2011) about students' preference and orientation to sustainable development is significant to connect ecological learning, economic learning, as well as the sustainability development program.

1. Literature review

Wooltorton, Palmer, and Steele (2011) and Bhat (2014) both mentioned that synergy and trade-off are essential dimensions of sustainable development, which was echoed by Shephard (2015) who reported that sustainable attributes are explained through knowledge, skills, and competence as well as supported by effective attributes such as values, attitudes, and disposition.

Ecotourism is an idea of tourism that is nature-based and contributes to social and environmental benefits. Although it has been generally agreed, an industry that is environmentally friendly is a discourse that is not easy to realize. This is because along with the industrial and technological advances of a country, the greater the impact of environmental damage will follow. Many scientists and environmentalists try to find ways and research how to reduce the impact of environmental damage caused by industrial or technological advances. From these studies it was found that ecotourism could be one of the sustainable development options that would provide incentives to maintain and manage the environment. According to Wearing and Neil (1999), the concept of ecotourism offers local communities as the main components affected need to be beneficiaries. However, in addition to providing benefits to the surrounding (local) community, ecotourism can also foster environmental ethics through good experience and interpretation.

Ecotourism as an environmentally friendly method of educational tourist activity has various focuses and meanings referred to as green tourism (Funck & d'Hauteserre, 2016; Furqan, Puad, Som, & Hussin, 2010; Savage, Huang, & Chang, 2004). In Wonorejo Surabaya, there is a mangrove forest named "Surabaya Mangrove Ecotourism" that functions as a tourism and education area. Surjanti et al. (2018b) stated using mangrove forest as learning media to possibly increase learning outcomes and applying m-learning in a learning activity to improve the expected results.

According to Surjanti, Soejoto, and Muafi (2018c), teachers have to increase their competence and skills in teaching, because their proficiency significantly affects the learning process and students' mastery of the lesson. Selecting an appropriate learning method and learning media becomes a factor in successfully improving learning outcomes. One potential method is participatory ecological learning, which comes from participatory action research (PAR). It is an approach to research that can promote new knowledge, learning, and action to support social and environmental changes through readjusting the standard process of generating knowledge.

Ecotourism with its high potential possibly acts as a catalyst through its role as a learning tool because ecotourism involves learning experiences; in addition, this can be a complementary activity needed because ecotourism can be a source of knowledge and learning for all interested parties Mondino and Beery (2018). Mullins (2014a) argued that developing theoretical and practical approaches to outdoor adventure education, recreation, and tourism required perspectives referring to environments from students' socioecological engagement. Mullins (2014b) designated perspectives on ecology as 1) *moving through organic bodies*, referring to landscape and environment in outdoor activity (derived from Haskell, 2001); 2) *choreographing organic adventure*, referring to social space and physical choreography to learn, experience, and practice skills; 3) *cultivating meaningful landscapes and people*, referring to self-image creation via a) teaching and learning, (b) criticizing and understanding, and c) implementing and portraying the human-environment relationship in outdoor activity; 4) *ecological ontology*, referring to skilled learning and practice in outdoor activity; 5) *proposed notions of skill*, or learning that engages skills, activities, and outdoor adventure to form living creatures, environment, and its roles through life-time learning experience; and 6) *toward a participatory ecological approach*, referring to learning that focuses on recognizing, gaining, and using skills and competence to understand the environment and prospects.

According to Bandura and Bandura (1997), self-efficacy comprehension is related to behavior. Dinther, Dochy, Segers, and Mien (2011) and Diseth (2011) argued that there was a healthy relationship between all variables, especially in inferring learning goals. However, Ferla, Valcke, and Cai (2009) stated that academic self-efficacy is a better mediator for academic achievement. This study employed the concept of SE from Bong and Skaalvik (2003) and referred to measurements used by Emanuel and Adams (2011), along with the Programme for International Student Assessment (PISA) scale in Bandura and Bandura (1997) for a mathematics course, and it was modified to measure demands and orders in an economic theory course. This measurement assessed how confident students carry out the tasks on an economic theory course, including a) implementing data of demands and orders with its assumptions; b) calculating output on certain price and its assumptions; c) calculating the mathematic equation for demands and orders; d) understanding demand and order curves; e) solving problems in demand and order equations; f) finding appropriate composition of output on demanded and ordered prices; g) solving problems with the balance price equation, and h) calculating price and amount in certain combinations.

Beier and Rittmayer (2008) defined SC as a self-perception influencing behavior. Bandura and Bandura (1997) and Marry (2014) similarly argued that academic self-concept incorporates academic achievement and performance aside from prior interest. Kornilova, Kornilov, and Chumakova (2009) noted that academic self-concept has more incremental predictive value than conventional intelligence regarding academic achievement. Therefore, considering prior studies, this study assumed that SC was able to affect learning outcomes and sustainable behavior. This study adopted the SC measurement used by Ferla et. al (2009) for mathematics and applied it to an economic theory course using these statements: a) I am good at the Economic Theory course; b) I get good scores in the Economic Theory course; c) I learn quickly in the Economic Theory course; d) I believe that I am the best at the Economic Theory course, and e) In Economic Theory course, I understand all the tasks, even the most difficult ones.

Clark and Button (2011) state that the STEM (science, technology, engineering, and mathematics) curriculum issue is about the relationship between human and environment as well as how humans affect natural resources. Gould (2018) argued that a sustainable education program could address this issue. Measuring students' sustainable behavior was proposed by Oliveira and Rodrigues (2010) using the following indicators: (a) sustainability at all levels is determined by biological, physical and economic resources (S1); (b) personal well-being is different from natural welfare (S2); (c) sustainability engagement significantly and positively impact behavior to purchase product sustainably (S3); (d) considering oneself as part of the life cycle process (S4).

Corresponding to prior studies, to address issues relating to education and environment as found in the research conducted by (Emanuel & Adams, 2011; Pane & Patriana, 2016; Pellas, 2014) referring to students' environmental awareness which mostly lack and cause the emergence of not only environmental but also related to economical and social issues. Therefore, this study becomes significant as it suggests on how to employ ecological learning to develop and improve student sustainable behavior. However, this study only focuses on how to perceive the students' sustainable behavior referring to the influence of self-efficacy and self-concept through participatory ecological learning technique.

1.1. Research method

This study was quantitative research due to the causality relationship among variables. This study tested the effects of participatory ecological learning that has been implemented in ecotourism of the mangrove forest over 3 years on students' sustainable behavior regarding Self-Efficacy and Self-Concept. The 128 participants were divided into 3 groups by academic year in an Economic Theory course. The study referred to participatory ecological learning techniques developed by Reunamo and Pipere (2011) about the development of research model of Education for Sustainable Development (ESD) which was further developed from Mullins (2014a). Moreover, the Self-Efficacy and Self-Concept research intruments were adopted from Ferla et. al (2009) and Ferla, Valcke, and Schuyten (2010) on how students' SE and SC were assessed in Mathematics understanding. Researchers referred to both prior researches in order to design the model in assessing Microeconomic theory course especially. Meanwhile, regarding to Sustainable Behaviour, researchers developed intruments adopted from Oliveira and Rodrigues (2010) referring to the students' sustainable behavior measurement indicators. The assessments used a 4-point Likert scale, ranging as: 1) strongly agree to 4) strongly disagree. Data were collected through questionnaires given to students who took Microeconomics Theory course using simple random sampling technique. Data were analyzed using partial least study (PLS) and structural equation modeling (SEM) to obtain the result.

2. Result and discussion

Respondents. The 128 participants selected as respondents were second academic year students of State University of Surabaya who took Microeconomic Theory course. It means that they were given learning activities where the learning media is Mangrove forest. Therefore, they experienced in participatory ecological learning. They were divided by age, interest, sex, status, origin, prior study, and Economic Theory course score. A total of 74.8% were students aged 18–21; 25.2% were students from the academic year 2014; 46.5% were interested in human resources development; 72.4% were female; 77.2% were from out of town; 71.7% graduated from State Senior High School; and 74.4% scored a 2 in the Economic Theory course.

2.1. Result

From data analysis, this study drew results that provably find the evidences on how the participatory ecological (PE) learning has positive and significant effects on students' self-efficacy (SE) and self-concept (SC). This can be seen through the data calculation that all variables (PE, SE, SC, and S) are averagely higher than standard deviation. In addition, the coefficient correlation of variables (p) is less than α ($p < 0.05$) meaning that all the variables provably have positive and significant effects. This indicates that using PE learning as learning model to develop S (students' sustainable behavior) through the perception of students' SE and SC considers as acceptable.

2.2. Research variables

The correlation of the PE variables is on the average of 3.32 with standard deviation of 0.37 meaning that respondents adequately participated in ecotourism. While an average of SE is 3.10 with standard deviation of 0.34, this indicates that in general, the respondents confidently meet the demands and tasks given by the lecturers in Microeconomic theory. For the SC analysis, the result shows the average of SC is 2.69 with standard deviation of 0.40. This suggests that respondents generally understand Microeconomic theory course. Furthermore, for the S variables, the average is 3.22 with standard deviation of 0.37. This study has coefficient correlation of variables (p) less than α ($p < 0.05$) indicating that all variables have positive and significant relationships. Accordingly, the data calculation shows that the highest average of all variables is S meaning that students have good understanding on the sustainable behavior. Further, it proves that they are considerate of the relationship between human and environment.

2.3. Structural equation model (SEM)

This study was conducted in several stages: convergent validity, discriminant validity in the inner model, and evaluation of the outer model. Results were significant ($p < 0.05$), verifying the validity of the questionnaires. Coefficients of the endogenous variables in the inner model structure showed that self-efficacy (SE) and self-concept (SC) were determined by participatory ecological (PE) learning. Meanwhile, students' sustainability (S) was determined by SE. The determinant coefficient (R2) was 0.539 (53.9%) caused by variables in the inner model, while the remaining 46.1% were due to variables in the outer model. Predictive relevance (Q2) was more significant than zero, meaning that the model had good predictive relevance. PLS quality indexes showed that the goodness of fit model (GoF) was 0.356 or less, so the model was categorized as having a moderate fit.

In Appendix A, the figure shows the inner model of latent variables that explains the condition of each variable. The interconnection of variables is described further in Tables 1 and 2, which show how the result answered the objectives of the study. This study aimed to confirm the relationship between PE, SE, SC, and S found in prior studies. The result indicates that PE proved to have a significant effect on SE; PE proved to affect SC; SE increase affected S, and SC increase did not affect S. These answered three of the four conditions stated in the prior studies. The only difference was that SC did not show any effect on S, as was found in the prior studies.

In Appendix B, Table 1 shows there are three paths with significant $\alpha = 0.05$. First, PE proved to have a positive and significant effect on SC with a coefficient of 0.478 and *t* value of 7.100; having a significance of 0.000 (less than $\alpha = 0.05$) means that the PE increase encouraged SC. Second, PE proved to have a positive and significant effect on SE with a coefficient of 0.420 and *t* value of 4.795 (significance less than $\alpha = 0.05$) means that the positive coefficient showed that PE increase encouraged SE. Third, SE proved to have a positive and significant effect on S (Sustainability) with a coefficient of 0.433 and *t* value of 4.304. The significance of 0.000 (less than $\alpha = 0.05$) means that SE increase encouraged S. Finally, SC did not have a positive and significant effect on S, as demonstrated by a coefficient of 0.153 and *t* value of 1.432 (significance of 0.155, more than $\alpha = 0.05$), indicating that SC increase did not encourage S.

2.4. Indirect effect

Table 2 (see Appendix B) shows that the indirect effect on PE to S through SE had a coefficient of 0.182 and z value of 3.203, and the significance of 0.001 (less than $\alpha = 0.05$) means that SE mediated PE to S. The indirect effect of PE on S through SC had a coefficient of 0.073 and *z* value of 1.403. Due to the significance of 0.161 (more than $\alpha = 0.05$), SC did not mediate PE to S.

2.5. Validity and reliability test

This study employed Validity test by using convergent and discriminant test, where the rule of thumb to measure loading 0.50, the discriminant test is assessed by comparing the square root of average variance extracted (AVE) with correlation between constructs. Reliability tests are assessed based on composite reliability and Cronbach alpha, rule of thumb of the reliability test is the coefficient ≤ 0.60. Both tests were used to determine the validity and reability of the result. According to the outer loading, all item score higher than 0.50 meaning that data were valid. Meanwhile in the participatory ecological (PE), there are six items analyzed and all were valid. In self-concept (SC), all items tested score higher than 0.50 meaning that those are valid. For the sustainability (S), all items analyzed score higher than 0.50 meaning that those consider as valid. However, in self-efficacy (SE), there is an item (fulfillness) which is less than 0.50 meaning that it considers as not valid. Regarding to the realibility test, all variables tested score higher than 0.60 meaning that those variables are reliable.

3. Discussion

This study found evidence to support the prior researches (Furqan et. al, 2010; Mary, 2014; Sugandin, Sudiyarto, Maroah, & Muafi, 2018; Tan & Lau, 2009. The finding proves that there is a relationship among PE, SE, SC, and S. Participatory ecological (PE) learning shows a positive and significant effect on self-efficacy (SE). Thus, PE learning possibly serves an SE controller which signified a cognitive or mental process to influence others in responding to the environment. Another, participatory ecological (PE) learning shows a positive and significant effect on self-concept (SC), especially on environmental education. Meanwhile, SC had no effect on S; it is proved by the average score of SC as 2.69 meaning that students have an average understanding of Microeconomic Theory. However, this study failed to confirm the findings of Bong and Skaalvik (2003) which both SE and SC affected S in the sustainable learning project (Oliveira and Rodrigues, 2010). In addition, the result of this study enervates the study conducted by (Ferla et. al, 2009), who found that SE and SC were two different factors in influencing behavior.

The results of this study indicates that: a) SE has positive and significant effects to encourage S even though it shows less than optimal results; b) there is an indirect effect on PE to S through SE, meaning that SE mediates PE to S, where SE serves as a mediator in academic achievement; and b) there is no indirect effect on PE to S through SC, as SC does not mediate PE to S, where SC does not appear as a mediator in PE learning.

From the results, it can be derived that SE in microeconomics theory leaning can be functioned as mediator which highly influence the ecological learning to develop sustainability behavior. In addition, the sustainability behavior can be improved by improving self-efficacy due to its effect in mediating the success of participatory ecological learning.

4. Conclusion, suggestion, and implication

In conclusion, participatory ecological learning on ecotourism of the mangrove forest could be implemented to develop self-efficacy and self-concept. In developing students' sustainable behavior, self-efficacy was shown to have a significant effect on the sustainable behavior of students; however, self-concept did not have a significant effect.

Relatively, participatory ecological learning is possibly implemented to develop self-efficacy and self-concept in economics learning. To develop student's sustainable behavior, lecturers should employ and design appropriate learning method and media which can improve self-efficacy and self-concept on students. Therefore, the objectives of economics learning are possibly achieved. In addition, this study will further assist the sustainable program of coastal conservation by promoting and supporting ecological learning based on economical aspect of ecotourism. Furthermore, the improvement and increase of ecological understanding in ecotourism especially in mangrove forest, the further developmental program to cultivate mangrove will be achieved.

Author contribution statement

Jun Surjanti: writing- original draft preparation.

Ady Soejoto: consultant especially on Microeconomic Theory learning.

Dwiarko Nugroho Seno: consultant on self-efficacy and self-concept on learning activity (education).

Waspodo: consultant and reviewer on methodology.

Zainur Rahman: analyzing and calculating statistic data obtained.

Twin D. Martiana: reviewing and editingmanuscripts.

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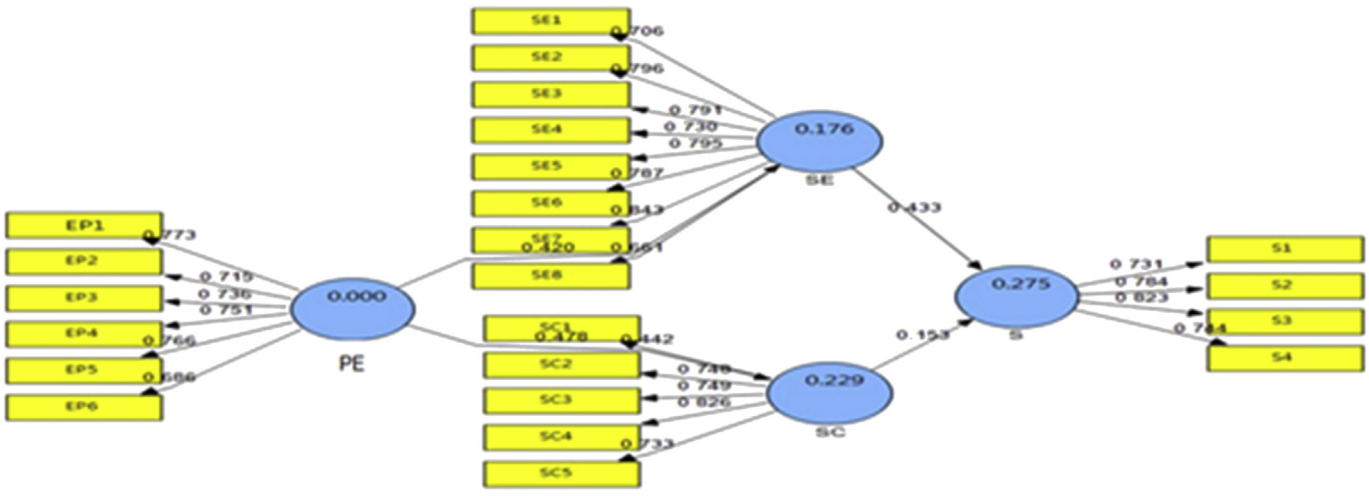
Declaration of competing interest

Due to the research funding provided by the State University of Surabaya to improve the teaching and learning quality in the university, there is not either conflict of interest or ethical issues regarding the publication of this article.

Appendix A

Structural Model (Inner Model) of Latent Variables.



Appendix B

Table 1
Results of Inner Model Test

Hypotheses	Path	Original Sample (O)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)	Sig,
1	PE → SC	0.478	0.067	0.067	7.100	0.000
2	PE → SE	0.420	0.087	0.087	4.795	0.000
3	SC → S	0.153	0.107	0.107	1.432	0.155
4	SE → S	0.433	0.101	0.101	4.304	0.000

Table 2
The result of Indirect Effect on Inner Model Calculation

Exogent	Mediator	Endogent	Sobel Test			Decision
			axb	Z-test	p-value	
Participatory Ecology (PE)	Self Efficacy (SE)	Sustainability (S)	0.182	3.203	0.001	Mediation
Participatory Ecology (PE)	Self Concept (SC)	Sustainability (S)	0.073	1.403	0.161	No mediation

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