Towards Standardization of Students’ Teamwork Attitude in the 21st Century through the Application of Generative Model in Science Learning

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Abstract. This study aimed to find out the effectiveness of generative learning model enactment towards students’ teamwork attitude. This study was a quasi-experimental research which employed a posttest-only non-equivalent control group design. The samples were selected by utilizing a simple random sampling technique. They were comprised of 67 students taken from State Junior High School 3 Surakarta, academic year 2017/2018, with two-class distribution i.e.: 34 students representing the class VIII.9 as the experimental group, and 33 students representing the class VIII.7 as the control group. The students in the experimental group were given a learning treatment applying generative learning model. The data pertinent to students’ teamwork attitude were garnered from an instrument administered in the form of questionnaire consisting of 20 questions that were anchored in the theory proposed by Crebert. The data were analyzed by using t-test. The t calculation result indicated that (t_{	ext{score}} > t_{	ext{table}}, or, 2.02 > 1.99), and the significance level reached 0.048 (p < 0.05). As regards the obtained result, a conclusion could be drawn that \( H_0 \) was rejected. The result manifested that the learning process enacted by using generative model had a significant impact on students’ teamwork attitude.

Keywords: Generative learning model; Teamwork attitude; 21st century competency.

1. Introduction
Nowadays, each country is demanded to generate the human resources that conform to the competency standard required in the 21st century. That competency is so-called 4C which extends to Critical thinking, Communication, Collaboration, and Creativity [1,2]. The advancement of technology and information requires individuals who are capable of working effectively in a team [3,4,5]. Appertaining to the aforementioned need, the Indonesian Ministry of Education and Culture has proposed a learning paradigm to deal with the 21st century whereby one of the criteria addresses the students’ efficacy to be cooperative and collaborative in order to cope with a problem [6]. Schools are expected to capably facilitate students to train soft skills regardless of the students’ diverse ability.

A teamwork attitude is one of the soft skills the students require in the 21st century in order to be successful and able to maintain a good socialization in society [7]. In today’s era, it is of importance for individuals to develop their teamwork ability to face the challenges in the 21st century. A teamwork attitude which is contained in one of the aspects in the learning of natural science refers to scientific attitude. Accordingly, it is necessary for students to have a scientific attitude in order to capably make
a proper decision [8]. In the actual condition, the empirical fact shows that the learning process applied in schools has not potentially promoted students to empower a teamwork attitude. A couple of general problems encountered in students’ discussion activity in the classroom are comprised of task delivery which is not appropriately prevalent among students and the lack of students’ commitment to continuously be engaged in group activity in order to accomplish the given task [9,10].

Based on the result of observation conducted in the natural science learning process in the classroom, the discussion activity seems to run ineffectively. Such condition occurs inasmuch as the tasks are not prevalently given in the discussion. The other problem is oriented to the feedback towards students’ learning result which is less given. Repetitive feedback given in learning processes is potentially capable of leading to sustainable improvement towards teamwork attitude such as trust, students’ performance, and reaction to diversity [3]. The efficacy of teamwork involves a number of complex attitudes. Crebert et al. in [11] state that there are 12 attitudes existing in teamwork. They subsume group objectives, trust, reaction to diversity, leadership, procedure, the use of facilities, interpersonal communication, listening skill, communication stream, problem solving and decision making, creativity, and evaluation [11]. Since teamwork ability engages a quantity of important complex attitudes, it is then considered necessary to have an alternative solution to be undertaken such as by planning or devising the processes of learning.

The learning processes devised effectively and leading students to be reflectively interactive can yield an appropriate teamwork attitude among students [12]. A range of learning models contributing to increase students’ teamwork attitude extend to: 1) the availability of learning activities that encourage students to understand and put their trust in one another, 2) the presence of learning activities that facilitate students to communicate effectively and efficiently, 3) the availability of learning activities that promote students to accept and support one another, and 4) the presence of learning activities that reconcile the diversity and prevent the rise of potential conflict [13]. The learning models which are contributive to have a good effect upon students’ teamwork attitude are those that lead to students’ active. One of them is generative model [14]. Generative learning model can facilitate students to be collaborative while solving a problem associated with their daily lives [15]. The learning condition whereby students are encouraged to organize their understanding of factual phenomena using their own words will help them comprehend the learning materials more meaningfully [16,17,18,19,20].

Splitting students into a couple of groups in the process of problem solving as suggested in generative learning model will create an interactive learning circumstance that leads students to effectively communicate either interpersonally or in group [21,22]. Help-seeking behaviors that emerge in students’ selves during the learning process will subsequently lead them to build up a better teamwork attitude [23]. Motivated from above explanation, this study is aimed to find out the effectiveness of generative learning model enactment towards students’ teamwork attitude.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method
This section describes the proposed research method.

2.1. Research design and samples
This study was conducted in SMP Negeri 3 Surakarta, one of the junior high schools in Surakarta, on the even semester, in academic year 2017/2018. This study was categorized into a quantitative study which employed a quasi-experimental research. In this study, the control group was used. However, that group was not considered totally relevant to control the variable, the external one that influenced the conduction of experiment [24]. The design adopted in this study was posttest-only non-equivalent control group design. The concept of this study design involved two groups, the experimental and control group [25]. The samples of this study were selected by applying a simple random sampling
technique. The technique was used because there was no level in the research population, and the samples were selected randomly from the class where the research was conducted [24]. The aggregate number of samples was 67 VIII students with sample distribution that was composed of 34 students from VIII.9 as the experimental group and the rest 33 students from VIII.7 as the control group.

2.2. Technique of data collection
The data of this study were garnered from questionnaire addressing the students’ teamwork attitude. The questionnaire which had been validated in prior contained 20 questions which oriented to the 12 indicators of teamwork attitude as proposed by Crebert et al. in [11]. Those indicators extended to group objectives, trust, reaction to diversity, leadership, procedure, the use of facilities, interpersonal communication, listening skill, communication stream, problem solving and decision making, creativity, and evaluation [11]. The assessment of teamwork attitude questionnaire was undertaken by utilizing five points through likert scale. The first point was set to be the least in that it referred to the option “never”, and the fifth point was administered as the highest in which it referred to the option “always”.

The learning processes of natural science were implemented 4 times through applying generative learning model specifically for students in the experimental group and the model of discussion enacted to those in the control group. The first three meetings were filled in learning the excretion material. At the fourth meeting, the questionnaires of teamwork attitude were handed out to students to be filled in for about 45 minutes. The questionnaires were subsequently returned to the teacher for further analysis. At the first meeting, the students carried out the practicum of excretory system on the learning material of skin, the practicum on the material of kidney at the second meeting, and the practicum on the material of liver and lungs at the third meeting. In the practicum, students were split into 5 groups containing 6 to 7 students each. They then worked collaboratively in their own groups to do the practicum and to present the result of their experimentation.

2.3. Data Analysis Technique
The data analysis was undertaken by examining the prerequisites on the posttest data of the students’ teamwork attitude in which they referred to normality and homogeneity test. Kolmogorov-smirnov test was used for reaching the normality, and Levene was utilized for reaching the homogeneity. Once the obtained result indicated that the data were normally distributed and homogenous, the further step was to examine the hypothesis which was carried out by employing t-test. Besides testing the hypothesis, the data were also analyzed descriptively and by calculating the teamwork attitude mastery of the students from both the experimental and control group. The gained scores of teamwork attitude were further interpreted into a number of categories [25] (see Table 1).

| No | Score | Category   |
|----|-------|------------|
| 1  | 20 – 35 | Very low   |
| 2  | 36 – 51 | Low        |
| 3  | 52 – 67 | Moderate   |
| 4  | 68 – 84 | High       |
| 5  | 85 – 100| Very high  |

3. Results and Discussion
This presents the obtained results and following by discussion

3.1. Results
This study was conducted by giving a treatment in the form of generative learning model application to the experimental group and the model of discussion as the general learning model applied at the school to the control group. The questionnaire dissemination to solicit the data regarding students’ teamwork attitude was carried out after the learning processes of the excretion material had been done.
3.1.1. The data of students’ teamwork attitude

The data vis-a-vis the students’ teamwork attitude from both the experimental and control group after the treatment of this study had been completely provided can be viewed in the following Table 2.

| The highest score | The lowest score | Mean | Median | Standard deviation | Number of students |
|-------------------|------------------|------|--------|--------------------|--------------------|
| Experimental group| 97               | 69   | 80.62  | 80                 | 7.78               | 34                 |
| Control group     | 91               | 65   | 76.82  | 70                 | 7.55               | 33                 |

Based on the Table 2, it was seen that the students in the experimental group had the average score of teamwork attitude as high as 80.62, whereas those in the control group had the average score as high as 76.82. The obtained average score of students’ teamwork attitude in the experimental group was higher than that of ones in the control group, 80.62 > 76.82. The same thing also occurred in the score of standard deviation in which that of students in experimental group was higher than that of ones in the control group, 7.78 > 7.55.

3.1.2. The Teamwork Attitude Category of Students in Experimental and Control Group

The data pertaining to the logical thinking ability had by students in both experimental and control groups were subsequently classified into the categories suggested by Arikunto in [25]. The data description of students’ teamwork attitude on the basis of the related categories can be seen in the following Table 3 and Figure 1.

| Teamwork Attitude (Very high) | Teamwork Attitude (High) | Teamwork Attitude (Moderate) |
|-------------------------------|--------------------------|-----------------------------|
| N (33%)                       | N (67%)                  | N (70%)                     |
| 90.09                        | 76.09                    | 74.09                       |

**Figure 1.** Students’ teamwork attitude in experimental and control group
Concerning with Table 3 and Figure 1, the data indicated that there were no students who had a low teamwork attitude for those either in the experimental group or in the control group. The students in the experimental group had gained a high teamwork attitude, whereas in the control group, some students still had a moderate teamwork attitude.

3.1.3. Prerequisite test Analysis
Prerequisite test was conducted before examining the study hypothesis. The prerequisite test consisted of normality and homogeneity test. The normality test conducted to the posttest results of students from both experimental and control group was functional to know whether the data were normally distributed or not. In this study, the normality test was carried out by assigning Kolmogorov-smirnov through utilizing SPPS 21. The data were categorized as normal (H₀ is accepted) if the obtained score of significance referred to > 0.05. The following Table 4 displays the result of normality test.

Table 4. The normality test data of students’ teamwork attitude.

| Class   | Kolmogorov-Smirnov* | Conclusion                           |
|---------|---------------------|--------------------------------------|
| Score   |                     |                                      |
| Experimental | .119 | 34  | .200* | The data are normally distributed |
| Control            | .103 | 33  | .200* | The data are normally distributed |

* This is a lower bound of the true significance.
a. Lilliefors Significance Correction

As regards the Table 4, the result of Kolmogorov-smirnov test manifested that the significance score of students in both groups referred to 0.200. That result attested that the significance score gained from both experimental and control group was > 0.05, and H₀ was accepted. Thus, it could be concluded that the data were normally distributed.

Once passing the normality test, the further step was to examine the homogeneity towards the posttest data of students’ teamwork attitude. The homogeneity test was carried out in order to examine whether the obtained data were derived from the homogenous population or not. In this study, the homogeneity test was conducted by assigning Levene test through utilizing SPPS 21. The following Table 5 displays the result of homogeneity test.

Table 5. Homogeneity test data of students’ teamwork attitude.

| Test of Homogeneity of Variances | Conclusion          |
|----------------------------------|---------------------|
| Levene Statistic                 |                     |
| .059                             | 1  | 65  | .809 | The data are homogenous          |

In association with the Table 5 above, the result of Levene test manifested that the score of significance was as high as 0.809. The result as such indicated that the significance score was > 0.05, and H₀ was accepted. Accordingly, it could be drawn a conclusion that the data were derived from homogenous population.

3.1.4. Hypothesis Testing
After finished with undertaking prerequisite test and reaching a conclusion that the data were normally distributed and homogenous, the further step to be executed was to examine the hypothesis formulated in this study. The hypothesis was examined by using t-test. This test was exerted to find out whether there was a significant difference between the score of teamwork attitude had by students in the
experimental group and those in the control group. The formulated hypothesis proposed in this study can be viewed in the following statements.

\[ H_0 : \text{There is no a significant effect of generative learning model towards students’ teamwork attitude.} \]
\[ H_1 : \text{There is a significant effect of generative learning model towards students’ teamwork attitude.} \]

T-test was calculated by utilizing SPPS 21 software. The level of significance that was used referred to 0.05, and the degree of freedom \((df)\) referred to \((n_1 + n_2) - 2 = 65\). Therefore, the \(t_{\text{table}}\) that was achieved referred to \(t = 1.99\). Principally, \(H_0\) would be rejected if \(t_{\text{score}} \geq t_{\text{table}}\) and the score of significance < 0.05. The following Table 6 displays the result of hypothesis testing.

| Levene’s Test for Equality of Variances | t-test for Equality of Means |
|----------------------------------------|-----------------------------|
| Equal variances assumed                | .059 | .809 | 2.02 | 65 | .048 |
| Equal variances not assumed            | 2.02 | 64.99 | .047 |

As presented in Table 6, it was found that the score of \(t\) was as high as 2.02 with the score of \(t_{\text{table}} = 1.99\). That result indicated that \(t_{\text{score}} > t_{\text{table}}\) or \(2.02 > 1.99\). The obtained score of significance was 0.048 \((p < 0.05)\). Hence, it could be concluded that \(H_0\) was rejected. There was a significant difference of teamwork attitude between the students in the experimental group and those in the control group. In other words, there was a significant effect of generative learning model towards students’ teamwork attitude.

3.2. Discussion

The objective of this study was to find out the effectiveness of generative learning model enactment towards students’ teamwork attitude. This study was conducted to two groups of students categorized as experimental and control group. The experimental group was given a learning treatment in the form of generative learning model enactment, whereas the control group underwent the learning process through the model of discussion similar to the common model used at the school.

The result of hypothesis testing manifested that the enactment of generative learning model in the learning processes of natural science had a significant effect on students’ teamwork attitude. That condition was shown whereby \(t_{\text{score}} > t_{\text{table}}\) i.e. \(2.02 > 1.99\), therefore \(H_0\) was rejected. This finding accounted for that the students’ teamwork attitude could be increased more optimally in the experimental group than in the control group. In line with this finding, there has also been encountered the previous study which proves that generative learning model in the classroom is capable of creating an interactive learning circumstance [26] which will further lead students to have a better teamwork attitude [23].

The generative model applied in this study is popularized by Osborne and Wittrock in [14] with the syntaxes that subsume selecting, attention, sensory input, generating links, constructing meanings, evaluating constructions, subsumption, and motivation [14]. Furthermore, the indicators of teamwork attitude adopted in this study are those postulated by Crebert, et al. in [11] in that they are composed of group objectives, trust, reaction to diversity, leadership, procedure, the use of facilities, interpersonal communication, listening skill, communication stream, problem solving and decision making, creativity, and evaluation [11].
In this study, the main learning process was initiated by presenting students a number of phenomena appertaining to their daily activities. Such initiation was functional for triggering students’ interest and exploring their prior knowledge or schemata so that they became more confident to come up with their conception. In the generative learning model, that sort of learning activity is contained in the syntaxes extending to selecting, attention, sensory input, and generating links. Furthermore, in the perspective of teamwork attitude, such activity can potentially train students’ leadership ability and confidence. The confidence upon one’s self ability per se is very necessary to smoothen the stream and processes of communication among students [27].

The result of studies conducted by Pilegard in [23] and Thiede in [28] explains that generative learning model is a strategic approach that is promising in order to capably improve the accuracy of students’ meta-comprehension [23,28]. It is well known that meta-comprehension aligns with students’ efficacy in order to be able to control their comprehension. In other words, the students who are provided with generative learning model can be more confident towards their own ability. This condition will lead students to help and share one another their perspectives in the practicum activity so that they can draw on an expected and appropriate conclusion of the learned materials.

The learning process was further continued by giving students worksheets. In this sense, the students were demanded to conduct the practicum in order to deal with the given learning phenomena. The learning process using generative model is oriented to students’ active [14] so that it creates a learning circumstance that is centralized to students [29]. The practicum activity will trigger students to be collaborative, and if the students are given a meaningful learning feedback and repetition, the learning per se will generate a better teamwork attitude as well [3].

The practicum activity in this study guided students to appropriately organize the data and construct them to be a set of information which was further examined by applying the current issues in association with the material of excretory system. The teacher’s attention is of very importance in this stage since one of the challenges found during the practicum is that this process requires students’ high mobility [30]. In the practicum, the continuum of activities was done on the basis of generative model syntaxes which were comprised of constructing meanings, evaluating of constructions, and subsumption. In addition, in the realm of teamwork attitude, the activities in the practicum were potential to lead students not to be worried or hesitated to creatively work using the existing facilities while experimenting in a variety of ways as long as the experimentation was done based on the appropriate procedure.

The result of practicum garnered by the students was then presented in front of the classroom. During the presentation, the teacher facilitated the ongoing discussion in two-way communication, one among students and one between the teacher and the students. Such activity trained students to willingly listen to, respect the diversity, and find out the solution of the problems so that the proper decision could be made. In the end, the students would get feedback from the teacher in order for them to manage to evaluate and reflect the real benefit of the learning process alongside the practicum that they had undertaken.

A good result was also achieved as manifested by the posttest data vis-a-vis students’ teamwork attitude gained at the fourth meeting. The students’ teamwork attitude in the experimental group was included in the very good category that reached 33% of students alongside the average score as high as 90.09. Those numbers were higher than the achievement found in the control group which only reached 24% of students alongside the average score as high as 87.37. In addition, all students in the experimental group had been successful to have a good teamwork attitude, and there was no any student who had a teamwork attitude at a moderate category. On the other hand, in the control group, there were encountered 6% of students who merely reached to have a moderate teamwork attitude (see figure 1).

4. Conclusion
Anchored in the result of hypothesis testing using t-test, from the calculation of the posttest data of students’ teamwork attitude, in both the experimental and control group at the level of significance
0.05 and the degree of freedom \( df = n_1 + n_2 - 2 = 65 \), it is found out that \( t_{\text{table}} \) is as high as 1.99, and \( t_{\text{score}} \) reaches 2.02. The obtained score of significance reaches 0.048 \((p< 0.05)\). That finding proves that \( t_{\text{score}} > t_{\text{table}}, \) or \( 2.02 > 1.99, \) so \( H_0 \) is rejected and \( H_1 \) is accepted. Thus, it can be drawn a conclusion that there is a significant effect of generative learning model towards students’ teamwork attitude.

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