The Impact of Character-Based Collaborative Learning Model on Student Attitudes and Achievements

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Abstract: This study aims to investigate the impactof implementing a characters-based collaborative learning model on students' attitudes and achievementin the course of machining process. This experimental studywas conducted in the fitting and machining workshop at the Department of Mechanical Engineering Education,Faculty of Engineering, Yogyakarta State University. The population consisted of 85 students who were enrolled in a machining process course. The samples included33 studentswhowere determined by purposive sampling technique. The experiment was carried out by the posttest-only controldesign. The instrument validation was conducted by expert judgment. The data in this study were analyzed usingdescriptive analysis and t-test with significance level of 0.05. The results showed that there were significant differences in attitudes and student achievement between the model class and the conventional class. The attitudes and learning achievements of students in model classes are better than conventional classes.
Keywords: Character-based, collaborative learning, attitudes and achievement

1. Introduction

The responsibility of educational institutions, particularly vocational education institutions, is to produce competent graduates. Therefore, the learning process must refer to the competencies demanded by the industry. One of the important and strategic subjects taught in vocational education to create competence in manufacturing is the machining process course.In the machining process, good teamwork is needed. Therefore, the collaborative learning model is very appropriate for learning machining processes.

Collaborative learning aims to help students work collaboratively to develop and change together [1] [2]. On the other hand, there is the fact that most students do not have the expected character. Therefore, it is very urgent to implement a character-based collaborative learning model for students in machining process courses.

Learning must focus on the teaching process, not just the transfer of knowledge. Learning methods that only transfer knowledge do not provide opportunities for students to carry out interactions and transactions [3]. Learning must provide critical thinking practices and social interaction to students. The learning process needs to consider several aspects of character building or soft-skills, such as cooperation, respect for opinions, a sense of belonging, responsibility, honesty, and willingness to sacrifice. In fact, learning that emphasizes the formation of critical thinking skills and social interaction practices for students is still rarely carried out. Consequently, it is undeniable that developing teamwork, respecting opinions, understanding oneself and others is neglected during the learning process. Therefore, steps need to be taken to improve our education process and system, especially the learning process which focuses more on the cognitive, affective, and psychomotor dimensions in a balanced way.

Teaching must be more than imparting knowledge and developing critical thinking skills. The role of education must include character development so that students become more complete and dignified human beings in society. Therefore, students need to be properly taught the desired character traits such as integrity, independence, perseverance, optimism, growth mindset, and self-control (emotional). Character education plays an important role in helping the younger generation to deal with very fast changes in the 21st century.

Character education in higher education needs to be implemented through moral virtues, intellectual virtues, civic virtues, and performance strengths [4] [5]. Moral virtues -Those that relate to an ethical awareness in academic work and wider university life, coupled with a sense of purpose that places ambition within a commitment to the common good. Examples include honesty, courage, compassion and justice. Intellectual virtues – Those that relate to the pursuit of knowledge, truth and understanding. Examples include curiosity, open-mindedness and patience. Civic virtues – Those that relate to the engagement of institutions and individual students in their local, national and global contexts. Examples include civility, service and charity. Performance strengths – Character traits that have an instrumental value in enabling intellectual, moral and civic virtues. Examples include confidence, determination, motivation, perseverance, resilience and teamwork.

In order to strengthen the implementation of character education in each educational unit, 18 points of

character building values have been identified that originate from religious and cultural norms, namely: (1) religious, (2) honesty, (3) tolerance, (4) discipline , (5) diligent, (6) creative, (7) independent, (8) democratic, (9) curiosity, (10) patriotic, (11) love for the country, (12) appreciate performance, (13) friendly and communicative, (14) love for peace, (15) reading culture, (16) sensitive to the surrounding environment, (17) social sensitivity, and (18) responsible [6]. The education unit can determine the priority of implementing the character values that have been developed. The application of character values can be selected from the essential, simple, and applicable such as cleanliness, tidiness, comfort, discipline, honesty, and politeness.

Education must be responsible for producing graduates who not only have high academic competence, but also have good character. Therefore, integrating character values into the learning process is an obligation that is no exception in practical learning. To integrate character values in the practical learning process can be done by applying a collaborative learning model. Collaborative learning is a learning model that involves study groups to work, solve problems, complete assignments, or create a product together.

Collaborative learning can be defined as learning philosophy which facilitates learners to cooperate, to encourage each other, and also to improve and succeed together [7]. The structure of collaborative purpose is characterized by the great number of inter dependency between the individual members in groups. In collaborative learning, students say we as well as you and they will reach the goal only if the other members of the group can reach their own learning goals together [8] [9] [10] [11]. Collaborative learning calls in the active participation of individuals and minimizes the differences among them. This approach enriches the momentum of formal and informal education from two meeting strengths: (1) practice realization, that collaborative efforts are needed outside the classroom or in real life, and (2) building social interaction awareness in the effort of realizing meaning full earnings. There are five basic principles for creating collaborative learning in groups: (a) positive interdependence, (b) face-to-face promotive interactions, (c) individual accountability and personal responsibility, (d) teamwork and social skills, and (e) effectiveness group processing [12].

The concept of collaborative learning, putting learners together in groups and pairs to achieve a learning goal, has been widely researched and promoted; the term Collaborative Learning refers to a teaching method in which students of different levels of achievement work together in small groups to achieve a common goal. Students are responsible for each other's learning as well as their own. Thus, the success of one student helps other students to be successful [13]. The development of higher-order reasoning skills allows students to understand the meaning of information and to analyze, evaluate, synthesize, and apply it, which differs from traditional education that emphasizes learning facts [14].

Collaborative Learning promotes the development of these critical thinking skills much better than competitive or individualistic learning environments [15] [16] [17]. A pedagogical approach enabled by technology and expected by the 21st century learner is Collaborative Learning through group/team projects.

The effort is by developing character-based collaborative learning model in the practice learning of vocational education therefore the aim of this study was to figure out whether a character-based collaborative learning model contributes positive impacts in building the students' character and learning achievement in the course of Machining Process.

2. Method

Implementation of the character-based collaborative learning model in the course of Machining Process was designed with posttest-only control. It suited the characteristic of practice learning of which the students' achievement was assessed with the workshop products thus a pretest is unnecessary. Figure 1 and Figure 2 present the frame work of character-based collaborative learning model and the research design respectively.
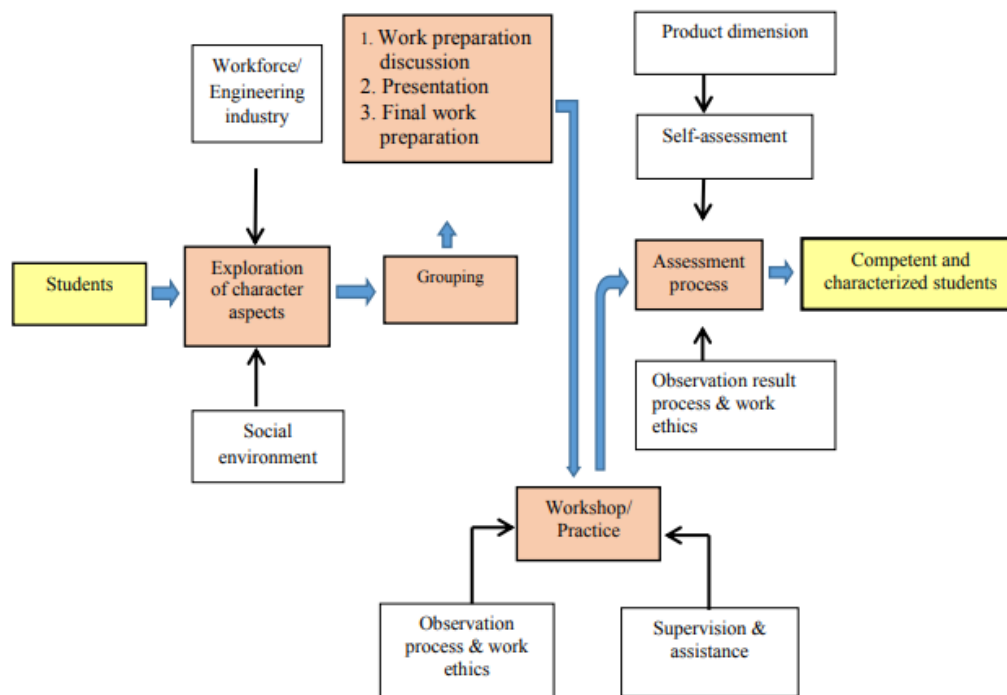
Figure 1. Character-Based Collaborative Learning Model

Note:
R= Control group and experimental group who are purposively taken
O2= Postest experimental group
O4= Postest control group

Figure 2. Postest-Only Control Group

This study was conducted in a workshop in Department of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Yogyakarta. The population was the students taking the course of Machining Process consisted of 85 students. The samples included 33 students determined by purposive sampling technique. The 33 students were divided into two groups, namely the experimental class (T1) with 16 students, and the control class (T2) with 17 students. The object of research is the attitude and achievement of students in the process of making drilling-vise. Implementation of the learning of the machining process is carried out eight meetings.

The attitude aspects studied include: honest, disciplined, diligent, conscientious, independent, hardworking, and empathetic. Aspects of learning achievement are reflected in the results of making a vise-drill based on the job-sheets given. The data were collected using observation sheets, documentation, and learning evaluation. The research instrument was validated by expert judgment. The results of the study were analyzed qualitatively and quantitatively. T-test is used to analyze the impact of the implementation of character-based collaborative learning models compared to the application of conventional learning models on student attitudes and achievements.

3. Result and Discussion

This study was carried out in eight meetings. The first and second meeting of this study focused on elaboration and preparation, while the third up to eighth meetings were the main activities of this study. Starting from the third meeting, the aspects of students' attitudes and learning achievement needed to be carefully observed. In accordance with the characteristic of the course of Machining Process, some work manners that should be concerned were honesty, discipline, diligence, carefulness, independent, hard-working, and empathy. In the other hand, the students' learning achievement aspect was reflected in the results of making a vise-drill

based on the job-sheet given. The vise-drill consists of three main components: (1) rod player/thread, (2) vise jaws, and (3) vise house.

Data collection on students' attitudes consisted of seven manners, namely honesty, discipline, diligence, carefulness, independent, hardworking, and sensitivity. The result data of the research on those aspects from both experimental and control groups are displayed in Table 1.

Table 1 shows that at the 8th meeting almost all T1 students obtained the expected attitude or manners. Furthermore, when viewed from meetings 3 to 8 it was revealed that more than 80% of students in class T1 had aspects of discipline, honesty, and caring. Whereas for students in class T2 only about 63% of students have the expected work attitude. That is, the character-based collaborative learning model has a positive impact on building students' attitudes in the learning process, especially in the practice of machining processes.

Table1. Students' attitudes of Experimental Group (T1) and Control Group (T2)

Aspect Attitude	Number of meetings in learning activities												Average		Percentage	
	III		IV		V		VI		VII		VIII					
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Honesty	8	5	12	6	12	9	14	9	14	12	16	12	13.0	8.8	0.81	0.74
Discipline	13	7	15	10	15	9	15	12	15	10	16	12	15.0	10.0	0.94	0.83
Diligence	7	4	11	5	12	6	12	6	12	8	16	10	12.0	6.5	0.75	0.54
Carefulness	7	5	11	6	12	6	11	4	11	7	15	9	11.7	6.2	0.74	0.52
Independent	6	5	12	6	13	5	14	7	14	7	16	9	12.5	6.5	0.78	0.54
Hardworking	5	6	10	5	12	7	15	5	15	5	14	7	11.7	5.8	0.73	0.49
Empathy	12	4	13	6	14	6	15	8	15	11	15	12	13.8	7.8	0.86	0.65
Totalaverage													12.81	7.38	0.81	0.63

Note**:** T1= experiment group, T2= control group

Learning carried out by implementing collaborative model is believed to be successful in rising students' learning achievements. This is in line with the results of research showing that students who were given collaborative learning obtained learning outcomes in reading technical drawings higher than students who were given direct learning strategies [18].

Data on students' achievements were drawn based on work products from three workshops. The complete data of students' learning outcomes in the course of Machining Process are presented in Table 2.

Table2. Students' Practice Achievement

Student	Machining Process Job						Average	
	I		II		III			
	T1	T2	T1	T2	T1	T2	T1	T2
1	80	65	81	65	82	72	81.00	67.33
2	85	60	76	72	80	68	80.33	66.67
3	78	71	86	65	80	60	81.33	64.33
4	81	65	82	70	82	65	81.67	64.67
5	80	60	82	65	85	65	82.33	63.33
6	75	70	85	66	80	60	80.00	65.33
7	82	72	80	63	85	60	82.33	65.00
8	80	65	85	66	86	70	83.67	67.00
9	79	60	85	65	87	65	83.67	63.33
10	80	70	79	68	83	68	80.67	68.67
11	79	72	85	70	87	70	83.67	67.33
12	78	68	80	70	85	66	81.00	67.67
13	80	72	80	60	85	60	81.67	61.67
14	82	68	87	62	82	65	83.67	65.00
15	80	70	80	65	84	62	81.33	64.00
16	81	70	80	62	82	66	81.00	66.00
17		70		72		69		70.33
Machining Process Job							81.83	65.75

Notes:
T1= experimental group, T2= control group
Job I: Thread; Job II: Jaw (permanent and acquitted); Job III: Vice-house

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Table 2 shows that the learning achievement scores obtained from the results of the machining practice assessment for class T1 show a significant increase, while for class T2 there is no significant increase. Learning achievement in class T1 is influenced by positive changes in student character in the learning process using a character-based collaborative learning model.

Before testing the hypothesis, a normality test and homogeneity test were first carried out on the research data. To test whether the research data is normally distributed or not, the skewness value and kurtosis ratio are used. The data is said to be normally distributed if the skewness ratio and kurtosis ratio are in the range of -1.96 to +1.96 (statistical confidence level of 95% or alpha=0.05). Based on the results of the analysis, the skewness ratio and kurtosis ratio values for student attitude data were -1.648 and 0.273, while for student achievement data were (0.842) and (-0.370). Based on the results of the normality test, it can be concluded that the research data on attitudes and student achievement are normally distributed.

The homogeneity test of the research data used the Levene's statistical technique. The results of the homogeneity test of student attitudes and learning achievement data can be seen in Table 3 and Table 4. Based on the results of the homogeneity test of student attitude data a significance value of 0.338 was obtained, while for student achievement data a significance value of 0.162 was obtained. Based on the results of the homogeneity test, it can be concluded that the research data on attitudes and student achievement is homogeneous because the significance value is greater than 0.05. Based on the results of the analysis requirements test, the t-test can be carried out using the parametric test.

Table 3 Test the homogeneity of student attitude data

| | | Attitude | |
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	.947	
	Sig.	.338	
t-test for Equality of Means	t	13.367	13.510
	df	31	28.762
	Sig. (2-tailed)	.000	.000
	Mean Difference	2.574	2.574
	Std. error Difference	.193	.190
95% Confidence Interval of the Difference	Lower	2.181	2.184
	Upper	2.966	2.963

Table 4. Test the homogeneity of learning achievement data

| | | Achievement | |
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	3.756	
	Sig.	.162	
t-test for Equality of Means	t	24.954	24.954
	df	31	27.412
	Sig. (2-tailed)	.000	.000
	Mean Difference	16.169	16.169
	Std. error Difference	.648	.639
95% Confidence Interval of the Difference	Lower	14.848	14.858
	Upper	17.491	17.480

Table 5. Group Statistics Student's Attitude

	Class Achieve	N	Mean	Std. Deviation	Std. Error Mean
Student's Attitude	Class Experiment	16	6.75	.447	.112
	Class Control	17	4.18	.636	.154

Table 6. Independent Samples Test Student's Attitude

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score student's Attitude	Equal variances assumed	.947	.338	13.367	31	.000	2.574	.193	2.181	2.966
	Equal variances not assumed			13.510	28.762	.000	2.574	.190	2.184	2.963

Table 7. Group Statistics Student's Practice Achieve

	Class Achieve	N	Mean	Std. Deviation	Std. Error Mean
Student's Achieve	Class Experiment	16	81.875	1.408	.352
	Class Control	17	65.706	2.201	.534

Table 8. Independent Samples Test Student's Practice Achievement

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Score student's Achieve	Equal variances assumed	3.756	.162	24.954	31	.000	16.169	.648	14.848	17.491
	Equal variances not assumed			25.283	27.412	.000	16.169	.639	14.858	17.480

Based on Table 5, it can be seen that the average score of students' attitudes in class T1 is 6.75 and in class T2 is 4.18.To ascertain whether there is a significant difference in student attitudes between classes T1 and T2 it is necessary to do a t-test. The results of the t-test on students' attitudes can be seen in Table 4. Based on the results of the t-test, it is known that the value of t = 13.367; p = 0.000. This proves that there are significant differences in student attitudes between classes T1 and T2.

Based in Table 7, it can be seen that the average score of students' practical learning outcomes in class T1 is 81.875 and in class T2 is 65.706. To find out whether there is a significant difference between the practical learning outcomes of students in class T1 and T2, it is necessary to do a t-test. The results of the t test can be seen in Table 8. Based on the results of the t-test, it is known that the value of t = 24.954; with p = 0.000. This proves that there is a significant difference between the practical achievements of students in the experimental group (T1) and the control group (T2). Student learning outcomes in the experimental group were better than the control group (T1 = 81.875 > T2 = 65.706).

Based on the result of the implementation of the character-based collaborative learning model which had been carried out, it quantitatively confirmed that this model was able to integrate the aspects of attitudes to shape students' character which were manifested from the activities performed during the practice learning process. In the same words, those were observable during the process of the learning model implementation.

In the stage of work manner exploration it was proved that the character-based collaborative learning model was effective in evoking students' awareness in relation to work ethics. In this stage students were insisted to deliver their opinions towards the expected attitudes, especially in performing the practice learning process. As for the aim of the stage, it was to make students realize theoretically on work manners or ethics. In this way, students would be likely at ease and guided in putting the perceived manners into practice in the learning process of machining practice or workshop. That was proven by the observation result toward students' activities during the on- going process, with enthusiasm and high awareness, students carried out the work ethics aspects appropriately. As a result, this model of character-based collaborative learning was indeed effective in integrating character aspects in the process of learning practices.

In the stage of composing work preparation sheets, the students' activities were also observed very positive. Here, the students were assigned to learn collaboratively. Collaborative learning process habituated the students to convey ideas bravely, to appreciate others, and to cooperate well. Furthermore, it is also mentioned

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that some of the benefits obtained from the collaborative learning model are: (1) promoting higher learning achievement, (2) providing deeper understanding; (3) experiencing fun learning, (4) developing leadership, (5) upgrading positive attitude, (6) boosting self-esteem, (7) learning inclusively, (8) sense of belonging, and (9) developing prospective skills [19]. Students are stipulated to collaborate and also to respect their teammates and others' at the same time. Empirically, that collaborative and cooperative learning experience is able to improve academic achievement better than learning independently or in competition [20].

Another stage in the process of character integration was in the assessment process of workshop product. Before the product was assessed by teachers, self-assessment by students was done in the very first place. In this process, students were obliged to hold independent measurement on their own products of which the result was filled up on the given sheets. Data of self-assessment were then cross-checked by the teachers. From this activity, students' honesty in conducting self-assessment could be observed.

Based on the implementation of the learning model, there were differences on the aspects of students' work attitudes between T1 and T2. This was reflected on the students' activities during the learning process. The students in T1 were more active and better than those in T2. Results on students' learning achievement signified that the result on the observation of learning activity was equivalent to the learning achievement. This was in line with the result data showing that the high frequency level of the student activities in the learning process of Machining Process in T1 was followed by the high attainment of the students' achievement. Schools that implement character building have an impact on increasing student learning motivation and academic achievement [21].

Character education is placed as a foundation for realizing the national development visions that are to realize good- character, moral, ethical, cultured, and civilized society under the philosophy of *Pancasila* [22]. It holds a crucial role to overcome the national problems, such as the shift of ethical values in life as a nation, the weakening of cultural norms awareness, the thread of national disintegration, the weakening of national sovereignty. Character education does not only teach what is right or wrong. Furthermore, it is an endeavor to internalize good habits (habituation) so that students are capable to behave and act in accordance with the values or principles they have possessed as their characters. Good character education should take account of moral knowing, moral feeling and moral behavior [23].

Character-Based Collaborative Learning Model presents as the development of Competency Based Training (CBT) learning model in which the learning process combines or integrates the aspects of behavior or character in the process of practice learning all at once. The integrated behavioral aspects are synchronized with the work natures of machining process practice course. Based on the results of the study shows that the self - evaluation model can improve the quality of learning of the machining process shown by an increase in activity, independence, attention, and student learning outcomes [24].

Collaborative learning is a learning style where students or colleagues conduct training and development in group environments. Implementing this collaborative learning style can produce many benefits, such as improved engagement, enhanced team-work and an emphasis on communication [25].Collaborative learning can describe a large variety of approaches, but effective collaborative learning requires much more than just sitting pupils together and asking them to work in pairs or group; structured approaches with well-designed tasks lead to the greatest learning gains [26].

Based on the results of the study, it was shown that the application of collaborative learning models in the machining process was effective in increasing learning achievement and student attitudes. Thus, the results of this study are also consistent with research on improving student achievement in practical learning that applies collaborative learning [27]. The character-based collaborative learning model had been proved to improve students' work manner and learning achievement. For that reason, this learning model needs to be tried out for other practice courses. The application of a character-based collaborative learning model places more emphasis on student activities during the teaching and learning process, so that the role of the teacher or lecturer must pay more attention to the process of supervision and assistance. The five fundamental elements involved in collaborative learning that need attention are: positive interdependence, individual and group accountability, interpersonal and small group skills, face-to-face promotive interactions, and group processing.

4. Conclusion

Based on the research findings, the following conclusions can be drawn: (a) there was a significant difference between the attitudes of students who were taught with and without the application of a character-based collaborative learning model (t = 7.211; p = 0.000). The attitude of students who applied the character-based collaborative learning model increased by 50%, (b) there was a significant difference in student achievement between students who were taught with and without using the character-based collaborative learning model (t=10.573; p=0.000). The average learning achievement of students who were taught using a character-based collaborative learning model was higher than the average learning achievement of students who

were taught not using a character-based collaborative learning model (T1 = 81.83 > T2 = 65.75).

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