The Effect of Project-Work Learning Model on the Improvement of the Quality of Craft Learning in Higher Education in Indonesia

Alifia Zahra Khoirunisa

Craft Study Program, Department of Fine Arts Faculty of Language, Arts and Culture, Universitas Negeri Yogyakarta

DOI: https://dx.doi.org/10.47772/IJRISS.2024.8120220

Received: 12 December 2024; Accepted: 16 December 2024; Published: 13 January 2025

ABSTRACT

The purpose of this study is to examine the effects of project-work learning model on the development of students' soft skills and hard skills in metal craft learning. The research with research and development and experimental designs was conducted in the metal craft industry in Special Region of Yogyakarta, as well as in the metal craft workshop at the Faculty of Language, Arts and Culture, Universitas Negeri Yogyakarta. The purposive sampling was applied to a total of 108 students of the Craft Study Program, resulting in 41 students as the research sample. The posttest-only control design was employed while the research instrument validation was measured by experts at metal craft and education. The data were collected through survey, observation, and by means of assessment sheets of the outcomes of craft learning. They were analyzed by descriptive analysis and t-test at the significance level of 0.05. The research findings suggest that the students in the project-work learning class have better soft skills and hard skills than those in the class that does not apply the model. In conclusion, the project-work learning model is suitable for metal craft learning in higher education as it has been proven to improve integrated soft skills and hard skills acquisition in metal craft learning.

Keywords: Metal craft learning, project-work learning, soft skills and hard skills

INTRODUCTION

As part of the national education system, higher education plays a strategic role in producing skilled and work-ready human resources, who not only have high academic competence (hard skills), but also have good interpersonal (soft skills) and character. In higher education, the workshop program is a prominent characteristic because it has a key role in ensuring that graduates with a bachelor's degree in crafts have hard skills and soft skills that are in accordance with the needs of the world of work.

Ultimately, in order to produce such human resources, higher education must always strive to improve the quality of workshop courses. In order for the courses to run effectively in teaching both the academic competence and character values, there needs to be learning model development and application that can integrate hard skills and soft skills in the learning process.

Fundamentally, the products of manufacturing industry, particularly in the metal craft industry, consist of smaller parts or components which are then assembled into the actual finished products. In order to produce high quality products, there needs to be skilled workers with academic competence involving theoretical and practical mastery concerning the product manufacturing process using machine tools (hard skills), as well as character values such as having a high attention to detail, discipline, caring, independence, confidence, and cooperativeness (soft skills). In addition, there needs to be a good and systematic process, which is often referred to as project work. This is why it is important for the students to get used to such a working system by applying project-work learning model in vocational education.

According to Calhoun and Finch, (1976: 2), the notion of vocational education is derived from the concepts of vocational and occupational education which refer to individual readiness to join the industry or a supplementary preparation required to pursue a certain career. Furthermore, Finch and Crunkilton (1979: 2) define vocational education as a means of providing any necessities for students to have access to jobs in order to sustain their lives. Vocational education is crucially needed to prepare students with competencies valuable for their career. Thus, the educators and policy makers' main purpose in the teaching process is providing fundamental values

of learning that will eventually produce well-equipped students in terms of academic and conceptual skills to deal with the real career issues. In addition, Prosser and Allen (1959) point out that in order for vocational education to produce well-equipped graduates, it is necessary to consider the following principles: 1) an effective vocational education can only be done when students are trained to do exercises using the method, tools, and similar to the ones in the workplace, 2) vocational education will be effective if individuals are trained directly and specifically in terms of thinking and work habits, 3) an effective work habit can only be developed if the learning and training processes are in accordance with real jobs and are not merely in the form of exercises.

It is clear that the focus of vocational education is to equip students with a set of skills and abilities to work or develop themselves according to their area of expertise. Thus, designing the standard competencies which are compatible with the career or industry needs is critically demanded. In the end, a compatible standard competency design can lead to the improvement of vocational education.

According to Fortus (2005), project-work learning is a learning process that intensely focuses on collaborative problem solving. The project, according to Alamaki (1999), should be collaborative, unique, and focused on solving real problems related to community needs. Project-based learning is an innovative learning approach which focuses on creating contextual learning through complex activities (Bern and Ericson, 2000). The focus of the project-work learning lies in the process of instilling the core concepts and principles of a certain field of study by conducting the following activities: 1) engaging learners in problem-solving investigations, 2) allowing learners to work autonomously, and 3) enabling learners to construct their own knowledge to produce real products (Thomas, 2000). Thus, project-work learning has great potential to create interesting and meaningful learning experiences.

Based on the above-mentioned reality, it is the responsibility of education, especially vocational education, to generate graduates who have not only high academic competence but also good characters. Therefore, it is important to improve workshop course quality by integrating both hard and soft skills. Developing a character-based project-work learning model for higher education is an attempt to integrate character values into the workshop teaching. The problem adressed in this paper is “Does the application of the project-work learning model in the metal craft course affect students’ soft and hard skills?”

RESEARCH METHOD

The research and development designed by Borg & Gall (1998: 536) and experimental research design were employed in this study. The product of this research went through some specific stages namely conceptual, theoretical, hypothetical, and final models. The model development process was carried out using focus group discussion (FGD), Delphi techniques, and an experiment. The model of development is presented in Figure 1 and the final model of this study is shown in Figure 2.

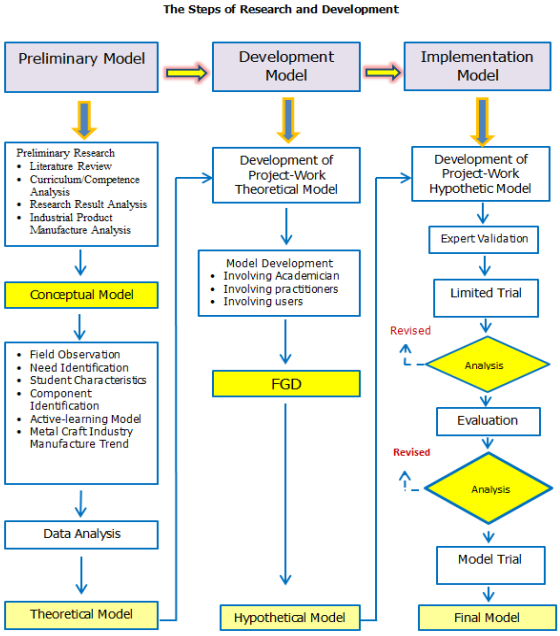

Figure 1. The Development of the Model

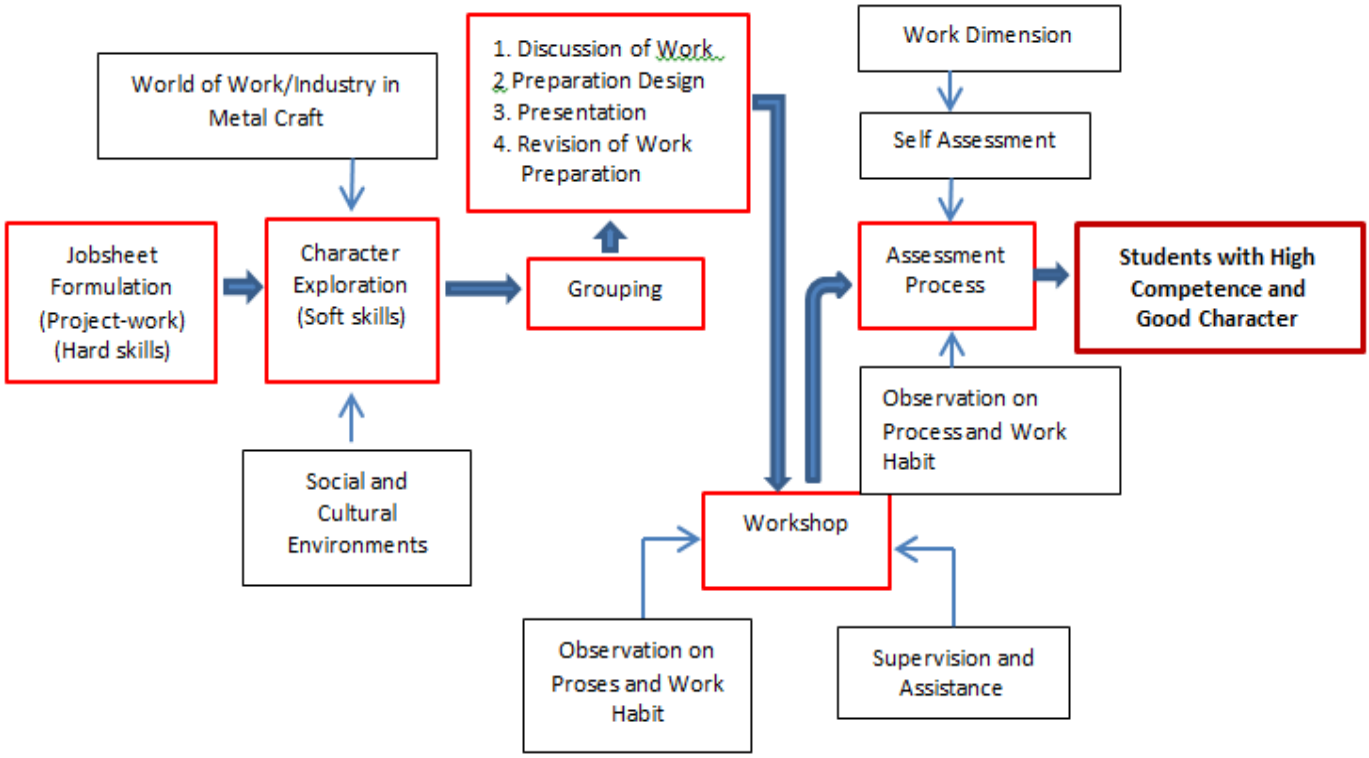

Figure 2. The Final Model

The implementation of the project-work learning model in the workshop course of craft employed the posttest-only control design. The design was adopted by considering the characteristics of the workshop course where students' achievement is assessed from their work-piece, so pretest is not required. The research design can be seen in Figure 3 below.

R	X	O2
R		O4

Figure 3. The Posttest-Only Control Design

Description:

R = Control and experimental classes which are taken randomly

O2 = Posttest of the experimental class

O4 = Posttest of the control class

The population in this study were all students in the Craft Education Study Program, Faculty of Language, Arts and Culture, Yogyakarta State University who were taking the metal craft practice course. The total of the population was 108 students. The sample consisting of 41 students was established using the purposive sampling technique and divided into two classes namely control and experimental classes. The experimental class consisted of 20 students, and the control class consisted of 21 students.

The study was conducted at Craft Education Study Program, Faculty of Language, Arts and Culture, Universitas Negeri Yogyakarta and the metal craft industries located in Yogyakarta. The instrument validation was measured by the experts at metal craft and education. The data were collected by means of (1) observation sheet, (2) documentation, (3) questionnaire, (4) assessment sheet of process and product of students' work piece. The data were analyzed by using the qualitative and quantitative methods. In order to measure the effectiveness of the model, the developed model was compared to the last model and then t-test was conducted.

FINDINGS AND DISCUSSION

Findings

The project-work learning model was implemented in the course of metal craft and was conducted in eight meetings. The first and second meetings were about the description and preparation of the learning process. The third to the eighth meetings focused on the research, so there should be a thorough observation of both hard and soft skills. In accordance with the characteristics of the course, students' soft skills were measured from the following aspects: discipline, diligence, meticulousness, independence, care, hard work, and cooperation. Meanwhile, the hard skill aspect was measured from students' competencies and the quality of their job sheets in producing a speed-reducer.

The result of the observation on the attitude and activity of 32 students in the experimental class is presented in Table 1 below.

Table 1. Soft skills of the students in the experimental class

Soft skill Aspects	The number of students of each meeting					
	3	4	**5**	**6**	**7**	**8**
Discipline	13	15	17	18	19	20
Diligence	11	14	18	19	20	20
Meticulousness	12	15	17	18	18	20
Independence	11	14	16	17	17	18
Hard work	14	16	18	19	20	19
Cooperation	12	15	16	18	19	20
Care	13	17	18	19	20	20
Percentage	61 %	76 %	86 %	91 %	95 %	98 %

In order to provide the better description of the attitude and activity of the students in the experimental class, the histogram is presented in Figure 4 below.

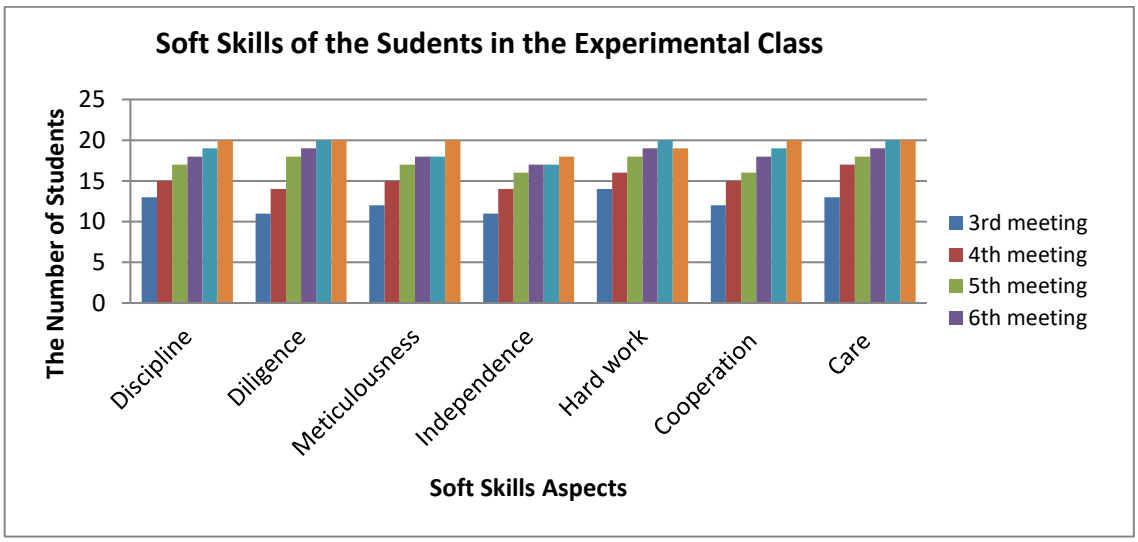

Figure 4. The Histogram of the Activity of the Students in the Experimental Class

It can be seen from the data in Table 1 that all students' soft skill aspects in third and eighth meetings consistently improve. The soft skills aspects of discipline, diligence, cooperation, and care are 100%. It means that all of the students, 20 in total, have good soft skill aspects. Meanwhile the other aspects of soft skills namely independence and hard work consistently improve on the third to eighth weeks, but two of the students did not possess the independence aspect, and one student did not possess the hard work aspect.

The result of the observation on the soft skills in the course of metal craft of the students in the control class can be seen in Table 2 below.

Table 2. Soft Skills of the students in the Control Class

Soft skill Aspects (Attitude and Behavior)	The number of students of each meeting					
	3	4	5	6	7	8
Discipline	11	11	12	14	12	15
Diligence	8	9	10	10	12	14
Meticulousness	9	10	10	8	10	10
Independence	9	9	10	10	11	11
Hard work	10	10	11	10	9	9
Cooperation	9	10	12	13	12	14
Care	9	8	9	10	9	10
Percentage	44 %	46 %	50 %	51 %	51 %	56 %

More detailed information on the attitude or performances of the students in the control class is presented in Figure 5 below.

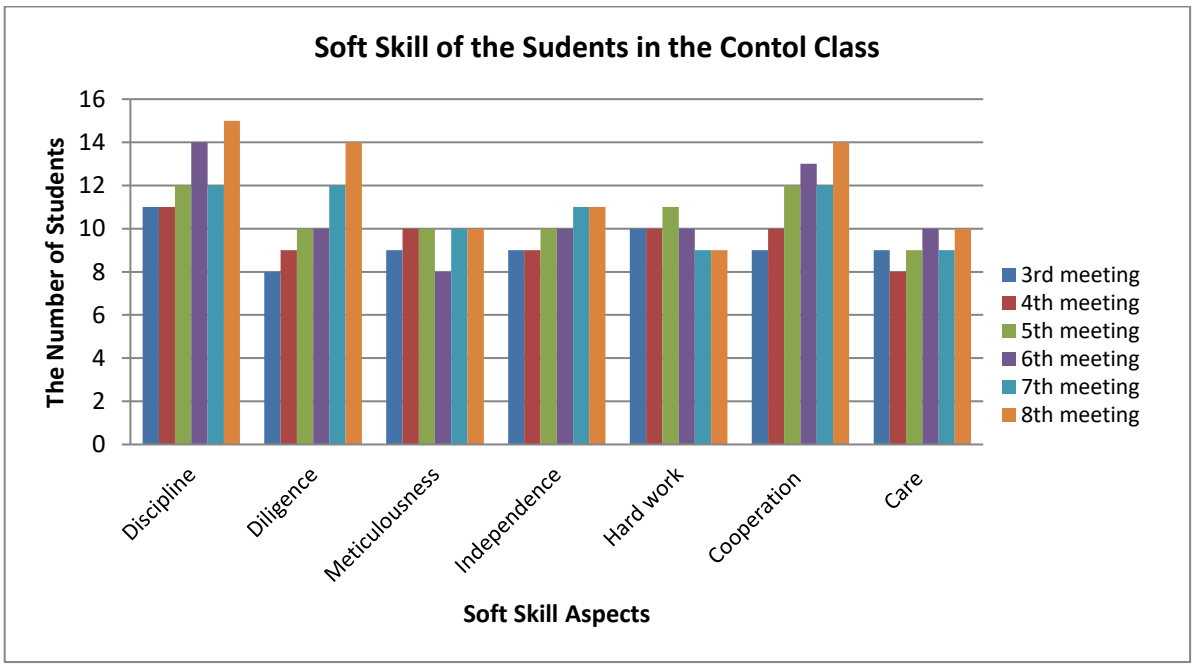

Figure 5. Histogram of the Activities of the Students in the Control Class

Based on the data, it can be seen that the third week to eighth week meetings/the last week, 56% of the students have performed soft skill aspects. With regard to the research findings, it can also be inferred that all aspects of

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue XII December 2024

soft skills consisting of: discipline, determination, meticulousness, independence, hard work, cooperation, and care are not performed consistently by students.

The data of the students' hard skills are measured from students' competencies and the quality of their job sheets in producing speed-reducer. The product assessed in this study consists of three kinds of components, namely: 1) worm gear, 2) worm gear shaft, and 3) worm shaft. The data on the hard skills of the students in the experimental class can be seen in Table 3 below.

Table 3. Hard Skills of the Students in the Experimental Class

Students	**Workshop Activities**			**Means**
	I	**II**	**III**	
1	82	78	81	80.33
2	80	80	80	80.00
3	81	85	85	83.67
4	79	80	82	80.33
5	79	83	79	80.33
6	80	82	82	81.33
7	82	85	80	79.00
8	77	80	80	79.00
9	78	80	79	79.00
10	80	79	82	80.33
11	80	85	80	81.67
12	82	85	80	82.33
13	85	85	85	85.00
14	80	82	82	81.33
15	82	80	81	81.00
16	80	79	82	80.00
17	81	82	85	82.67
18	85	85	85	85.00
19	86	85	85	85.33
20	80	80	82	80.67
The Sum of Students' Hard Skills Mean Values				**81.60**

A description of the hard skills of the students in the experimental class can also be seen in Figure 6 below.

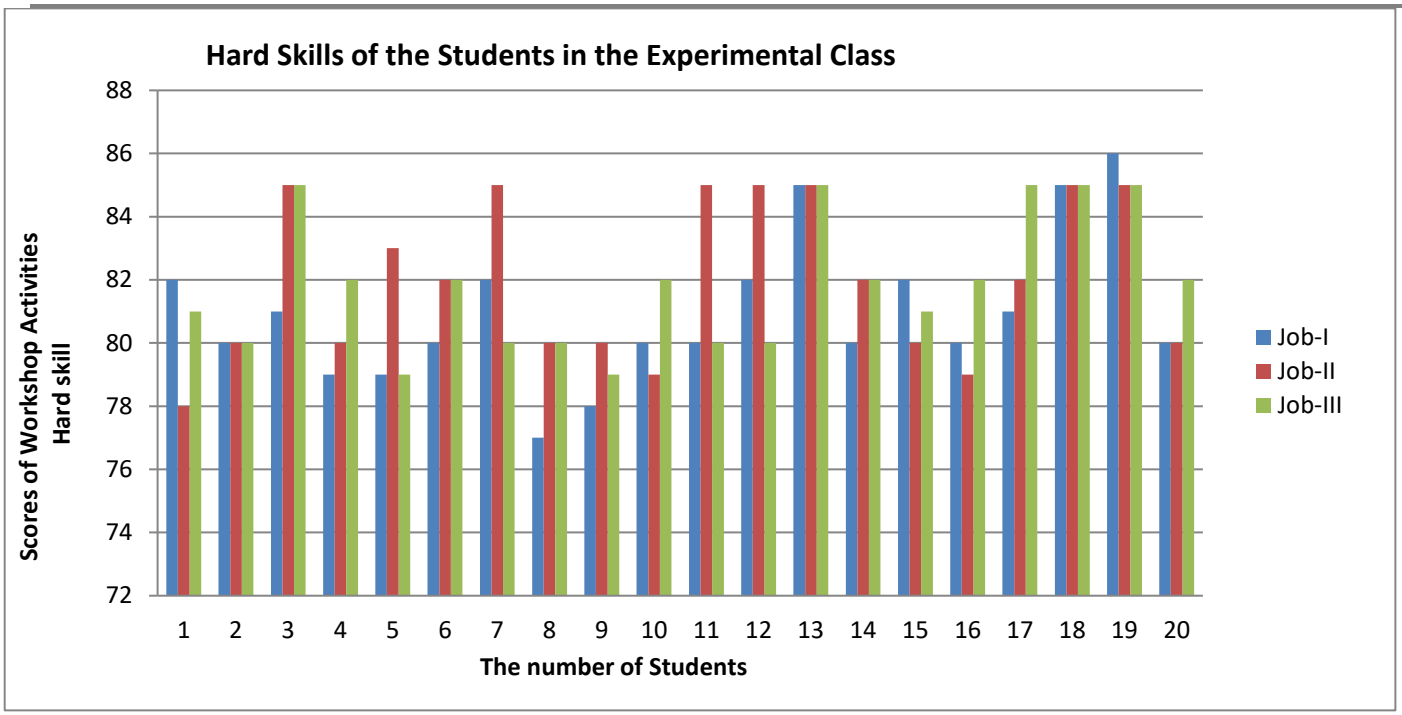

Figure 6. Histogram of the Competence (Hard Skills) of the Students in the Experimental Class

The results indicate that the students' hard skills have relatively high mean values (81.60). Then, the hard skills of the students in the control class are presented in Table 4 below.

Table 4. Hard Skill of the Students in the Control Class

Students	Workshop Activities			Means
	I	II	III	
1	65	66	70	67.00
2	60	65	65	63.33
3	70	68	68	68.67
4	72	70	70	70.67
5	68	70	66	68.00
6	72	60	60	64.00
7	68	62	65	65.00
8	70	65	62	65.33
9	70	60	66	67.33
10	65	65	72	67.33
11	60	72	68	66.67
12	70	66	60	65.33
13	65	70	65	66.67

14	60	65	65	63.33
15	70	66	60	65.33
16	72	60	60	64.00
17	72	70	70	70.67
18	70	70	68	69.33
19	71	70	70	70.33
20	67	68	65	66.67
21	65	62	65	64.00
The Sum of Students' Hard Skills Mean Values				**66.54**

In addition, the description of hard skills of the students in the control class in the metal craft course is presented in Figure 7 below.

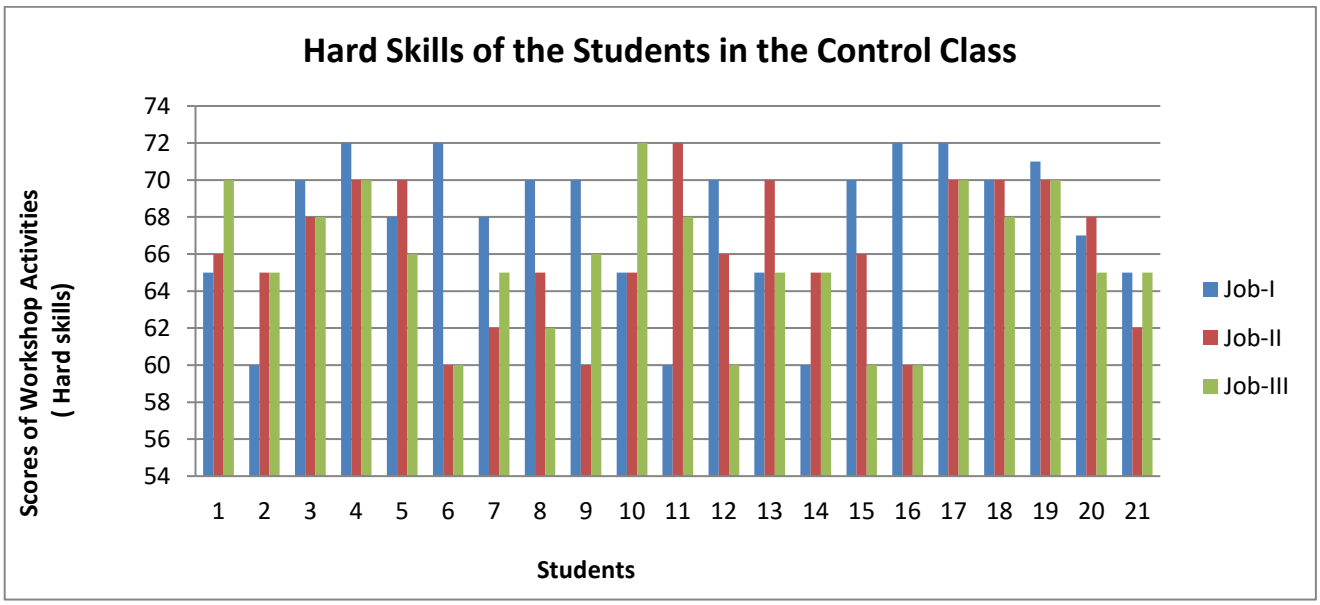

Figure 7. Histogram of the Competence (Hard Skills) of the Students in the Control Class

The results of this research indicate that the students' hard skills have a fairly low mean value (66.54). Thus, the students who are taught using the conventional method do not perform good hard skills in the course of metal craft.

Testing of Assumptions

It is necessary to conduct the test of assumptions in accordance with the techniques used to analyze the data. Furthermore, to find out the difference in the students mastery of both the soft skills and hard skills of the students in both experimental and control classes, t-test was conducted. The testing of assumption conducted in this study are normality and homogeneity tests.

Normality test

To test the distribution of the data, Skewness and Kurtosis ratio tests were used. The data are in normal distribution if the ratio is greater than -2 and lower than +2. The results of the normality test of the data on the hard skills of the students in the experimental class show the skew-ness ratio (-1.748) and kurtosis ratio (¬0.288).

It can be stated that the data of students' hard skills in the form of Machining Process course activities in the experimental class are in the normal distribution.

The normality test values on the soft skills scores of the students in the control class are greater than -2 and less than +2. The skewness ratio is 0.821, and the kurtosis ratio is -0.370. It can be inferred that students' soft skills scores are in normal distribution.

Homogeneity Test

Students' Hard skills

The result of homogeneity test on students' hard skills scores is presented in Table 5.

Table 5. The Result of the Homogeneity Test of Students' Hard skills Scores

	Levene Statistic	df1	df2	Sig.
Hard Skill Scores				
Based on Mean	1.802	1	39	.189
Based on Median	.546	1	39	.465
Based on Median and with adjusted df	.546	1	24.483	.467
Based on trimmed mean	1.578	1	39	.218

Levene test was used to check the data, and it is shown that students' hard skill scores are homogenous since the value of Based on Mean is higher than 0.05. The significance value of the Metal Craft Course is 0.189.

Students' Soft Skills

The results of the homogenity test on the students' soft skills can be seen in Table 6.

Table 6. The Result of the Homogeneity Test of Students' Soft Skills Scores

	Levene Statistic	df1	df2	Sig.
Soft Skill Scores				
Based on Mean	.776	1	39	.394
Based on Median	.166	1	39	.690
Based on Median and with adjusted df	.166	1	9.902	.690
Based on trimmed mean	.734	1	39	.407

The Lavene test shows that *the-based-on-Mean* significance value is 0.394. Since the value is higher than 0.05, it can be concluded that the scores of students' soft skills are homogenous. Then, in accordance with the testing of assumption, the parametric test, t-test is used to analyze the data. The results of the t-test analysis are as follows:

Students' Hard Skills

The results of t-test on the hard skills scores in the Metal Craft workshop course of the students in both experimental and control classes are presented as follows.

Table 7. The Result of t-test of Students' Hard Skills Scores

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Man Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Hard Skill_Scores	1.802	.189	9.623	39	.000	9.70742	.92652	7.92667	11.70007
Equal variances assumed Equal variances not assumed			9.350	26.245	.000	9.70742	.93660	7.88751	1.72932

Based on the t-test, the t value is 9.623 at the significance level of 0.000. This means that hard skill scores of the students in both experimental and control classes are significantly different. The mean value of the experimental class is higher than that of the control class ($X_{experiment} = 81.60 > X_{control} = 66.54$).

Students' Soft Skills

The t-test result on students' soft skills which include discipline, preserverance, meticulousness, independence, hard work, cooperation, and care in the course of Metal Craft of both experimental and control classes is presented in the following.

Table 8. The Result of t-test on Students' Characters

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Man Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Obs_SK	.776	.394	7.211	12	.000	5.42900	.75292	3.78954	7.07044
Equal variances assumed Equal variances not assumed			7.211	11.420	.000	5.42900	.75292	3.78026	7.07972

The value of t is 7.211 at the significance level of 0.000. Therefore, it is concluded that there is a significant difference between the character aspects of the students in both experimental and control classes. Each aspect score percentage in the experimental class is higher than that in the control class ($X_{experiment} = 98\% > X_{control} = 56\%$).

DISCUSSIONS

The character-based project-work learning model is developed from a competency-based training (CBT) learning model which has existed and integrated the aspects of attitude and behavior. Both models are used

particularly in workshop courses, so the learning processes focus on the students' practical competence and skills. The integrated soft skill aspect of the models is adapted to the characters of the workshop course.

After the implementation of the model, it is proven that the project work-based learning model successfully integrates soft skill aspects into the course activities as shown by the students' learning attitude. Based on the observation conducted during the model implementation (the exploration stage), the project work model is effective. It can make the students participate in learning and raise their awareness of the importance of character building in the metal craft course. At the exploration stage, the students are required to convey their opinions related to aspects of essential work attitude, which are particularly related to metal craft. This is intended to make sure that students have theoretical awareness of the character aspects which are shown from the ways they share their opinions about the character aspects during FGD. It is assumed that they will wholeheartedly carry out the various aspects of character in the Machining Process. Therefore, the characters that have been believed, understood, and done in the learning process will eventually be implemented when are at work.

The observation results on students' activities during the teaching and learning of Machining Process indicate that the students who actively express their opinions when character or soft skills exploration process takes place are proven to be more persistent in implementing the inculcated soft skills. Thus, an exploration of soft skill aspects in the project-work learning model is indeed effective in integrating them into the learning process of metal craft workshop course.

The next stage in the character-based project-work learning model is the discussion of the Work Preparation Sheet. At this stage, the students are required to work in groups to solve problems and at the same time they have to respect the opinions of others, either friends of their own group or of other groups. Through this stage, they are expected to have the following soft skills: having the courage to communicate their thoughts, respecting others' opinions, cooperating with others, thinking critically, and being able to solve problems. Further, critical thinking leads to another skill, namely wisdom. Critical thinking allows someone to analyze information thoroughly and to make the right decisions when dealing with controversial issues. Therefore, teachers are expected to familiarize the students with critical thinking skill through such activities as proposed by Kirschenbaum (1995), including (1) defining statements or questions clearly, (2) reasoning, (3) searching for correct information, (4) using credible sources, (5) taking into account the whole situation, (6) looking for alternative possibilities, (7) being open-minded, (8) changing position when the evidence is reliable, (9) seeking as much precision as the subject permits, and (10) being sensitive to the feelings, level of knowledge, and degree of sophistication of others.

The next stage in the process of soft skill integration is self-assessment by the students themselves. Before the teacher assesses the students' work piece, the students are given a chance to assess their own work piece independently and later fill in the provided assessment form to be then crosschecked by the teacher. Through this activity, the students' honesty level can be measured.

Based on the implementation results, there is a difference between the experimental and the control classes as shown in their activities during the teaching and learning process. The students in the experimental class look more enthusiastic and engaged in the learning process than those in the control group. In relation to their learning outcomes, the experimental class that has better classroom involvement proves to have higher achievement scores than the control one does. This is in accordance with the results of a study conducted by Berkowitz (2005) which indicates an increase in students' motivation to have better academic achievement when character education model is implemented at their school. The classes that are comprehensively involved in character education show a drastic decline in the students' negative behaviors that eventually can hinder academic success. Similarly, Zins (2007) affirms that the risk factors causing students' failure are not solely rooted on their intelligence, rather on their own characters such as self-confidence, cooperation, sociability, concentration, empathy, and communicativeness. Further, Kirschenbaum's (1995) agrees that project-work learning model is a comprehensive learning approach as the method used in the teaching and learning process includes the aspects of inculcation, modeling, and facilitation. The inculcation aspect involves the following characteristics: (1) communicating beliefs with their underlying reasons, (2) appreciating other people's opinion, (3) making social and emotional experiences about the desired values, and (4) defining rules, giving rewards, and providing reasonable consequences. The modeling aspect can improve students' assertive and listening skills. These skills are essential in creating interpersonal and intergroup relationships. The assertive skill is related to one's ability

to communicate their opinion in such a way that does not hurt other people's feelings, while listening skill is related to one's ability to comprehend things critically. Further, assertive and listening skills are described as *yin* and *yang* which must be developed in a balanced way as it is a vital component of communication. The facilitation aspect involves giving assistance or guidance to the students in solving problems. This facilitation activity proves to have a positive impact on both the teacher and the students. The activity includes: (1) improving teacher-student relationship, (2) helping students deepen their understanding, (3) encouraging students to think more about the inculcated value, to search for insights into their own, and to ultimately realize the positive values conveyed by their teachers, (4) giving teachers a better understanding of the students' thoughts and feelings, and (5) encouraging students to relate certain issues with their lives, beliefs, and feelings.

It has been successfully proven that project-work learning model can integrate soft skills and hard skills in the course of Machining Process. Thus, this model can develop students' competence and characters. This is in line with Lickona (1991:51) who writes that character education (soft skills) consists of three main components, i.e knowing the good, loving the good, and doing the good. Furthermore, Kirschenbaum (1995:15-28) states that there are four ways to facilitate students with sufficient competencies and good characters, i.e value realisation, character education, civic education, and moral education. Important values that need to be implemented and cultivated among students are: self-understanding, self-esteem, goal-setting skill, thinking skill, decision-making skill, communication skill, social skill, as well as academic and transcendental knowledge. Character education that needs to be instilled includes: respect, responsibility, compassion, discipline, loyalty, bravery, tolerance, open-mindedness, work ethic, as well as belief in and love of God. Meanwhile, the main aspects of civic education that need to be instilled include knowledge of being a good citizen, respect for democratic systems and citizenship values, critical thinking skills, communication skills, and conflict resolution skills. Finally, moral education includes knowledge, attitudes, beliefs, skills, good behavior, honesty, and compassion. The main reason for implementing moral education is to generate autonomous individuals who understand moral values and are committed to doing things which are in accordance with those values.

CONCLUSIONS

1. There is a significant difference in terms of soft skills between students who were taught using the project-work learning model and those who were not, in metal craft learning (t= 7.21 ; p= 0.000). The percentage of soft skills value implementation in the class taught using the character-based project-work learning model is higher ($X_{experiment} = 98\% > X_{control} = 56\%$).

2. There is a significant difference in terms of hard skills between students who were taught using the project-work learning model and those who were not, in metal craft learning (t=9.62; p= 0.000). The average value of students' hard skills scores taught using the project-work learning model is higher ($X_{experiment} = 81.15 > X_{control} = 66.33$).

Therefore, this learning model is suitable for increasing the quality of teaching metal craft workshop course in higher education.

RECOMMENDATIONS

Some suggestions which can be drawn from the discussions are as follows.

1. The character-based project-work learning model has been proven to be an effective model to integrate soft skills and hard skills aspects in metal craft teaching. To check its suitability, this model is recommended to be applied to other courses

2. This learning model focuses more on students' activities during the teaching-learning process, thus, other lecturers/teachers need to focus more on the students mentoring and guidance.

REFERENCES

1. Alamaki, A. 1999. Current Trends in Technology Education in Finland. The Journal of Technology Studies. Available on: Digital Library and Archives.

2. Bern, R.G., and Erikson, P.M. (2001). Contextual teaching and learning. Preparing students for the new economy. Ohio: Bowling Green State University.
3. Borg, W.R., and Gall, M. D. (1998). Educational Research, an intro-duction. New York: Longman.
4. Calhoun, C.C. and Finch, C.R. (1976). Vocational educational: Concepts and operation, Belmont: Wadsworth Publishing Company.
5. Finch, C.R. and Crunkilton, J.R. (1979). Curriculum development in vocational education, Boston: Allyn and Bacon Inc.
6. Fortus, D., et al. (2005). Incorporating modeling practices into middle school project-based science. Research Report. Weizmann Institute of Science.
7. Johnson, D. W., and Johnson, R. T., Qin, Z. (1995). Cooperative versus competitive efforts and problem solving. Review of Educational Research. 65(2). 129-143.
8. Joseph E. Zins, Michelle R. Bloodworth, Roger P. Weissberg & Herbert J. Walberg. (2007). The scientific base linking social and emotional learning to school success. Journal of Education and Psychological Consultation. Volume 17-2007, issue 2-3, page: 191-210.
9. Kirschenbaum, H. (1995). Enhance values and morality in schools and youth. Boston: Allyn and Bacon.
10. Lickona, T. 1991. Educating for Character: How Our School Can Teach Respect and Responsibility. New York, Toronto, London, Sydney, Auckland: Bantam Books.
11. Berkowitz, M., and Bier, M. (2005). What Works in Character Education: A research-driven guide for educators. Washington: CEP.
12. Prosser, C.A., & Allen, C.R. 1952. Vocational Education in a Democracy. New York: Century.
13. Thomas, J.W. (2000). A review of research on project-based learning. California: The Autodesk Foundation 111 McInnis Parkway San Rafael.