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PROJECT-BASED LEARNING ASSISTED WITH E-MODULE BASED TRI HITA KARANA: IMPROVING STUDENTS CRITICAL THINKING AND SOCIAL BEHAVIORS IN ISAD

APRENDIZAGEM BASEADA EM PROJETOS ASSISTIDA COM TRI HITA KARANA BASEADO EM MÓDULO E: MELHORAR O PENSAMENTO CRÍTICO E OS COMPORTAMENTOS SOCIAIS DOS ALUNOS NA ANÁLISE E PROJETO DE SISTEMAS DE INFORMAÇÃO

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Abstract: This study was conducted to find out the effectiveness of project-based learning assisted with e-module based tri hita karana to improve students' critical thinking and social behaviors in information system analysis and design (ISAD). Quasi-experimental study was used as the research design implemented in the form of pretest-posttest non-equivalent control group design. The research sample was 80 students who took analysis and system information design in which they were selected by using simple random sampling. The data were obtained by distributing questionnaire and conducting test. The research instruments were test and questionnaire. The obtained data were analyzed by using descriptive and inferential statistic particularly MANCOVA. The findings showed that there was an influence contributed by project-based learning assisted with e-module based tri hita karana on students' critical thinking and social behaviors simultaneously and partially. It was also found that project-based learning assisted with e-module based tri hita karana was more effective than direct instruction learning model.

Keywords: E-module. Project-based learning. Tri hita karana.

Resumo: Este estudo foi conduzido para descobrir a eficácia da aprendizagem baseada em projetos assistida com tri hita karana baseado em módulo eletrônico para melhorar o pensamento crítico e os comportamentos sociais dos alunos na análise e design de sistemas de informação (ISAD). O estudo quase experimental foi utilizado como desenho de pesquisa implementado na forma de desenho de grupo de controle não equivalente pré-teste-pós-teste. A amostra da pesquisa foi de 80 estudantes

que realizaram análise e desenho de sistema de informação, no qual foram selecionados por meio de amostragem aleatória simples. Os dados foram obtidos por meio de distribuição de questionário e realização de teste. Os instrumentos de pesquisa foram teste e questionário. Os dados obtidos foram analisados por meio de estatística descritiva e inferencial, principalmente MANCOVA. As descobertas mostraram que houve uma influência da aprendizagem baseada em projetos, assistida com tri hita karana baseado em módulo eletrônico, no pensamento crítico e nos comportamentos sociais dos alunos, simultânea e parcialmente. Verificou-se também que a aprendizagem baseada em projetos, assistida por tri hita karana baseado em módulos eletrônicos, foi mais eficaz do que o modelo de aprendizagem por instrução direta.

Palavras-chave: Módulo eletrônico. Aprendizagem baseada em projetos. Tri hita karana.

1. Introduction

Information System Analysis and Design (ISAD) is a course which has a strong connection with students' problem-solving skills covering critical thinking, self-efficacy, and social behavior. Those skills are required since its learning objective is preparing students to develop and implement software in which it depends on students' critical skills and interpersonal skills (Iqbal *et al.*, 2019). In fact, this requirement cannot be fulfilled optimally indicating that the learning objective in Information System Analysis and Design (ISAD) not achieved by the students. It is relevant to the current problem found during the preliminary observation conducted at Institute Bisnis dan Teknologi Indonesia (INSTIKI). It shows that students have low critical thinking skills reflected on their ISAD test. The average score is mostly achieved at 4.91 categorized into low criteria. The questionnaire distributed to the students indicate that the students have low social behaviors shown by the mean score 47.7 in which it is also supported by the teachers who teach ISAD for the third semester. It can be a serious problem for the students in which they cannot achieve the learning objectives in ISAD course.

Critical thinking skill is perceived as one of important attributes to assist students in facing working industry in which it builds their knowledge in solving the problem and evaluating the information (Hazaymeh & Alomery, 2021; Ouhiba, 2022). Kopzhassarova et al., (2016) state that critical thinking is an ability of directing creative cognitive activity in analyzing the problem and solving it independently. It is also defined as a thinking process allowing students to comprehend and explain the interrelationship between a problem and relevant information obtained from many different perspectives (Amin & Adiansyah, 2018; Warsah et al., 2021). Students with low critical thinking skill tend to face difficulty in showing or expressing their opinions. Therefore, critical thinking is required to be emphasized by the

teachers into their classrooms to strengthen students' cognition (Fikriyatii *et al.*, 2022;Zhou, 2022).

In addition, developing students' critical thinking skills is not only the main concern in conducting a successful learning. It is stated that social behavior is another aspect influencing the success of learning process (Wishkoski *et al.*, 2022). Social behavior is defined as an individual's awareness in determining a real action toward a certain case by considering the relationship between his or her needs and the society (Ahmed *et al.*, 2021). It is perceived as the way of an individual behaves towards a certain social object (Kusuma & Sutapa, 2020;Oktaviyanti et al., 2016;Utami et al., 2020). The development of students' social behaviors influenced by many factors including the learning environment and their background (Arshad & Zaman., 2020; Pakpahan., 2020). It is added that an appropriate learning method implemented by the teacher also has a significant role in building students' social behaviors (Fikriyatii *et al.*, 2022; Gerdts-Andresen *et al.*, 2022; Hazaymeh & Alomery, 2021; Maulida *et al.*, 2020; Muharam *et al.*, 2019).

Learning method has been widely perceived as a significant factor in accomplishing the learning objectives. Project-based learning is one of learning method which provides students a learning experience by accomplishing a project (Beneroso & Robinson, 2022). It aims at introducing students to a problem-solving condition in which it provides an authentic problem to be solved by the students through a depth-analysis (Mirici & Uzel, 2019; Rio & Rodriguez, 2022; Steffen *et al.*, 2022).Students are able to have their independent learning by working collaboratively and cooperatively (Beuchat *et al.*, 2022;Goyal *et al.*, 2022). Safaruddin et al., (2020) argue that project-based learning is an innovative learning strategy offers students-centered learning approach allowing students to implement contextual principle through their active involvement in accomplishing the project. It has a main purpose in developing students' critical thinking skills and the ability in building their own knowledge (Amini et al., 2019).

Implementing project-based learning is required to be integrated with another concept since improving critical thinking is not the only problem occurs in information system analysis and design course. Teachers and other stakeholders have a role in creating a learning process which also develops students' social behaviors (Arshad & Zaman, 2020). Dewi *et al.* (2020) state that local culture value can be integrated to the learning process to improve students' social behaviors. Tri Hita Karana is a local culture value believed by Balinese local people as the concept of building a harmony among the society (Astuti et al.,

2019). It has been perceived by the local people as the main factor which navigates an individual's social behavior (Divayana *et al.*, 2020). It builds students' social behaviors through the emphasize of three main relationships; *parahyangan* (the relationship between humans and god, *pawongan* (the relationship between humans and other beings), *palemahan* (the relationship between humans and the environment) (Karpika & Mentari, 2020). Kusuma et al., (2023) add that *tri hita karana* is a local culture value that can be recognized as a teaching approach for developing students' affection. It can be seen that tri hita karana is essential to be integrated with the learning model to establish students' social behaviors.

Project-based learning can be integrated with *tri hita karana* by functioning e-module to support the learning process. E-module based tri *hita karana* is an innovative learning media in which it can be adjusted to the implementation of project-based learning itself (Sumarmi *et al.*, 2021). It allows the students to comprehend the learning process in system information analysis and design through a video, an audio, and an animation provided in e-module (Rajabalee & Santally, 2021). It is argued that e-module assists students in building information system through the materials displayed in details (Rahayu & Sukardi, 2021). Therefore, the e-module can be used as a media for implementing a certain learning approach or model (Aufa *et al.*, 2021; Komikesari *et al.*, 2020).

Regarding to the current issue, several studies have been conducted to investigate the implementation of project-based learning integrated with *tri hita karana*. Permana and Jayanta (2019) conduct a study to develop e-module based *tri hita karana* in which it reveals that the developed e-module is effective for increasing students' competences in system information. . Sutrisna et al., (2020) investigate the effect of project-based learning integrated with *tri hita karana* which reveals that the integrated model is effective for improving students' social competences. Widiana et al., (2023) find that project-based learning underlined by tri hita karana is effective in improving students' creativity. Those studies prove that integrating tri hita karana with project-based learning is appropriate. Further study needs to be conducted regarding to the problem occurs in information system analysis design course. Therefore, this study is conducted to find out the effect of project-based learning assisted with e-module based tri hita karana in improving students' critical thinking skills and social behaviors.

2. Theoretical framework and literature review

a. Project-Based Learning

Project-based learning is defined as a learning model establishing students-centered learning approach through the tasks covered in the form of project (Rahmawati et al., 2018).

Sarwandi et al., (2019) state that project-based learning provides a learning experience through an actual activity by integrating and gathering it in the form of problem introduced to the students at the early stage of learning process. It is added that project-based learning involves students' critical thinking, creativity, collaboration, cooperation, and communication skills (Sudjimat et al., 2020). It engages students to form knowledge and skills through inquiry process indicated by authentic, complex questions, and product designs (Pratiwi et al., 2023) (Rahayu & Sukardi, 2021;Surur et al., 2023).

b. E-module

E-module is perceived as e-learning form provides learning sources through the equipment of ICT (Sari et al., 2021). Sanova et al., (2022) state that e-module is a utilization of technology facilitating students with various creative learning materials leading them to have an independent learning. It is added that e-module can be used as multimedia application for creating fun and innovative learning environment (Fahmi et al., 2021; Indarta et al., 2021; Rahayu & Sukardi, 2021). A various of learning sources can be inserted in the e-module to stimulate students' self-regulated learning (Yolanda & Rizal, 2021).

c. Tri Hita Karana

Tri hita karana is a Balinese local wisdom believed as a concept of harmony dealing with three main relationships; humans and god, humans and other beings, humans and environment (Dharmawan et al., 2023; Waisnawa & Padmanaba, 2022). It consists of three main domains; parahyangan, pawongan, and palemahan. It is argued that those domains are the factors cause the harmony. Parahyangan deals with the relationship between humans and God. Pawongan concerns on the relationship between humans and other beings. Meanwhile palemahan focuses on the relationship between humans and environment (Asih, 2022).

d. Critical Thinking Skill

Critical thinking is an ability to obtain and assess the information given in constructing a reflective and rational reasons (Basori et al., 2023; Zamroni et al., 2020). It deals with students' abilities in applicating, analyzing, synthesizing, and evaluating the information that they obtain (Awan et al., 2017). It is argued that students who have higher critical thinking skills are able to comprehend a certain case or problem in a deeper analysis by restructuring the situation (Hariyanto et al., 2022; Hasna et al., 2021;Thaiposri & Wannapiroon, 2015).

e. Social Behavior

Social behavior is commonly recognized as social intelligence related to a certain phenomenon occurs in the society (Maksum et al., 2021; Stormont et al., 2015). It is stated that social behavior related to people's role as a social being in ruling and structuring themselves in the society (Astami et al., 2016; Utami et al., 2020). It is also defined as a way of behaving towards a social entity (Kusuma & Sutapa, 2020;Oktaviyanti et al., 2016;Utami et al., 2020). Ahmed *et al.*, (2021) state that social behavior is a real action towards a certain case determined by an individual's awareness by considering the relationship between his or her needs in the society.

3. Research design and methods

This study was designed by using quantitative approach particularly adapting quasi-experimental model through pretest-posttest non-equivalent control group design. The study was conducted at Institute Bisnis dan Teknologi Indonesia (INSTIKI). There were 80 of third semester students who joined information system analysis and design (ISAD) course involved as the research sample. They were selected by using random sampling technique in which they were divided into two main groups; control and experimental groups. Each group consisted of 40 students where the control group was taught with conventional learning model meanwhile the experimental group was taught using project-based learning assisted with e-module based tri hita karana. The data were obtained through a test and questionnaire in which the research instruments were; test and questionnaire. The test was designed by adapting six indicators; formulating the problem, providing an argument, deducting, inducting, evaluating, determining and implementing. Those indicators were elaborated into twelve essay questions. The questionnaire was arranged by adapting seven indicators; discipline, responsibility, honesty, tolerance, courtesy, confidence, and cooperation. Those were implemented into forty statements. The obtained data were analysed by using descriptive and inferential statistics. The inferential statistics was conducted through MANCOVA test analysis with the assistance of SPSS 26.0 for Windows.

4. Results

Descriptively, the current study showed that the implementation of project-based

learning assisted with e-module based tri hita karana influenced students' critical skills and social behaviors in information system analysis and design. It was indicated by a significant mean difference between the students in control and experimental groups. The difference mean was gained on 7.86 for the test meanwhile the questionnaire also showed that the gap score was at 2.76. The findings were elaborated as follows.

Table 1. The Descriptive Analysis Result

Treatments	Variables	Mean	Std. Deviation	Min	Max
Project-based learning assisted with e-module based tri hita karana	Students' critical thinking and social behaviors	80.79	14,64	14,29	83,43
		42,86	14,91	14,29	78,57
		77,68	9,73	57,14	100,00
		121,45	6,18	108,00	135,00
Conventional learning model	Students' critical thinking and social behaviors	72,93	14,91	14,29	78,57
		91,58	8,13	75,00	109,00
		68,21	11,08	42,86	92,86
		118,70	5,52	105,00	132,00

Table 1 presented the descriptive analysis result related to the effect of project-based learning assisted with e-module based tri hita karana on students' critical thinking skills and social behaviors. It revealed that there was a difference between the mean score of the students who were taught with project-based learning assisted with e-module based tri hita karana and the students who were taught with the conventional learning model. It was found out that the mean score achieved by the students in the experimental group was 80.79 which was higher than the students in the control group shown at the mean score of 72.93. It indicated that project-based blended learning assisted with e-module based tri hita karana was effective in improving students' critical thinking skills and social behaviors.

This result was strengthened by the result of inferential statistics. The data were tested for its normality and homogeneity. The normality test showed that the data were normally distributed indicated with the significant value .07 higher than the standard value .05. The data were also homogenous indicated with the significant value .010 which was higher than 0.05. Then, the data were analyzed for its linearity. The regression among the co-

variables were significant in which it had a significant value .001 which was less than the standard value .05. It indicated that the data were linear and it was continued for MANCOVA test. The result was presented in table 2.

Table 2. The Result of MANCOVA Analysis

Multivariate Tests						
	Effect	Value	F	Hypothesis df	*Error df*	*Sig.*
PA_KBK	Pillai's Trace	0,27	14,21	2	75	0,00
	Wilks' Lambda	0,73	14,21	2	75	0,00
	Hotelling's Trace	0,38	14,21	2	75	0,00
	Roy's Largest Root	0,38	14,21	2	75	0,00
PA_SS	Pillai's Trace	0,36	21,01	2	75	0,00
	Wilks' Lambda	0,64	21,01	2	75	0,00
	Hotelling's Trace	0,56	21,01	2	75	0,00
	Roy's Largest Root	0,56	21,01	2	75	0,00
MP	Pillai's Trace	0,17	7,85	2	75	0,00
	Wilks' Lambda	0,83	7,85	2	75	0,00
	Hotelling's Trace	0,21	7,85	2	75	0,00
	Roy's Largest Root	0,21	7,85	2	75	0,00

Based on table 2, the multivariate analysis revealed that there was a simultaneous difference between the critical thinking skills and social behaviors of the students who were taught with project-based learning assisted with e-module based tri hita karana and the students who were taught with conventional learning model. It was shown by the statistic of *Pillai's Trace,Wilk's Lambda*, *Hotelling's Trace*, and *Roy's Largest Root*, with the coefficient F = 7.85 with the significant 0.00. It indicated that there was a simultaneous difference. It was followed by the result of between-subjects effects test as presented in table 3.

Table 4. The Result of Test of Between-Subjects Effects

Tests of Between-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
PA_KBK	KBK	1158,68	1	1158,68	13,29	0,00
	SS	80,39	1	80,39	4,45	0,04
PA_SS	KBK	1551,73	1	1551,73	17,80	0,00
	SS	708,51	1	708,51	39,26	0,00
MP	KBK	1196,23	1	1196,23	13,72	0,00
	SS	147,36	1	147,36	8,16	0,01
Error	KBK	6624,37	76	87,16		
	SS	1371,64	76	18,05		
Total	KBK	435970,18	80			
	SS	1156270,00	80			
Corrected Total	KBK	10273,38	79			
	SS	2829,55	79			

Table 4 indicated that there was a partial difference between students' critical thinking skills who were taught with project-based learning assisted with e-module based tri hita karana and the students who were taught with conventional learning model. It was shown from the coefficient score F = 13.72 with the significant value 0.00. In addition, it was also found that there was a partial difference between students' social behaviors who were taught with project-based learning assisted with e-module based tri hita karana and students who were taught with conventional learning model. It was presented on the coefficient score F = 13.72 with the significant value 0.00. The results from descriptive statistic and inferential statistic revealed that project-based learning assisted with e-module based tri hita karana was effective in improving students' critical thinking skills and social behaviors.

5. Discussion

The current finding indicated that there was a significant influence towards students' critical thinking skills contributed by project-based learning assisted with e-module based *tri hita karana*. It was relevant to the constructivism theory in which the learning model required to give a space for students to deal with problem-solving by creating their dissonant cognition to stimulate the learning process (*Rusman, 2018*). It was supported by the condition in which students were able to think critically in finishing their project in which it showed that students depending on their inquiry process (Chanpet et al., 2020;Jalinus et al., 2017). This current study strengthened the previous study conducted by Sutrisna et al., (2020) which also discovered that project-based learning integrated with tri hita karana was effective in

improving students' competences including their critical thinking skills. The finding also supported the previous stud y mentioning that local wisdom was effective to be adopted in the implementation of a learning model (Sukarma et al., 2018). The assistance of e-module based tri hita karana also improved students' critical thinking as found in the current study was relevant to the previous study conducted by Permana and Jayanta (2019). It developed e-module based tri hita karana which was effective for improving students' learning outcomes.

The implementation of project-based learning assisted with e-module based tri hita karana in the current study provided students with the real-world based tasks requiring their problem-solving skills in which they had an opportunity to work independently and cooperatively in finishing the tasks as a project. This treatment was relevant to the principle of project-based learning in which it was implemented in students-centered form where the students were able to explore their cognition by solving the problems in the form of project or authentic tasks (Sudjimat et al., 2020). A similar finding was discovered by Widiana et al., (2023) in which the study revealed that project-based learning explore students' creativity through the provision of tasks that should be accomplished by the students. Nurfikri et al., (2022) also found that the application of project-based learning improved students' critical thinking skills obtained from their learning outcomes. Those previous studies were relevant to the current study. In case, the current study integrated e-module based tri hita karana into the learning process.

Another finding indicated that project-based learning assisted with e-module based tri hita karana improved students' social behaviors. This finding indicated that the integration of tri hita karana as the local wisdom was effective in building students' character obtained from their social behaviors. It strengthened the previous studies revealing that tri hita karana was effective for improving students (Anastasya & Wulandari, 2022; Parmiti et al., 2021). Kusuma et al., (2023) discovered a similar finding in which the study showed that e-module design with tri hita karana increased students' social behaviors. The current finding also strengthened the implementation of character education based tri hita karana as found out by Asih (2022). It also revealed that tri hita karana was effective for implementing character education. The use of e-module based tri hita karana was aimed at presenting the learning materials of information system analysis and design in detail through the provision of pictures, videos, or audios. It was relevant to the previous study conducted by Rahayu and Sukardi (2021) discovering that e-module was an effective learning media assisting students

to comprehend the learning materials in an interesting electronic means. It supported the previous study which revealed that there was a positive relation between students' competence and the use of e-module (Rajabalee & Santally, 2021).

6. Conclusion

The current study concludes that there is an effect contributed by project-based learning assisted with e-module based tri hita karana on students' critical thinking skills and social behaviors. There is a difference found related to students' critical thinking and social behaviors who are taught with project-based learning assisted with e-module based tri hita karana and the students who are taught with conventional learning model. It is also shown that there is a simultaneous and partial difference between the students in control group and experimental group. It reveals that project-based learning assisted with e-module based tri hita karana is effective. The results implicate the existence of tri hita karana as the concept in building character education particularly in improving students' social behaviors. The integration of project-based learning assisted with e-module based tri hita karana can be used as the learning model and media for teaching information system analysis and design (ISAD). Further study is suggested for reaching a deeper insight related to the implementation of project-based learning assisted with e-module based tri hita karana viewed from other students' internal and external factors.

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