Increasing Critical Thinking Through the Blended Socratic Method of Teaching Model

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Abstract

This study aims to determine the increase in student critical thinking from the Blended Socratic Method of Teaching (BSMT) model that is applied to visual programming courses, and determine the level of student satisfaction with the BMST model. This study uses the experimental method of choosing 1 class in the Informatics Engineering Education study program to be given a pretest, then applying the BMST model and finally to the posttest. Descriptive method is also used to determine the level of satisfaction with the BMST model. The instrument uses critical thinking skills and questionnaire tests to determine the level of student satisfaction. Collected data was analyzed with descriptive analysis techniques. The results showed a significant increase in students' critical thinking between pretest and posttest significantly. The results of the overall aspects of satisfaction with the BMST model applied showed a very satisfied category. It was concluded that the BMST model could increase student critical thinking and the level of satisfaction with the BMST model was very satisfied in the visual programming course. The renewal of the BMST model compared to other blended learning models is the existence of syntax to conduct case studies and percentage of case analysis, online and offline discussions with the concept of growing student critical thinking, the existence of monitoring discussions and the teacher's reaction to student responses.

Keywords: Critical Thinking, Socratic Method

1. Introduction

Technological developments in the era of the industrial revolution 4.0 are currently bringing about changes with the transformation of learning leading to digital through the use of technology (Francis et al., 2017). One of the dominant technologies used over the internet that allows creating learning not limited by distance, space and time, which can be done online. Learning that often occurs traditionally face-to-face in class can also be combined online which is known as blended learning. One thing that is needed to face the era of the industrial revolution 4.0 in learning is through blended learning. Blended learning is a combination of online (electronic) and offline (face-to-face learning) learning for classroom teaching or other training modalities to help develop knowledge and skills (Hilliard, 2015). Through blended learning there is greater time flexibility (Ho et al., 2006; Gedik et al., 2012). Blended learning supports students to interact not only physically in the classroom but also through online connections via the internet outside the classroom (Zainuddin & Keumala, 2018). So this type of learning allows students to increase learning interactions with teachers and other students through online discussions.

The use of the blended learning model has developed globally in educational institutions such as the existing blended learning models that are divided into several categories consisting of a rotation model consisting of a rotation model, lab rotation, flipped classroom, individual rotation, then a flex model. model, the self-blend model, the enriched virtual model (Graham et al., 2014; Staker & Horn, 2012). In general, the existing types of blended learning models have gaps that have several weaknesses such as the absence of learning syntax, online learning that only uploads material online for download while other

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activities are still not optimal. In addition, research findings from Dziuban discuss problems regarding the success of students, perceptions of the learning environment in various course modalities, and how the blended learning model is configured, the findings of blended learning are able to increase student access and result in increased success for minority and non-minority students. Similarly, blended learning has an effectiveness that offers the potential to improve the teaching and learning process (Dziuban, Graham, et al., 2018). Then the results of research on blended learning, it was found that the blended learning model contributed to improving learning outcomes, motivation and giving positive responses by students (Aeni et al., 2017).

One of the developments of the blended learning model, namely the Blended Socratic Method of Teaching (BSMT) model, this model was developed based on existing blended learning models (Staker & Horn, 2012; Graham et al.,2014; Kocour, 2019). This BMST model is a learning model that is carried out face-to-face in class and online, which is then implemented through the survey method to improve students' critical thinking. Critical thinking is deliberate thinking based on logic, and emphasizes a decision made whether or not it is good (Ennis, 2011). Critical thinking skills indicators include interpretation, analysis, evaluation, inference, explanation and self-regulation (Purwati et al., 2016; Facione, 2011). Critical thinking consists of processes such as displaying intelligence about a problem, deciding and assessing it accurately. Some scientists define critical thinking as scientific observational observations (Paul, 1991). This critical thinking ability is also needed in the learning of the XXI century because people will face global competition and problems (Sahin, 2009; Pheeraphan, 2013).

Problems that occur from the findings (Alotaibi, 2013) regarding the effect of blended learning on the development of critical thinking skills, it shows that there is no effect of critical thinking. Then the other findings state that there is no impact on increasing critical thinking from the applied blended learning model (Akyuz & Samsa, 2009). From these results, it can be seen that there are still gaps in the blended learning model that is applied to foster critical thinking because it has not included the appropriate steps, such as synchronous and asynchronous activities through discussion. Developing critical thinking skills using blended learning must involve several educational activities that encourage critical thinking through synchronous management and asynchronous electronic communication and activate the role of discussion forums (Akyuz & Samsa, 2009). Another problem based on the initial survey conducted by researchers in November 2019 in measuring the critical thinking of students in the visual programming course in Informatics Engineering at Padag State University had low critical thinking skills below the average of 15.46. From these results it can be seen that there are gaps. Then also in the characteristics of visual programming courses require the ability to analyze problems, be able to critical thinking in understanding the concept of program algorithms and be able to think creatively in programming, but in fact what happens is the critical thinking ability of students is still relatively low (Fagin et al., 2006; Lesmana, 2015). In the visual programming course, one of the learning objectives of students is to be able to master the program field so that they can become a programmer. As a programmer, you must have the ability to critical thinking, but the problem that occurs is the lack of critical thinking people in studying programming.

Critical thinking ability is a non-negotiable requirement for the human service profession to meet the needs of today's society (Ahuna et al.,2014). However, the reality is that there are still problems that occur in various countries, one of which is the lack of critical thinking skills, including in learning activities in visual programming courses. The characteristics of the content of the visual programming course require critical thinking skills such as interpreting understanding problems, identifying the relationships of logical statements in the program, analyzing concepts, using the right strategy in creating visual programs that require logic. Able to evaluate solving correct, complete and argumentative questions. Inference, namely being able to make conclusions by making decisions, explaining by stating the results and justifying systematic and rational procedures on artificial visual programs, conducting self-regulation by reviewing the results. Therefore, to overcome the lack of critical thinking skills among students, this study provides a solution in the form of

applying learning that is able to foster critical thinking through the application of the blended learning model. Through the blended learning model, it can provide a learning experience that enables the development of critical thinking skills through the use of online technology and offline interpersonal interactions (Giraldo Garcia et al., 2015). Blended learning is able to foster external thinking styles by allowing students to interact with each other, it also integrates internal thinking styles by providing effective tools for learners who prefer to learn alone (Yang & Wu, 2012). The urgency of this research is because in studying visual programming which has programming characteristics it requires critical thinking skills in studying these courses, besides that it is also based on the weaknesses of blended learning research on critical thinking.

The blended learning model used in this study is the Blended Socratic Method of Teaching (BSMT) model, the BMST model has a contribution because based on the findings of previous research conducted on this BMST model it can improve students' critical thinking (Boa et al., 2016). Furthermore, this BMST model is a learning model that is carried out face-to-face in class and online using discussion forums via Facebook, which are then implemented through the sekorates method with the concept of critical thinking skills (Boa et al.,2018). With the Socratic element during the discussion, it is able to stimulate students to critical thinking, get direct feedback and create an interactive and interesting learning atmosphere (Lammendola, 2009). Therefore, the location of the contribution to this research allows students to learn blended with the element of critical thinking to support learning in visual programming courses. This study aims to determine the increase in students' critical thinking from the Blended Socratic Method of Teaching (BSMT) model applied to visual programming courses, and to determine the level of student satisfaction with the BMST model.

2. Method

In this study, using an experimental method in which 1 class was chosen to be given a pretest, then given treatment by implementing the BMST model and at the end by giving a posttest. In addition, descriptive methods are also used to determine the level of student satisfaction with the applied BMST model. The population of this study was carried out in affiliated educational colleges at Padang State University. The sample is part of the number and characteristics of the population. The sample was selected using purposive technique which has a specific purpose, therefore one class group was chosen in the study program in Informatics Engineering Education in the visual programming course. The research instrument was made using a critical thinking ability test, namely the RED Model of Critical Thinking and a questionnaire to determine the level of student satisfaction with the BMST model. The data analysis technique used was calculating the tests and questionnaires which were carried out descriptively, to determine the mean and standard deviation as well as the increase (Watson & Glaser 2010).

The components in the Blended Socratic Method of Teaching (BSMT) model are focus (model objectives), syntax (learning process), reaction principles (teacher reactions to student responses), social systems (activities), support systems (teaching materials), and applications (Boa et al., 2016). Component 1 is Focus (Model Objectives) The objective of this model is to cultivate RED learners through blended learning with the addition of the Socratic method; Component 2 is Syntax (Instructional Process) The essence of this BSMT model is the instructional process or syntax with sequential steps that show how to use the model. Step 1: Read Cases and Write Case Analysis in Groups. At this stage, it involves assigning students to their respective groups, writing cases and analyzing cases according to the week assigned to the group. Where students are thrown, given case assignments, case presentations and groups complete case analysis. students in this learning model will work in teams to investigate and write case analyzes. Then also encourage active learning and motivate students to engage with the material. Step 2: Presentation of Case Analysis. So what is done is to prepare presentations and pay attention to presentations; discuss problems, present alternative actions; such as answering problems; and draw conclusions.

Step 3: Socratic Discussion. The Socratic discussion started after the group presentation in class. Students can ask questions directly to the presenter, there is no limit to asking questions about analysis / concepts / investigating except factual questions. He evaluates questions and makes arguments. The teacher concludes the discussion but does not answer questions. Learners are encouraged to participate by answering, commenting, or asking questions. Step 4: Post the Case in an online discussion forum. He conducted online discussions because he had limited discussion time when studying in class only. Step 5: Online Socratic Discussion. The Socratic discussion using Facebook is done because there is no time limit or questions in the discussion that can be done flexibly anywhere and anytime. In online discussion activities, students post questions and / or answers, and the instructor carries out continuous monitoring, instructors / participants students can ask probing questions, class members evaluate questions / comments and provide more arguments and probing questions; and also the juxtaposition is expected to conclude the discussion. Discussions conducted online were carried out by fostering critical thinking of students.

Component 3 is Principle of Reaction (Teachers 'Reactions to Students' Responses). Teachers are expected to maintain a dialogical mode of interaction among class members and direct students to focus on the case at hand. In addition, at the time of the discussion, he also pays attention to a comfortable environment with the discussion being intellectual and productive. Then the teacher can list the participation of students to add to a feeling of urgency, as well as to respond and appreciate the ideas / opinions presented by students. Component 4 is Social Systems (Activities) The BSMT model involves activities that are considered learner-centered such as case analysis in groups, case analysis presentations, Socratic questions in class, and online Soratics discussions. Component 5: Support System (Teaching Materials) by providing case studies. Use case studies to help students in real work and foster critical thinking skills. Component 6: The BSMT Model Application can be applied to students of informatics engineering education in visual programming courses so that they can carry out case studies, and develop processes in improving students' critical thinking skills through the use of face-to-face and online discussions that can be done anytime and anywhere. anywhere flexibly.

3. Result and Discussion

Results

The results of critical thinking from the pretest and posttest data after applying learning through the BMST model are shown in Table 1.

Table 1. The critical thinking assessment of the experimental group

Comparison of pre-test and post-test critical thinking assessments	N	Mean	Std Deviation	Level critical thinking
Pre-test	20	15,37	3,041	Below average
Post-test	20	24,26	1,851	Below average

Based on Table 1, the average pretest results are 15.37 with a standard deviation of 3.041 with a low level of critical thinking, while the average post-test results are 24.26 with a standard deviation of 1.851 with a low level of critical thinking based on the percentile calculation of (Watson & Glaser 2010) on critical thinking. From these results there is a significant difference at the level of significance at 0.01 level. The results of the level of student satisfaction with the BMST model can be seen in Table 2.

Table 2. The results of student satisfaction on the BSMT model

No	Question Items	Average	Std Deviation	Level Of Statistic
1.	Purpose	4,579	0,507	Very Satisfied
2.	Instructional Process (Syntax)	4,236	0,562	Very Satisfied

No	Question Items	Average	Std Deviation	Level Of Statistic
3.	Content	3,947	0,621	Very Satisfied
4	Teaching Materials (Support system)	4,211	0,713	Very Satisfied
5	Lecturer-Student Interaction or Relationships (Reaction Principles)	4,789	0,419	Very Satisfied
6	Social System	4,368	0,597	Very Satisfied
7	Measurement and Evaluation	4,211	0,713	Very Satisfied
8	Provide an impact on students, and the value achievement of students	4,623	0,806	Very Satisfied
	Total	**4,33**	**0,617**	**Very Satisfied**

Based on Table 2, the results of student satisfaction with the BSMT model through a questionnaire, namely having very satisfied responses in all aspects. Whereas for each category, namely the interaction aspect, it has the highest satisfaction response with a value of 4.789, with the very satisfied category, this indicates that students can improve their critical thinking through the role of interaction that occurs in the classroom and outside the classroom in a flexible manner. As for the lowest aspect of content, this shows that improvements are needed in these aspects such as packaging attractive teaching materials, and content in developing and implementing this BMST model.

Whereas in open questions through questionnaires, dominant students answered very satisfied with the application of the BMST model being taught, with the model being able to improve insight and critical thinking such as analyzing cases, being able to solve problems, making conclusions, presenting case study results, discussing and posting them online, learning also occurs interactively, establishes good communication between students and lecturers, can collaborate with each other in groups. In addition, students also think that it is easy to understand material that can have an impact on achievement, increase focus and critical thinking. For a low level of satisfaction, namely on the content aspect, students thought the teaching materials were less attractive.

Discussion

The transformation of the educational paradigm is in line with the widespread use of Information and Communication Technology (ICT), so with the role of ICT learning can occur flexibly online. Various learning models are also combined with the use of ICT. One of them is the blended learning model which is able to make learning happen anywhere and anytime online and offline. Blended learning is an innovative concept that embraces the advantages of traditional classroom teaching and ICT-supported learning, including both combining offline learning and online learning (Lalima & Dangwal, 2017). Blended learning itself is a prospect for increasing face-to-face learning activities between teachers and students, using internet or computer-based techniques (Morris, 2010). Therefore, blended learning is synonymous with online and offline learning using internet technology.

Various blended learning models have been developed, one of which is the BMST model, which is a learning model intended to foster critical thinking skills to achieve a RED Model of Critical Thinking which includes Recognize Assumptions (recognize assumptions), Evaluate Arguments (evaluate arguments), Draw Conclusion (draw conclusions). Critical thinking skills are an essential element of modern educational approaches and models (Karakoc, 2016). Therefore, teachers must be able to choose a learning model that can foster critical thinking in their students. Because of the importance of critical thinking in learning, which is being able to influence students' ability to identify and interpret information, analyze information, and evaluate evidence and arguments (Firdaus et al.,2015).

In this study, the objective of this research is to determine the increase in students' critical thinking from the Blended Socratic Method of Teaching (BSMT) model applied to the visual programming course, and to determine the level of student satisfaction with the BMST

model. It should be noted that the characteristics of visual programming courses are one of the necessities of critical thinking in understanding the concept of programming algorithms (Lesmana & amat, 2015). Based on preliminary observations, it is known that students' critical thinking in the visual programming course is below an average of 15.46 which is classified as low average. Students get low critical thinking due to lack of understanding of concept analysis, lack of problem solving, lack of discussion to open other understandings, it is difficult to make conclusions because it could be that students think not in fact, and reviewing the results learned is not done. The findings (Boa et al., 2018) show that to succeed in work, it requires critical thinking because having critical thinking skills can help solve and manage the unknown.

In this research, the BMST model is applied to overcome the lack of critical thinking skills of students in visual programming courses. This learning model was developed which is able to increase students' critical thinking (Boa et al., 2018). This model is also developed systematically following the principles in the development of the teaching model. At the beginning of this study, students were given a pretest to measure their initial critical thinking skills so that the results were 15.37 below the average. Then the implementation of this BMST model has steps / learning syntax that is able to foster critical thinking, such as analyzing and writing case studies, group presentations, communication through Socratic discussions / questions in class and online, working in groups. This model also positions students as student centers and teachers as facilitators. Then with the Socratic discussion, it is able to motivate the learning environment and stimulate it to foster critical thinking of students. As proof of the effectiveness of the BMST blended model through Facebook discussions, students can learn anywhere and anytime more flexibly when compared to traditional classes. In addition, students can ask questions and / or answers without limits. In this BMST model, it gives students the opportunity to make conclusions, assumptions, arguments, convey their ideas which are embodied in critical thinking which is in line with the RED critical thinking model.

After the BMST model is applied, then a posttest is given to measure the final ability of students' critical thinking with a score of 24.26 in the category below average. Although the post-test results are below the average, there is a significant increase in the pretest and post-test results, which are significant at the 0.01 level of significance. Next, a measurement of the level of student satisfaction was carried out in the BMST model which contained aspects of the goal, syntax, content, support systems, reaction principles, social systems, measurement and evaluation, and the impact was 4.33 categories very satisfied. It is concluded that the BMST model can improve students' critical thinking in the visual programming course and the level of student satisfaction in the BMST model is very satisfied. Based on these results, this BSMT model has succeeded in improving students' critical thinking skills. This finding is supported by that blended learning contributes more to the disposition and critical thinking level of students when compared to traditional learning models (Korkmaz & Karakus, 2009; Sulisworo et al., 2020). There is an increase in the ability of critical thinking between the pretest and posttest scores using the blended learning model (Anggraeni et al., 2019). In addition, it is also in line with the findings that applying blended learning can improve critical thinking because the learning includes various collaborative activities between students, small groups, active teacher involvement, and blended instruction (Mamman et al., 2019).

On a different side, the results of this study are also not in accordance with Alotaibi's findings regarding the effect of blended learning on the development of critical thinking skills, the results show that there is no difference in critical thinking between the experimental group that uses the blended learning model and the control group that does not use blended learning, so that the results This finding does not have a positive effect on the development of critical thinking skills, this happens because in developing critical thinking it is limited to the tools used and the lack of active discussion of students (Alotaibi, 2013). Likewise with the findings about the impact of blended learning on increasing critical thinking which resulted in no significant difference between the pre-tets and post-test results, this happened because online learning activities were not sufficient to support face-to-face lessons with short

periods, the form of discussion was not can be used to support critical thinking skills because students have difficulty using discussions in the e-learning system (Akyuz & Samsa, 2009). Meanwhile, the BMST model used in this study has active interaction through group discussions, the presence of feedecks between teachers, case studies to stimulate students to foster critical thinking and is supported by the use of Facebook which makes it easier for students to have online discussions.

The novelty found from the application of the BMST model is compared to other blended learning models, namely the presence of a syntax for conducting case studies and percentage case analysis, online and offline discussions with the concept of fostering critical thinking of students, monitoring the discussion and teaching reactions to student responses . In contrast to other research such as blended learning, it can remind the effectiveness of learning outcomes (Aeni et al., 2017; Mehmet, 2018; M. Sahin, 2010). Blended learning can improve teaching effectiveness. From the findings of this study, there is no measurement of the use of the blended learning model for critical thinking (Dziuban, et al., 2018). Then also the fellow blended learning research on increasing critical thinking, the difference is that this research does not have a case study syntax, a percentage of case analysis and there is no online discussion monitoring, so you can see differences from previous research (Mamman et al., 2019; Sulisworo et al., 2020). The implication of this finding is that learning can occur anywhere and anytime offline and online which can foster critical thinking of students in learning in visual programming courses.

4. Conclusions and Suggestions

The results of the study showed that there was a significant increase in students' critical thinking between the pretest and posttest. Then for the overall results of the satisfaction aspects of the BMST model in the applied visual programming course which includes aspects of objectives, syntax, content, support systems, reaction principles, social systems, measurement and evaluation, and impact, it shows the category very satisfied. The contribution found from the application of the BMST model with other blended learning models, namely the existence of a syntax for discussion with the concept of growing students 'critical thinking, then from the applied BMST model, students' critical thinking can increase in visual programming courses and the level of student satisfaction in the model BMST is very satisfied. The implication of this finding is that learning can occur anywhere and anytime offline and online which can foster critical thinking of students in learning in visual programming courses. Recommendations from the results of these findings are that teachers must study in detail the syntax or steps of learning activities in the BMST model and prepare online teaching materials online, besides that the teacher must be able to provide feedback to students; and teachers must ensure and prepare an e-learning portal, computer equipment, internet connection to carry out this BMST learning.

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