

# Developing Constructivist-Based Blended Learning Model to Increase Critical Thinking Skills

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## **Abstract**

*This study aims to develop a model of constructivist-based blended learning to increase critical thinking skills. Constructivist-based blended learning was developed through literature studies to create a model syntax that is compatible with critical thinking skills characteristic. The test was conducted internally to obtain learning model validity. Validity model was carried out through assessment of expert judgment and focus group discussion (FGD). Five experts in the field of instructional model and media were involved in expert judgment process, and ten participants were involved in FGD process. The results of this study stated that constructivist-based blended learning models to increase critical thinking skills have high validity. The result of statistical test showed a significance value of  $0.000 < \alpha$ , with an  $\alpha$  significance level of 5% (0.05). The result indicated that there was a positive effect on critical thinking skills through the implementation of the constructivist-based blended learning model.*

**Keywords:** *research and development, constructivist-based blended learning, critical thinking*

## **1. Introduction**

Education has a major role to play in improving human development. Education faces various challenges to be able to equip individuals with various competencies needed to overcome future challenges. Béres, et al. (2012) describes the European Union (*LLL Programme of the EU*) recommendation for ‘life long learning’ are: (1) critical thinking and problem-solving skills; (2) communicative skills; (3) creativity and innovation skills; (4) collaboration skills; (5) contextual learning skills; (6) information and media literacy skills.

Critical thinking skills as an important competence must be mastered by individuals. Skills in critical thinking helps to be more accurate and specific in noting what is relevant and what is not. The skills listed above are useful to problem-solving and to project management, bringing greater precision and accuracy to different parts of a task (Cottrel, 2005). Critical thinking is reasonable reflective thinking focused on deciding what to believe or do. The emphasis is on reasonableness, reflection, and the process of making decisions (Ennis, 1996). Critical thinking is the ability and tendency to make and assess conclusions based on evidence (Eggen & Kauchak, 2012). Critical thinking is the art of thinking about thinking in such a way as to (1) identify its strengths and weaknesses, and (2) recast it in improved form (where necessary) (Paul & Elder, 2008). Based on some definitions outlined, critical thinking defined as the individual's ability to activate their cognitive not only to receive information but also to analyze and evaluate, and the ability to rearrange the information in a better form.

One has the capacity to be critical, but the capacity is different in each individual. Critical thinking is a skill that should be developed and practiced as stated by Novela (2012) “we have the capacity for logic, but logic and critical thinking are skills. We’re not born as master critical thinkers—just as we’re not born as violinists. Both are skills that need to be developed and practiced over many years”.

Until recently, the type of learning adopted by most of education institutions in Indonesia is teacher-centered where teacher or lecturer becomes the major source of learning. Learning activities are still focused on the lecturer. Such conditions become one of the causes of students

having low critical thinking skills, having difficulties in working in groups, communicating, solving problems when submitted examples of a real problem, and not being able to make decisions about the right solution of a problem (Alatas, 2014; Fakhriyah, 2014; Dwiyojo, 2018).

Thinking requires content, substance, something to think through. On the other hand, content is parasitic upon thinking. It is discovered and created by thought, analyzed and synthesized by thought, organized and transformed by thought, accepted or rejected by thought. To teach content separate from thinking is to ensure that students never learn to think within the discipline (that defines and creates the content) (Paul & Elder, 2007). It can be interpreted that providing new content must be related to content that already exists in the individual's thought. This is in accordance with the schema theory which views the learning process as acquiring new knowledge by relating it to existing cognitive structures.

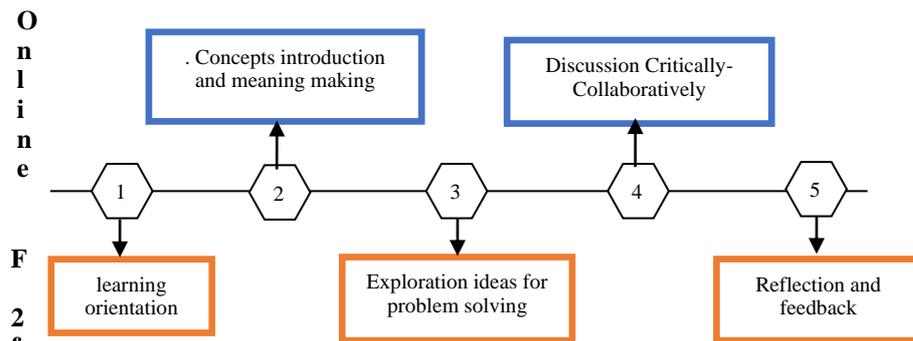
The methods usually considered most effective in providing opportunities to develop critical thinking skills include activities such as group or class discussion, debate, and case studies, which often use controversial issues to inspire passion and analytical thinking in the student (Wallace & Jefferson, 2013; Rachmadtullah et al, 2019ab, Humaira et al, 2019, Rasmitadila et al, 2019). In fostering critical thinking, a teacher really must encourage the ability of students to build or control their own thoughts, and avoid being controlled by ideas that are not reflective (Seifert & Sutton, 2008). Based on the previous description, the principle of constructivist learning to increase critical thinking skills involve giving clearly learning orientation, give opportunities for solving the problem, give a discussion space, and give a feedback for the learning process. These principle then implemented in blended learning.

Blended learning is a learning that takes the eminence of face-to-face learning and online-based learning. Online-based learning environment can also give positive impact on thinking skills development. The findings research of Luca & McLoughlin (2011) indicated that the students' capacity to display higher order thinking increased as a result of the students collaborating and communicating through the custom-built on-line problem-solving environment. Furthermore, Sayed (2013) in his study gave recommendations for activating the virtual learning labs in educational institutions and dedicating more attention to the relationship between the developments of concepts and thinking skills of learners.

Research studies that discuss blended learning learning models become new learning model issues, especially in Indonesia let alone Developing Constructivist-Based Blended Learning Models to Increase Critical Thinking Skills. This research contributes renewal in the development of science in the field of educational technology because according to the results of research conducted by Siregar, Han & Ellis (2019) the blended learning model facilitates the learning process by assisting technology to facilitate the delivery of contextual information, furthermore the results of Asarta & Schmidt's research (2020) learning using blended learning can increase students' learning motivation. Based on the previous studies of blended learning, it is expected to be an alternative solution to increase critical thinking skills. Although there have been previous studies on blended learning, the studies about the implementation of constructivist principles in blended learning models to increase critical thinking skills still need to be developed

Blended learning philosophy is to simulate active learning, individual learning and learner-centered learning strategy (Sayed, 2013) In this paper, a blended learning that selected for this model has flipped classroom. Flipped classrooms can maximize time with the instructor and focus on higher order thinking skills rather than just taking notes and regurgitating facts (Hanover Research, 2010). The learning process in flipped classroom consists of three components. These components are concept exploration (video/audio recordings, content-rich websites, simulations, readings etc), meaning making (reflective podcast (students), quizzes, blogging, online discussions), and demonstration/application (personalized projects, problem-based learning, experiments, presentations, role play etc). With this model the instructor will have more time to pay attention to the development of students because the content is neatly arranged and can be delivered outside the hours of face-to-face sessions. However, in terms of content and assignments the teacher must be able to carefully select and prepare it completely before the learning session begins.

These components are then combined with constructivist principles to increase critical thinking skills above. The combination generates learning steps can that be seen as follows:



**Figure 1.***The Syntax of Constructivist-Based Blended Learning Model to Increase Critical Thinking Skills*

Based on Figure the syntax of constructivist-based blended learning model to increase critical thinking skills consist of:

1. Learning orientation. In this phase learning orientation activities are: (1) students listen to explanations from lecturers about the activities to be performed, and (2) students give feedback to the activities to be performed.
2. Concept introduction and meaning-making (online learning). This phase is an online learning activity. Students work on activities: (1) download material or links, and (2) work on quizzes that provided by lecturers.
3. Exploring ideas for solving problems. In this phase students perform activities: (1) forming a small group of 4-5 students, (2) explore for problem-solving together with the group, (3) find information that supports the argument or idea of the problem solution, and students can also find relevant examples as supporting information. In this exploration phase, students get assistance from lecturers.
4. Critically-collaboratively discussion (online forum). In this phase, the activities are: (1) the students present the results of the exploration activities, and (2) the students respond to each other and discuss the material presented.
5. Reflecting and informative feedback. The activities are: (1) students do reflection by giving an opinion about the learning process that has been performed, and (2) the students get feedback from the lecturer.

## 2. Method

### 2.1. Research Design

This research aims to develop a Constructivism Based Blended Learning Model to Improve Critical Thinking Skills. The research was conducted using a research and development (R&D) design. This study uses development procedures from Ellis dan Levy (2010): (1) Identify the problem; (2) Describe the objectives, (3) Design & development the artifact, (4) Test the artifact, (5) Evaluate testing results, and (6) Communicate the testing results.

### 2.2. Validation Model

The activities of test consist of expert judgment and focus group discussion (FGD) process. Expert judgment was done by 5 experts in the field of model and media learning, and FGD process involving 10 people consisting of 5 experts in the field of learning and 5 lecturers in the field of Educational Technology as blended learning users. All experts from Yogyakarta State University. Lecturers participants in the focus group discussion process come from Ahmad Dahlan University of Yogyakarta, Sarjanawiyata Tamansiswa University of Yogyakarta, Sultan

Amai State Islamic Institute of Gorontalo, University of Sumbawa, and State Polytechnic of Manado.

### 2.3. Testing

The trial of model using quasi-experiment Pretest-Posttest Control Group Design (Cresswell, 2005). The design of the trial in this study can be seen in table 1:

**Tabel 1. Pretest-Posttest Control Group Design**

Control Group	<i>Pretest</i>	No Treatment	<i>Posttest</i>
Experimental Group	<i>Pretest</i>	Experimental Treatment	<i>Posttest</i>

In this study the treatment that carried out on the control group uses as is commonly used in the classroom, and the experimental group uses constructivist-based blended learning models. This study involved students of Islamic Education study programs, consisting of 16 students in experimental group and 16 students in control group.

### 2.4. Instruments

Instruments used in this study included instrument for model validations and instrument for critical thinking assessment. Instrument for model validations used questionnaire containing the assessment of learning model component. Instrument for critical thinking assessment used test containing problem and open question about the problem was presented.

### 2.5. Data Analysis

Data obtained from the questionnaire instrument with a range of assessment scores from 0 - 4. Analyze the test result from expert judgment through interpretation based on criteria. Making criteria using guidelines conversion score (Azwar, 2016). Qualitative data on FGD results as a material for revision of the constructs of constructivist-based blended learning model. Analysis of differences in critical thinking skills in the experimental group and control group using the Mann Whitney U test. The use of these statistical tests is because in this study using a small sample.

## 3. Result

Five experts consisting of learning model, and learning media experts validated the model. The learning model is stated to have very high validity if the experts score is  $> 47$ , it is stated to have high validity if the expert score is between 38 - 47, it is stated to have medium validity if the score is between 28 - 37, it is stated to have low validity if the score is between 18 - 27, and it is stated to have very low validity if the score is  $\leq 17$ . Expert validation results are presented in table 2:

**Table 2. Validation Results of Constructivist Based Blended Learning Model to Increase Critical Thinking Skills**

Component	Score				
	Expert I	Expert II	Expert III	Expert IV	Expert V
Purpose/focus	3	4	4	4	3
Construct of theory	15	14	18	15	15
Syntax	12	12	13	11	7
Social system	9	10	11	7	3
Support system	9	8	10	8	7
Total	48	48	56	45	35
Category	Very High	VeryHigh	Very High	High	Medium

The mean score of all experts was 46.4. Based on the formulated categories in advance, the mean score of these experts into the category of high validity. Based on Table 1, it can be seen that the components of the model are in fit with the model requirements. The component model consists of focus models, construct theories, syntax, social systems, and support systems. The focus of developing this model is to increase critical thinking skills. The theory that constructs from this model is constructivist theory, critical thinking skills, and blended learning. The model syntax consists of 5 steps, namely learning orientation, concept of production and meaning-making (online), exploration of ideas for problem-solving, critically and collaboratively discussion (online), reflection and feedback. The social system in this model tends to collaborative. Collaborative climate helps students to develop thinking skills. The support system of this model consists of e-learning media, materials, assignments, and quizzes that mutually support the development of critical thinking skills.

This learning models use e-learning as supporting media. E-learning was validated by 3 experts in the field of learning media. E-learning is stated to have very high validity if the experts score is > 41,5, it is stated to have high validity if the expert score is between 32,6 – 41,5, it is stated to have medium validity if the expert score is between 23,6 – 32,5, it is stated to have low validity if the expert score is between 14,6 – 23,5, it is stated to have very low validity if the expert score is ≤ 14,5. Expert validation results are presented in table 3:

**Table 3. Validation Result of E-Learning for Constructivist-Based Blended Learning Model to Increase Critical Thinking Skills**

Component	Score		
	Expert I	Expert II	Expert III
Learning objective	6	7	7
Information	6	6	7
Language	6	5	6
Interest and Engagement of Learners	6	5	6
Technical quality	3	3	4
Guide	3	2	3
Free of bias	3	4	3
Collaboration	1	1	3
Practice and feedback	6	4	3
Total	40	37	42
Category	High	High	Very High

The mean score of all experts was 39,66. Based on the formulated categories in advance, the mean score of these experts into the category of high validity. Based on Table 2, it can be seen that e-learning is appropriate with learning source requirements. E-learning contains elements of learning objectives, information, language, supports for learning, has technical quality, is free from bias, provides guidance, has collaboration space, and has room for feedback.

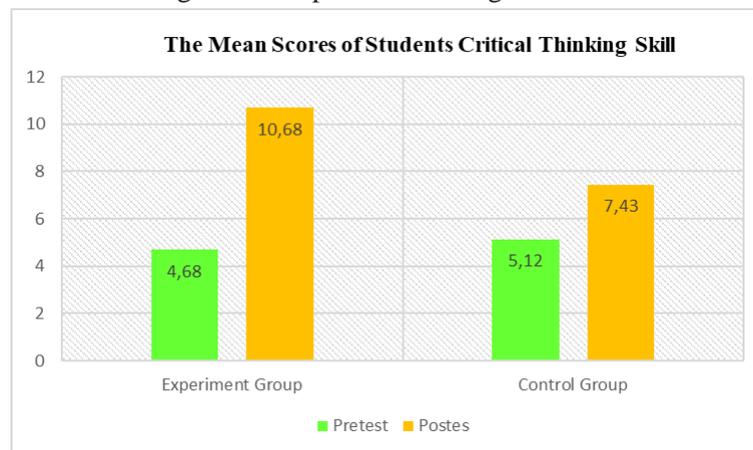
Furthermore, validation process was focus group discussion (FGD) which had 10 participants. Participants consisting of 5 experts in the field of learning, and 5 lecturers in the field of Educational Technology. There are some notes from the FGD process: a) implicitly, the syntax still cannot support critical skills; b) online learning portals need to be improved for feedback and collaboration room; c) every activity related to critical thinking skills needs to be clarified; and d) the evaluation phase can be part of the reflection phase.

The effectiveness analysis of constructivist-based blended learning model on increasing of critical thinking skills was carried out through statistical test using Mann Withney U. Test results are presented in table 4:

**Table 4. Test Result of Constructivist-Based Blended Learning Model on Increasing of Critical Thinking Skills**

	<b>Critical Thinking Skill</b>
Mann-Whitney U	48,500
Asymp. Sig. (2-tailed)	,000
Exact Sig. [2*(1-tailed Sig.)]	,000 <sup>b</sup>

Table 4. showed that the p-value of critical thinking skills was obtained 0,000. The p-value is  $0,000 < 0,05$ , so it can be stated that there are significant differences in students' critical thinking skills using constructivist-based blended learning models. The results of the pretest and posttest scores of critical thinking skills are presented in Figure 2:



**Figure 2. The Mean Scores of Students Critical Thinking Skill**

Figure 2. showed that mean scores of students critical thinking skill in experiment and control group were increased. The mean score of experiment group higher than the mean score of control group. This result in line with previous study, found that critical thinking skills can be improved by using a blended learning environment (Yeh, 2012; Yang et al., 2013; Saadé et al., 2012).

#### 4. Discussion

Based on the results of the test obtained, it can be said that this model has proper to increase critical thinking skill. It because this model has syntax that appropriates with critical thinking skills development. The syntax model as follows Learning orientation. Learning orientation is an effort to avoid various things that can divert attention so that students become clear and focus on skills that must be mastered. This orientation is needed because the brain can actively accommodate various information around it as stated by Novela (2012) that our perceptions are not passive. In fact, our brains actively construct a picture of what is going on around us based on a tiny fraction of all the sensory information that's coming in, which introduces many opportunities for distortions and error. Judge et al. (2009) Two common problems can lead to confusion when thinking critically about a subject is ambiguity and subjectivity. Ambiguity of an object or sentence is very influential on one's perception in the critical thinking process. Therefore, students need to be encouraged to be objective in thinking, because subjectivity will influence cognitive decisions when receiving or rejecting information.

Concept introduction and meaning-making (online learning). The concepts introduction and meaning-making is carried out independently by students through online learning. In online learning students complete quizzes or tasks that lead to the meaning of the concept. Students can download material and special links as enrichment learning that provided by lecturer.

Besides, students can search for other references that support their understanding of the concepts learned. The tasks in online learning are arranged in accordance with the objectives to be achieved. Sriarunasmee et al. (2015) in his study argued that e-learning and social networks are just tools to inspire students to learn more and to make the educational environment more convenient for students and instructors to achieve their goals.

Exploring ideas for solving problems. In this phase, students learn in small groups. Group learning provides collaborative conditions that stimulate student's thinking skills. Students are given a task or case to be solved with their group. The aims of this phase is to provide collaborative space for students to strengthen their understanding and practice their critical thinking skills. The tasks given are designed to support the development of critical thinking skills. This is in accordance with Vygotsky's opinion that learning awakens various internal development processes that are able to operate only when individuals interact with others in their environment and collaborate with their friends. The result study showed that collaborative learning has a number of benefits for students, including greater levels of engagement, increased confidence, and improved behavior (Burns et al., 2014).

Critically-collaboratively discussion (online forum). At this phase, students discuss through e-learning. At this phase, a group of students presents the results of learning exploration. Students from other groups respond and criticize the exploration results presented. Student groups present the results of exploration in turn. This phase aims to facilitate critical thinking skills. Students learn to respect the views of others, evaluate the results of other people's thoughts, be objective, open-minded, and reflective thinking. Discussion activities can make students receive a variety of different points of view. Hakkarainen et al. (Koh et al., 2010) describe through the process of judging, valuing, supporting, or opposing different viewpoints, students experience multiple perspectives, develop critical thinking skills, and construct their knowledge. Greenlaw & DeLoach (2003) argued when used effectively, electronic discussion can provide a natural framework for teaching critical thinking to a group, capturing the best features of traditional writing assignments and in-class discussions.

Reflecting and informative feedback. Lecturer responds student performance. Vice versa, the students give advice on learning activities that have been implemented. Feedback is used as a reflection material in order to improve the next learning activities. Lecturers also provide informative feedback on solving problems discussed by students. This is in order to support and strengthen the concept for students. Feedback is an important process in learning. Feedback is called Brophy (Paul & Elder, 2012) as a process that can motivate students because it provides information about increased competencies and helps students understand how they develop.

## 5. Conclusion

Critical thinking skills are very important skills to support the problem-solving process. The constructivist-based blended learning model is expected to be an alternative solution to increase critical thinking skills. This model has learning steps that support the increase of these skills. The implementation of this model requires certain conditions, such as the skills of lecturers in designing and managing online-based learning, the readiness of students in online-based learning, and the facilities and infrastructure that support blended learning. This model is different from existing blended learning models. So far, blended learning still emphasizes the presentation of solid material, while the principle of constructivist learning has not been seen in the learning process. This blended learning model emphasizes constructivist-based learning processes and emphasizes the material presentation design on critical thinking skills development. Therefore, lecturers are expected to be able to understand the management of materials that support these skills. In addition, this model is more flexible. The learning steps that developed can be adapted to conditions, not necessarily prioritizing face-to-face meetings or online-based learning.

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