
THE EFFECT OF WEB BASE LEARNING ON THE LEVEL OF CRITICAL THINKING AND COLLABORATION IN DIGITAL CIRCUIT COURSES

Farid Baskoro¹, Bambang Suprianto², I Gusti Putu Asto Buditjahjanto³, Lilik Anifah⁴,

¹ Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia
E-mail: faridbaskoro@unesa.ac.id

^{2,3,4} Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia
E-mail: bambangsuprianto@unesa.ac.id, asto@unesa.ac.id, lilikanifah@unesa.ac.id

Abstract

This study aims to produce interactive web-based learning media for digital circuit courses. The resulting learning media must meet the feasibility and validity so that it can be said that the learning media that has been developed is feasible and valid for students to use in the learning process. The validation results through the validation sheet are then analyzed to obtain the validation results. The results of the questionnaire on 65 students consisting of class A who received treatment and class B who did not receive treatment stated that for web media display a score of 4.122 (good) was class A, while class B for media display was 3.64 (good enough). in terms of media content, class A gets a value of 4.06 (good) for class B gets a value of 3.62 (good enough) student learning outcomes from the aspect of critical thinking get an average score of 3.43 (good enough) and for collaboration gets a value of 3.45 (good enough) This shows that web-based learning media is enough to help students in the digital circuit learning process in this pandemic era.

Keywords: *learning media, web, critical thinking, collaboration*

I. INTRODUCTION

Education is a fundamental factor that determines the level of progress of a country. Quality education is needed in improving human resources for the progress of the nation. Of the 10 ASEAN member countries, Indonesia is ranked 6 (six) in terms of the quality of education. Indonesia still loses to the closest countries, such as Malaysia, Singapore, Vietnam, the Philippines and Thailand. Through the results of the 2018 Human Development Index (HDI), Indonesia ranks 111th out of 189 countries in the world with a score of 0.707, [1] in other words, the quality of education in Indonesia is included in the category of Medium Human Development. Human Development Index (HDI) is data that can show the level of position of a country with other countries based on development and level of welfare in the field of education. Currently in the era of pandemic education is a challenge that must be faced by educators to maintain the quality of education in Indonesia.

Realizing an effective learning system is a must in efforts to improve the quality of education. Effective learning itself cannot be separated from how to improve the quality of learning where the effectiveness of learning will affect the quality of

learning [2]. Based on research, [3] said that there are 7 indicators that can improve the effectiveness of learning outcomes where: (1) good learning outcomes; (2) the spirit of the mastery of the subject matter; (3) effective communication; (4) provide fair value; (5) positive attitude towards students; (6) in the learning approach refers to flexibility, and (7) material organization.

Currently, a level of collaboration and critical thinking is needed in everyday life as well as in the world of work. This ability is used for problem solving and decision making [4]. Critical thinking is a process to find certain goals and reasons through the steps. According to [5] critical thinking skills are divided into 3 stages and 6 levels, including self-regulation explanation, interpretation, evaluation, analysis, and inference.

The word collaboration comes from the Latin roots *com* and *laborare* are steps and means to work together [6]. [7] Andrews and Rapp reviewed the literature on collaboration citing its distinctive advantages and challenges in enhancing cognitive and psychological development in utilizing collaboration for individual participants through social, affective, and psychological, collaborative approaches to teaching critical thinking are highly recommended by various schools [8]. According to

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[9], collaboration skills are not inherited abilities, but are skills that can be learned, according to Hill and Tim, there are 4 steps in collaborating, including 1) managing differences within the team. 2) Doing problem solving together. 3) Working in groups, and 4) Ability to form a team.

One of the efforts to increase students' learning motivation in the classroom is to provide an innovative learning media. ICT (Information and Communication Technology) Learning media is considered to be able to provide fresh air for students so that interest and motivation can increase. Power point media according to survey results is still often used in teaching which if not packaged properly can reduce students' interest in learning. Based on this background, researchers seek to develop Web-based learning media that can be accessed anytime and anywhere for digital circuit courses so that students can be assisted in their learning process in the current pandemic era. To make learning media there are 3 aspects that are used, among others: 1) the practicality of the media; 2) the validity of the learning media; and 3) the effectiveness of using the media.

According to [10] a media used for learning can be interpreted as a tool both non-physical and physical that is used as an intermediary for students and teachers to share information to make it more effective. UNESCO officially uses the term ICT (*Information and Communication Technology*) which in Indonesian is known as information and communication technology or TIK [11]. According to [12] In using learning media for the learning process, the feasibility of the media must first be checked. In particular, with Web (E-Learning) information media tools through the online learning process (using network access) can improve the learning process where students can download textbooks so they can save students' costs in learning. Students are also not limited by space and time, which means that there is flexibility in the learning process. With digital media, students can send assignments, there is media to store these assignments which can make it easier for teachers to store student data. to enrich their studies. Students can actively participate because online learning provides interactive learning environments.

II. RESEARCH METHODOLOGY

In this study, the experimental method was used in 2 classes which were used to test whether web media could be used as a medium for the learning process [13]. In this research, the product produced is in the form of web-based learning media and google classroom. The data collection techniques used in this study are learning media validation. The instrument is a learning media validation sheet. The validation sheet is filled out by two validators or experts in the field of electrical engineering. The

data analysis technique used is the analysis of the results of the validation through the percentage assessment of the validator. Analysis of the validator value was carried out using a 1-5 linkert scale. For the validator assessment, it can be seen in Table 1.

To conclude the results of the validity of the Web-based interactive multimedia learning media, then the interpretation scale of the validity criteria score is used. Based on the rating results that have been obtained, the conclusion of validity is drawn using the criteria as shown in Table 2. This trial was carried out on students consisting of users of learning devices, namely 65 students of the 2019 class which were divided into 2 classes, namely class 2019 A with a total of 33 students. and class B totaling 32 students with flip flop and register learning materials. Where class 2019A is a class that gets treatment, namely in addition to using the web, it also gets assignments on the web, while class 2019 B does not get treatment, only adding materials on the web in the implementation of lectures carried out 100% online because of factors the ongoing covid-19 pandemic. From the two classes, students' responses to the use of web-based learning media will be sought. the influence of critical thinking and collaboration is assessed through group presentation assignments and UAS.

To determine whether the media can be used, it must be validated first by a validator, whether it is a media expert or a linguist. After getting input and analysis, calculating the total number of assessment scores by the validator can be used Table 1 in the calculation.

To determine students' understanding of the material, 2 assessments of latent variables were carried out, namely critical thinking and collaboration. The critical thinking variable is translated into 3 indicators, namely simple explanation, interference, decision making, while the collaboration variable is broken down into 3 indicators, namely sharing responsibility, respect, and working productively. The following is a table of assessment criteria:

Very valid/good (n validator)	n x 5
Valid/good (n validator)	n x 4
Quite valid/good (n validator)	n x 3
Invalid/good (n validator)	n x 2
Very invalid/good (n validator)	n x 1+
Σ The total score of the validator's answers	

Table 1. Validator Rating Scale

Category	Value weight
Very good	5
Good	4
Good enough	3
Bad	2
Very bad	1

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Table 2. Validation Results Assessment Criteria

Validation result	Category	Interpretation
Very valid	Very good	86 % - 100%
Valid	Good	71% - 85%
Quite Valid	Good enough	56% - 70%
Invalid	Bad	41% - 55%
Very invalid	Very bad	0 % - 40%

III. RESULT AND DISCUSSION

The results of this study are the use of web-based learning media and google classroom. Where web media is used to convey material and storage of material while Google Classroom is used to store student assessment results in the form of assignments and exams. The main menu display from the web can be seen in Figure 1.

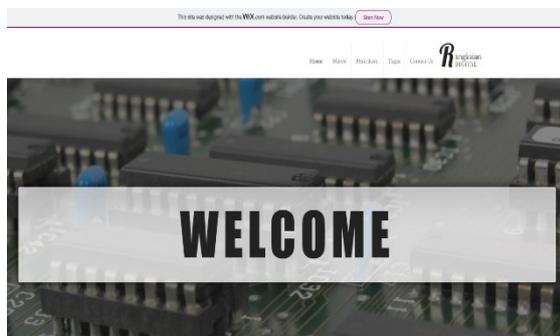


Figure 1 Home Menu Display

This learning media consists of 5 menus, namely home, material, practicum, assignments, and contact us which can be downloaded at <https://faridbaskoro.wixsite.com/mysite>. The menu contains materials that will be taught to students, either in the form of power points or in the form of reference books in the form of pdf and software. The practicum menu is an example of a given task. The task menu is what tasks students have to do. The contact us menu is the telephone number for the supporting lecturer if there are students who find it difficult or confused about the tasks they will be doing. The following is a display of the material menu, and practicum.



Figure 2 Material Page

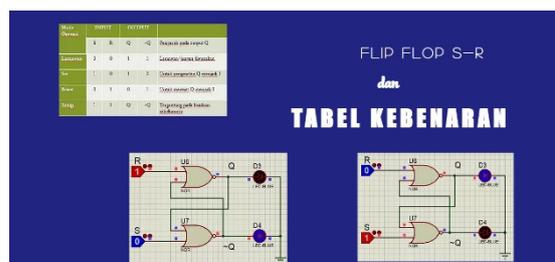


Figure 3 Practicum Page

The task menu and appearance of google classroom can be seen in Figures 4 and 5. Google classroom was chosen because it is easy to use and has a large capacity for data storage.

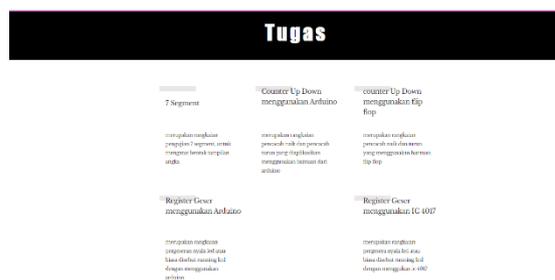


Figure 4 Task Menu Display

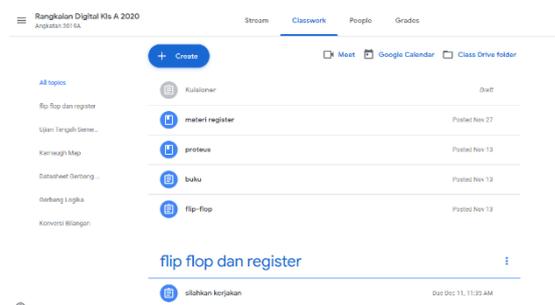


Figure 5 Google Classroom Menu Display

To find out the student's response to the learning media, a questionnaire was conducted to 65 students on the content of the media material and the appearance of the media which was divided into 11 questions. 5 questions for media display, namely questions number 1,2,3,4, 6 and 6 questions to find out media content, namely questions number

5,7,8,9,10 and 11. The following is a list of questions asked:

1. Is the interface of this web media attractive?
2. Is the menu display on the web easy to learn?
3. Is it easy to download existing materials?
4. Can the given power point help in understanding digital circuit lecture material?
5. Can this web media be used as a learning?
6. Is this web learning media good enough?
7. Can this web media increase your learning motivation?
8. Is this web media enough to help you in the learning process in the era of the COVID-19 pandemic?
9. Is the PPT media available on the web enough to help understand the material?
10. Is the material available on the web in accordance with the syllabus?
11. Are the sentences and words in this web media expressed in a straightforward manner (not convoluted)?

The results of the questionnaire can be seen in Figures 6 to 8 below

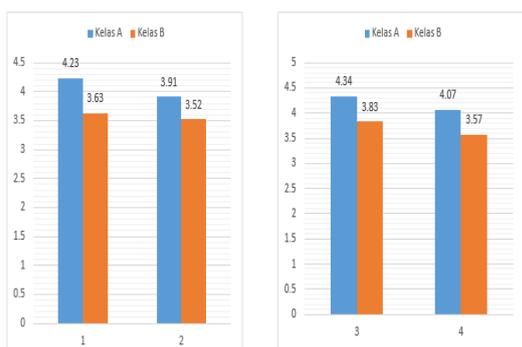


Figure 6 Questionnaire Results Question Number 1,2,3,4

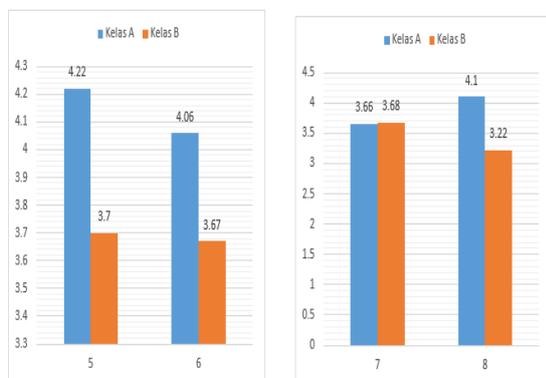


Figure 7 Questionnaire Results Question Number 5,6,7,8

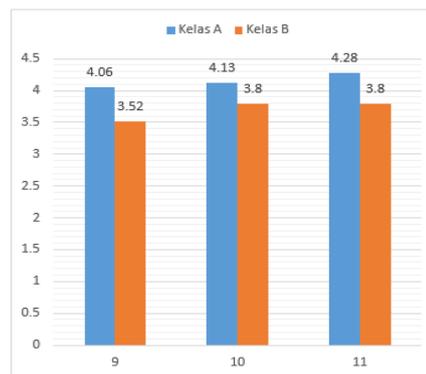


Figure 8 Questionnaire Results Question Number 9,10,11

Kuisloner Pemanfaatan media Web untuk menunjang perkuliahan Rangkaian Digital.

Dengan Hormat,

Untuk membantu meningkatkan pemahaman mahasiswa pada materi Rangkaian digital di era pandemic covid 19 ini, maka saya selaku pengajar membuat inovasi media pembelajaran yang dapat di unduh di <https://syndikator.waze.com/m344>

Untuk evaluasi kedepannya, kami meminta saudara untuk mengisi kuisloner di bawah ini dengan memberi tanda check list (v) pada kotak tanggapan yang tersedia dimana nilai 1 (sangat kurang baik), 2 (kurang baik), 3 (cukup baik), 4 (baik), 5 (sangat Baik). Terimakasih.

Nama : Muhammad Andhika Alifahrul
NIM : 19050874044

No	Pernyataan	1	2	3	4	5
1	Apakah Tampilan media web ini menarik?					V
2	Apakah menu-menu tampilan web ini mudah di paham?		V			
3	Apakah materi yang tersedia mudah di download ?				V	
4	Apakah adanya contoh-contoh dapat membantu dalam memahami materi perkuliahan rangkaian digital ?				V	
5	Apakah media bantu web ini dapat digunakan media bantu belajar ?		V			
6	Apakah media pembelajaran web ini sudah cukup baik ?		V			
7	Apakah media Web ini dapat meningkatkan motivasi belajar saudara?			V		
8	Apakah media Web ini cukup membantu saudara proses belajar di era Pandemic covid 19 ?					V
9	Apakah media PPT yang tersedia di web cukup membantu memahami materi ?			V		
10	Apakah materi yang tersedia di web sudah sesuai dengan silabus?				V	
11	Apakah kalimat dan kata dalam media Web ini di ungkapkan secara lugas (tidak berbelit-belit)			V		

Figure 9 Sample Student Questionnaire

From the three images above, it can be divided into 2 questions, namely in terms of appearance and content of web material. The results of the questionnaire on 65 students consisting of class A who received treatment and class B who did not receive treatment stated that for media display a score of 4,122 was obtained for class A, while class B for media display received a value of 3.64. In terms of media content, class A got a value of 4.06 for class B got a value of 3.62. This shows that class A who received treatment gave a better response than class B who did not get treatment during

lectures, so it can be concluded that students feel helped by this learning media.

To find out whether students understand digital circuit material, 2 assessments of latent variables are carried out, namely critical thinking and collaboration. The critical thinking variable is translated into 3 indicators, namely simple explanation, interference, decision making, while the collaboration variable is broken down into 3 indicators, namely Sharing Responsibility, Respect, Working Productively where the data is processed through the Stata software so that the following results are obtained:

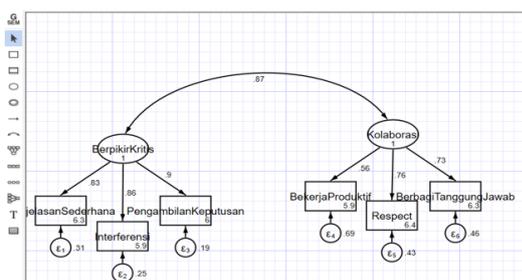


Figure 10 Example of a Student Questionnaire for Critical Thinking Pathway Analysis and Collaboration

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Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(8)	12.622	model vs. saturated
p > chi2	0.126	
chi2_bs(15)	203.828	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.098	Root mean squared error of approximation
90% CI, lower bound	0.000	
upper bound	0.196	
pclose	0.202	Probability RMSEA <= 0.05
Information criteria		
AIC	454.575	Akaike's information criterion
BIC	494.368	Bayesian information criterion
Baseline comparison		
CFI	0.976	Comparative fit index
TLI	0.954	Tucker-Lewis index
Size of residuals		
SRMR	0.048	Standardized root mean squared residual
CD	0.950	Coefficient of determination

Figure 11 Statistical FIT Test Results

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. summarize PenjelasanSederhana Interferensi PengambilanKeputusan BekerjaProduktif Respect BerbagiTanggungJawab
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Variable	Obs	Mean	Std. Dev.	Min	Max
PenjelasanSederhana	60	3.516667	.5672314	2.5	5
Interferensi	60	3.45	.594466	2.5	4.5
PengambilanKeputusan	60	3.333333	.5574356	2	4.5
BekerjaProduktif	60	3.541667	.605705	3	5
Respect	60	3.408333	.5406498	2.5	5
BerbagiTanggungJawab	60	3.4	.543061	2.5	5

Figure 10 Summarize Test Results

In figure 10, it can be seen that there are 2 latent variables, namely critical thinking and collaboration. To get the value of the latent variable, each variable is translated into 3 indicators. From figure 10 it is obtained: 1) The coefficient of simple explanation, interference, decision making on the critical thinking coefficient has a P value > |z| ie 0.000 < 0.05 and the value of z-stat > z-table (1.96) then H0 is rejected and H1 is accepted. That is, there is a significant influence between the indicator variables of simple explanation, interference, decision making on critical thinking 2) The coefficient of sharing responsibility, respect, productive work on the collaboration coefficient has a P value > |z| ie 0.000 < 0.05 and the value of z-stat > z-table (1.96) then H0 is rejected and H1 is accepted. That is, there is a significant effect between the indicator variables sharing Responsibility, Respect, Working Productively on collaborative thinking. The results of figure 11 are summed up in the table below:

Table 3. Data Comparison Results

Value Criteria	Value Cut-Off	Analysis Results	Description
X2 Chi Square	Expected Small	12.622	FIT
Sig. Probability	≥ 0.05	0.126	FIT
RMSEA	≤ 0,08	0.098	NOT FIT
CFI	≥ 0,95	0.976	FIT
TLI	≥ 0,95	0.954	FIT

Table 3 shows that based on the goodness of fits analysis using chi-square criteria, chi-square probability, RMSEA, CFI, and TLI. The conclusion obtained based on the calculation criteria above is that the research model can be said to be fit or good, only 1 data that has a not-fit value, namely RMSEA, namely . 0.08.

From figure 12 it can be concluded that the value of critical thinking can be explained through indicators: 1) a simple explanation of the existing material with a min score of 2.5 (not good) and a max value of 5 (very good) with an average score of 60 students 3.51 (good enough) This means that students are able to think and explain the existing

material quite well. 2) For the interference indicator, the min score is 2.5 (not good) the max value is 4.5 (good) and the students' average score is 3.45 (good enough). 3) for the decision-making indicator the min value is 2 (not good) the max value is 4.5 (good) and the average value is 3.33 (good enough). Of the three indicators, the average value of decision-making is the smallest because the demands of this indicator are the largest, namely students are required to be able to conclude a topic of material that exists as a whole correctly.

For collaboration variables, the score is obtained from 3 indicators, there are: 1) working productively with a min score of 3 (good enough) max 5 (very good) value with an average student score of 3.54 (good enough) this means that students are able to place individuals in a team well enough so that they can solve a given problem optimally in the pandemic era. 2) for the respect indicator, the min value is 2.5, the max value is 5 and the average value is 3.41 (good enough) which means that each individual is either in the team or doesn't pay enough attention when his friends express opinions. This can be seen by the presence of students and the position on camera during lectures. 3) to share responsibility a min score of 2.5 (not good) max value of 5 (very good) and an average value of 3.4 (good enough).

IV. CONCLUSION

The results of the questionnaire on 65 students consisting of class A who received treatment and class B who did not receive treatment stated that for media display the score was 4.122 for class A, while class B for media display was 3.64. In terms of media content, class A got a value of 4.06 for class B got a value of 3.62. This shows that class A who received treatment gave a better response than class B who did not get treatment during lectures, so it can be concluded that students feel helped by this learning media. Student learning outcomes from the critical thinking aspect get an average score of 3.43 and for collaboration get a score of 3.45

There is a significant influence between the indicator variables of Sharing Responsibility, Respect, Working Productively on collaborative thinking. There is a significant influence between the indicator variables of simple explanation, interference, decision making on critical thinking. This learning media needs to be developed from its interactive aspect. This learning media needs to be developed from the material aspect in the selection of reference points.

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AUTHOR'S INFORMATION

<p>First Author: Farid Baskoro</p> 	<p>Student in Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia and lecture in S1 electrical engineering</p> <p>E-mail: faridbaskoro@unesa.ac.id</p>
<p>Second Author: Bambang Suprianto</p> 	<p>Lecture in Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia and profesor in elektronik field</p> <p>E-mail: bambangsuprianto@unesa.ac.id</p>
<p>Third Author: I Gusti Putu Asto Buditjahjanto</p> 	<p>Lecture in Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia and profesor in computing field</p> <p>E-mail: asto@unesa.ac.id</p>
<p>Fourth Author: Lilik Anifah</p> 	<p>Lecture in Postgraduate vocational education, Univeristas Negeri Surabaya, Surabaya, Indonesia</p> <p>E-mail: lilikanifah@unesa.ac.id</p>