

The Impact of Interactive Features on Broadcasting Virtual Laboratory on Vocational Students' Learning Motivation; Study at SMKN 1 Bangil and SMKN 1 Sragen, East Java, Indonesia

Indra Prawira^{1*}, Mariko Rizkiansyah¹, Riana Jogi Ahdareni M¹, Arleen Ariestyani¹, and Amelia Mettadewi²

¹Mass Communication, Department of Communication, Faculty of Digital Communication and Hotel & Tourism, Bina Nusantara University, Jakarta, Indonesia, 11480

²Marketing Communication Program, Communication Department, Faculty of Digital Communication and Hotel & Tourism, Bina Nusantara University, Jakarta, Indonesia, 11480

Abstract. Media learning is a vital component in achieving student learning goals. The development of technology, especially digital media, has made the learning process more diverse. However, media learning is contextual according to the readiness of students, teachers, and technology. Learning institutions are in search for appropriate media learning following the Covid19 pandemic and post-pandemic. Research has found that media learning affects motivation. However, research on virtual media learning laboratories concerning vocational broadcasting study in Indonesia is rare. Binus University developed a virtual laboratory for broadcasting study in response to the media learning gap that follows technological developments in Indonesia but requires further research. This study adopted the Anderson and Garrison model with a quantitative correlation method to find the relationship between interactive features of broadcasting virtual laboratories with student motivation. The research data was obtained through 88 questionnaires with purposive sampling from two vocational schools: SMKN 1 Bangil and SMKN 1 Sragen. The results showed that the interactive feature of the virtual broadcasting laboratory positively affects students' motivations at both schools, with the image feature of the virtual laboratory as the most influential in students' motivation. Students feel that pictures help them complete assignments related to the broadcasting course.

1 Introduction

Media learning is a vital component in achieving student learning goals. Various studies show that media learning depends on several factors such as; student acceptance, teacher readiness, and technology availability [1-4]. The development of digital technology has had a significant influence on media learning. For instance, social media development has made students familiar with asynchronous learning through the Whatsapp application [1] and Youtube [5]. Students can also learn by using virtual laboratories to conduct experiments through computer devices [6]. Virtual laboratories are a solution to the low achievement of student learning outcomes due to the lack of traditional laboratory capacity, quality, equipment, and human resources [7]. The virtual laboratory could support distance learning since students cannot attend school during the COVID-19 pandemic [8].

Media learning is also used to generate motivation and stimulation [9] and create a pleasant learning atmosphere during learning activities [10]. The researchers found that virtual laboratories provide a similar experience to in situ experiences [12]. Still, most

importantly, virtual laboratories offer a pleasant experience that stimulates student learning motivation [13].

Motivation stimulates changes in individuals to achieve the desired goals [14]. Researchers have found a positive relationship between motivation and student learning success [11, 15]. Student learning outcomes are believed to be low during the COVID-19 pandemic in Indonesia because, according to Cahyani et al. [16], students' learning motivation decreased [16]. Scholars have researched student learning motivation in various contexts, such as learning physics [17] and medical [18]. Scholars' attention is also focused on motivation related to the rapidly developing e-learning learning method [19-20]. However, the study of motivation in the distance learning through virtual laboratories, especially in Indonesian vocational education, is rarely explored.

1.1 Objectives

This study aims to determine the relationship between motivation and the use of virtual laboratories. This research utilizes the case study method of vocational

* Corresponding author: iprawira@binus.edu

learning for the broadcasting department of Vocational High School Students (SMK) in Bangil, and Sragen, East Java, Indonesia. Based on the description above, this study asks the following research questions.

H0; There is no impact of the virtual laboratory Binus University on the learning motivation of Bangil and Sragen Vocational High School students.

Ha: There is an impact of virtual laboratories Binus University on the learning motivation of Bangil and Sragen Vocational High School students

2 Literature Review

2.1 Digital Media Learning

Media learning is a tool that supports the teaching and learning process so that the message conveyed becomes more evident and learning objectives can be achieved effectively and efficiently [21]. Media learning is defined as one of the ways to overcome many kinds of problems in teaching [22]. Meanwhile, Atsani [23] divides media learning into two categories, namely online media learning, and offline media learning. Online media learning can be interpreted as media equipped with controllers obtained and operated by the user. Examples of activities in online media learning are exchanging messages via email, commenting on discussion forums, and using chat rooms and video conference links. In comparison, offline media learning is not equipped with a controller or navigation [23].

Some teachers are yet reluctant to use sophisticated media learning for several reasons. Some teachers assume that using media requires preparation to learn it besides being expensive. The school does not always provide equipment for supporting media learning use, and teachers have negative perceptions of media learning as entertainment only [22].

Traditional media learning, such as blackboards and books, is more familiar at lower school levels. At the primary and secondary levels, the use of media learning is negligible because school rules tend to be strictly forbid students from bringing gadgets. Still, at the same time, school infrastructure is inadequate [24]. Coupled with the problems with using online learning media, Atsani said that not all children have adequate facilities such as mobile phones, limited quotas, unsupported networks, and lots of distractions [23]. The slowness of media learning development is also because the teaching personnel does not understand how to use the needed hardware and software [25]. However, at the higher education level, stakeholders can quickly adapt to the development of contemporary media learning. University students are enthusiastic about using Youtube to work on their assignments and study lecture material [5]. Furthermore, some universities have also developed virtual laboratories to overcome the problems of conventional laboratories.

2.2 Media use and learning motivation

The use of media learning affects various learning factors such as perception, motivation, study habits [19], technical abilities, and vocational skills [2]. The importance of motivation makes it a determinant of learning success [15]. Syamsudin [26] mentioned several factors that indicate motivation; duration of the activity, frequency of activity, persistence in activity goals, fortitude, tenacity, ability to face activities and difficulties to achieve goals, dedication, and sacrifice to achieve goals, level of aspirations to be achieved with the activities carried out, level of achievement qualifications, and direction of attitude towards the target of the activity [26]. Meanwhile, Uno and Hamzah simplify the motivation indicators, that are: (1) There is a desire to succeed; (2) There is encouragement and need in learning; (3) Diligent in facing the task; (4) Tenacious in the face of adversity; (5) There are exciting activities in learning [27].

Interactive learning can be held in various models by utilizing technology. Interactive learning can use audio or radio, video or TV, multimedia, computer media, and the internet. An example of an interactive feature is the Aplikasi Rumah Belajar (ARB)-Learning House Application. The ARB is a web-based learning portal that contains various learning services. It has learning resources, digital classes, question banks, virtual laboratories, digital modules, cultural maps, space cruises, sustainable professions, and books. The interactive feature of ARB makes learning more interesting because it presents technology-based learning materials [28].

Interactive features are used as one of the methods used to overcome online learning in the post-pandemic of Covid19. There are interactive features that teachers can use to interact with their students, such as; template features, text features, choice features, number features, website features, draw features, draggable features, and audio features. Teachers can use various interactive elements to deliver course materials online and monitor student activities during teaching and learning. This interactive feature can help teachers provide feedback to students who do not respond when asked a question [29].

Distance education interactivity has received the attention of researchers by adopting various strategies such as using Ha and James model, Downes and McMillan Model [30], or online communication model (Computer Mediated Communication-CMC interactivity model) [31]. Meanwhile, the Anderson and Garrison model [32] has become an important reference in understanding education through online media [33]. Anderson and Garrison's model traces interactivity through three factors in education, namely [34] student factors, course factors, and instructor factors. This study focuses on understanding the effect of content in learning through virtual laboratories, so we adapted the Anderson and Garrison model.

2.3 Virtual Laboratory

A virtual laboratory is a computer-based media that contains simulations of activities like a conventional laboratory. Schools create virtual laboratories to overcome the constraints faced by traditional laboratories and provide features beyond the previous one. Gunawan [34] said that virtual physics laboratories describe reactions that may not be visible in real situations. Virtual laboratories can have interactive multimedia features of various formats that contain text, hypertext, sound, images, animation, video, and graphics [35].

The virtual laboratory is developed with various features according to user needs, such as a virtual digital laboratory based on mobile virtual reality, a virtual laboratory using Physics Education Technology (PhET) simulations, and a virtual oscillation physics laboratory. Therefore, each virtual laboratory has different benefits, uniqueness, and advantages.

A virtual laboratory is usually designed to resemble the conventional one. Virtual laboratory features generally use virtual reality (VR) box, and control of the virtual laboratory's movement is managed by a Bluetooth remote or VR controller [36]. However, basically, users can access the laboratory without using the VR feature. There are various benefits of using a virtual laboratory; for example, in the PhET Virtual Laboratory, the user can conduct experiments [37] or the user can explore the laboratory independently as in the physics oscillation laboratory. Users of the virtual oscillatory physics laboratory can investigate unobserved and undiscovered phenomena. Students can do more experiments at the atomic level [38].

3 Methods

This study applies a quantitative research method with data obtained through surveys of students and teachers of Vocational High School-SMKN 1 Bangil and SMKN 1 Sragen, East Java, Indonesia. The sample was determined through the purposive sampling method for students and teachers who had attended a virtual laboratory lecture. The research instrument was a questionnaire related to the use of interactive features in the virtual laboratory and student learning motivation. Questions are presented in the form of answers on a Likert scale of 1 (highly disagree) to 5 (highly agree). Meanwhile, the data analysis used statistical analysis software SPSS 26.

4 Data Collection

This research collected data from questionnaires of 88 respondents participating in the virtual laboratory lecture. The questions use a Likert scale on virtual laboratory interactivity as variable X. Variable X in this study has dimensions based on elements found in multimedia objects, including text, hypertext, sound, images, animation, video, and graphics [35]. Based on

the results of the index value of variable X, it showed that variable X (interactive feature) increases motivation because the overall appearance of the visual media is attractive, and students can easily access the interactive feature. The average total index value obtained for the variable X is 72.24%. In the index table of respondents' answers to variable X, the third statement obtains the highest answer index value, namely "Interactivity features that I often find in learning are in the form of pictures," with the percentage of the index value of 74,6%. While the lowest index value was obtained by the second statement, namely "The interactivity feature that I often find in learning is in the form of sound." get an index value presentation of 64.4%.

The variable Y (Learning Motivation of Broadcasting Vocational High School Students) has five dimensions taken from (1) Existence desire and desire to succeed; (2) There is encouragement and need in learning; (3) Diligent in facing the task; (4) Tenacious in the face of adversity; (5) There are interesting activities in learning.

In the index table of respondents' answers to variable Y, the first and eight statement obtains the highest answer index value, namely "The Text feature in the BINUS TV virtual laboratory makes me want to be a broadcaster or work in the television world," and "The Voice feature in the BINUS TV virtual laboratory provides an interesting learning experience" with the percentage of the index value of 68%. While statements obtained the lowest index value, "The Subtitles feature in the BINUS TV virtual laboratory helps me with my broadcasting task," with an index value of 64,4%.

Based on the results of the index value of the Y variable, it can be concluded that the Y variable (student learning motivation) is influenced by the learning media (visual, text or audio visual) used in learning, this media attracts the attention of students in increasing motivation and increasing the number of vocational students' participation. in teaching and learning activities. The average total index value obtained for the Y variable is 67.41%.

This validity test uses the SPSS 26 program to manage data from the questionnaire. We use a significance level of 5% or 0.05, a confidence level of 95% of the total sample studied. To test the validity of the data, use the table r product moment $df = N-2$ with a significance level of 5% (included in the r table). The r table for this study is 0.1765.

The Simple Linear Regression Analysis

Simple linear regression analysis was used in testing the effect of variable X (Media Interactivity Features) on variable Y (Student Learning Motivation) and analyzing changes that occurred based on known variables. According to Kriyantono (2014) regression analysis is used if the correlation between two variables has a causal relationship (causation) or a functional relationship [36].

Coefficient of Determination Test Analysis

The analysis of the coefficient of determination was carried out to measure how the contribution of the X variable "The Effect of Media Interactivity Features" to the Y variable "Student Learning Motivation". Analysis of the Coefficient of Determination Test was carried out with the help of the SPSS 26 program and the following are the results:

The t test

According to Sugiyono (2013), the t-test is used to independently test the significant relationship between the X variable and the Y variable [37]. The formula for the t-test is as follows:

Based on the significance value:

- a. If the significance is < 0.05 , it can be concluded that there is an influence between the X variables on Y.
- b. If the significance is > 0.05 , it can be concluded that there is no influence between the X variables on Y.

A hypothesis can be interpreted as a temporary conclusion to a problem that is still not certain to be proven true. According to Sugiyono (2013), the hypothesis can be stated as a theoretical answer to the research problem formulation, which does not yet have an empirical answer [37]. The hypothesis is also a proposition that will be tested for its validity [38].

The hypothetical formulas are:

Ho: There is no effect of the Interactive features of learning media on students' learning motivation.

Ha: There is an effect of the Interactive features of learning media on students' learning motivation.

If the significance value of $t < 0.05$, then Ho is rejected and Ha is accepted.

If the significance value of $t > 0.05$, then Ho is accepted and Ha is rejected.

It can be seen that the statistical value of tcount is 3,369 which is greater than ttable, which is 1,662, so it can be concluded that Ho is rejected and Ha is accepted. The significance value of the table above has a value of 0.001 which is more than 0.05. If the significance value is $0.001 < 0.05$, then Ho is rejected, which means that there is an effect of the Interactive Features of learning media on learning motivation.

5 Results and Discussion

This study aims to find the correlation of virtual laboratory interactive features to the student motivation in learning broadcasting topic. We analysed the interactive features of Binus Broadcasting virtual laboratory and student learning motivation as variable X and Y. The research uses a purposive sampling method, which selects a portion of the total population as research samples. The population is students from SMKN 1 Bangil dan SMKN 1 Sragen, East Java, Indonesia. There were 88 respondents answering to the questionnaires after given a lecture on broadcasting virtual laboratory. The lecture is a part of Pengabdian Kepada Masyarakat-PKM (social responsibility) of Binus University lecturer.

The variable X (Virtual laboratory Interactive Features) has four dimensions taken from interactive features elements which include text, sound, images, video and graphics, while variable Y (Learning Motivation of Broadcasting Vocational High School Students) has five dimensions taken from (1) Existence desire and desire to succeed; (2) There is encouragement and need in learning; (3) Diligent in facing the task; (4) Tenacious in the face of adversity; (5) There are interesting activities in learning.

5.1 Numerical Results

The validity test conducted on 88 respondents concluded that $r_{count} > r_{table}$ on all statements as many as 21 statements, five statements each for the X variable and 16 questions for the Y variable. The r table value was obtained from the r table product moment $df = N-2$ with the significance level of 5% is 0.1765. This study uses Cronbach's Alpha in, which to get a reliable or consistent result value must be greater than 0.60. The two variables X and Y show a greater Cronbach's Alpha value, for the X variable, it is 0.872 and the Y variable is 0.978. Therefore, the X variable (Media Interactivity Features) and Y (Student Learning Motivation in Virtual Laboratory) are stated as reliable data. Therefore, the X variable (Media Interactivity Features) and Y (Student Learning Motivation in the Virtual Laboratory) are valid.

The results of the normality test of the data using the Kolmogorov-Smirnov obtained Monte Carlo. Sig (2-tailed) is 0.121, which means it is greater than 0.05. So based on the statement and the value of the significance of the data, the data is concluded to be normally distributed. The correlation test results show that the Pearson Correlation value is 0.341, which is greater than the significance value > 0.05 . If the value is included in the coefficient interval category.

It can be concluded that the correlation between variable X (Media Interactivity Features) and variable Y (student learning motivation in the Virtual Laboratory) has a low relationship. Correlational analysis shows the variable X has a low relationship to the variable Y with the value of 0.341. The simple linear regression analysis in this study is $Y = 17.587 + 3.468X$ which means a constant value of 17.587 as a constant value and a value of 3.468X as an increase/ decrease in variable Y which follows the direction of increase/decrease in variable X. Simple linear regression analysis in this study shows that variable X and variable Y have a unidirectional and positive relationship. Meanwhile, the analysis of the coefficient of determination indicates that the X variable "Virtual laboratory interactive features" has an effect of 11.7% on the Y variable "Students' Learning Motivation in Virtual Laboratory" and the remaining 88.3% is influenced by other factors which is not examined in this study.

The results of the simple linear regression analysis test can be concluded that the constant is 17,587. If the X value is 0, then Y has a value of 17,587. The X

regression coefficient of 3.468 states that for every 1% addition to the value of the X variable (Media Interactivity Features), the value of the Y variable (student learning motivation in the Virtual Laboratory) increases by 3,468. The regression coefficient is positive, so it can be stated that the X variable to the Y variable is positive. The results of the t-test can be concluded that n can be seen that the statistical value of tcount is 3,369, which is greater than t table, which is 1,662, so it can be concluded that Ho is rejected, and Ha is accepted, which means that there is an influence of Media Interactivity Features in the learning motivation of SMK students in the Virtual Laboratory.

The results of the validity test of the X variable (Media interactivity feature) in the table above show that the r table value in the validity test of this study is 0.1765 using the table r product moment $df = N-2$ with a significance level of 5%. It can be concluded that the statement of variable X, namely the interactivity feature, is valid. The validity test results of the variable Y (student learning motivation) show that the r table value in the validity test of this study is 0.1765, also valid. The results of the reliability test of the X variable (media interactivity feature) show that the Cronbach's Alpha value obtained is 0.872. Meanwhile, the Cronbach's alpha for variable Y is 0.978 to make them > 0.60 reliable and valid.

Table 1. Reliability test result

Variable	Cronbach's Alpha	N item
X	.872	5
Y	.978	16

The results of the Monte Carlo normality test a value of 0.112, and if it is adjusted to the provisions of the Kolmogorov-Smirnov test, a significance value of 0.112 > 0.05, it can be concluded that the data is normally distributed.

Table 2. The Correlations Test Results

		Interactive features	Learning motivation
Interactive features	Pearson Correlation	1	.341**
	Sig. (2-tailed)		.001
	N	88	88
Learning motivation	Pearson Correlation	.341**	1
	Sig. (2-tailed)	.001	
	N	88	88

** . Correlation is significant at the 0.01 level (2-tailed).

The results of the correlation test in the table above show that the Pearson Correlation value is 0.001, which is smaller than the significance value <0.05, which means it is correlated. After calculating to the above formula, the Pearson Correlation result is 0.341. Using SPSS 26, the correlation between variable X (interactive feature) and variable Y (student learning motivation) has a low relationship.

Table 3. The Regression Coefficient Valuea

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.587	21.702		.810	.420
	Interactivity feature	3.468	1.029	.341	3.369	.001

a. Dependent Variable: Learning motivation

Based on table 3, it is known that the constant value is 17.587 and the regression coefficient value of the X variable is 3.468. The results need to be calculated through the following formula:

$$Y = a + bX$$

$$Y = 17,587 + 3,468X$$

Legend:

Y = Variable Y "Student Learning Motivation"

a = constant of 17.587

b = regression coefficient value of 3.468

X = variable X "Media Interactivity Features"

Table 4. Coefficient Determination Test

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.341 ^a	.117	.106	18.12279

a. Predictors: (Constant), Interactivity features
 b. Dependent Variable: Learning motivation

Based on table 4, the R square in this study is 0.117 or 11.7%. So it can be concluded that Variable X "Influence of Media Interactivity Features" has an influence of 11.7% in influencing variable Y "Students' Learning Motivation" and the remaining 88.3% is influenced by other things not examined in this study.

Based on tCount and tTable

a. If the statistical value tcount > ttable, it can be concluded that there is an influence between the X variables on Y.

b. If the statistical value of tcount < ttable, it can be concluded that there is no influence between variable X and variable Y.

Table 5. The t Test Result

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.587	21.702		.810	.420
	Interactive features	3.468	1.029	.341	3.369	.001

a. Dependent Variable: Learning motivations

From the information above, it can be explained that:

1. The constant value of 17.587 means that if the variable X "Effect of Media Interactivity Features" is 0, then the consistency value of the Y variable is positive with a value of 17.587.
2. The regression coefficient value of variable X is 3,468 which indicates that the coefficient is positive so that if there is an addition of 1% to the value of variable X, the value of variable Y will increase by 3,468.

So it can be concluded that $Y = 17,587 + 3,468X$ is the X variable "The Effect of Interactivity Features" has a positive and significant influence on the Y variable "Students' Learning Motivation" then the Y variable

always follows the X variable, if the X variable increases then the Y variable also experiences increase while if the variable X decreased then the variable Y also decreased.

The results of the table above explain that the results of the t-test (tcount) are 3.369. To get the value of t table, using the formula $df = N - 2$ which the result is 86 with a significance level of 0.05 or 5% resulting in a value of 1.662.

In decision making, the statistical value of tcount is 3,369 which is greater than ttable, which is 1,662, so it can be concluded that H_0 is rejected, and H_a is accepted, which means that there is an influence of Media Interactivity Features in students' learning motivation.

5.2 Proposed Improvements

Variable X "Influence of Media Interactivity Features" has an influence of 11.7% in influencing variable Y "Students' Learning Motivation" and the remaining 88.3% is influenced by other things not examined in this study.

Be a reference material for further research. Can be a reference to find out an efficient interactive feature for increasing strategy of student learning motivation. This research is expected to be further investigated by using different methods, namely qualitative.

5.3 Validation

The results of the decision-making hypothesis test can be seen that the statistical value of tcount is 3,369 which is greater than ttable, which is 1,662, so it can be concluded that H_0 is rejected, and H_a is accepted. The significance value of the table above has a value of 0.001 which is more than 0.05.

If the significance value is $0.001 < 0.05$, then H_0 is rejected, which means that there is an influence of media interactive features on the learning motivation of SMK students in the Virtual Laboratory.

The statistic for tcount of 3.369 is greater than ttable of 1.662, which means that there is an effect of using media interactive features on the learning motivation of SMK students in the Virtual Laboratory.

This research is based on the Interactivity theory model from Garrison and Anderson [32] where this theory explains that the emergence of virtual educational institutions that occur is driven by efforts to meet the needs of the community in obtaining the desired learning opportunities. In this study, the use of media was measured by the Interactivity Feature of the Media (X) and the resulting effect was the learning motivation of the Broadcasting Vocational High School students (Y). So that the relationship between this research and the theory of Interactivity is how the three factors contained in the components are equally important

where teachers, students, and content influence each other, all these need to be considered in virtual laboratory learning.

6 Conclusion

This study was conducted as part of Binus University's broadcasting virtual laboratory development project for vocational education. Specifically, this study aims to find a correlation between the interactive features of the Binus University broadcasting laboratory and students' learning motivation. Data obtained from 88 questionnaires at SMKN1 Bangil, and SMKN1 Sragen, East Java, Indonesia, show that the interactive features of the Binus virtual laboratory have a positive effect on students' learning motivation. The image features in the Binus virtual laboratory are the most influential factors in student motivation. Students feel that the picture feature helps them complete assignments related to the broadcasting course. Anderson and Garrison's model is used to understand learning factors such as media, students, and instructors. However, this study focuses on finding the impact of virtual laboratory features or learning media on students' learning motivation due to the limitations of the researcher. Further research is suggested to explore student and instructor factors to understand learning through virtual laboratories comprehensively.

References

1. O. K. Boyinbode, O. C. Agbonifo, and A. Ogundare, Supporting mobile learning with WhatsApp based on media richness. *Circulation in Computer Science*, 2(3), 37–46. (2017)
2. C. Latchem, Using ICTs and blended learning in transforming technical and vocational education and training. UNESCO Publishing. (2017)
3. C. Lytridis, A. Tsinakos, and I. Kazanidis, ARTutor—an augmented reality platform for interactive distance learning. *Education Sciences*, 8(1), 6. (2018)
4. L. Petrenko, S. Kravets, O. Bazeliuk, L. Maiboroda, and I. Muzyka, Analysis of the current state of distance learning in the vocational education and training institutions. *E3S Web of Conferences*, 166, 10010. (2020)
5. M. Y. Kamar, and E. Lestari, Pemanfaat Sosial Media Youtube Sebagai Media Pembelajaran Bahasa Indonesia di Perguruan Tinggi. *INTELIGENSI: Jurnal Ilmu Pendidikan*, 1-7. (2019)
6. S. Sugiharti, and M. K. Sugandi, LABORATORIUM VIRTUAL: MEDIA PRAKTIKUM ONLINE UNTUK MENINGKATKAN PEMAHAMAN SISWA DI MASA PANDEMI. *Prosiding Seminar Nasional Pendidikan* 2, 45-51. (2020)
7. Jasmadi. PENGGUNAAN MEDIA VIRTUAL LABORATORY DALAM PEMBELAJARAN

- KONSEP OPTIK GEOMETRI DI SMK KESEHATAN ASY-SYIFA SCHOOL BANDA ACEH. Banda Aceh: Universitas Islam Negeri Ar-Raniry. (2018)
8. D. Muldani, N. Syamsiah, Wahruji, and Nurasa. LABORATORIUM VIRTUAL DENGAN CIRCUIT WIZARD UNTUK MENUNJANG PRAKTIKUM JARAK JAUH PADA LABORATORIUM ELEKTRO. Prosiding Simposium Nasional Multidisiplin **3**, (2021)
 9. Y. Febrita, and M. Ulfah, Peranan Media Pembelajaran Untuk Meningkatkan Motivasi Belajar Siswa. Diskusi Panel Nasional Pendidikan Matematika, 181-188. (2019)
 10. S. Maulani, N. Nuraisyah, D. Zarina, I. Velinda, and A. N. Aeni, Analisis Penggunaan Video sebagai Media Pembelajaran Terpadu terhadap Motivasi Belajar Siswa. Jurnal Pendidikan dan Teknologi Indonesia (JPTI), 19-26. (2022)
 11. A. Emda, Kedudukan motivasi belajar siswa dalam pembelajaran. Lantanida Journal, 5(2), 172–182. 2018
 12. A. Voit, S. Mayer, V. Schwind, and N. Henze, Online, VR, AR, Lab, and In-Situ: Comparison of Research Methods to Evaluate Smart Artifacts. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 1–12. (2019)
 13. C. C. Firdaus, B. G. Mauludyana, and K. N. Purwanti, FAKTOR-FAKTOR YANG MEMPENGARUHI MOTIVASI PEMBELAJARAN DI SD NEGERI CURUG KULON 2 KABUPATEN TANGERANG. PENSA: Jurnal Pendidikan dan Ilmu Sosial, 43-52. (2020)
 14. S. D. Febnasari, Z. Arifin, and E. S. Setianingsih, “Efektifitas Penggunaan Metode Pembelajaran Diskusi Kelas dengan Strategi ‘TPS’ untuk Meningkatkan Motivasi Belajar,” *Jurnal Ilmiah Sekolah Dasar*, vol. 3, no. 3, p. 315, Jul. 2019, doi: <https://doi.org/10.23887/jisd.v3i3.19456>.
 15. R. Andriani, and R. Rasto, Motivasi belajar sebagai determinan hasil belajar siswa. Jurnal Pendidikan Manajemen Perkantoran (JPManper), 4(1), 80–86. (2019)
 16. A. Cahyani, I. D. Listiana, and S. P. D. Larasati, Motivasi belajar siswa SMA pada pembelajaran daring di masa pandemi covid-19. IQ (Ilmu Al-Qur’an): Jurnal Pendidikan Islam, 3(01), 123–140. (2020)
 17. D. Sulisworo, and S. P. Agustin, Dampak pembelajaran e-learning terhadap motivasi pada pembelajaran fisika di sekolah kejuruan. Berkala Fisika Indonesia: Jurnal Ilmiah Fisika, Pembelajaran Dan Aplikasinya, 9(1). (2017)
 18. S. Wright, Medical school personal statements: a measure of motivation or proxy for cultural privilege? *Advances in Health Sciences Education*, 20(3), 627–643. (2015)
 19. S. Lee, and Y. Park, Distance E-learners’ Motivation, Perception, and Learning Behaviour in Vocational Training Environment. *Journal of Digital Contents Society*, 18(3), 499–508. (2017)
 20. E. N. Zaborova, I. G. Glazkova, and T. L. Markova, Distance learning: Students’ perspective. *Sociological Studies*, 2(2), 131–139. (2017)
 21. T. Nurrita, PENGEMBANGAN MEDIA PEMBELAJARAN UNTUK MENINGKATKAN HASIL BELAJAR SISWA. *Misykat*, 171. (2018)
 22. T. Tafonao, PERAN MEDIA PEMBELAJARAN DALAM MENINGKATKAN MINAT BELAJAR MAHASISWA. *Jurnal Komunikasi Pendidikan* 2 No.2, 103. (2018)
 23. K. L. Atsani, TRANSFORMASI MEDIA PEMBELAJARAN PADA MASA PANDEMI COVID-19. *Al-Hikmah: Jurnal Studi Islam*, 82-93. (2020)
 24. I. Z. Ichsan, A. K. Dewi, F. M. Hermawati, and E. Iriani, Pembelajaran IPA dan Lingkungan: Analisis Kebutuhan Media Pembelajaran pada SD, SMP, SMA di Tambun Selatan, Bekasi. *JIPVA (Jurnal Pendidikan IPA Veteran)*, 132-140. (2018)
 25. U. H. Salsabila, W. M. Lestari, R. Habibah, O. Andaresta, and D. Yulianingsih, Pemanfaatan Teknologi Media Pembelajaran di Masa Pandemi Covid-19. *Trapsila: Jurnal Pendidikan Dasar*, 1-20. (2020)
 26. A. Syamsudin, Psikologi Kependidikan. Bandung: PT Remaja Rosda Karya. (1996)
 27. H. B. Uno, Model pembelajaran menciptakan proses belajar mengajar yang kreatif dan efektif. (2014)
 28. Y. P. Utami, and P. S. Dewi, Model Pembelajaran Interaktif SPLDV dengan Aplikasi Rumah Belajar. *MATHEMA JOURNAL*, 24-31. (2020)
 29. N. Sa'adah, PEMBELAJARAN DARING YANG INTERAKTIF DI ERA NEW NORMAL. *ABIDUMASY*, 36-40. (2020)
 30. K. C. Harper, K. Chen, and D. C. Yen, Distance learning, virtual classrooms, and teaching pedagogy in the Internet environment. *Technology in Society*, 26(4), 585–598. (2004)
 31. C. Juditha, Hoax Communication Interactivity in Social Media and Anticipation (Interaksi Komunikasi Hoax di Media Sosial serta Antisipasinya). *Pekommas*, 3(1), 261723. (2018)
 32. T. Anderson, Modes of interaction in distance education: Recent developments and research questions. *Handbook of Distance Education*, 129–144. (2003)
 33. J. Gillett-Swan, The challenges of online learning: Supporting and engaging the isolated learner. *Journal of Learning Design*, 10(1), 20–30. (2017)
 34. J. L. Lear, C. Ansorge, and A. Steckelberg, Interactivity/community process model for the online education environment. *Journal of Online Learning and Teaching*, 6(1), 71–77. (2010)

35. Gunawan. Persepsi dosen dan mahasiswa terhadap model virtual laboratory fisika modern. *Jurnal Kependidikan*, **10** no. 2. (2011)
36. Rachmat Kriyantono, Teknik praktis riset komunikasi : disertai contoh praktis riset media, public relations, advertising, komunikasi organisasi, komunikasi pemasaran. Jakarta: Kencana, 2007.
37. Sugiyono, Metode penelitian pendidikan : (pendekatan kuantitatif, kualitatif dan R & D). Bandung: Alfabeta, 2013.
38. Nanang Martono, *METODE PENELITIAN KUANTITATIF*. RajaGrafindo Persada, 2010.