Relationship between the use of the internet as a learning resource and physics learning outcomes

A Halim¹,³*, Soewarno¹, E Yani¹, Elisa¹, E Mahzum¹, A Farhan¹ and I Irwandi²,³

¹ Department of Physics Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Banda Aceh, Indonesia 23111
² Department of Physics, Faculty Mathematics and Natural Science, Universitas Syiah Kuala, Banda Aceh, Indonesia 23111
³ STEM Research Center, Universitas Syiah Kuala, Banda Aceh, Indonesia 23111

*E-mail: abdul.halim@unsyiah.ac.id

Abstract. The purpose of this study was to determine the relationship between the use of the internet as a learning resource and physics learning outcomes. This research is a quantitative study using the correlation method. The population in this study were all 105 students of class XI IPA Public High School 6 Banda Aceh, while a sample of 31 students was selected using random sampling techniques. Due to survey research, the data collection instruments used questionnaires and documentation. Data processing was performed using the Product Moment correlation test and the hypothesis was tested using the t-test. Based on the results of the calculation of data analysis, the value of the correlation coefficient $r = 0.2646$ (low correlation) and the tested hypothesis with a significant level $\alpha = 0.05$ and degrees of freedom $= 31 - 2 = 29$ is $1.699$, obtained $t$-count $< t$-table is $0.4762 < 1.699$. Therefore, it can be concluded that there is no significant correlation between the use of the internet as a learning resource and the physics learning outcomes of class XI students of State Senior High School 6 Banda Aceh.

1. Introduction
The development of science and technology in the IT field has influenced all aspects of life including education. Internet media (as an IT product) is a global collection of thousands of networks that are managed freely. The internet is becoming popular because it is the right medium for obtaining the latest information with various variations quickly and easily. The web, as an intermediary between the internet and the user, is growing and has even been combined with interactive multimedia. Web-based learning is a learning activity that utilizes a media site (website) that can be accessed via the internet network [1,2,3]. Research the use of internet as a support for education in learning activities has been carried out, including the use of the internet as a source of learning and teaching to arouse student motivation [4], the design and use of the internet as a medium for learning Business English [5], and the use of the internet for education. Communication and student involvement in learning [6]. Several studies have also been studied related to students' attitudes towards internet use, including Malaysian university students having a positive attitude and seeing the internet as a good medium [7], students and teachers having different attitudes towards using the internet as a learning resource [8], and attention. Chinese students to use the internet were significantly influenced by students' attitudes, usability and subjective [9]. Several previous research results are related to the effect of using the internet as a learning resource on student learning outcomes. Among them, the use of the internet as a learning resource affects the
learning outcomes of Geography [10], the use of the internet has a significant impact on the learning outcomes of biology [11], and school, institute and university students around the world are interested in using the internet during the covid-19 epidemic and their average learning outcomes [12]. Related to fields of science that often use the internet as a learning resource, several relevant studies have been reported. Among them, the use of the internet as a learning resource for biology teachers in Brazil has a positive impact on the learning process [13] and the internet media affects the critical thinking skills of biology students [14]. Meanwhile, the field of physics has also reported several relevant research results that use the internet as a learning resource. Among them, it was found that the internet was also a source of misunderstanding the concepts of radiation and radioactivity [15] and students responded very well to the use of the internet as a learning resource for physics that was an increase in their learning outcomes and knowledge [16]. Besides, it was also found that internet-based virtual labs were very helpful for students to improve, learning outcomes and science process skills [17].

Although there have been many previous research results that are relevant to the use of the internet as a learning resource, there are still very few studies on the relationship between using the internet as a learning resource for student learning outcomes in physics courses. Therefore, the main objective of this study is to obtain information on the relationship between learning outcomes and the use of the internet as a learning resource. Another objective to be investigated in this study is what kind of learning resources students often use (web online) as a learning resource for physics.

2. Research Methods

2.1. Research Type and Approach
This study uses a quantitative approach using survey techniques. This research includes correlation research, which is research that aims to investigate the extent to which variations in a variable are related to variations in one or more other variables based on the correlation coefficient [18].

2.2. Population and Sample
The study population was all students of public high school 6 Banda Aceh class XI IPA 2017/2018 academic year as many as 105 students or 3 local. While the sample was 31 students of class XI IPA-1 and XI IPA-2 who were selected by means of non-random or purposive sampling. The requirements imposed are that the selected class as a sample of students uses the internet in implementing learning.

2.3. Data Collection
The types of data collected in this study are quantitative data in the form of learning outcomes scores on a scale of 0-100 and quantitative data in the form of a 5-point Likert scale (1-5). Based on the type of data, the instruments used for data collection were documentation and questionnaires.

2.3.1. Documentation. Documentation techniques are used to obtain data on student learning outcomes covering the three cognitive, affective, and psychomotor domains. The form of the documentation data collected was the physics report card scores of the students of class XI IPA 1 and XI IPA 2 in the 1st semester of the 2017/2018 years the public high school 6 in Banda Aceh.

2.3.2. Questionnaire. The questionnaire was used to obtain data on the use of the internet as a learning resource. The indicators used for the development of a questionnaire on the use of the internet as a learning resource were adopted from several sources from relevant research [19,20,21,22]. Thus the indicators selected and used are (1) Understanding of learning sources from the internet, (2) Types of referral source domains, (3) Intensity of access to referral sources, (4) Benefits of access results as references, and (5) Site categories which is widely accessed. The questionnaire grid used to access the use of the internet as a learning resource is shown in table 1. The questionnaire was distributed to students in a closed state consisting of 20 answer items using a 5-point Likert scale.
Table 1. Questionnaire Grid Using the Internet as a Learning Source with Students' Physics Learning Outcomes.

| Variable                                      | Indicator *) | Item No. | Total |
|-----------------------------------------------|--------------|----------|-------|
| Utilization of the internet as a learning resource | Understanding of learning resources from the internet. | 1A,2A,3A,4A,5A | 5    |
| Types of referral source domains              |              | 1B,2B,3B | 3    |
| Reference source access intensity             |              | 1C,2C,3C | 3    |
| Benefits of access results as a referral      |              | 1D,2D,3D,4D, 5D,6D | 6 |
| Most accessed site categories                 |              | 1E,2E,3E | 3    |
| **Total**                                     |              | **20**   | **20**|

*) adopted from [19, 20, 21, 22]

2.3.3. Testing Instrument Validity. The questionnaire is a validation non-test instrument that is used is construction validation. Validation techniques are carried out through direct consultation with IT experts or experts. Experts are asked for their opinion regarding the instruments that have been prepared. Each input given by the expert is used to improve the questionnaire and after several consultations with the expert, a 20-item questionnaire is obtained that is ready to be distributed to respondents.

2.4. Data Analysis

2.4.1. Documentation Data. After the documentation, data was collected in the form of student grades XI IPA-1 and XI IPA-2 for physics courses the correlation coefficient (r) was calculated using the Pearson Product Moment formula [23]. To facilitate the calculation process, Y expresses the variable use of the internet as a learning resource and X. expresses the data from the documentation or the physics course report card. The decision on the calculation of the correlation coefficient refers to table 2.

Table 2. Product moment correlation interpretation index.

| No | interval coefficient | Relationship Level |
|----|----------------------|--------------------|
| 1  | 0.00 - 0.199         | Very low           |
| 2  | 0.20 - 0.399         | Low                |
| 3  | 0.40 - 0.599         | Moderate           |
| 4  | 0.60 - 0.799         | Strong             |
| 5  | 0.80 - 1.000         | Very strong        |

Source: [23].

2.4.2. Hypothesis Test. The hypothesis formulated is that there is a significant correlation between the use of internet media as a learning resource and student learning outcomes in physics courses. Based on the r coefficient that has been obtained, it is followed by t-test analysis. The use of the analysis process refers to the view of Sugiyono [24] who said "to test the significance of the relationship, namely whether the relationship found applies to the entire population, it is necessary to test its significance by utilizing the t-test formula". The criteria for rejection or acceptance of the hypothesis are based on the comparison of the t-value with the t-table at the 5% significance level [24].

3. Results and Discussion

This study used two instruments, namely a questionnaire and documentation of learning outcomes or student report cards for physics courses. The questionnaire used in this study was in the form of a 5-point Likert scale with 20 statements regarding the use of the internet as a learning resource. While student-learning outcomes are in the form of student report cards for the odd semester of the 2017/2018 school year in a physics course.
3.1. Utilization of the Internet and Learning Outcomes
Based on a questionnaire with 5 indicators and 20 items that have been distributed to 70 students of Public High School 6 Banda Aceh, the data is used to analyse the correlation with learning outcomes. The analysis results and the correlation coefficient values are shown in Table 3.

Table 3. Results of Analysis of Utilization of the Internet as a Learning Source with LO.

| Indicators                                           | r<sub>xy</sub> | t-count | t-table<sub>α = 0.05</sub> | LO (Y) |
|------------------------------------------------------|---------------|---------|-----------------------------|--------|
| Understanding of learning resources from the internet (A) | 0.335         | 1.91    |                             |        |
| Types of referral source domains (B)                  | 0.043         | 0.23    | 1.699                       | 2498   |
| Reference source access intensity (C)                 | 0.290         | 1.15    |                             |        |
| Benefits of access results as a referral (D)          | 0.087         | 0.47    |                             |        |
| Most accessed site categories (E)                     | 0.051         | 0.27    |                             |        |

Based on the data in Table 3 it can be understood that several indicators of internet use as a learning resource have a correlation with student learning outcomes. By referring to Table 2 as a correlation criterion, it can be said that the indicator of understanding of learning resources on the internet has a correlation coefficient of 0.335 with the positive low category. Likewise, the intensity indicator of access to learning resources obtained a correlation coefficient of 0.290 with low criteria. Meanwhile, the indicators of the type of domain referral sources, the benefits of referral access results, and the web frequently accessed by students have a correlation coefficient of < 0.1 with very low criteria.

The relationship between the uses of the internet as a learning resource can also be predicted for its linearity using the linearity graph as shown in Figure 1. Based on this figure, it can be found that there is a slight tendency between the increase in internet use as a learning resource and the learning outcomes achieved by students with a linear gradient of 0.69 and with a coefficient of about 0.15.

![Figure 1. Linearity between internet use and learning outcomes.](image)

It can be understood that about 15% of the use of the internet as a learning resource contributes to student learning outcomes in physics courses. The highest contribution appears in the indicator of understanding of learning resource media on the internet and the frequency with which students access the internet (in Table 3). In a deeper discussion, it can be seen that the relationship between internet use and learning outcomes for two extreme indicators. Indicator A has a high contribution to learning outcomes and indicator B has a small contribution to learning outcomes in physics, both are shown in Tables 4 (a) and 4 (b).

3.2. Understanding of learning resources in Internet
The first indicator is students' understanding of learning resources that are integrated with the internet. The results of the questionnaire circulars to 31 students are shown in Table 4 (a) for the 5 items asked.
The results of the analysis show that almost all students or 30 students or 96% understand what the internet is, understand how to operate a computer for internet access, understand important learning resources, and understand technology related to physics.

**Table 4(a).** Patterns of answers to indicators of understanding of learning resources on the internet.

| No | Statements                                                                 | Sum of answers |
|----|-----------------------------------------------------------------------------|----------------|
|    |                                                                            | 5  | 4  | 3  | 2  | 1  |
| 1A | I understand what the internet is.                                          | 30 | 1  |    |    |    |
| 2A | I understand how to operate a computer or cellphone to access data from the internet as a source of learning physics. | 6  | 17 | 8  |    |    |
| 3A | I understand the various sites (web) about physics knowledge that are on the Internet. | 2  | 13 | 15 | 1  |    |
| 4A | I know that learning resources are anything that can improve learning achievement | 12 | 17 | 1  | 1  |    |
| 5A | I understand that through the internet we can find out about technological developments or applications related to physics. | 9  | 17 | 4  | 1  |    |

This indicator has the highest and positive correlation coefficient ($r = 0.34$) and it turns out that the item with the highest contribution to learning outcomes in physics courses is 1A "I understand what the Internet is". Likewise, indicator 4A "I know that learning resources are anything that can improve learning achievement", where 29 students agreed with the statement. Besides the contribution of the 5A indicator is also relatively large, where around 26 students or 84% said they agreed with the statement "I understand that through the internet we can find out about technological developments or applications related to physics subjects".

Furthermore, it can be discussed that the use of learning resources on the internet can also cause misconceptions of physics concepts, especially concepts that are abstract in nature [15]. Several previous researchers have studied such phenomena. Including the concept of wave-particle dualism [25], modern physics [26], and basic physics [3]. In addition, the concept of electricity [27]. But on the other hand, students' understanding of learning resources on the internet can also trigger student motivation in learning physics, because the internet is also a medium for learning physics. Several studies have been carried out including understanding of PhET-based virtual labs [28] and understanding of online-based media tracker [29].

3.3. Types of domains accessed in the Internet

The second type of indicator is the types of domains that are widely accessed by students as a learning resource. This indicator consists of three items, all of which are related to the types of domains that are mostly accessed by students. Students' answers to these three items are shown in Table 4 (b).

**Table 4(b).** Patterns of student answers to indicators of the types of domains searched on the internet.

| No | Statements                                                                 | Sum of answers |
|----|-----------------------------------------------------------------------------|----------------|
|    |                                                                            | 5  | 4  | 3  | 2  | 1  |
| 1B | I have used a variety of learning resources on the internet (for example: e-books, videos, pictures, tutorials) | 5  | 18 | 8  |    |    |
| 2B | I often use a browser (example: Mozilla Firefox, Internet Explore) to browse physics learning resources. | 2  | 25 | 4  |    |    |
| 3B | I understand that to get physics information we can use various kinds of sites, one of which is the word wide web (WWW) | 3  | 18 | 9  | 1  |    |

Among the three items that have been distributed to students for this indicator. It turns out that item 1B or the statement: "I have used a variety of learning resources on the internet (for example: e-books,
videos, pictures, tutorials)" had the highest contribution, namely 4 students said they strongly agreed and 18 students said they agreed or about 71% said they agreed with the statement.

The same thing is also shown by indicator 2B, where 27 students or about 87% of students agreed with the statement "I often use a browser (for example: Mozilla Firefox, Internet explorer) to browse physics learning resources". Based on the findings on these two indicators, it can be said that the largest contribution of indicators of types of domains accessed on the internet to student learning outcomes of public high school 6 Banda Aceh is in items 1B and 2B. In other words, the diversity of sites and the frequency of accessing learning resource sites on the Internet are one of the reasons for the increase in learning outcomes. This is an important that high school teachers need to pay attention to in directing students to maximize the use of the internet as a learning resource. Such findings are also supported by several previous research results, including understanding and use of online PhET media influencing student learning outcomes and motivation [30,31], understanding and use of online EduPlaza media affects the reduction of misconceptions in learning physics [32], and understanding and Online smartphone use affects interest in learning physics.

4. Conclusion

Based on the results of data analysis and also referenced to several previous research results, it can be said that the use of the internet as a source of learning will affect student learning outcomes, interest, and student motivation in learning physics. Two indicators have a high contribution to student learning outcomes, namely understanding of internet-based learning resources and the types of sites students frequently access for learning resources. Based on these two indicators, the item with the highest contribution to student learning outcomes is understand the internet in general, realizing that learning resources from the internet are important for increasing understanding of physics, the intensity of using a browser when accessing the internet, and the diversity of learning resources accessed on the internet.

References

[1] Montelpare W J and Williams A 2000 Education and Information Technologies 5 85
[2] Halim A, Mustafa, Nurulwati, Soewarno and Nanda N 2018 J. Phys. Conf. Ser. 1120 1
[3] Resta N N, Halim A, Mustafa and Huda I 2020 J. Phys. Conf. Ser. 1460 1
[4] Hussain P J F 1998 Education + Training 40 359
[5] Vallance M 1998 ELT Journal 52 1 38–42
[6] Livingstone S and Bober M 2004 E–Learning 1 395
[7] Hong K S, Ridzuan A A and Kuek M K 2003 Educational Technology & Society 6 45
[8] Walmsley A D, White D A, Eynon R and Somerfield L 2003 Eur J Dent Educ. 7 27
[9] Huang F, Teo T and Zhou M 2019 Educational Technology Research and Development 4 25
[10] Aulia and Normi 2016 Jurnal Pembelajaran Geografi 3 28
[11] Nisa, Khairun and Edi S 2015 Jurnal Pelita Pendidikan 3 020
[12] Radha R, Mahalakshmi K, Kumar D V S and Saravanakumar A R 2020 International Journal of Control and Automation 13 1088
[13] Rolando L G R, Salvador D F and Luz M R M P 2013 Teaching and Teacher Education 34 46
[14] Euis Noviyanti E, Rusdi and Ristanto R H 2019 Journal of Biology and Education 2 7
[15] Sesen B A 2010 The Turkish Online Journal of Educational Technology 9 94
[16] Martín-Blas T and Serrano-Fernández A 2009 Computers & Education 52 35
[17] Yang K Y and Hef J S 2007 Journal of Science Education and Technology 16 451
[18] Wirartha M 2006 Metodologi Penelitian Sosial Ekonomi (Yogyakarta: Andi)
[19] Martínez-Torres M R, Toral Marín S L, García F B, Vázquez S G, Oliva M A and Torres T 2008 Behaviour & Information Technology 27 495
[20] Zaharnita E, Witarsa W and Rosiyid R 2016 Jurnal Pendidikan dan Pembelajaran Untan 5 1
[21] Setiyani R 2010 Jurnal Pendidikan Ekonomi Dinamika Pendidikan 5 117
[22] Fraenkel J R, Wallen N E and Hyun H H 2012 How to Design and Evaluate Research in Education (New York: McGraw-Hill).
[23]  Mahdizadeh H, Biemans H and Mulder M 2008 Computers & Education 51 142

[24]  Sugiyono 2010 Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D (Bandung: Alfabeta)

[25]  Halim A, Meerah T S and Halim L 2009 Sains Malaysiana 38 543

[26]  Halim A, Mustafa, Nurulwati, Soewarno and Nanda N 2018 J. Phys. Conf. Ser. 1120 1

[27]  Halim A, Elmi, Wahyuni A, Ngadimin, Musdar and Balqis N N 2020 AIP Conf. Proc. 050003 1

[28]  Mizayanti, Halim A, Safitri R and Nurfadilla E 2020 J. Phys. Conf. Ser. 1460 1

[29]  Wati S, Halim A and Mustafa 2020 J. Phys. Conf. Ser. 1460 1

[30]  Nafaida R, Halim A and Rizal S 2015 J. Pendidik. Sains Indones. 3 181

[31]  Marlinda, Halim A and Maulana I 2016 J. Pendidik. Sains Indones 4 69

[32]  Halim A, Mahzum E, Zanaton and Humairah 2020 J. Phys. Conf. Ser. 1521 1

**Acknowledgment**

We express our highest appreciation to all parties who have provided support for the implementation of this research, especially the Banda Aceh Public high school 6 management team and administrative staff at the Department of Physics Education, FKIP Syiah Kuala University. STEM Research Center Universitas Syiah Kuala who has provided the fees for the publication of this article, we would like to thank you.