Cypriot Journal of Educational Sciences

Volume 20, Issue 1, (2025) 33-55

www.cjes.eu

Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions

Maison [a1], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0002-4020-3051
Hidayat M. [b], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0002-5550-7568
Dwi Agus Kurniawan [c], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0002-0130-2436
Rizka Octavia Sandra [d], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0001-9251-5770
Fauziah Yolviansyah [e], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0002-6338-7201
Muhammad Iqbal [f], Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia, https://orcid.org/0000-0001-5033-5245

Suggested Citation:
Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Received from July 10, 2024; revised from November 12, 2024; accepted from January 20, 2025
Selection and peer review under the responsibility of Prof. Dr. Hafize Keser, Ankara University, Turkey (retired)

iThenticate Similarity Rate: 15%

Abstract

This study investigated the impact of student perceptions on the effectiveness of web-based assessment technology in identifying misconceptions. Addressing a gap in research on digital assessment tools in physics education, this study focused on hydrostatic pressure concepts. The research employs the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation) to design and implement the web-based assessment. The study sample consisted of physics students, and the results highlight the potential of web-based assessments to enhance learning by identifying and addressing misconceptions. Findings reveal that students respond positively to the use of this technology, which supports the assessment of their conceptual understanding. These findings emphasize the importance of integrating electronic assessment tools into physics education to improve conceptual understanding and learning outcomes.

Keywords: Development; misconception; technology; web-based assessment

* ADDRESS FOR CORRESPONDENCE: Maison, Jambi University, Jl. Jambi - Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia. *E-mail address*: maison@unja.ac.id

1. INTRODUCTION

The developments that occur in the world today cannot be separated from the existence of technology that coexists in daily human life. Technology will facilitate all human activities in accessing information (Fitriyana et al., 2020; Francis et al., 2020; Budiningsih et al., 2019; Popovic et al., 2018). Many technologies have been developed to be able to access all information, such as smartphones, laptops, and PC (Zhai et al., 2019; Alvarez-Cedillo et al., 2019; Farozin, 2019; Kusuma, 2021). The existence of technology is a transformation in developing a more professional system (Racz et al., 2017; Farr, 2017; Yoon et al., 2019; Lusigi, 2019; Amin et al., 2016). Emerging technologies have the potential to support Education reform and to improve practice in teaching and assessment (Madsen, 2020; Tsivitanidou et al., 2021; Subramaniam, 2021). This is due to technology that can be integrated into the realm of Education (Rosana et al., 2017; Raja and Nagasubramani, 2018; Teo, 2019; Astuti, 2021). One of the technologies that can be used in the realm of education is Web-Based Assessment.

Web-based assessment is part of the E-Assessment. E-assessment is one of the information technologies used in conducting electronic assessments (Elmabaredy et al., 2020; Ogange et al., 2018; Alshehri et al., 2019; Yılmaz ince et al., 2020). Web-based Assessment refers to the process of assessing student learning outcomes by utilizing technology (Salam & Farooq, 2020; Wu et al., 2021; Yuan and Kim, 2018; Appiah and van Tonder, 2018; Astalini et al., 2019). With the Web-Based Assessment, it makes it easier for teachers to make assessments (Korkmaz and Toraman, 2020; Tawafak et al., 2018; Chen & Liu 2023). This designed system can have a positive impact on the evaluation and assessment system in education (Zinn et al., 2021; Arefian & Esfandiari, 2024; Liu, 2024). The use of Web-Based Assessment makes teacher assessment activities more structured, systematic, and effective (Henriksen et al., 2018; Keskin and Daya, 2020). Web-based Assessment not only provides a medium to convey personalized information but also makes it easier to display the results of the assessment anytime and anywhere (Fathali and Okada, 2018; Essel et al., 2019). The use of web-based assessment is because if you use paper-based tests in testing and assessing students, it will require accuracy and a long time to correct student test results (data analysis) (Purwanto et al., 2018). One of the activities that teachers can do by using Web-Based Assessment is to assess students' misconceptions.

Web-based assessment technology can be used in the assessment of students' misconceptions. Understanding student concepts needs to be identified by the teacher to be able to prevent students from experiencing misconceptions in the future (Mohyuddin and Khalil, 2016; Sahin, 2019). The identification of these misconceptions will certainly be able to improve the quality of students' understanding of concepts (Sirakaya and Alsancak Sirakaya, 2018; Kanim and Cid, 2020). This is done by the teacher in the learning process where one of the lessons that needs to be done to identify misconceptions is physics learning (Curto Prieto et al., 2019). Web-based assessment is one solution in identifying students' misconceptions in learning physics (Hochberg et al., 2018; Gusukuma et al., 2018). The use of Web-Based Assessment certainly eases the teacher's work in identifying the assessment results, especially misconceptions (Kesorn et al., 2020; Tor and Gordon, 2020). The use of Web-Based Assessment in assessing the level of students' conceptual understanding is the right choice (Hudha et al., 2018; Serevina et al., 2018). Because Web-Based Assessment provides many benefits in conducting an assessment (Nikou and Economides, 2018; Reyna and Meier, 2018). The benefits of Web-Based Assessment are avoiding human errors and wasting paper, and the results obtained will come out automatically and in real time (Swida et al., 2018; Soeharto et al., 2019; Feldman et al., 2018). It can be asserted that the use of Web-Based Assessment in the process of assessing students' conceptual understanding levels will greatly assist teachers in the learning process.

Developing a web-based assessment technology requires students' perceptions in its development. Perception is the experience of a view obtained by inferring information and interpreting it (Yunita and Maisarah, 2020). Physics lessons are often considered difficult by students due to several factors, one of which is that the material presented is less understandable, and the media used is less supportive of the learning process (Sorge et al., 2019;

Thompson et al., 2018). The technology used in the field of education functions as a medium of information for teachers in presenting information and as a learning resource for students (Astashova et al., 2017; Zughoul et al., 2018; Muhametjanova and Akmatbekova, 2019).

The development of electronic assessment (Web-Based Assessment) has been widely used in various studies. As for the research carried out, Lin et al. (2016) conducted a two-tier web-based test that combines the traditional advantages of written tests and interviews in assessing student answers and student reasons. Further research conducted by Üce and Ceyhan (2019) conducts an assessment of learning on abstract material to eliminate conceptual misunderstandings that occur in students. Continue research conducted by Qian et al. (2020) exploring students' conceptual understanding of the positive relationship with students' self-confidence. Phanphech et al. (2019) researched using pedagogical strategies to identify the level of understanding of students' concepts and reduce the misunderstanding of students' concepts in learning physics on electrical circuit material.

In addition to Indonesia, misconceptions in physics are widely studied in various countries. Research conducted by Taslider (2016) explained that students in Turkey are taught about the concept of photoelectric, but because the concept is not experienced in everyday life, it can lead to misconceptions. Research conducted by Kamcharean and Wattanakasiwich (2014) shows that the identification of student misconceptions in Thailand and Laos uses a two-tier diagnostic test on thermodynamic material where many students experience misconceptions. The research carried out by Motlhabane (2016) shows that students in South Africa experience many misconceptions about kinematics material because of the difficulty in determining the distance and speed of objects.

From previous research that has discussed misconceptions about the use of assessment tools, it can be seen that there are still many researchers who use conventional methods, even though technology has developed rapidly, so it is very necessary to evaluate the way teachers identify the occurrence of misconceptions and use of technology in the assessment process. Identifying the occurrence of misconceptions in students at this time has been widely done, namely by using the development of a four-tier instrument, but according to Widodo et al., (2020); and Setiawan and Jaelani (2022) this method is less than optimal, because the source of knowledge from the student is unknown, so it is necessary to ask questions in the form of level 5 or Five-Tier questions. Five-tier can be developed using Web-Based Assessment in operation so that teachers can be more optimal in identifying and assessing the level of understanding of students' concepts.

The results of this study can be used as a consideration for teachers in schools to understand how the influence of student responses to the use of Web-Based Assessment in students' misconception testing on hydrostatic pressure material. The results of the development of this product are to be able to give the implication that students' perceptions greatly affect the results of the level of understanding of the concepts possessed by students in the hydrostatic pressure material. By knowing that students' perceptions affect the level of conceptual understanding that occurs in students, the developed Web-Based Assessment can be used by teachers in schools as a reference in planning the next learning process and helping students understand the concept of good and correct hydrostatic pressure.

Web-based assessment not only serves to identify and assess misconceptions but also plays a crucial role in reducing their occurrence among students (McKenzie & Ziemann, 2020; Thohir et al., 2021). Reducing misconceptions can be seen as a means of improving learning outcomes (Asuman et al., 2018; Cai et al., 2021). Misconceptions, if left unaddressed, can significantly hinder the quality of learning. Web-based assessments help students grasp abstract concepts more effectively (Enders et al., 2021; Rahman et al., 2021). The material presented through these assessments is designed to be simple and easy to understand, facilitating better comprehension (Azura et al., 2021; Kaps et al., 2021). Furthermore, the convenience of web-based assessments greatly supports students throughout the learning process (Aksnes & Sivertsen, 2019; Afrilia et al., 2021). With this, it is necessary to develop technology in the form of Web-Based Assessment to identify, assess, and reduce the occurrence of misconceptions experienced by students at school.

1.1. Purpose of study

Based on the description above, the purpose of this research is to produce a Web-Based Assessment for assessing the level of students' conceptual understanding and assess if there is an influence of student perceptions on the results of the web-based assessment of hydrostatic pressure material misconceptions.

2. METHOD AND MATERIALS

This study employs a mixed-methods approach, which is part of explanatory research. According to Irvine et al. (2020), explanatory research design initially utilizes quantitative methods, followed by the application of qualitative methods in the second stage. In this study, data were processed using descriptive statistics. Harrison et al. (2020) noted that descriptive statistics are recommended as an initial step before conducting more complex data analyses, as they facilitate the organization and identification of data efficiently.

The research design used in this study is development research, focusing on creating a web-based assessment. The development model employed is the Research and Development (R&D) design, utilizing the ADDIE model. The ADDIE model is a widely recognized framework for developing educational products and outlines the stages of development systematically (Woo, 2018; Alnajdi, 2018; Yao, 2021). It is an approach that enhances the effectiveness and efficiency of assessment and teaching design processes (Ghani, 2018; Alodwan & Almosa, 2018; Babalola & Omolafe, 2022). The ADDIE model consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Budoya et al., 2019; Yuanngoen et al., 2019; Tu et al., 2021).

In this web-based assessment development research, the product reached only the implementation stage. This was because the objectives of the research were achieved by the time the implementation stage was completed. The development process began with a needs analysis, followed by a literature review and interviews. In the design phase, the researcher planned the development of the product in alignment with its specific needs. During the development stage, the designed product was tested and validated by media experts to assess its feasibility. Once the product was deemed feasible, it was considered ready for use.

2.1. Participants

The population for this study consisted of students from SMAN 8 Jambi City, with a purposive sampling technique employed for sample selection. Purposive sampling is a technique in which samples are selected based on criteria defined by the researcher. The criteria for selecting the sample were that the students had studied the material on hydrostatic pressure, resulting in a total sample of 22 students.

2.2. Data collection tool

In this study, several instruments were used to develop the web-based assessment, including a media expert validation instrument, a student perception instrument, and a misconception questionnaire on hydrostatic pressure. To evaluate the feasibility of the product, a media expert validation questionnaire was used. The grid for the media expert validation questionnaire can be seen in Table 1.

Table 1

Grid for the media expert validation questionnaire

Variable	Indicator		Items
Functionality	1.	Suitability	3, 7, 8, 9
	2.	Accuracy	4, 5, 6
	3.	Fulfillment	1, 2
Reliability	1.	Maturity	15, 16
	2.	Fault Tolerance	10, 11, 12

	3.	recovery1an	13, 14
Usability	1.	Ability to understand	18, 19, 20, 23
	2.	Ability to learn	26, 27
	3.	Operation	17, 21, 22, 24, 25
Efficiency	1.	Time	28, 29
	2.	Real-Time	31, 32, 34
	3.	Resource	30, 33, 35

After the media expert validation test was carried out, the next step was to take a question of misconceptions on the hydrostatic pressure material with a total of 5 questions. Where is this question adopted from Setiawan & Yosepha's (2020) research. The lattice of the five-tier instrument on the hydrostatic pressure material can be seen in Table 2.

Table 2

The instrument lattice for five-tier hydrostatic pressure material

Theory	*Question Indicator*	*Question Form*	*Question Number*
Hydrostatic Pressure	An illustration of a container filled with liquid with a certain volume is presented so that the hydrostatic pressure at the bottom of the container is P. Students can understand the concept of hydrostatic pressure at the bottom of the container if a liquid is replaced with another liquid.	Multiple choice	1
Hydrostatic Pressure	Presented images of vessels associated with variations in the shape and size of the cross-section filled with liquid. Students can understand the concept of hydrostatic pressure at several points in a vessel.	Multiple choice	2
Hydrostatic Pressure	Pictured are three open containers filled with liquids of different shapes and volumes. Students understand the concept of the pressure of a liquid in a vessel.	Multiple choice	3
Hydrostatic Pressure	Pictures of several vessels with different shapes and sizes are presented, which are filled with similar liquids. Students can understand the concept of pressure from a liquid on the surface of a vessel	Multiple choice Multiple choice	4 5

The results of students' answers to five-tier test format questions on hydrostatic pressure material will later be collected into two categories, namely students who experience misconceptions and students who do not experience misconceptions. After this misconception test is carried out, then the students' perception of the misconception test is carried out, where the student perception questionnaire is adopted from the research. The grid of student perception questionnaires can be seen in Table 3.

Table 3

Grid of perception instruments for web-based assessment

Variable	*Items*
Theory	1, 2, 3, 4, 6, 7, 8, 9
Language	5, 10, 11, 12, 18
Appearance	13, 14, 19, 25, 26, 27, 28

Benefit	20, 21 22, 23, 24

The data contained in this study are quantitative data and qualitative data, and both of these data will be analyzed. Quantitative data in this study were obtained from the results of media expert validation tests, product trial results, and results from students' perceptions of the use of web-based assessment electronic assessments, which were then analyzed using descriptive and inferential statistics. Descriptive statistics are statistics used to determine the distribution of data by explaining the mean, media, percentage, maximum, and minimum values Tanti et al., (2021). Descriptive statistics in this study will explain the results of the validation test, the results of product trials, and the results of student perceptions. Inferential statistics is a method used to determine the population based on a sample to be able to draw general or specific conclusions from the data that has been processed.

Inferential statistics begins with testing assumptions before testing the hypothesis. The assumption test carried out in this study is the normality and linearity test. Where the requirements for normality and linearity tests can be continued to test the hypothesis is seen from the significance value of the two tests must be > 0,05. After the assumption test is met, a hypothesis test is carried out where the hypothesis test used is a regression test. The regression test conducted in this study was used to see how the influence of students' perceptions on the use of web-based assessment to reduce five-tier-based misconceptions. The requirement for the acceptance of the hypothesis that perception affects the use of web-based assessment to reduce misconceptions is that the significance value of the tests carried out is more than 0.05. The stages of data collection in this study can be seen in Figure 1.

Figure 1

Data collection procedure

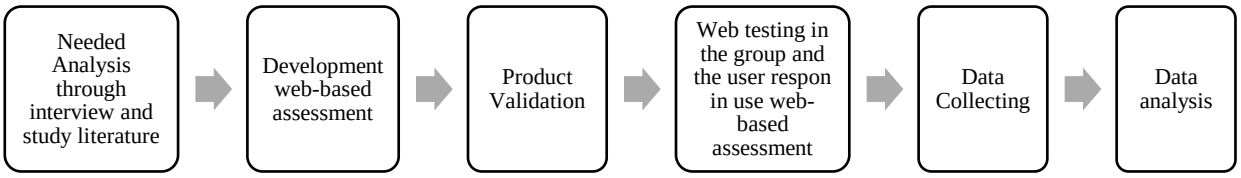

Table 4

Interval of media expert validation category

Assessment Aspect	*Range*	*Category*
Functionality	< 25%	Very Inappropriate
Reliability	25% - 50%	Not feasible
Usability	50% - 75%	Worthy
Efficiency	75% - 100%	Very Worthy

In conducting a media expert validation test to see the feasibility of the web-based assessment to be used, the data obtained will be converted into a Likert scale (Table 4). This Likert scale consists of 4 scales where the higher the score, the better the feasibility of the web-based assessment to be developed. Meanwhile, if the score is lower, the web-based assessment is not good. From the validation interval, the media expert obtained 4 points in the very good category, 3 in the good category, 2 in the poor category, and 1 in the very bad category. To find out the value of the category of student perception ratings, it needs to be categorized using intervals, which can be seen in Table 5.

Table 5

Intervals of perception rating categories

Range	*Category*

30.0 - 52.5	Very Bad
52.6 - 75.0	Bad
75.1 - 97.5	good
97.6 - 120.0	Very Good

To test the level of student perception, it is necessary to make intervals in grouping the categories of each student's perception. If the students' perception range is in the range of 30.0–2.5, then it can be categorized as very bad. If the student's perception range is in the range of 52.6–75.0, the student's perception can be categorized as bad. If the student's perception range is in the range of 75.1–97.5, the student's perception can be categorized as good. If the student's perception range is in the range of 97.6–120.0, the student's perception can be categorized as very good. In addition to knowing the intervals from students' perceptions, it is also necessary to take intervals from the level of understanding of students' concepts, using the intervals that can be seen in Table 6.

Table 6

Interval of students' concept understanding level

Range	*Category*
< 20%	Very low
20% - 39%	Low
40% - 59%	Currently
60% - 79%	Tall
80% - 100%	Very high

To see the level of understanding of students' concepts, intervals are used to categorize them. If the student is in the range <20%, the student is categorized as having very low misconceptions. If the student is in the range of 20%-39%, the student is categorized as having low misconceptions. If the student is in the range of 40%-59%, the student is categorized as having high misconceptions. If the student is in the range of 60%-79%, the student is categorized as having very high misconceptions. If the student is in the 80%-100% range, the student is categorized as having very high misconceptions.

2.3. Data analysis

The data that has been obtained from the results of interviews and literature studies are then analyzed using the Miles & Huberman model analysis technique. Miles & Huberman's analysis was carried out in several stages, namely collecting data, reducing data, displaying data, concluding data, and verifying data (Miles and Huberman, 1994). The qualitative research that has been done by Miles and Huberman (1994) can analyze the data based on different types and code names so that it will be easier to carry out analysis. After the data has been collected, the next step is the data is compiled based on the code that has been prepared and determined in the form of a color code that is done manually. Researchers classify these colors based on aspects that are by the observation instrument on the student's conceptual understanding level test. After the participants had been grouped according to the color code, the next researcher analyzed the results of the color code. From the analysis of Miles and Huberman, the mathematical value of the anchoring and handover process.

3. RESULTS

This development research was conducted with a needs analysis. This needs analysis is used to meet the needs of teachers and students. A needs analysis was carried out using interview methods and literature studies. The results of the needs analysis obtained are a reference for researchers in developing electronic assessments in the form of web-based assessments to assist teachers in the process of assessing student misconceptions. The things that resulted from interviews and literature studies were to get information from teachers about how teachers identify misconceptions that occur in students in hydrostatic pressure material and how teachers process data

from the results of the students' misconception test. This is in line with research conducted by Djudin (2021). In the research conducted, the researcher tested students' misconceptions by using a paper-based test, which is one of the factors that causes the low understanding of students' concepts obtained by researchers in their research. To see the feasibility of this electronic assessment in the form of a web-based assessment, a media expert validation test is needed first by the validator. The existence of this validation is to determine the feasibility of a web-based assessment that will be used in identifying the occurrence of misconceptions experienced by students. The results of the descriptive analysis of media expert validation can be seen in Table 7.

Table 7

Media expert validation test results

No.	Assessment Aspect	Validator 1			Validator 2		
		mean	Percentage	Category	mean	Percentage	Category
1.	Functionality	3.70	74%	Good	3.70	75%	Good
2.	Reliability	3.60	72%	Good	3.80	71%	Good
3.	Usability	3.65	71%	Good	3.70	73%	Good
4.	Efficiency	3.85	73%	Good	3.65	72%	Good
	Overall average	3.70	72.5%	Good	3.71	72.7%	Good

In the media expert validation test, an assessment of the assessment aspects in the form of buttons for functionality, reliability, usability, and efficiency was carried out by the validator to see the results of the feasibility test for using web-based assessment in identifying students' misconceptions. As for the results obtained in this validation test, namely the first aspect of the assessment of functionality, the results obtained from the validator (1) mean 3.70 with a percentage of 74% categorized as good, and the validator (2) mean 3.70 with a percentage of 75% categorized as good. Second, in the aspect of reliability assessment, the results obtained from validator (2) mean 3.60 with a percentage of 72% categorized as good, and validator (2) means 3.80 with a percentage of 71% categorized as good. Third, in the aspect of usability assessment, the results obtained from the validator (1) mean 3.65 with a percentage of 71%, validator (2) means 3.70 with a percentage of 73% categorized as good. Fourth, in the aspect of efficiency assessment, the results obtained by validator (1) are 3.85 with a percentage of 73% categorized as good, and validator (2) means 3.65 with a percentage of 72% categorized as good. From the above results, the overall average of the results of the media expert validation test, validator (1) means 3.70 with a percentage of 72.5% categorized as good, and validator (2) means 3.71 with a percentage of 72.7 categorized as good. With the results that have been obtained, it can be concluded that the development of this web-based assessment is categorized as good, which means that this web-based assessment is feasible to test students' misconceptions. After the web-based assessment is categorized as good, this website can be directly used to test the level of understanding of students' concepts, Student misconception results can be seen in Table 8.

Table 8

Percentage of students' concept understanding level

Question Number	Understanding Presentation		Description
	Misconception	No Misconception	Misconception
1	18%	82%	Low
2	5%	95%	Low
3	15%	85%	Low
4	20%	80%	Low
5	17%	83%	Low

The results of the students' conceptual understanding level test were obtained by giving 5 questions about misconceptions to students. This question is given to determine the level of understanding of students' concepts on hydrostatic pressure material. The questions given are in the form of multiple-choice questions. In question number 1, it was found that 18% of students experienced misconceptions and 82% of students did not experience

misconceptions. This means that in question number 1, the level of understanding of concepts that students have is good because the misconceptions that occur are categorized very low. Then, in question number 2, it was found that 5% of students had misconceptions, and 95% of students did not experience misconceptions. This shows that in question number 2, the level of understanding of concepts that students have is good and is included in the very low category of misconceptions. Next, question number 3, it was found that 15% of students had misconceptions and 85% did not have misconceptions, this also shows that in question number 3 the level of understanding of concepts that students have is also good and is included in the very low category of experiencing misconceptions. Further, in question number 4, it was found that 20% of students had misconceptions and 80% of students did not have misconceptions. this shows that in question number 4, the level of understanding of concepts that students have is good, so it can be categorized as low. Finally, in question number 5, it was found that 17% of students experienced misconceptions and 83% of students did not experience misconceptions. This shows that in question number 5, the level of understanding of the concept that students have is good, so it is categorized as very low in experiencing misconceptions.

This also shows that in question number 3, the level of understanding of the concept that students have is also good and is included in the very low category of experiencing misconceptions. Further, on question number 4, it was found that 20% of students had misconceptions and 80% of students did not have misconceptions. This shows that in question number 4, the level of understanding of concepts that students have is good, so it can be categorized as low. Finally, in question number 5, it was found that 17% of students experienced misconceptions and 83% of students did not experience misconceptions. This shows that in question number 5, the level of understanding of the concept that students have is good, so it is categorized as very low in experiencing misconceptions. This also shows that in question number 3, the level of understanding of the concept that students have is also good and is included in the very low category of experiencing misconceptions. Further, on question number 4, it was found that 20% of students had misconceptions and 80% of students did not have misconceptions. This shows that in question number 4, the level of understanding of concepts that students have is good, so it can be categorized as low. Finally, in question number 5, it was found that 17% of students experienced misconceptions and 83% of students did not experience misconceptions. This shows that in question number 5, the level of understanding of the concept that students have is good, so it is categorized as very low in experiencing misconceptions. Further, on question number 4, it was found that 20% of students had misconceptions and 80% of students did not have misconceptions. This shows that in question number 4, the level of understanding of concepts that students have is good, so it can be categorized as low. Finally, in question number 5, it was found that 17% of students experienced misconceptions and 83% of students did not experience misconceptions. This shows that in question number 5, the level of understanding of the concept that students have is good, so it is categorized as very low in experiencing misconceptions. Further on question number 4, it was found that 20% of students had misconceptions and 80% of students did not have misconceptions, This shows that in question number 4, the level of understanding of concepts that students have is good, so it can be categorized as low. Finally, in question number 5, it was found that 17% of students experienced misconceptions and 83% of students did not experience misconceptions. This shows that in question number 5, the level of understanding of the concept that students have is good, so it is categorized as very low in experiencing misconceptions.

Question number 3 has a percentage of misconceptions of 15% and no misconceptions of 85%, which is included in a small percentage of misconceptions. Furthermore, for question number 4, the percentage of misconceptions is 20%, and there is no misconception of 80%, including a small percentage of misconceptions. Continue on question number 5 where the percentage for misconceptions is 17% and not misconceptions 83% is included in a small number of misconceptions. With the results of the students' conceptual understanding level test, it can be said that it is very unlikely that there will be misconceptions in students about the hydrostatic pressure material. Getting the results of the level of student understanding is inseparable from the knowledge

that students have. The presence of a small number of students is said to be a misconception that can be caused by the source of knowledge that students get (Dirman et al., 2022). The sources of student knowledge are themselves, friends, textbooks, learning media used, the internet, teachers, and others.

Figure 2

Misconception test results using web-based assessment

Nis	Kategori					Action
	Soal 1	Soal 2	Soal 3	Soal 4	Soal 5	
100	Kurang Pengetahuan	Positif Palsu	Negatif Palsu	Negatif Palsu	Positif Palsu	delete
101	Miskonsepsi	Negatif Palsu	Miskonsepsi	Positif Palsu	Kurang Pengetahuan	delete
102	Positif Palsu	Kurang Pengetahuan	Negatif Palsu	Negatif Palsu	Miskonsepsi	delete
103	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	delete
104	Miskonsepsi	Positif Palsu	Miskonsepsi	Kurang Pengetahuan	Positif Palsu	delete
105	Kurang Pengetahuan	Kurang Pengetahuan	Positif Palsu	Miskonsepsi	Kurang Pengetahuan	delete
106	Kurang Pengetahuan	Positif Palsu	Negatif Palsu	Negatif Palsu	Positif Palsu	delete
107	Kurang Pengetahuan	Positif Palsu	Negatif Palsu	Negatif Palsu	Positif Palsu	delete
108	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	delete
109	Miskonsepsi	Kurang Pengetahuan	Paham Konsep	Negatif Palsu	Kurang Pengetahuan	delete
110	Miskonsepsi	Negatif Palsu	Miskonsepsi	Positif Palsu	Kurang Pengetahuan	delete
111	Positif Palsu	Miskonsepsi	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	delete
112	Negatif Palsu	Positif Palsu	Kurang Pengetahuan	Miskonsepsi	Paham Konsep	delete
113	Negatif Palsu	Positif Palsu	Kurang Pengetahuan	Miskonsepsi	Paham Konsep	delete
114	Kurang Pengetahuan	Negatif Palsu	Positif Palsu	Kurang Pengetahuan	Miskonsepsi	delete
115	Kurang Pengetahuan	Kurang Pengetahuan	Kurang Pengetahuan	Positif Palsu	Miskonsepsi	delete
116	Paham Konsep	Kurang Pengetahuan	Miskonsepsi	Kurang Pengetahuan	Negatif Palsu	delete
117	Negatif Palsu	Positif Palsu	Kurang Pengetahuan	Miskonsepsi	Paham Konsep	delete
118	Positif Palsu	Negatif Palsu	Kurang Pengetahuan	Miskonsepsi	Kurang Pengetahuan	delete
119	Kurang Pengetahuan	Positif Palsu	Negatif Palsu	Negatif Palsu	Positif Palsu	delete

It can be seen that the results of the answers of students who have filled in the questions in the form of five-tier which amounted to 5 items in the form of multiple choice in the test using web-based assessment (figure 2). The results obtained by students are misconceptions, lack of knowledge, false positives, and false negatives. These results are obtained from student test results contained in the web-based assessment page.

After testing the misconceptions using a web-based assessment, the data was obtained from the student test results. The next step is to do a descriptive analysis of the effect of the results of misconceptions and student perceptions. The results of this descriptive analysis obtained from the questionnaire of misconceptions in hydrostatic pressure material can be seen in Table 9.

Table 9

Descriptive statistics of student perception

interval	*Category*	*Description*	*mean*	*Me*	*Mo*	*Max*	*Min*
28-49	STB	Very Not Good					
50-70	TB	Not good					
71-91	B	Good	82,470	80.00	80	110	60
92-112	SB	Very good					

The results were obtained from the statistics of student perceptions. In students' perceptions, the mean value is 82,470, the mode value is 80.00, the minimum value is 60.00 and the maximum is 110.00. From the results obtained, it can be said that students' perceptions of the student's perception test are categorized as good. Furthermore, the results of the Normality Test from the misconception test on the hydrostatic pressure material and students' perceptions can be seen in Table 10.

Table 10

Test of normality

	Kolmogorov-Smirnova		
	Statistics	df	Sig.
Perception	.151	40	.078
Misconception	.182	40	.200

Based on table 10. The results were obtained from the normality test of misconceptions and student perceptions. The results obtained are .078 and .200, which shows that the data is normally distributed, this is because the requirements for the data to be normally distributed are that the significance value must be 0.05. Furthermore, the linearity value of the misconception test and students' perceptions of the hydrostatic pressure material can be seen in table 11.

Table 11

Test of linearity

			Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
VAR00010* VAR00012	between Group	(Combined)	4010,517	5	802.103	15.861	.000
		linearity	185.315	1	185.315	3,664	.068
		Deviation from Linearity	3825,202	4	956,300	18,910	.000
	Within Groups		1719,458	34	50,572		
	Total		5729,975	39			

Based on table 11. The results of the linearity test can be seen that the significance value (Sig.) in the Linearity row is .068, if the significance value for linearity is 0.05 then it can be interpreted that between the independent variable and the dependent variable, there is a linear relationship. (Setiawan and Yosepha 2020). Furthermore, to find out the results of the variant of the regression test of students' perceptions of the use of web-based assessment students' misconceptions can be seen in table 12.

Table 12

Results of Student Perception Regression Test Variants on the Use of Web-based Assessment of Student misconceptions

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2768.102	1	2786,102	38.056	.000b
	Residual	2628,873	38	76,393		
	Total	5927,975	39			

Based on Table 12. It can be seen that the variance of the student perception regression test on the use of web-based assessment of student misconceptions. The student's significance value is 0.000 which shows that there is an influence of student perceptions on the results of students' misconceptions in the use of web-based assessment. These results are the basis for decision-making where the significance value is <0.05. Furthermore, to find out the results of the regression coefficient test of students' perceptions of the misconception test using a web-based assessment can be seen in table 13.

Table 13

Results of student perception coefficient regression test against the misconception test in the use of web-based assessment

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	94,416	2.120		37,897	.000
	Misconception	4.445	.700	-.707	-6.169	.000

Simple linear regression has the general equation Y = a + Bx. Based on table 10 by looking at column B of non-standard coefficients, students get a value of a (number of non-standard coefficient constants) of 94,416 and a value of b (number of regression coefficients) of 4.445. Because the value of the regression coefficient is not negative, the student's perception has a positive effect on the student's misconception test (Y) in the use of web-based assessment. So, the regression equation becomes Y = 94,416 + 4.445X. The significance value is 0.000 which means Ha is accepted (there is a perception effect on the student's misconception test in the use of web-based assessment) with the basis for making decisions, the significance value is <0.05 (Rahmatih et al., 2020; Wirantasa, 2017). To find out the magnitude of the effect of student perceptions on the misconception test on the use of web-based assessment, it can be seen in table 14.

Table 14

Result of Regression Test of Student Perception Determinants of Misconception Test using web-based assessment

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.707a	.500	.487	8.67979	.700	38.056	1	38	.000

The results of the regression test showed that the results of the regression test were the determinants of students' perceptions of students' misconceptions using a web-based assessment. Based on table 14. The value of R squares is 0.500 which shows that the effect of students' perceptions on the misconception test using a web-based assessment is 50%.

4. DISCUSSION

Based on the results obtained from quantitative data interviews and literature studies that have been carried out, it can be concluded that in the use of web-based assessment students have a positive response to the application of misconception assessment. Coupled with the perception of students, the more it gives a stronger reason for the development of this web-based assessment (Mofield and Parker Peters, 2018; Akmam et al., 2018; Qian et al., 2020). The existence of students' perceptions of this web-based assessment is to provide convenience in working on questions. The questions and materials contained in the web-based assessment are designed simply

so that students can easily understand the material provided. There is a student's perception in conducting a misconception test to see the results of the misconception test conducted by students (King 2019). This proves that there is a relationship between student perceptions and misconceptions, where if the student's perception is high then the misconception that occurs in students is low, on the contrary, if the student's perception is low then the misconception that occurs in students is high.

Electronic assessments such as web-based assessments are expected to provide convenience and new experiences for students in conducting the misconception test. The novelty of this study aims to determine the effect of students' perceptions on the results of students' misconceptions by using a web-based assessment. The misconception test assessment is carried out through a website that has simple features so that it can be easily accessed by users. Electronic assessment has several advantages so it is more optimal to use. Therefore, electronic assessments such as web-based assessments are needed to test students' misconceptions at school.

The development of a web-based assessment on hydrostatic pressure material is a good alternative for teachers in solving problems that often occur in the learning process. This web-based assessment is an electronic assessment technique that has the right performance to be able to test students' level of conceptual understanding. In developing a web-based assessment, this is supported by the results of interviews that have been conducted with teachers at schools, then from the results of students' perceptions of using technology in the form of web-based assessments, and the results of needs analysis, this done to find out the needs needed in the process of identifying misconceptions. Students provide advice and input to teachers in solving problems that exist in schools. Before using this web-based assessment, a media expert validation test was conducted to determine the feasibility of this web-based assessment in testing, assessing, and reducing misconceptions experienced by students at school (Ahmadi et al., 2018; Nurdyansyah, 2019). After knowing the feasibility of developing a web-based assessment that has been carried out by 2 validators, it is known that the developed web-based assessment can be categorized as suitable for use by teachers in testing, assessing, and reducing misconceptions that occur in students at school in terms of hydrostatic pressure.

Descriptive tests were conducted on three data sources, namely expert validation, student perceptions, and misconceptions. Media expert validation showed that the two validators stated that the product was valid with a level of validity based on the mean of 3.74 which the product was included in the good category. Furthermore, a student perception test was conducted where from the results of the descriptive analysis, the mean result was 82.47, where the value was in the good category, which means students have a good perception of this misconception web-based assessment. Furthermore, the results of the descriptive analysis of students' misconceptions of Pascal's legal material obtained the percentage value obtained at the level of understanding of students' concepts in question number 1 by 18% of students experiencing misconceptions and 82% not experiencing misconceptions. This shows that a small number of students have misconceptions. Then in question 2, 5% are misconceptions and 95% are not misconceptions.

Furthermore, in question number 3, 15% are misconceptions and 85% are not misconceptions. Continue on question number 4 with 20% misconceptions and 80% no misconceptions. Finally, in question number 5, 17% have misconceptions and 83% do not have misconceptions. This shows that the results of the misconception test conducted using a web-based assessment can be categorized as very small. The misconception test in the fou-tier format is often more attractive to students because it is easy to apply but cannot explore student responses in depth regarding the causes of misconceptions that occur with students. So, therefore (Putra & Hamidah 2020). Level five questions are open-ended questions (Salsabila and Ermawati 2020). This open-ended question is used to find out where the source of student knowledge comes from Qonita and Ermawati (2020). This source can be from yourself, friends, Teachers, how to teach books, teaching materials used, parents, and others. (Setiawan and Jaelani, 2022). So, the occurrence of misconceptions experienced by students cannot be separated from the source or cause of the student's knowledge.

To find out whether there is a student's perception variable that affects the misconception test variable using a web-based assessment, a regression test is carried out. But before that, it is necessary to test the prerequisites, namely the normality test and linearity test. The data in this study is normally distributed with a significant value > 0.05, which has been tested with the normality test, and the data has a significant linearity relationship between the perception variable and the student's misconception test using web-based assessment with decision-making is a significant value > 0.05 through the linearity test. The fulfillment of these two conditions is a must in hypothesis testing. If these two prerequisites are met, a regression test can be performed. A regression test was conducted to see the effect of student perception variables on misconception test variables in the use of web-based assessment electronic assessments. The regression test that has been carried out, shows that there is a significant relationship between students' perceptions of the misconception test with the same significance value of 0.000. This shows that the student's perception variable will affect the student's misconception variable in the use of web-based assessment of the level of understanding of students' concept understanding. With this, it shows that if the misconceptions experienced by students are high, then the perceptions that students have are low. On the other hand, if the students' perceptions are high, the misconceptions experienced by students are low (Basri 2018).

Students' perceptions of the application of web-based assessment of misconceptions test in physics learning can show the results of how web-based assessment is used in the assessment process. Web-based assessment of students' misconception test results can increase students' interest in learning. Where this can help teachers in reducing the occurrence of misconceptions experienced by students. The use of web-based assessment can train students' independence and creativity online to support the learning process to produce positive student attitudes in learning. In addition, research on student perceptions of the assessment of students' misconception test results can also make the assessment process more complex and systematic. This is to the research conducted by Van der Kleij and Lipnevich (2021) which shows that incorporating technology in students' pedagogical knowledge will help in developing students' perceptions. Student perceptions can also be linked to the development of student learning outcomes for the better with positive perceptions (van Dinther et al., 2014). With the integration of technology, it will improve the experience in student education.

There are some gaps between previous research on misconceptions about hydrostatic pressure material, where identification of students' misconceptions about hydrostatic pressure material is carried out to be able to see how the effect of gender on concept misunderstanding (Saputra et al., 2019). Develop a four-tier format instrument to identify students' conceptions in the hydrostatic field using HCCT which is one of the diagnostic instruments (Purwanto et al., 2018). A student's misconception test was conducted using a four-level analysis which was considered effective in identifying misconceptions that occurred in students in the subject of pressure (Ammase et al., 2019). The use of qualitative methods to investigate students' misconceptions on the topic of hydrostatic pressure. Identifying students' physics misconceptions on the hydrostatic pressure material using a four-level diagnostic test with a certainty of response index (CRI) (Syafe'I and Diani 2021).

In conducting development research in education, students' perceptions are needed in the process. Where perception will help researchers in developing. There are several student perceptions of the use of technology in the learning process, identification of the level of understanding of students' concepts is carried out by involving perceptions in seeing the results shown by students in using technology (Jill et al., 2019). Research is conducted on the effect of students' perceptions in mastering the material by using technology in the learning process to minimize distractions and encourage effective learning (Santos et al., 2018). The use of technology in the learning process, according to students' perceptions, is an interesting thing where technology plays an important role in offering flexibility and convenience for students (Bolliger and Martin 2018). The research was conducted, namely to see the effect of students' perceptions of electronic assessment (Domingo and Bradley 2018). Overall, it was found that students' perceptions of the use of technology showed a positive condition, this was supported by

several previous studies that had been described.

Similar research has been carried out such as this research, namely the research conducted by Mandinach & Schildkamp (2021) where in the research he did the web was used as a technology to measure the problem-solving skills of individual students by using interactive web-based assessments. Then the research was conducted by Van Ginkel et al., (2019) where in his research the web was used as a technology to identify the effect of student self-assessment. Further research was conducted by Mubarokah et al., (2018) Web-based assessment is used to increase effectiveness and efficiency in recording teacher assessments and database management systems to store student assessments for a longer period so that they can be retrieved easily and more regularly. Data processing. With this web-based assessment, it can help teachers as education personnel in conducting assessments automatically and the results can be archived for a long period.

The novelty of this study was to determine the effect of students' perceptions on the results of students' misconceptions. Previous research discussed the differences and the effect of student perceptions on learning outcomes variables that tend to assess student knowledge. Therefore, this researcher explores the study of the effect of students' perceptions on the results of the misconception test on hydrostatic pressure material. Web-based electronic assessment also makes it easier for teachers to manually correct students' answers so that the assessment process is much more effective and efficient (Suhendi et al., 2018). This study aims to determine students' perceptions of the application of electronic assessment in identifying the level of understanding of students' concepts. Teachers as teaching staff are expected to be able to face the growing technological paradigm by changing the traditional assessment method to a more modern assessment method using web-based assessments (Arista and Kuswanto 2018). So that this research is expected to be used as a basis for developing a web-based assessment technology-based assessment process to support the implementation of a better learning process.

The explanation above can be used as a reference in considering the importance of implementing web-based electronic assessment as a medium for assessing students' misconceptions of hydrostatic pressure material in schools. This research has implications for the physics learning process, especially in the assessment process. Assessment is an important thing to do in the learning process so it must be done carefully. A good assessment process will result in good and quality physics learning. Therefore, this research has an impact on increasing students' misconception test results and also increasing the ability of teachers and students to use technology such as smartphones and laptops in the learning process to facilitate all activities contained in the learning process.

In the research conducted, the researchers were only limited to developing web-based assessment technology on hydrostatic pressure materials. By using a web-based assessment, it is hoped that in the future teachers will be more familiar with the application of technology-based assessment in all fields of education, especially in learning physics at school. The implementation of a web-based assessment will enable teachers to make learning models as well as more creative and innovative assessments of the availability of existing technology. By doing, in addition to advancing the ability of teachers and students to use technology, it is also able to generate enthusiasm for teachers and students in conducting assessments and tests as well as improving the results of students' misconception tests.

The researcher provides recommendations for further research to develop technology in the form of Web-Based Assessments on other physics materials in a five-tier format, we already know that our daily life contains a lot of physics concepts, therefore it is necessary to develop a web-based assessment to identify, reduce, and assess the level of students' conceptual understanding of other physics concepts. Developing a web-based assessment, can be done by looking at students' perceptions of using a web-based assessment. The existence of student perceptions will assist researchers in developing web-based assessment technology that is by student needs. This is done to build and produce quality students in the learning process at school.

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

5. CONCLUSION

This study concludes that the average response given by students regarding the use of web-based assessments in conducting tests and assessing the level of understanding of the hydrostatic pressure material is Good. Results Based on the results obtained, where if the perception possessed by students is low, then these students will experience high misconceptions. Furthermore, if the perceptions possessed by students are high, then the misconceptions experienced by students are low. The results also show that there is an effect of students' perceptions on the misconception test conducted by students on the hydrostatic pressure material, this can be seen from the statistical significance ($\alpha \leq 0.05$).

The researcher provides recommendations for further research to develop technology in the form of Web-Based Assessments on other physics materials in a five-tier format, we already know that our daily life contains a lot of physics concepts, therefore it is necessary to develop a web-based assessment to identify, reduce, and assess the level of students' conceptual understanding of other physics concepts. A web-based assessment can be conducted by observing students' perceptions of using a web-based assessment. The existence of student perceptions will assist researchers in developing web-based assessment technology that is by student needs. This is done to build and produce quality students in the learning process at school.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study adheres to the ethical guidelines for conducting research.

Funding: This research received no external funding.

REFERENCES

Afrilia, A., Rusli, F., Tanti, T., Mutamasikin, M., & Yusuf, M. (2021). Development of web-based learning media for physics materials using Moodle in high school. In *Journal of Physics: Conference Series, 1869*(1), 012179. https://iopscience.iop.org/article/10.1088/1742-6596/1869/1/012179/meta

Ahmadi, F., Fakhruddin, T., & Khasanah, K. (2018). The development of pop-up book media to improve 4th-grade students' learning outcomes of civic education. *Asia Pacific Journal of Contemporary Education and Communication Technology*, *4*(1), 42-50. https://scholar.archive.org/work/5la74z43bnbitfal5mxhmk7seu/access/wayback/https://apiar.org.au/wp-content/uploads/2018/01/5_APJCECT_v4i1_2018_Edu-42-50.pdf

Akmam, A., Anshari, R., Amir, H., Jalinus, N., & Amran, A. (2018). Influence of learning strategy of cognitive conflict on student misconception in a computational physics course. In *IOP Conference Series: Materials Science and Engineering, 335*, 012074. https://iopscience.iop.org/article/10.1088/1757-899X/335/1/012074/meta

Aksnes, D. W., & Sivertsen, G. (2019). A criteria-based assessment of the coverage of Scopus and Web of Science. https://sciendo.com/pdf/10.2478/jdis-2019-0001

Alnajdi, S. M. (2018). The Effectiveness of Designing and Using a Practical Interactive Lesson Based on the ADDIE Model to Enhance Students' Learning Performances at the University of Tabuk. *Journal of Education and Learning*, *7*(6), 212-221. https://eric.ed.gov/?id=EJ1196051

Alodwan, T., & Almosa, M. (2018). The Effect of a Computer Program Based on Analysis, Design, Development, Implementation, and Evaluation (ADDIE) in Improving Ninth Graders' Listening and Reading Comprehension Skills in English in Jordan. *English Language Teaching*, *11*(4), 43-51. https://eric.ed.gov/?id=EJ1173477

Alshehri, A., Rutter, M., & Smith, S. (2019). Assessing the Relative Importance of an E-Learning System's Usability Design Characteristics Based on Students' Preferences. *European Journal of Educational Research*, *8*(3), 839-855. https://eric.ed.gov/?id=EJ1222289

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Alvarez-Cedillo, J., Aguilar-Fernandez, M., Sandoval-Gomez Jr, R., & Alvarez-Sanchez, T. (2019). Actions to Be Taken in Mexico towards Education 4.0 and Society 5.0. *International Journal of Evaluation and Research in Education*, *8*(4), 693-698. https://eric.ed.gov/?id=EJ1238365

Amin, N., Wiendartun, W., & Samsudin, A. (2016). Analisis instruments tes diagnostik dynamic-fluid conceptual change inventory (DFCCI) bentuk four-tier test pada beberapa SMA di Bandung Raya. *Prosiding Snips*, 570-574.

Ammase, A., Siahaan, P., & Fitriani, A. (2019). Identification of junior high school students' misconceptions on solid matter and pressure liquid substances with four-tier test. In *Journal of Physics: Conference Series, 1157*(2), 022034). https://iopscience.iop.org/article/10.1088/1742-6596/1157/2/022034/meta

Appiah, M., & Van Tonder, F. (2018). E-assessment in higher education: A review. *International Journal of Business Management & Economic Research*, *9*(6). https://www.researchgate.net/profile/Martin-Appiah/publication/329775612_E-Assessment_in_Higher_Education_A_Review/links/5c1a2f61458515a4c7e90a08/E-Assessment-in-Higher-Education-A-Review.pdf

Arefian, M. H., & Esfandiari, R. (2024). E-learning-oriented assessment and collaborative reflection for situated learning in language teacher education. *Language Testing in Asia*, *14*(1), 36. https://link.springer.com/article/10.1186/s40468-024-00305-0

Arista, F. S., & Kuswanto, H. (2018). Virtual Physics Laboratory Application Based on the Android Smartphone to Improve Learning Independence and Conceptual Understanding. *International Journal of Instruction*, *11*(1), 1-16. https://eric.ed.gov/?Id=EJ1165233

Astalini, A., Darmaji, D., Kurniawan, W., Anwar, K., & Kurniawan, D. (2019). Effectiveness of using e-module and e-assessment. https://www.learntechlib.org/p/216564/

Astashova, N. A., Bondyreva, S. K., & Malkina, O. V. (2017). Strategic guidelines of the educational interactive environment as a basis to develop the atmosphere of a future teacher. *Journal of Fundamental and Applied Sciences*, *9*(7S), 1392-1418. https://www.ajol.info/index.php/jfas/article/view/169275

Astuti, F. (2021). *Exploring local wisdom from YouTube: An investigation on the Indonesian higher education students' dance performance across gender. Cakrawala Pendidikan, 40 (1), 230–241*.

Asuman, B., Khan, M. S. H., & Clement, C. K. (2018). Integration of web-based learning into higher education institutions in Uganda: Teachers' perspectives. *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT)*, *13*(3), 33-50. https://www.igi-global.com/article/integration-of-web-based-learning-into-higher-education-institutions-in-uganda/205550

Azura, A., Suwarma, I. R., & Efendi, R. (2021). Measuring collaborative problem-solving skills (CPSS) of vocational high school students using web-based assessment. In *Journal of Physics: Conference Series, 1806*(1), 012025. https://iopscience.iop.org/article/10.1088/1742-6596/1806/1/012025/meta

Babalola, E. O., & Omolafe, E. V. (2022). Detailed experimental procedure for the construction process of robotic devices to teach aspects of auto mechanics. *ASEAN Journal of Science and Engineering Education*, *2*(2), 169-176. https://ejournal.upi.edu/index.php/AJSEE/article/view/42765

Basri, H. (2018). Multiple Regression Modeling For In-Study Data. *Dikdata Journal of Education 12*, 103–16.

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. *Distance education*, *39*(4), 568-583. https://www.tandfonline.com/doi/abs/10.1080/01587919.2018.1520041

Budiningsih, I., Soehari, T. D., & Irwansyah, I. (2019). The dominant factor for improving information security awareness. *Jurnal Cakrawala Pendidikan*, *38*(3), 490-498.

Budoya, C., Kissaka, M., & Mtebe, J. (2019). Instructional design enabled the agile method using the ADDIE model and feature-driven development method. *International Journal of Education and Development using ICT*, *15*(1). https://www.learntechlib.org/p/209737/article_209737.pdf

Cai, S., Liu, C., Wang, T., Liu, E., & Liang, J. C. (2021). Effects of learning physics using Augmented Reality on students' self-efficacy and conceptions of learning. *British Journal of Educational Technology*, *52*(1), 235-251. https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.1111/bjet.13020

Chen, H. L., & Liu, C. Y. (2023). The effects of web-based peer assessment and peer feedback quality on students' performances in a financial market course. *TechTrends*, *67*(4), 664-675. https://link.springer.com/article/10.1007/s11528-023-00856-8

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Curto Prieto, M., Orcos Palma, L., Blázquez Tobías, P. J., & León, F. J. M. (2019). Student assessment of the use of Kahoot in the learning process of science and mathematics. *Education Sciences*, *9*(1), 55. https://www.mdpi.com/2227-7102/9/1/55

Dirman, H. M., Mufit, F., & Festiyed, F. (2022). Review and comparison of four-tier multiple-choice and five-tier multiple-choice diagnostic tests to identify mastery of physics concepts. *Jurnal Penelitian Pendidikan IPA*, *8*(1), 1-12. https://jppipa.unram.ac.id/index.php/jppipa/article/view/838

Djudin, T. (2021). Promoting students' conceptual change by ıntegrating the 3-2-1 reading technique with refutation text in the physics learning of buoyancy. *Journal of Turkish Science Education*, *18*(2), 290-303. https://www.tused.org/index.php/tused/article/view/734

Domingo, J. R., & Bradley, E. G. (2018). Education student perceptions of virtual reality as a learning tool. *Journal of Educational Technology Systems*, *46*(3), 329-342. https://journals.sagepub.com/doi/abs/10.1177/0047239517736873

Elmabaredy, A., Elkholy, E., & Tolba, A. A. (2020). Web-based adaptive presentation techniques to enhance learning outcomes in higher education. *Research and Practice in Technology Enhanced Learning*, *15*(1), 20. https://link.springer.com/article/10.1186/s41039-020-00140-w

Enders, N., Gaschler, R., & Kubik, V. (2021). Online quizzes with closed questions in formal assessment: How elaborate feedback can promote learning. *Psychology Learning & Teaching*, *20*(1), 91-106. https://journals.sagepub.com/doi/abs/10.1177/1475725720971205

Essel, H. B., Butakor, P. K., & Nortey, S. (2019). Summative e-examination for high stake assessment in higher education: a case of undergraduate students at the Kwame Nkrumah University of Science and Technology. *Global Journal of Human-Social Science Research*, *19*(3). https://www.academia.edu/download/83206284/2673.pdf

Farozin, M. (2019). *Counselor professional identity of counselor profession education*. Yogyakarta State University. https://scholar.archive.org/work/tcqzyfui4be37ovv7josj3zejm/access/wayback/https://journal.uny.ac.id/index.php/cp/article/download/22515/pdf

Farr, M. M. (2017). Silk Road: A Reference. Creating public architectural intervention in the context of education & technology. *The Design Journal*, *20*(sup1), S4019-S4037. https://www.tandfonline.com/doi/abs/10.1080/14606925.2017.1352904

Fathali, S., & Okada, T. (2018). Technology acceptance model in technology-enhanced OCLL contexts: A self-determination theory approach. *Australasian Journal of Educational Technology*, *34*(4). https://ajet.org.au/index.php/AJET/article/view/3629

Feldman, M. Q., Cho, J. Y., Ong, M., Gulwani, S., Popović, Z., & Andersen, E. (2018). Automatic diagnosis of students' misconceptions in k-8 mathematics. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1-12). https://dl.acm.org/doi/abs/10.1145/3173574.3173838

Fitriyana, N., Wiyarsi, A., Ikhsan, J., & Sugiyarto, K. H. (2020). Android-based-game and blended learning in chemistry: Effect on students' self-efficacy and achievement. *Jurnal Cakrawala Pendidikan*, *39*(3), 507-521.

Francis, B. S., Latib, A. A., Amiron, E., Subari, K., & Kamin, Y. (2020). Measuring the Importance of Non-Technical Skills for Integration into Metalwork Technology Curriculum Using Structural Equation Modelling. *International Journal of Instruction*, *13*(3), 317-328. https://eric.ed.gov/?id=EJ1259684

Ghani, M. T. A., & Daud, W. A. A. W. (2018). Adaptation of the ADDIE instructional model in developing an educational website for language learning. *Global Journal Al-Thaqafah*, *8*(2), 7-16. http://jurnal.usas.edu.my/gjat/index.php/journal/article/view/457

Gusukuma, L., Bart, A. C., Kafura, D., & Ernst, J. (2018). Misconception-driven feedback: Results from an experimental study. In *Proceedings of the 2018 ACM Conference on International Computing Education Research* (pp. 160-168). https://dl.acm.org/doi/abs/10.1145/3230977.3231002

Harrison, R. L., Reilly, T. M., & Creswell, J. W. (2020). Methodological rigor in mixed methods: An application in management studies. *Journal of mixed methods research*, *14*(4), 473-495. https://journals.sagepub.com/doi/abs/10.1177/1558689819900585

Henriksen, H. J., Roberts, M. J., van der Keur, P., Harjanne, A., Egilson, D., & Alfonso, L. (2018). Participatory early warning and monitoring systems: A Nordic framework for web-based flood risk management. *International journal of disaster risk reduction*, *31*, 1295-1306. https://www.sciencedirect.com/science/article/pii/S2212420917301553

Hochberg, K., Kuhn, J., & Müller, A. (2018). Using smartphones as experimental tools—effects on interest, curiosity, and learning in physics education. *Journal of Science Education and Technology*, *27*, 385-403. https://link.springer.com/article/10.1007/s10956-018-9731-7

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Hudha, M. N., Aji, S. D., & Huda, C. (2018). E-Rubric: scientific work based on Android for experimental physics. In *IOP Conference Series: Materials Science and Engineering,* 288(1), 012100. https://iopscience.iop.org/article/10.1088/1757-899X/288/1/012100/meta

Irvine, F. E., Clark, M. T., Efstathiou, N., Herber, O. R., Howroyd, F., Gratrix, L., ... & Bradbury-Jones, C. (2020). The state of mixed methods research in nursing: A focused mapping review and synthesis. *Journal of advanced nursing*, *76*(11), 2798-2809. https://onlinelibrary.wiley.com/doi/abs/10.1111/jan.14479

Jill, M. D., Wang, D., & Mattia, A. (2019). Are instructor-generated YouTube videos effective in accounting classes? A study of student performance, engagement, motivation, and perception. *Journal of Accounting Education*, *47*, 63-74. https://www.sciencedirect.com/science/article/pii/S0748575117301859

Kamcharean, C., & Wattanakasiwich, P. (2014). A two-tier multiple choice question to diagnose thermodynamic misconceptions of Thai and Laos students. In *Proceedings of the 12th Asia Pacific Physics Conference (APPC12)* (p. 017008). https://journals.jps.jp/doi/abs/10.7566/JPSCP.1.017008

Kanim, S., & Cid, X. C. (2020). Demographics of physics education research. *Physical Review Physics Education Research*, *16*(2), 020106. https://journals.aps.org/prper/abstract/10.1103/PhysRevPhysEducRes.16.020106

Kaps, A., Splith, T., & Stallmach, F. (2021). Implementation of smartphone-based experimental exercises for physics courses at universities. *Physics education*, *56*(3), 035004. https://iopscience.iop.org/article/10.1088/1361-6552/abdee2/meta

Keskin, M., & Kaya, D. Ö. (2020). COVID-19 sürecinde öğrencilerin web tabanlı uzaktan eğitime yönelik geri bildirimlerinin değerlendirilmesi. *İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, *5*(2), 59-67. https://dergipark.org.tr/en/pub/ikcusbfd/issue/55773/754174

Kesorn, N., Junpeng, P., Marwiang, M., Pongboriboon, K., Tang, K. N., Bathia, S., & Wilson, M. (2020). Development of an Assessment Tool for Mathematical Reading, Analytical Thinking, and Mathematical Writing. *International Journal of Evaluation and Research in Education*, *9*(4), 955-962. https://eric.ed.gov/?id=EJ1274748

King, L. L. (2019). Perceptions about sexual offenses: Misconceptions, punitiveness, and public sentiment. *Criminal Justice Policy Review*, *30*(2), 254-273. https://journals.sagepub.com/doi/abs/10.1177/0887403416660150

Korkmaz, G., & Toraman, Ç. (2020). Are we ready for the post-COVID-19 educational practice? An investigation into what educators think about online learning. *International Journal of Technology in Education and Science*, *4*(4), 293-309. https://eric.ed.gov/?id=EJ1271308

Kusuma, I. P. I. (2021). TPACK-related programs for pre-service English teachers: An in-depth analysis on efforts and issues of ICT integration. *Jurnal Cakrawala Pendidikan*, *40*(1), 183-195.

Lin, Y. C., Yang, D. C., & Li, M. N. (2016). Diagnosing students' misconceptions in number sense via a web-based two-tier test. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(1), 41-55. https://www.ejmste.com/article/diagnosing-students-misconceptions-in-number-sense-via-a-web-based-two-tier-test-7627

Liu, C. (2024). Automating student assessment using digital data to improve education management effectiveness in higher education institutions. *Education and Information Technologies*, *29*(2), 1885-1901. https://link.springer.com/article/10.1007/s10639-023-11898-z

Lusigi, A. (2019). Higher education, technology, and equity in Africa. *New Review of Information Networking*, *24*(1), 1-16. https://www.tandfonline.com/doi/abs/10.1080/13614576.2019.1608576

Madsen, S. S. (2020). What is the motivation of Norwegian and New Zealand teacher educators for using digital technology when teaching? https://munin.uit.no/handle/10037/18752

Mandinach, E. B., & Schildkamp, K. (2021). Misconceptions about data-based decision making in education: An exploration of the literature. *Studies in Educational Evaluation*, *69*, 100842. https://www.sciencedirect.com/science/article/pii/S0191491X1930416X

McKenzie, M., & Ziemann, M. (2020). Assessment of the web-based audience response system socrative for biomedical science revision classes. *International Journal of Educational Research Open*, *1*, 100008. https://www.sciencedirect.com/science/article/pii/S266637402030008X

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage. https://books.google.com/books?hl=en&lr=&id=U4lU_-wJ5QEC&oi=fnd&pg=PR12&dq=Miles+and+Huberman,+1994&ots=kGWz-GSUYW&sig=8FWlcNk2ZS8mhyh6gKE3c3BhxCU

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Mofield, E. L., & Parker Peters, M. (2018). Mindset misconception? Comparing mindsets, perfectionism, and attitudes of achievement in gifted, advanced, and typical students. *Gifted Child Quarterly*, *62*(4), 327-349. https://journals.sagepub.com/doi/abs/10.1177/0016986218758440

Mohyuddin, R. G., & Khalil, U. (2016). Misconceptions of Students in Learning Mathematics at Primary Level. *Bulletin of Education and Research*, *38*(1), 133-162. https://eric.ed.gov/?id=EJ1210348

Motlhabane, A. (2016). Learner's alternative and misconceptions in physics: A phenomenographic study. *Journal of Baltic Science Education*, *15*(4), 424-440. https://www.ceeol.com/search/article-detail?id=974465

Mubarokah, F. D., Mulyanı, S., & Indrıyantı, N. Y. (2018). Identifying students' misconceptions of acid-base concepts using a three-tier diagnostic test: A case of ındonesia and Thailand. *Journal of Turkish Science Education*, *15*(STEM Special Issue), 51-58. https://www.tused.org/index.php/tused/article/view/688

Muhametjanova, G., & Akmatbekova, A. (2019). The web-based learning environment in general physics course in a public university in Kyrgyzstan. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(3), em1681. https://www.ejmste.com/article/the-web-based-learning-environment-in-general-physics-course-in-a-public-university-in-kyrgyzstan-7636

Nikou, S. A., & Economides, A. A. (2018). Mobile-based assessment: A literature review of publications in major referred journals from 2009 to 2018. *Computers & Education*, *125*, 101-119. https://www.sciencedirect.com/science/article/pii/S0360131518301490

Nurdyansyah, N. (2019). Teaching Media Design Innovation Using Computer Application with Scientific Approach. *International Journal of Academic Research in Business and Social Sciences*, *9*(3), 373-382. http://eprints.umsida.ac.id/6260/

Ogange, B. O., Agak, J. O., Okelo, K. O., & Kiprotich, P. (2018). Student perceptions of the effectiveness of formative assessment in an online learning environment. *Open Praxis*, *10*(1), 29-39. https://search.informit.org/doi/abs/10.3316/INFORMIT.423669258504414

Phanphech, P., Tanitteerapan, T., & Murphy, E. (2019). Explaining and enacting for conceptual understanding in secondary school physics. *Issues in Educational Research*, *29*(1), 180-204. https://search.informit.org/doi/abs/10.3316/ielapa.171950763587256

Popovic, N., Popovic, T., Rovcanin Dragovic, I., & Cmiljanic, O. (2018). A Moodle-based blended learning solution for physiology education in Montenegro: a case study. *Advances in physiology education*, *42*(1), 111-117. https://journals.physiology.org/doi/abs/10.1152/advan.00155.2017

Purwanto, M. G., Nurliani, R., Kaniawati, I., & Samsudin, A. (2018). Promoting the hydrostatic conceptual change test (HCCT) with a four-tier diagnostic test item. In *Journal of Physics: Conference Series, 1013*(1), 012035. https://iopscience.iop.org/article/10.1088/1742-6596/1013/1/012035/meta

Putra, A. S. U., & Hamidah, I. (2020). The development of a five-tier diagnostic test to identify misconceptions and causes of students' misconceptions in waves and optics materials. In *Journal of Physics: Conference Series, 1521*(2), 022020. https://iopscience.iop.org/article/10.1088/1742-6596/1521/2/022020/meta

Qian, Y., Hambrusch, S., Yadav, A., Gretter, S., & Li, Y. (2020). Teachers' perceptions of student misconceptions in introductory programming. *Journal of Educational Computing Research*, *58*(2), 364-397. https://journals.sagepub.com/doi/abs/10.1177/0735633119845413

Qonita, M., & Ermawati, F. U. (2020). The validity and reliability of five-tier conception diagnostic test for vector concepts. *Inovasi Pendidikan Fisika*, *9*(03), 459-465. https://www.academia.edu/download/88915371/31922.pdf

Racz, S. J., Johnson, S. L., Bradshaw, C. P., & Cheng, T. L. (2017). Parenting in the digital age: Urban black youth's perceptions about technology-based communication with parents. *Journal of Family Studies*, *23*(2), 198-214. https://www.tandfonline.com/doi/abs/10.1080/13229400.2015.1108858

Rahman, N. F., Dakhoir, A., Hasan, A. M., Ihsani, H. N., & Khair, N. (2021). Web-Based Assessment Alternative for Arabic Online Exam. *Izdihar: Journal of Arabic Language Teaching, Linguistics, and Literature*, *4*(2), 179-194. https://ejournal.umm.ac.id/index.php/izdihar/article/view/16525

Rahmatih, A. N., Asri F., & Ida E. (2020). The Relationship between Motivation and Learning Independence of Prospective Elementary School Teacher Students. *Elementary School Rides 28*(2), 76–83.

Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of applied and advanced research*, *3*(1), 33-35. https://pdfs.semanticscholar.org/788e/14bddd7035863fc556a4ef83441b181bed82.pdf

Reyna, J., & Meier, P. (2018). Learner-generated digital media (LGDM) as an assessment tool in tertiary science education: A review of literature. *IAFOR Journal of Education*, *6*(3), 93-109. https://eric.ed.gov/?id=EJ1198671

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Rosana, D., Kadarisman, N., Maryanto, A., & Sugiharsono, A. (2017). The evaluation of science learning programs, technology, and society application of Audio Bio Harmonic Systems with solar energy to improve crop productivity. *Jurnal Pendidikan IPA Indonesia*, *6*(1). https://journal.unnes.ac.id/nju/jpii/article/view/9596

Şahin, M. (2019). Classroom response systems as a formative assessment tool: an investigation into students' perceived usefulness and behavioral intention. *International Journal of Assessment Tools in Education*, *6*(4), 693-705. https://dergipark.org.tr/en/pub/ijate/issue/49554/576249

Salam, M., & Farooq, M. S. (2020). Does the sociability quality of web-based collaborative learning information systems influence students' satisfaction and system usage? *International Journal of Educational Technology in Higher Education*, *17*(1), 26. https://link.springer.com/article/10.1186/s41239-020-00189-z

Salsabila, F. N., & Ermawati, F. U. (2020). Validity and reliability of conception diagnostic test using the five-tier format for elasticity concepts. *Inovasi Pendidikan Fisika*, *9*(03), 439-446. https://ejournal.unesa.ac.id/index.php/inovasi-pendidikan-fisika/article/view/35747

Santos, I. M., Bocheco, O., & Habak, C. (2018). A survey of student and instructor perceptions of personal mobile technology usage and policies for the classroom. *Education and Information Technologies*, *23*, 617-632. https://link.springer.com/article/10.1007/s10639-017-9625-y

Saputra, O., Setiawan, A., & Rusdiana, D. (2019). Identification of student misconception about static fluid. In *Journal of Physics: Conference Series, 1157*(3), 032069. https://iopscience.iop.org/article/10.1088/1742-6596/1157/3/032069/meta

Serevina, V., Astra, I., & Sari, I. J. (2018). Development of E-Module Based on Problem-Based Learning (PBL) on Heat and Temperature to Improve Students' Science Process Skills. *Turkish Online Journal of Educational Technology-TOJET*, *17*(3), 26-36. https://eric.ed.gov/?id=EJ1184205

Setiawan, C. K., & Yosepha, S. Y. (2020). Pengaruh green marketing dan brand image terhadap keputusan pembelian produk the body shop indonesia (studi kasus pada followers account twitter@ thebodyshopindo). *Jurnal Ilmiah M-Progress*, *10*(1). https://journal.universitassuryadarma.ac.id/index.php/ilmiahm-progress/article/download/371/342

Setiawan, D., & Jaelani, J. (2022). Revealing the Profile of Student Concept Understanding in the Covid-19 Pandemic Era with a Five-tier Format Assessment. In *2nd International Conference on Social Science, Humanities, Education and Society Development (ICONS 2021)* (pp. 80-86). Atlantis Press. https://www.atlantis-press.com/proceedings/icons-21/125968114

Sirakaya, M., & Alsancak Sirakaya, D. (2018). Trends in educational augmented reality studies: a systematic review. *Malaysian Online Journal of Educational Technology*, *6*(2), 60-74. https://eric.ed.gov/?id=EJ1174807

Soeharto, S., CsapÃ, B., Sarimanah, E., Dewi, F. I., & Sabri, T. (2019). A review of studentsâ€™ common misconceptions in science and their diagnostic assessment tools. *Jurnal Pendidikan IPA Indonesia*, *8*(2), 247-266. https://journal.unnes.ac.id/nju/jpii/article/view/18649

Sorge, S., Kröger, J., Petersen, S., & Neumann, K. (2019). Structure and development of pre-service physics teachers' professional knowledge. *International Journal of Science Education*, *41*(7), 862-889. https://www.tandfonline.com/doi/abs/10.1080/09500693.2017.1346326

Subramaniam, K. (2021). An Investigation of the Organizational Impact of Computer Technology in Secondary Science Classrooms. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(7). https://eric.ed.gov/?id=EJ1302403

Suhendi, H. Y., Ramdhani, M. A., & Irwansyah, F. S. (2018). Verification concept of assessment for physics education student learning outcome. *International Journal of Engineering & Technology (UEA)*, *7*(3.21), 321-325. https://digilib.uinsgd.ac.id/12830/

Swidan, A., Hermans, F., & Smit, M. (2018). Programming misconceptions for school students. In *Proceedings of the 2018 ACM Conference on International Computing Education Research* (pp. 151-159). https://dl.acm.org/doi/abs/10.1145/3230977.3230995

Syafe'i, I., & Diani, R. (2021). An analysis of students' physics misconceptions in online learning using the four-tier diagnostic test with certainty of response index (CRI). In *Journal of Physics: Conference Series, 1796*(1), 012099). https://iopscience.iop.org/article/10.1088/1742-6596/1796/1/012099/meta

Tanti, T., Darmaji, D., Astalini, A., Kurniawan, D. A., & Iqbal, M. (2021). Analysis of user responses to the application of web-based assessment on character assessment. *Journal of Education Technology*, *5*(3), 356-364. https://ejournal.undiksha.ac.id/index.php/JET/article/view/33590

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Taslidere, E. (2016). Development and use of a three-tier diagnostic test to assess high school students' misconceptions about the photoelectric effect. *Research in Science & Technological Education*, *34*(2), 164-186. https://www.tandfonline.com/doi/abs/10.1080/02635143.2015.1124409

Tawafak, R. M., Romli, A. B., bin Abdullah Arshah, R., & Almaroof, R. A. S. (2018). Assessing the impact of technology learning and assessment method on academic performance. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(6), 2241-2254. https://www.ejmste.com/article/assessing-the-impact-of-technology-learning-and-assessment-method-on-academic-performance-review-5426

Teo, T. (2019). Students and teachers' intention to use technology: Assessing their measurement equivalence and structural invariance. *Journal of Educational Computing Research*, *57*(1), 201-225. https://journals.sagepub.com/doi/abs/10.1177/0735633117749430

Thohir, M. A., Sukarelawan, M., Jumadi, J., Warsono, W., & Citrasukmawati, A. (2021). The Effects of Instructional Design Based Web Course on Preservice Teachers' Competencies. *International journal of evaluation and research in education*, *10*(1), 230-236. https://eric.ed.gov/?id=EJ1286018

Thompson, J. D., Herman, G. L., Scheponik, T., Oliva, L., Sherman, A., Golaszewski, E., ... & Patsourakos, K. (2018). Student misconceptions about cybersecurity concepts: Analysis of think-aloud interviews. *Journal of Cybersecurity Education, Research and Practice*, *2018*(1), 5. https://digitalcommons.kennesaw.edu/jcerp/vol2018/iss1/5/

Tor, N., & Gordon, G. (2020). Digital interactive quantitative curiosity assessment tool: Questions worlds. *International Journal of Information and Education Technology*, *10*(8), 614-621. https://www.ijiet.org/vol10/1433-MT-333.pdf

Tsivitanidou, O. E., Georgiou, Y., & Ioannou, A. (2021). A learning experience in inquiry-based physics with immersive virtual reality: Student perceptions and an interaction effect between conceptual gains and attitudinal profiles. *Journal of Science Education and Technology*, *30*(6), 841-861. https://link.springer.com/article/10.1007/s10956-021-09924-1

Tu, J. C., Zhang, X., & Zhang, X. Y. (2021). Basic courses of design major based on the ADDIE model: Shed light on response to social trends and needs. *Sustainability*, *13*(8), 4414. https://www.mdpi.com/2071-1050/13/8/4414

Üce, M., & Ceyhan, İ. (2019). Misconception in Chemistry Education and Practices to Eliminate Them: Literature Analysis. *Journal of education and training studies*, *7*(3), 202-208. https://eric.ed.gov/?id=EJ1206967

Van der Kleij, F. M., & Lipnevich, A. A. (2021). Student perceptions of assessment feedback: A critical scoping review and call for research. *Educational assessment, evaluation, and accountability*, *33*, 345-373. https://link.springer.com/article/10.1007/s11092-020-09331-x

Van Dinther, M., Dochy, F., Segers, M., & Braeken, J. (2014). Student perceptions of assessment and student self-efficacy in competency-based education. *Educational Studies*, *40*(3), 330-351. https://www.tandfonline.com/doi/abs/10.1080/03055698.2014.898577

Van Ginkel, S., Gulikers, J., Biemans, H., Noroozi, O., Roozen, M., Bos, T., ... & Mulder, M. (2019). Fostering oral presentation competence through a virtual reality-based task for delivering feedback. *Computers & Education*, *134*, 78-97. https://www.sciencedirect.com/science/article/pii/S0360131519300351

Widodo, A., Sopandi, W., & Wu, H. K. (2020). Developing a five-tier diagnostic test to identify students' misconceptions in science: an example of the heat transfer concepts. *İlköğretim Online*, 1014-1029. https://dergipark.org.tr/en/pub/ilkonline/article/609690

Wirantasa, O. (2017). The Influence of Student Discipline on Mathematics Learning Achievement. *Formative: Scientific Journal of Mathematics and Natural Sciences Education 7*(1), 83–95.

Woo, W. H. (2018). Applying ADDIE model to ideate precision medicine in a polytechnic biomedical science program. *Journal of Biomedical Education*, *2018*(1), 4268517. https://onlinelibrary.wiley.com/doi/abs/10.1155/2018/4268517

Wu, X. B., Sandoval, C., Knight, S., Jaime, X., Macik, M., & Schielack, J. F. (2021). Web-based authentic inquiry experiences in large introductory classes are consistently associated with significant learning gains for all students. *International Journal of STEM Education*, *8*, 1-18. https://link.springer.com/article/10.1186/s40594-021-00290-3

Yao, Y. (2021). Blended teaching reform of higher vocational education based on Addie's teaching design model. *International Journal of Frontiers in Sociology*, *3*(10), 9-13. https://francis-press.com/uploads/papers/bopYOoWCXEI5xoYZxMcPRtcB4IcWv5b1iDfDSWVW.pdf

Yilmaz Ince, E., Kabul, A., & Diler, İ. (2020). Distance education in higher education in the COVID-19 pandemic process: A case of Isparta Applied Sciences University. *International Journal of Technology in Education and Science*, *4*(4), 345-351. https://eric.ed.gov/?id=EJ1271262

Maison, Hidayat M., Kurniawan, D.A., Sandra, R.O., Yolviansyah, F. & Iqbal, M. (2025). Web-based five-tier diagnostic assessment: Students' perceptions of hydrostatic pressure misconceptions. *Cypriot Journal of Educational Science*, *20*(1), 33-55. https://doi.org/10.18844/cjes.v20i1.8151

Yoon, B., Park, I., Yun, D., & Park, G. (2019). Exploring promising vacant technology areas in a technology-oriented company based on bibliometric analysis and visualization. *Technology analysis & strategic management*, *31*(4), 388-405. https://www.tandfonline.com/doi/abs/10.1080/09537325.2018.1516864

Yuan, J., & Kim, C. (2018). The effects of autonomy support on student engagement in peer assessment. *Educational Technology Research and Development*, *66*, 25-52. https://link.springer.com/article/10.1007/S11423-017-9538-X

Yuangngoen, W., Saengrith, W., Sitthimongkolchai, N., Makeshine, S., Petsangsri, S., & Tuntiwongwanich, S. (2019). Blended Learning Management of WordPress Website Development Skill for Communication Design Undergraduates Using The ADDIE Model. *International Journal of Industrial Education and Technology*, *1*(1), 50-58. https://ph02.tci-thaijo.org/index.php/IJIET/article/view/235411

Yunita, W., & Maisarah, I. (2020). Students' Perception Of Learning Language At The Graduate Program Of English Education Amid the Covid-19 Pandemic. *Linguists: Journal of Linguistics and Language Teaching*, *6*(2), 107-120.

Zhai, X., Li, M., & Chen, S. (2019). Examining the uses of student-led, teacher-led, and collaborative functions of mobile technology and their impacts on physics achievement and interest. *Journal of Science Education and Technology*, *28*, 310-320. https://link.springer.com/article/10.1007/s10956-019-9767-3

Zinn, S., Landrock, U., & Gnambs, T. (2021). Web-based and mixed-mode cognitive large-scale assessments in higher education: An evaluation of selection bias, measurement bias, and prediction bias. *Behavior Research Methods*, *53*(3), 1202-1217. https://link.springer.com/article/10.3758/s13428-020-01480-7

Zughoul, O., Momani, F., Almasri, O. H., Zaidan, A. A., Zaidan, B. B., Alsalem, M. A., ... & Hashim, M. (2018). Comprehensive insights into the criteria of student performance in various educational domains. *IEEE Access*, *6*, 73245-73264. https://ieeexplore.ieee.org/abstract/document/8534316/