

Received : 12 January 2023  
Revised : 26 March 2023  
Accepted : 2 April 2023  
Online : 6 April 2023  
Published: 30 June 2023

DOI: doi.org/10.21009/1.09110

# The Development of Web Diagnostic Test as a Misconception Tool in Work and Energy

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## Abstract

At this time, the assessment and measurement of the concept's level of understanding are considered less effective. This is due to the use of conventional media. With this in mind, researchers are interested in conducting research on developing assessments and measuring the understanding of concepts using web media. Web of the comprehension level test will be automatically stored in real-time on the system so that educators can process the data on the results of the misconception test and can also be seen by students as the results of the comprehension level test. This study aims to develop a web diagnostic test and identify students' misconceptions about effort and energy as the subject matter. This study uses the ADDIE development model. The results obtained from this study were that the responses given by users showed good results. This means that the media used to measure student misconceptions is interactive enough to be used as a support in the learning process.

**Keywords:** web diagnostic test, misconceptions, technology, physics

## INTRODUCTION

Physics has an important role in improving the quality of education to produce quality students who think logically, creatively, and innovatively. Physics deals with physical events in which there are scientific processes and behavior. In addition, physics also studies natural phenomena and their characteristics which are obtained systematically and involve the relationship between concepts whose purpose is to explain these natural phenomena and solve them (Pindy & Dimas 2022; Nurfadillah et al. 2022). In physics learning, the ability of students in the process of solving problems is still very low. This happens because of the lack of analysis and understanding of student's concepts of the material discussed (Maison et al. 2019; Rismatul et al. 2015). The achievement of competence through the teaching and learning process in the classroom often experiences obstacles caused by many factors, such as the learning environment and participants' mistakes in understanding the concepts being taught (Rachmawati & Supardi 2021; Rosyada et al. 2021). So in learning physics, understanding the concept has an important role in determining the success of student learning (Astuti et al. 2021; Harso et al. 2021). One of the things that hinder the learning process of physics is about problem-solving, this happens due to the lack of students in understanding the concept.

In the concept of mechanics, it was found that the discussion of the matter of work and energy experienced a misunderstanding of the most important concepts. The work and energy theorem derived from Newton's second law is often indistinguishable from the energy equation, so students often use the wrong equation to solve problems (Desianna & Nugroho 2019; Chabay et al. 2019). Research on students' understanding of energy materials has received wide attention from both high schools and universities. The reason is that energy is a crosscutting concept and a core idea in science that needs to be mastered by students (Mustofa et al. 2019; Prawendra et al. 2022). The ability to understand good concepts is the basis of good problem-solving.

Understanding the concept is a basic foundation in studying physics. Understanding concepts in physics is needed to study interactions and events in nature and useful in solving problems, especially abstract ones (Nikat & Loupatty 2022; Frans & Wasis 2022). To solve the understanding of abstract concepts, high-level thinking processes are needed with understanding the concepts possessed by these students will have an impact on learning outcomes because the learning objectives are essentially the ability of students to understand the content of learning (Aswara et al. 2021; Musliman & Kasman 2022). Students have different levels of understanding of concepts, so it is not uncommon for students to have difficulty solving problems (Yusal 2022; Nur 2022). Generally, students are only able to remember and memorize but have difficulty understanding a concept, especially when faced with problem-solving (Fajri et al. 2022; Pane et al. 2022). This happens because physics is considered complicated because you have to memorize formulas and a theory from here is the formation of misunderstanding concepts or misconceptions.

Misconceptions are students' interpretations that are not following the supposed concept, while understanding in interpreting concepts is called conception. Misconceptions can occur from various sources, both within and outside the school environment (Rohman et al. 2022; Entino et al. 2021). The misconceptions experienced by students in learning physics can be related because misconceptions are formed from the experiences and observations of students in everyday life (Asrial et al. 2022; Sandra et al. 2021). Initial experiences or concepts that students understand are firmly embedded in the minds of students, resulting in a high percentage of students' misconceptions (Uswatun et al. 2019; Fauziah et al. 2022). Misconceptions are very influential in the learning process that has a continuous nature on the subject to be studied. If students do not understand the basic concepts, it is likely that students will have difficulty understanding a more complex concept (Ulandari et al. 2022; Sarini & Selamet 2022). So educators need to overcome this so that it does not have a negative impact on student learning outcomes (Haerunnisa et al. 2022; Mellu & Baok 2020). educators must have competence and better understanding to avoid students from misunderstandings and develop appropriate instruments in identifying student misunderstandings.

Steps that need to be taken to identify misconceptions that occur in students can be done with diagnostic tests. The diagnostic test is a test that serves to find out students' difficulties, weaknesses and conceptual errors (Julianda et al. 2022; Ilhami et al. 2022). Identification of misconceptions can be done both before learning, during learning, and at the time after learning. A diagnostic test that can be used to identify students' level of understanding is using a four-tier diagnostic test (Rahmiati et al. 2022; Agustina & Ndana 2022). The four-tier diagnostic test (four-tier diagnostic test) is an instrument that can be used to diagnose misconceptions that occur in students which are considered effective and efficient. This instrument was developed based on the three-tier diagnostic test instrument (Priyasmika & Sholichah 2022; Setiawan et al. 2022). The advantage of the four-level diagnostic test is that it can explore students' deeper conceptual understanding because of the influence of the level of confidence because it involves students' beliefs in answering questions. (Tumanggor et al. 2020; Ilhami et al. 2022). The first level is a multiple-choice question following the subject to be discussed. The second level contains the students' beliefs on selecting the first-level answers. The third level is the reason why students choose the first-level answer. Furthermore, the fourth level is about students' beliefs on the reasons given at the third level.

The results of the diagnostic tests carried out will provide an overview of the misconceptions that occur in students. This misconception can interfere with students assimilating new knowledge (Santoso & Setyarsih 2021; Nazura et al. 2021). Therefore, this misconception must then be reduced using a learning model. One of the learning models used to reduce misconceptions is the expository learning model (Darwis & Amri 2022; Bramantha 2021). With the expository learning model, educators can

control the sequence and breadth of learning materials with the preparation of materials that educators have prepared, thus educators can find out to what extent students master the material (Marzal et al. 2022; Maison et al. 2022). In addition, the expository learning model is considered very effective if the learning material that students must master is quite broad, while their learning time is limited. (Hasbiyalloh et al. 2017; Istiqomah & Nurulhaq 2021). Because the expository model has a role to convey material verbally from educators with the intention that students can master the material optimally.

The development of diagnostic tests lately is still very little done, the form of tests that provide convenience for students and educators is still not widely applied. Educators still use conventional methods or Paper-Based Tests (PBT) to diagnose students' understanding levels (Santi & Prajana 2019; Widiastika et al. 2020). In the world of education, innovation is needed to overcome these problems to achieve learning objectives. One thing that can be done is by utilizing information technology by implementing a Computer Based Test (CBT) system. Computer-Based Test or Computer Based Test (CBT) is a test/evaluation conducted using a computer (Rosdiana 2018; Agusta 2022). The advantage of implementing a computer-based system is certainly a support for the effectiveness of the assessment and implementation of programs that have been implemented (Zulkifli 2022; Suseno 2017). The use of computer-based tests is gradually increasing significantly because it is influenced by the benefits obtained. Seeing the problems described above, an alternative is needed in diagnosing misconceptions that occur in students by utilizing information technology, namely web diagnostic tests.

As for the research that has been done previously that is related to the research on developing a web diagnostic test to identify misconceptions. The first research conducted by Septiyani & Nanto (2021) in his research that a four-tier diagnostic test has been developed to identify students' understanding of website-based concepts on the subject of temperature and heat. The results obtained from the development of the website were successful in identifying misconceptions that occurred in students, especially on the material of temperature and heat. Furthermore, research conducted by Jumilah et al. (2022) based on this study with the aim of introducing and identifying misunderstanding concepts in students indicates that there are still many students experiencing misconceptions, with a percentage level of 53% on the subject of Bernoulli's principle. Furthermore, research conducted by Rumapea & Silaban (2022) Regarding the development of a Three-Tier Multiple Choice diagnostic test instrument based on an Android Based Test, the results obtained that the instrument can be used to analyze the level of understanding of students' concepts on the subject of reaction rates. The last research conducted by Permatasari et al. (2022) discusses the identification of students' understanding levels using the Web-Based Three Tier Test. This study showed that students' misconceptions could be identified with the average percentage of students' misconception levels, namely 43.91-62.06%.

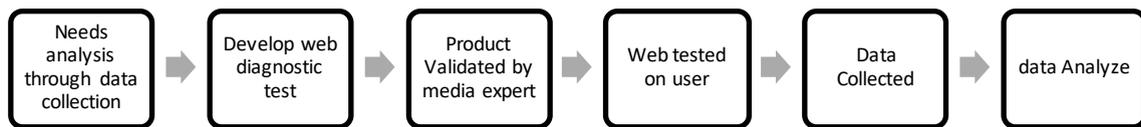
Therefore, the researcher studied the needs of this web diagnostic test technology about how the students' misconception test results on the use of the web diagnostic test technology. Because the web will speed up the teacher in identifying the occurrence of misconceptions and providing material according to the misconceptions experienced by students. For this reason, this research aims to develop web diagnostic test technology to identify and provide material on misconceptions on the subject of business and energy using expository learning models.

## METHODS

In this study, the method used is or Research and Development (R&D). The model used in developing the web diagnostic test is the ADDIE. According Branch (2009) ADDIE is a process that serves as a framework in a working guide for product development. In this study the procedure used is only up to the development stage, by testing the validity of experts and user responses to determine the feasibility of the product. Because until that stage the development objectives have been achieved (Pratiwi & Fatmaryanti 2020). Before the media is developed, a needs analysis is carried out in the first stage then the shape and workings of the product are designed. After that the product will be validated at the development stage by the validator and user response.

This four-tier diagnostic test consists of four levels and the results are analyzed using a decision table based on research conducted by (Gurel et al. 2015). The first level is multiple choice questions and answers, the second level is the level of confidence in the answers, the third level is the reason for

the answers given, and the fourth level is the level of confidence in the reasons. The test results based on the answer choices that students have filled out are identified so as to produce misconception points. The data obtained in this study are quantitative and qualitative data. These data will be analyzed later. Quantitative data was obtained from needs analysis test, validation test by validator and user response test, and test results from student diagnostic tests. data that will later be analyzed using descriptive statistics. Descriptive statistics are used to analyze data by describing or describing the results of data that have been collected from respondents without any intention of making conclusions that apply to the public (Noviansyah & Mujiono 2021). Furthermore, qualitative data was obtained from comments on the development that validators and respondents had carried out. which will later be analyzed using Miles and Huberman analysis. Miles and Huberman’s analysis will divide the analysis into several stages, namely the stages of collecting data, reducing data, presenting data, and stages of data verification (Ilyas 2016). The stages in the data collection process can be seen in FIGURE 1.



**FIGURE 1.** Stages in the data collection process

The instrument used in this study aims to analyze the level of need for development and validate the product made to determine the level of understanding of students’ concepts using four-tier-based tests that have been included on the website. Needs analysis was obtained from data collection involving 29 students of the Physics Education Study Program, Jambi University. Needs analysis questionnaire consists of 15 questions involving aspects of student perception, physics learning experience, and the need for a web diagnostic test to identify misconceptions as learning media. The instrument grid of need analysis can be seen in TABLE 1.

**TABLE 1.** Grid of Needs Analysis Instruments

Aspect	Indicator
Participants’ Perception of Learning	The method used in learning Efficiency in learning Technological facilities to support learning Applied learning media Media used by educators Educators use technology in learning
Physics Learning Experience	Media used by educators Educators use technology in learning
Need for web diagnostic test	Learning media needs Interest in using learning media The need for media to detect the level of understanding Applied learning media

The instrument grid explains the basic indicators of website development as a medium for students’ misconceptions with 3 aspects, namely the perception aspect of the user, the physics learning experience, and the need for a web diagnostic test. Furthermore, the media expert validation instrument was adopted from Agustian’s research (2021). The grid of expert validation instruments can be seen in TABLE 2.

**TABLE 2.** Grid of Media Expert Validation Instruments

<b>Aspect</b>	<b>Indicator</b>
<i>Usability</i>	Ease of Use menu Efficiency of using the website Ease of accessing the website address Applied learning media Website content updating
<i>Funcionality</i>	Use of the main menu Using the user menu (sign up and log in) Use of class menu Using the question menu Use of the test menu Use the menu to do questions and the results of the category understanding of student concepts Use of reduction menu Use of the training collection point menu
<i>Visual Communication</i>	Communication Simplicity and attractiveness Visual quality Use of website guide videos Use of layouts

After the expert validation response is collected, the results will be obtained from the validator for media validation in accordance with the Indicator. After that, data was collected on the user response test with a total of 19 questions which were adopted from the research Agustian (2021). Where to get the results of this user response involved 50 students of the Physics Education Study Program, Jambi University. The grid of user response questionnaires can be seen in TABLE 3.

**TABLE 3.** Grid of Needs Analysis Instruments

<b>Aspect</b>	<b>Indicator</b>
Website interest	Convenience in using the website The level of trust in using the website Information provided by the website Website appearance and performance
Website convenience	Ease of using the website Doing the questions Overcome problems/errors in using the website Looking for information in using the website Website functions and capabilities

After getting the results from the user’s response, a diagnostic test is carried out on the work and energy material to see the student’s understanding level of the topics, a diagnostic test is carried out on the student. The instrument used in the study was a four-tier format diagnostic test. The research instrument was adopted from the study (Maison et al. 2019). Developed a four-tier diagnostic test to identify students’ misconceptions on the topic of work and energy. some misconceptions occur in learning physics material for Work and Energy. The following are misconceptions that have been successfully classified in TABLE 4.

**TABLE 4.** Answer items key to work and energy

<b>misconception number</b>	<b>Description of Misconception</b>	<b>Items</b>
1	Work is only determined by the force, if the force is positive then the work is positive.	1.1d 1.2a 1.3c 1.4a
2	An work is positive if the direction of displacement is to the right, and work is negative if the direction of displacement is to the left. The more difficult or longer a path is to traverse, the greater the effort.	1.1a 1.2a 1.3a 1.4a 1.1b 1.2a 1.3b 1.4a 2.1a 2.2a 2.3d 2.4a 2.1b 2.2a 2.3a 2.4a 2.1c 1.2a 2.3c 2.4a 5.1a 5.2a 5.3b 5.4a 5.1b 5.2a 5.3c 5.4a 5.1c 5.2a 5.3a 5.4a
3	As an object moves closer to the earth’s surface, potential energy increases and kinetic energy decreases.	3.1b 3.2a 3.3b 3.4a
4	The kinetic energy or potential energy of an object in free fall is constant because the acceleration due to gravity is constant.	4.1c 4.2a 4.3b 4.4a
5	The mechanical energy of a free falling object will change due to changes in kinetic energy or potential energy.	3.1c 3.2a 3.3d 3.4a
6		3.1c 3.2a 3.3d 3.4a 3.1d 3.2a 3.3c 3.4a 4.1d 4.2a 4.3d 4.4a

## RESULTS AND DISCUSSION

### Results

Needs analysis is carried out to see the level of need for the product to be developed. The results of this needs analysis are used as a reference in making a web diagnostic test. The aspects to see how the level of needs of students for product development are aspects of student perceptions, aspects of physics learning experience and aspects of the need for web diagnostic tests. Based on the data that has been analyzed, it is obtained in the form of a percentage, namely 79.44% in the “needed” category in the aspect of student perception, 81.27% in the “needed” category in the learning experience aspect, and 86.79% in the “very needed” category. on the aspect of the need for a web diagnostic on the aspect of the need for a web diagnostic test, 86.79% was obtained in the “very needed” category. So the need for the development of media to support the learning process. This is supported by research conducted by (Bermana Sakti Gumilar & Nia Sania Effendi 2022) which states that the use of learning media can affect the learning outcomes. as well as research conducted by which in his research shows that educators in using learning media are still not varied and educators have not played a major role in developing learning media. The results of the descriptive analysis of the needs analysis are summarized in TABLE 5.

**TABLE 5.** Results of Needs Analysis

<b>No</b>	<b>Assessment Aspect</b>	<b>Percentage value</b>	<b>Category</b>
1	Student perception	79.44%	Needed
2	Physics learning experience	81.27%	Needed
3	Need for website diagnostic test	86.79%	Very Needed
	Average	82.50%	Needed

The next step is the product development process. Where at this stage of development the product’s condition is already in real form and needs to be tested by media experts to see the level of feasibility of the product that has been produced. Based on the results of the media expert test, the percentage value obtained in the first validation is 75% in the usability aspect, 75% in the functionality aspect, 69.09% in the visual communication aspect. Then the average percentage from the first validation is 73.03% which is included in the “feasible” category. The results of the media expert test in the stage are summarized in TABLE 6.

**TABLE 6.** Media Expert Test Results Phase I

No	Assessment Aspect	The percentage value of the feasibility stage I	Category
1	Usability	75%	Worthy
2	Functionality	75%	Worthy
3	Visual communication	69.09%	Worthy
	Average	73.03%	Worthy

After getting the results of the first stage of the validator test, comments and suggestions were obtained for the improvement of the product. The suggestions given are in TABLE 7.

**TABLE 7.** Comments and Suggestions of Media Experts on Phase I Products

No	Validator Comments and Suggestions
1	Changes to the appearance of the website
2	Added test history feature on educator page
3	Added reduction feature on the student page

After seeing the values and suggestions given by media experts in the first validation, the researcher revised the website for the second validation stage. The percentage obtained in the second validation obtained 80% usability aspect, 78.75% functionality aspect, 78.18% visual communication aspect. So that the average percentage in the second validation obtained is 78.97% which is included in the “feasible” category. The results of the validator test obtained in stage I are summarized in TABLE 8.

**TABLE 8.** Media Expert Validation Results for Phase II Products

No	Assessment Aspect	The percentage value of the feasibility stage II	Category
1	Usability	80%	Worthy
2	Functionality	78.75%	Worthy
3	Visual communication	78.18%	Worthy
	Average	78.97%	Worthy

After getting the results of the second phase of the validator test, suggestions are obtained in improving the product. The suggestions obtained are summarized in TABLE 9.

**TABLE 9.** Comments and Suggestions of Media Experts on Phase I Products

No	Validator Comments and Suggestions
1	Added a reduction page for students’ misconceptions
2	Added the reduction upload feature on the educator page
3	Added an assignment collection point feature on the educator page
4	Added practice delivery sites on the educator page

After getting the results of comments and suggestions by media experts in stage II, the researcher will revise and add features according to the suggestions the validator gave. Furthermore, the last validation was carried out with the results obtained percentage of 97.5% usability aspect, 96.25% functionality aspect, and 98.18% visual communication aspect 98.18%. So that the average percentage of the third validation is 97.31% which is included in the “very feasible” category to support the learning process, it is also supported by (Salma et al. 2016) where in his research showed that the development of the web diagnostic test developed had a high level of feasibility which showed a percentage value of >80% and from this development, various conception profiles of participants were obtained consisting of complete understanding, partial understanding and not understanding and based on research conducted that the web The developed diagnostic test is feasible, effective, and can describe the profile of students’ conceptual understanding. The percentage value of the third stage of the media expert test is summarized in TABLE 10.

**TABLE 10.** Media Expert Validation Test Results for Phase III Products

No	Assessment Aspect	The percentage value of the feasibility stage III	Category
1	<i>Usability</i>	97.5%	Very Worthy
2	<i>Functionality</i>	96.25%	Very Worthy
3	<i>Visual communication</i>	98.18%	Very Worthy
	Average	97.31%	Very Worthy

After passing the validity test by media experts on the developed product, it was continued with the trial phase or user response at this stage involving 50 physics education students from the 2021 University of Jambi. Based on the results of the research that has been done, it is obtained in the form of a percentage of each aspect of the user response questionnaire, obtaining a percentage of 83.20% for the aspect of interest in the web diagnostic test and 82.23% is obtained in the aspect of ease of using the web diagnostics test, while the average percentage of the whole aspects is 82.72% which is included in the category of “fit” to be used. Thus, the development of a web diagnostic test is good to use to support the learning process in schools. The percentage values in the user response test are summarized in TABLE 11.

**TABLE 11.** Media Expert Validation Test Results for Phase III Products

No	Assessment Aspect	The percentage value of the feasibility stage III	Category
1	Interest	83.20%	Worthy
2	Convenience	82.23%	Worthy
	Average	82.72%	Worthy

The test results from the user’s response to see the level of understanding were obtained by giving students 5 multiple-choice questions on the subject of work and energy, with a four-tier question format. By giving this question, it was found that students only experienced the second, third and sixth misconceptions from 50 users. In the second misconception, the percentage of students who experience misconceptions is 4% where the description of the misconceptions they experience is that an effort is positive if the direction of the displacement is to the right. The business is negative if the direction of the displacement is to the left. For the misconceptions of the three students who experienced misconceptions amounted to 18% where for the description of the misconceptions, namely the more difficult or longer a path to pass, the greater the effort. And lastly, in the sixth misconception, 12% of students who experienced misconceptions obtained where the misconceptions they experienced described that the mechanical energy of free-falling objects would change due to changes in kinetic energy or potential energy. Selanjutnya hasil dari analisis miskonsepsi siswa pada materi usaha dan energi dapat dilihat pada TABLE 12.

**TABLE 12.** Analysis of Students’ Misconception Results on Business and Energy Materials

Question number	SC (Scientific Conception)	LK (Lack of Knowledge)	FP (False Positive)	FN (False Negative)	MSC (Misconception)
1	70%	2%	20%	4%	4%
2	54%	2%	6%	16%	20%
3	78%	2%	2%	4%	14%
4	82%	2%	2%	4%	10%
5	72%	4%	4%	4%	16%
Mean	61.2%	2.4%	6.8%	6.4%	23.2%

From the results obtained through diagnostic tests that have been carried out in a four-tier format, the average Scientific Conception score experienced by students is 61.2% or students who have understood the concept. This is classified in the “High” category. Furthermore, students who experienced a lack of knowledge obtained an average score of 2.4%, included in the “Low” category. Students who experience false positives get an average score of 6.8% which is included in the “Low” category, and students who experience false negatives get an average of 6.4%. Furthermore, students who experienced misconceptions in the matter of work and energy obtained an average score in the

form of a percentage of 23.2%, belonging to the “Low” category. After getting the results per question from the diagnostic tests that have been carried out, it is necessary to identify misconceptions that occur in students who have taken the test. The results of the test per question can be seen in TABLE 13.

**TABLE 13.** Analysis of Students’ Misconception Results on Business and Energy Materials

Misconception number	Understanding Presentation		Information Misconception
	Misconception	No Misconception	
1	0%	100%	No Misconception
2	4%	96%	Fraction
3	16%	84%	Fraction
4	0%	100%	No Misconception
5	0%	100%	No Misconception i
6	8%	92%	Fraction
Mean	5.6%	95.4%	Fraction

With the results of the misconceptions, it can be said that it is very unlikely that there will be misconceptions in the matter of work and energy. It can be seen in FIGURE 2. which is a graph of the test results per misconception from filling out questions in the form of four-tier which consists of 5 items in the form of multiple choice. The results of students’ answers are misconceptions, lack of knowledge, false positives, false negatives, and understanding of concepts. These results are obtained from the user response test results page contained in the web diagnostic test.

**DETAIL HASIL TEST ISNAINI RAMADHONIARTI**

No. Soal	Nama Siswa	Tier 1	Tier 2	Tier 3	Tier 4	Kode	Keterangan Hasil
1	Isnaini Ramadhoniarti	0	1	0	1	MSC	Misconception
2	Isnaini Ramadhoniarti	0	1	0	1	MSC	Misconception
3	Isnaini Ramadhoniarti	0	1	0	1	MSC	Misconception
4	Isnaini Ramadhoniarti	0	1	0	1	MSC	Misconception
5	Isnaini Ramadhoniarti	0	1	0	1	MSC	Misconception

Jawaban Soal Isnaini Ramadhoniarti

No.	Tier 1	Tier 2	Tier 3	Tier 4	Kode	Keterangan Hasil
1	B	A	B	A	MSC	Misconception
2	A	A	D	A	MSC	Misconception
3	D	A	D	A	MSC	Misconception
4	A	A	B	A	MSC	Misconception
5	A	A	D	A	MSC	Misconception

**FIGURE 2.** Test results per student

### Discussion

With the existence of a diagnostic website to identify and provide material on misconceptions in the subject matter of work and energy using this expository learning model, it has indirectly contributed to solving problems in overcoming the level of misunderstanding of concepts that occur in students. Because the level of performance of the system used is based on a website diagnostic, it can make it easier for educators to identify misconceptions and share material for each misconception experienced by students (Abbas 2020; Shute & Rahimi 2017; Utami et al. 2019). The thing that supports this

development is the implementation of a needs analysis for product development which is carried out by collecting data at the Physics Education Study Program, Jambi University. This needs analysis is carried out to be able to find out the problems that occur in students and provide solutions for educators in solving these problems. From the results of the needs analysis carried out, it shows the need to develop a diagnostic website to identify and provide material for misconceptions on the subject of work and energy using an expository learning model because it makes it easier for educators to carry out the process of assessing the level of understanding of students and identifying misconceptions and providing special material according to misconceptions experienced by students (Sandra et al. 2022; Maison et al. 2022; Iqbal & Sandra 2022). Before this media is used, it is necessary to validate the media expert to see the feasibility level of the product that has been developed which will later be used to identify and provide material for students' misconceptions on the subject of business and energy using the expository learning model (Irwansyah et al. 2018; Jannah & Rahmi 2020; Fallensky et al. 2021). After conducting a media expert validation test on the media, it is known that the diagnostic website to identify and provide material on misconceptions is appropriate for use by educators and students in the learning process. Moreover, user response data supports this, which shows good results in using the website.

Then the results of the web diagnostic development show that it can identify and share each of the misconceptions experienced by students. This is shown that there is very little misconception experienced by students on the subject of work and energy by identifying and distributing material to each according to the misconceptions experienced. In accordance with research conducted by Sandra et al. (2022); Saputri et al. (2021) where in his research showed that website diagnostics are a technology that can assist educators in identifying the level of understanding of students. The development of an assessment of the level of understanding of this concept using a diagnostic website has advantages in tests because it can be done anywhere and at a flexible time and can provide feedback to students who experience misconceptions. The feedback given is following the description of the misconceptions experienced by students so that the misconceptions that occur can be resolved with the material provided by the educator. And the test results come out automatically after taking the exam so that it helps educators process data in real time and with accurate results (Rohmah et al. 2018; Jannah & Rahmi 2020).

From research that has been carried out by (Utami et al. 2019) where in this study the resulting diagnostic website was used only to identify the level of understanding of students' concepts. Using the diagnostic website makes it easier for researchers to identify misconceptions that occur in students. Furthermore, related research is research conducted by Abbas (2020) in his research a computer-based diagnostic test to detect misconceptions can increase conceptual understanding and be able to reduce misconceptions that occur in students. Furthermore, research conducted by (Upayogi & Juliawan 2019) where the method used in providing material for misconceptions uses virtual lab-based learning methods to reduce misconceptions that occur in students. In this study the diagnostic website is used to reduce misconceptions by utilizing learning models in reducing the level of misconceptions that occur in students.

In the development of a diagnostic website to identify and provide material for misconceptions experienced by students, there is an update in this study, namely where the system can provide material according to the misconceptions experienced when the diagnostic test has been carried out, with this material students can learn about the misconceptions experienced so that in the future students' understanding of the concept is following the actual concept and the material provided, namely material that uses a learning model to make it easier for students to understand the material presented by educators. Using this diagnostic website will make it easier for educators to identify and provide material according to the description of misconceptions, as well as assess students' level of understanding of concepts (Septiyani & Nanto 2021). Furthermore, there has been no research on diagnostic websites to identify and provide material for misconceptions experienced by students using learning models. This is supported by research conducted by (Cahyani et al. 2019; Boro et al. 2020; Nur Hasiyatin et al. 2021) in this research an instrument was developed for a diagnostic test, wherein the diagnostic test used a Paper Based Test (PBT) to see the profile of students' conceptions. So there is a need for an innovation that involves technological and educational aspects so that a diagnostic website is needed to identify and provide material for misconceptions experienced by students using

learning models in order to make it easier for students to understand a concept, especially on the subject of work and energy.

The development of this diagnostic website implies that it is able to identify students' understanding in physics learning on work and energy material while at the same time providing material that is following the misconceptions experienced by students so that students can learn on their own to see their level of understanding, the learning process carried out by students namely independent learning with expository learning methods, through the diagnostic website. The results of the comprehension level test will be automatically stored in real-time on the system so that educators can process the data on the results of the misconception test and can also be seen by students as the results of the comprehension level test. Furthermore, if students experience misconceptions, the system will automatically recommend to the test takers to repeat the test or study material according to the misconceptions experienced, this aims to see the recorded results from the first test, second test, and so on. And makes it easier for educators to see problems with certain materials and certain misconceptions. The limitations of this study were that it was only carried out up to identifying students' misconceptions and focused on work and energy materials and using expository learning models, whereas in physics learning there are still many other physics materials and learning models that can be applied.

For recommendations for further research that the development of a web diagnostic test is only limited to identifying and providing material according to misconceptions by using an expository learning model on the subject of business and energy. As it is known that the learning model in education is very much not only focused on the expository learning model. Therefore, material development can be carried out to reduce misconceptions that occur in students so that later conceptual errors can be overcome by utilizing learning models.

## CONCLUSION

Using this web diagnostic test, the user's responses show a good practicality in using the web diagnostic test. Good user response means that the media used to measure student misconceptions is interactive enough to support the learning process. Because it can provide feedback quickly to students and show results directly to educators, and can immediately evaluate the tests that have been carried out. Moreover, with this web, students can use the diagnostic four-tier test directly without printing the questions and work results first.

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