



*Corresponding author: Rifda Nur Hikmahwati Arif, Universitas Negeri Makassar, Makassar, Indonesia.

E-mail: rifdanha@unm.ac.id

RESEARCH ARTICLE

Analysis Of Student's Diagnostic Ability in Electricity And Magnetism's Course Based on Quizziz Platform.

Rifda Nur Hikmahwati Arif^{1*}, Sitti Rahma Yunus¹, Nurul Fakhrrannisa¹, Salma Samputri¹, Rifda Mardian Arif²

¹ Universitas Negeri Makassar, Makassar, Indonesia

² Universitas Negeri Gorontalo, Gorontalo, Indonesia.

Abstract: This study aims to analyse the diagnostic ability of ICP science students FMIPA UNM in the Electricity and Magnetism course. This research uses descriptive research with a Quizziz-based qualitative approach. The sampling technique used was purposive sampling. The data collection technique used in this study was a multiple choice diagnostic test accessed through the Quizziz platform online. The data analysis technique used is descriptive statistics (frequency, percentage, and average) and item analysis (index of difficulty and differentiating power of the questions. Quizziz-based diagnostic tests for electrical and magnetic topics are effective enough to evaluate students' initial abilities. Most questions have a moderate difficulty level and sufficient to good differentiating power; however, some questions have low or negative differentiating power and need to be corrected. The results showed that students' diagnostic ability in Electricity And Magnetism's Course using quizziz platform was at 5,0 score which in a low category. This research serves as a basis for the development of better diagnostic tests to achieve learning objectives.

Keywords: Diagnostic Ability, Electricity and Magnetism, Quizziz

1. INTRODUCTION

Learning is a process of a person in acquiring various skills, abilities, and attitudes as a result of a number of complex actions and behaviours experienced by students in the learning process (Kasful Anwar, 2006, 54). Therefore, a teacher must first know the initial abilities of his learners before starting the learning process. In analysing a learner's initial ability, it is the same as finding out what the learner needs in a lesson with the aim of determining or knowing what to achieve in learning and what kind of material is suitable for the learner.

According to Maharani (2023), a teacher needs more than just visual observations to understand the characteristics of learners. Diagnostic assessment is one of the effective solutions to find out the characteristics of these learners. For example, we can know their learning styles, talents, interests, and potentials. By doing so, personalised learning will increase learning comfort and motivation.

Diagnostic assessment is an evaluation conducted specifically to determine the strengths, weaknesses and level of mastery of each learner with the aim of tailoring learning to their unique characteristics and needs. Studies have shown that implementing diagnostic assessments at the beginning of class is positively correlated with better student learning



outcomes. Darmiyati's (2007) findings corroborate the idea that a thorough diagnostic assessment that includes cognitive, affective and psychomotor components can significantly improve student learning outcomes.

A diagnostic test is a test used to determine students' strengths and weaknesses in learning. It can be a number of questions or a request to do something. According to Yeany & Miller (1983, 19-26), diagnostic tests are usually conducted before summative tests. Diagnostic tests are conducted to find misconceptions that cause students' learning difficulties. The results can be used as a basis for making targeted learning interventions. High-quality diagnostic assessment instruments can not only measure students mastery levels, but they can also reconstruct learners' cognitive processes when answering questions that make it possible to find the main sources of error (Law & Treagust, 2010).

According to Rahmawati et al., (2021) Physics is one of the fields of science that is closely related to natural phenomena. Physics is taught from primary education to higher education. One of the important factors in learning physics is concept understanding (Maulida, et al. 2017). Electricity and magnetism material is very interesting for students because it is very important in everyday life. Learning Electricity and magnetism not only provides students with theoretical knowledge, but they can also understand how electricity is important to fulfil human needs. A learning approach based on observation and experimentation can help students learn the science process skills needed in real life.

The main objective of learning Electricity and magnetism is that students should be taught to observe and understand natural phenomena, especially those related to electricity and magnetism, using the scientific method. The broader goal of science is to help learners understand how matter and energy interact in various natural phenomena. This goal is in line with the teaching of magnetic electricity. This is in line with the opinion of Serway, & Jewett (2009) and Nasution (2012).

Various studies state that the concept of electricity requires innovative and creative learning approaches because the concept of magnetic electricity is an abstract concept that is difficult to visualise directly because it involves phenomena that are difficult to imagine and complex theories (Suseno (2010); Suseno (2014) and Fatima, Yusuf, & Bancong 2014). As shown by research conducted by Nugraha, Saepuzaman, & Tarigan (2014) and Mayub (2020), the concept of electricity is very abstract and complex. As a result, students tend to be uninterested and face difficulties when attending lectures. Therefore, a study was conducted entitled 'Analysis of Diagnostic Ability of ICP 2021 Science Education Students at Makassar State University in Electricity and Magnetism Subjects Assisted by Quizizz'.

2. Research Method and Materials

This research is descriptive research with a quantitative approach. The research design used is descriptive using the Quizizz application. The object of this research is diagnostic questions (10 multiple choice questions on Electricity and magnetism material). The population in this study were students of Makassar State University Science Education Study Programme ICP 2021. (Sugiyono, 2012 states that the sample is part of the number and characteristics of the population. The sampling technique used is purposive sampling technique. Purposive sampling is a method that involves certain considerations (Abdul Mukti, 2021). The data collection technique used in this study was a multiple choice diagnostic test accessed through the Quizizz platform online. The data analysis technique used is descriptive statistics (frequency, percentage, and average) and item analysis (difficulty index and question differentiator)

Table 1. Category of Question Difficulty Index

Range	Description
$P > 0,70$	Easy
$0,30 - 0,70$	Medium
$P < 0,30$	Difficult

Source: (Zaenal Arifin, 2009)

‘A good question is a question that has a balanced level of difficulty, not too easy, and not too difficult’ (Suharsimi, 2009: 207). Anas Sudijono (2011: 370) states that if the level of difficulty of a test item is in the medium or sufficient category, then the item is considered good. Questions that are too easy cannot make students try harder, while questions that are too difficult can make students desperate and unwilling to try again because they are beyond their abilities. The student's ability to answer the question should determine the difficulty level of the question, not from the teacher's perspective.

Table 2. Differentiating Power of Question Category

Score	Criteria
$D = 0,00 - 0,19$	Poor
$D = 0,20 - 0,39$	Fair
$D = 0,40 - 0,69$	Good
$D = 0,70 - 1,00$	Excellent

Source: (Zaenal Arifin, 2009)

Differentiating power, according to Daryanto (2007: 183), is defined as the ability of a student to make a difference between high ability students and low ability students in a question. Differentiating power analysis, according to Nana Sudjana (2005: 141), is intended to determine the extent to which a question can distinguish high-achieving students from low-achieving students. Differentiating power, according to Ngalim Purwanto (2009: 120), is defined as the ability of a question to distinguish students in a smarter group from a less intelligent group. In other words, questions given to less able students will produce lower achievement, while questions given to more able students will produce better achievement. Tests that do not have sufficient differentiating power will not provide an accurate picture of students' abilities.

Table 3. Categories of the average score of students' initial ability

Description	Interval
Very High	$x \geq 9,0$
High	$7,5 \leq x < 9,0$
Medium	$6,0 \leq x < 7,5$
Low	$4,0 \leq x < 6,0$
Very Low	$X < 4,0$

Source: (Ratumanan & Laurens, 2015)

The initial ability of a student is the potential that students have before participating in the learning process. It is important for teachers to understand the initial skills before starting to teach so that learning can be designed effectively (Gais & Afriansyah, 2017). The category of the average score of students' initial ability according to Ratumanan and Laurens (2015: 171) is divided into five levels. Very High includes a score of $x \geq 9.0$ indicating a very high ability. High is in the interval $7.5 \leq x < 9.0$ reflects good competence. Medium includes a score of $6.0 \leq x < 7.5$ depicting average ability. Low is given for a score of $4.0 \leq x < 6.0$ indicating inadequate ability, and Very Low for $x < 4.0$ indicating a very low level of ability. This scale helps to categorise students based on their initial level of understanding for evaluation and learning intervention.

3. Results and Discussion

In this study, a Quizizz-based diagnostic test containing 10 multiple choice questions was given before the material was taught with the aim of knowing students' initial ability to



Electricity and magnetism material. The results obtained are the average diagnostic ability of students, the difficulty index of the questions, and the differentiating power of the questions.

Table 4 Average score of ICP students Diagnostic Ability.

MHS	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	TOTAL SCORE
A	1	0	1	1	0	1	1	1	1	1	8
B	1	1	1	0	0	1	1	0	1	1	7
C	0	0	0	1	1	1	1	1	1	1	7
D	0	0	1	1	1	0	1	1	1	1	7
E	0	0	1	0	1	1	1	1	0	1	6
F	1	0	0	1	1	0	1	0	1	1	6
G	0	0	0	1	1	1	1	0	1	1	6
H	0	1	0	0	1	0	1	1	1	1	6
I	0	0	1	0	0	1	1	1	1	1	6
J	0	0	1	1	0	1	0	1	1	1	6
K	0	0	0	1	0	1	1	0	1	1	5
L	1	0	0	0	0	0	1	1	1	1	5
M	0	1	1	0	0	1	0	1	1	0	5
N	0	0	0	0	0	1	1	1	1	1	5
O	0	0	1	0	0	1	0	1	1	1	5
P	0	0	1	1	1	0	0	0	0	1	4
Q	1	1	0	0	0	0	0	1	1	0	4
R	0	0	0	0	1	0	0	1	1	1	4
S	0	1	0	1	0	0	1	1	0	0	4
T	0	0	0	0	0	1	0	1	1	1	4
U	0	0	0	0	1	0	0	0	1	1	3
V	0	0	0	0	1	1	0	1	0	0	3
W	0	0	0	0	0	0	1	1	0	1	3
X	0	0	0	0	1	0	0	0	0	1	2
AVERAGE											5

Based on the Table 4 student score data, it was found that student A received the highest score with a total of 8 correct answers out of 10 questions, while student X received the lowest score with a total of 2. Most students scored between 4 and 7, indicating that their proficiency in Electricity and magnetism materials tends to be in the moderate category.

The average overall score was 5.0, indicating that students on average were able to answer 50% of the questions correctly. This score indicates that their initial understanding of the lesson still needs to be improved. Problem 10 had the highest success rate as most students were able to answer correctly. Questions 1 and 2 were considered more difficult as only a few students were able to answer correctly. The score obtained is in accordance with the results of Sutarno's research (2011), namely the average score of the initial test in the experimental class with electricity and magnetism material of 52.14%. This result shows that although students have different ability levels, their initial understanding of the material is still not optimal. These results can be used as a basis for assessing and improving the quality of learning. They can also help improve questions with high difficulty and low discriminating power to more effectively measure students' abilities.

Table 5. Questions Difficulty Index and Question Discriminating Power

No.	Difficulty Inde	Problem Item Difficulty Level	Discrimination Index	Item Differentiation Level
1	0,20	Difficult	0,25	Fair
2	0,20	Difficult	0,08	Poor
3	0,37	Medium	0,25	Fair
4	0,37	Medium	0,41	Good
5	0,45	Medium	0,08	Poor
6	0,54	Medium	0,25	Fair
7	0,58	Medium	0,66	Good
8	0,70	Medium	0,08	Poor
9	0,75	Easy	0,33	Fair
10	0,83	Easy	0,33	Fair

Based on table 4, the analysis results show that the diagnostic tests have different levels of difficulty. Questions 1 and 2 are considered difficult, with a difficulty index of 0.20 each, indicating that only a few students can answer correctly. Questions 3, 4, 5, 6, and 7 were considered moderate, with a difficulty index ranging from 0.37 to 0.58. Questions 9 and 10 are considered easy, with a difficulty index of 0.20 each, indicating that students understand the material well. The number of item difficulty levels obtained is almost the same as the results of research from Lia Triani (2023), that the level of difficulty in electricity and magnetism material from 15 questions there are 3 questions in the easy category (20%), 11

questions in the medium category (73.3%), and 1 question in the difficult category (6.7%). The existence of a fairly diverse distribution of questions to measure students' abilities reflects this variation in difficulty levels.

In terms of differentiating power, the analysis showed that most questions had sufficient to good differentiating power. Questions 1, 3, 6, 9, and 10 had differentiating power varying from fair (0.20 and 0.39) and question 4 and 7 had differentiating power in good (0.40 and 0.69), indicating that these questions were effective in differentiating between low and high ability students. However, some questions had poor power in differentiating, such as question 2 (0.08), question 5 (0.08), and question 8 (0.08). Based on the results of Lia Triani's research (2023), from 15 questions, 4 questions were obtained in the excellent category (26.7%), 3 questions in the good enough category (20%), and 1 question in the poor category (6.6%). These questions must be revised because they cannot differentiate students' abilities. Overall, this test has a fairly good differentiating power, but some questions need improvement to increase efficiency.

Overall, the results show that the diagnostic test used in this study is effective enough to measure students initial abilities in Electricity and magnetism materials. Differentiating power analysis shows that most of the questions are able to distinguish between low and high ability students, while the variation in the difficulty level of the questions shows the spectrum of students' abilities. However, to improve the quality of the test, some questions, especially those with negative or low discriminating power, need to be improved. The results enable the development of evaluation tools that are more relevant and appropriate to the learning objectives. Conclusions and consequences of the study will be discussed in the next chapter.

4. Conclusion

The results showed that the Quizizz diagnostic test, which was used to evaluate students' initial proficiency in Electrycal and Magnetic topics, was effective. Some questions have low or negative discriminating power, so they need to be corrected to improve the quality of the test. Most of the questions were of moderate difficulty and had sufficient to good discriminating power, so the questions are able to differentiate between students with low and high ability levels. Students' initial understanding still needs to be improved, according to the average **score was 5 in the low category**. The results of this study provide a basis for the evaluation and creation of better diagnostic test tools that can help better achieve learning objectives in Electricity And Magnetism's Course.

References

- Abdul, M. & Kartini, A. (2021). Pengaruh Kualitas Pelayanan dan Harga Terhadap Keputusan Pembelian Pada Kedai Kirani Coffee. *Jurnal Bina Manajemen*, 10(1).
- Anas, S. (2011). *Pengantar Evaluasi Pendidikan*. Jakarta: PT Raja Grafindo Persada.
- Anwar, Kasful. (2006). *Media, Sumber Belajar dan Pusat Sumber Belajar*: IAIN Jambi Jambi.
- Darmiyati, D. (2007). Implementasi Asesmen Diagnostik dalam Upaya Meningkatkan Hasil Belajar Matematika di SD Kota Banjarbaru Kalimantan Selatan. *Jurnal Satuan Pendidikan dan Kebudayaan*, 13 (67), 509-531.
- Daryanto. (2008). *Evaluasi Program*. Jakarta: Rhineka Cipta.
- Fatima, F., Yusuf, I., & Bancong, H. (2014). Implementasi Pembelajaran Kurikulum 2013 Berbasis Multimedia Interaktif Pada Pokok Bahasan Listrik Magnet Terhadap Aktivitas, Persepsi, dan Hasil belajar Peserta Didik di SMA Tut Wuri Handayani Makassar. *Jurnal Fisika Indonesia*, 18(Agustus), 16-62.
- Gais, Z., & Afriansyah, E. A. (2017). Analisis Kemampuan Siswa dalam Menyelesaikan Soal High Order Thinking Ditinjau dari Kemampuan Awal Matematis Siswa. *Mosharafa: Jurnal Pendidikan Matematika*, 6(2), 255-266.

- Law, J. F. & Treagust, D. F. (2010). *Diagnosis of Student Understanding of Content Specific Science Areas Using ON-Line Two-Tier Diagnostic Tests*. Australia: Curtin University of Technology.
- Lia, T., Reni, M. & Semuel, R. (2023). Analisis Butir Soal Ulangan Harian Kemagnetan dan Induksi Elektromagnetik Kelas IX SMP. *Academy of Education Journal*, 14(1).
- Maharani, D. A., Ida, D., Fenny, R., Dkk. (2023). Analisis Karakteristik Peserta Didik Melalui Asesmen Diagnostik. *Journal Of Social Science Research*, 3(2).
- Maulida, F.O., Mardiyana, M., & Pramudya, I. (2017). Analisis Pemahaman Konsep Siswa Pada Materi Persamaan Lingkaran Ditinjau dari Motivasi Belajar Siswa Kelas XII IPS 4 SMA Negeri 6 Surakarta Tahun Pelajaran 2016/2017. *J. Pendidik. Mat. dan Mat. Solusi*, 1: 26-45.
- Mayub, A. (2020). Efektifitas ICT Belajar Fisika Mahasiswa Melalui Program Pembelajaran Fisika Berbasiskan. *PENDIPA Journal of Science Education*, 5(1), 40-49.
- Nana, S. (2005). *Penilaian Hasil Belajar Proses Belajar Mengajar*. Bandung.. PT Remaja Rosdakarya.
- Nasution. (2012). *Kurikulum Pengajaran*. Jakarta.. PT Bumi Aksara.
- Ngalim Purwanto. (2009). *Prinsip-prinsip dan Teknik evaluasi Pengajaran*. Bandung: PT Remaja Rosdakarya.
- Nugraha, M. G., Saepuzaman, D., & Tarigan, D.E (2014). Pengaruh Pembelajaran Kooperatif Jigsaw Terhadap Penguasaan Konsep Mahasiswa Pada Perkuliahan Listrik Magnet Topik Muatan Listrik dan Hukum Coulomb. In *Prosiding Seminar Kontribusi Fisika*, 127-130.
- Rahmawati, R., Syamsuddin, A., Marisda, D. H., & Nasrah, N. (2021). Kajian Konseptual Multirepresentasikan Pada Materi Perkuliahan Kelistrikan. *Seminar, Prosiding Pendidikan, Nasional Ii, IPA*, 40-53.
- Ratumanan, T. G., & Laurens, T. (2015). *Penilaian Hasil Belajar Pada Tingkat Satuan Pendidikan Edisi Ke 3*. Yogyakarta: Pensil Komunika.
- Serway, R. A., & Jewett, J. W. (2009). *Fisika Untuk Sains dan Teknik*. Jakarta: Salemba Teknika.
- Suharsimi, A. (2009). *Dasar-Dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara.
- Sugiyono. (2012). *Metode Pendekatan Penelitian Kuantitatif-Kualitatif*. Bandung: Alfabeta.
- Suseno, N. (2010). Kendala Penerapan Inkuiri dalam Perkuliahan Listrik-Magnet di LPTK. *Jurnal Pengajaran MIPA*, 15(2), 19-102.
- Suseno, N. (2014). Pemetaan Analogi Pada Konsep Abstrak Fisika. *Jurnal Pendidikan Fisika*, 2(2), 1-10.
- Sutarno. (2011). Penggunaan Multimedia Interaktif Pada Pembelajaran Medan Magnet Untuk Meningkatkan Keterampilan Generik Sains Mahasiswa. *Jurnal Exacta*, IX(1).
- Yeany, R., H. & Miller, P. A. (1993). Effect of Diagnostic Remedial Instruction on Science Learning.. A Meta Analysis. *Journal For Research in Science Teaching* 20, 19-26
- Zaenal Arifin. (2009). *Evaluasi Pembelajaran*. Bandung: PT Remaja Rosdakarya.