
Implementing a Four-Tier Diagnostic Test to Assess Elementary School Students' on Electricity Concept

Hendri Marhadi¹, Eva AstutiMulyani¹, Astri widyanthi¹, Neni Hermita¹

¹Program Studi PGSD FKIP, Universitas Riau, Jl. BinaWidya Km 12,5,
Pekanbaru 28293, Indonesia

Email: hendri.marhadi@lecturer.unri.ac.id

Abstract: This study reports on the implementing a four-tier test diagnostic instrument on magnetism concept, which has not been defined in the literature. It is an improved understanding of the two-tier test matters. The four-tier diagnostic test was focused on electricity concept. It was measured to 20 elementary school students. They were correctly trained on the preceding topics. The substantial corporate of the respondents was established to have an unfortunate kind and misconceptions of the subjects tested. We have already described that the test was able to investigate and categorize students into student conception of electricity concepts. Research result with four tier tests showed scientific conception 9 %, which was likely to have misconceptions 64 %, and the students were lack of knowledge the concept of 25 %, and had an error amounted to 2 %. The elementary school students' inclined to be unwell aware among what they diagnosed and what they do not diagnosed. It might be determined that a Four-Tier Diagnostic Test which has previously been established be able to assess elementary school students' conception on electricity concept.

Keywords: four-tier diagnostic test, elementary student, electricity concept.

1. Introduction

(Gurel, 2015) describes misconceptions as precise constant repeating thought patterns that do not conform to established scientific models. Misconceptions have also been described as alternative conceptions, pre-conceptions, children's science, preconceived notions, nonscientific beliefs, naïve theories, mixed conceptions or conceptual misunderstandings (Moodley & Gaigher, 2017). Many probable sources give to misconceptions, ranging from personal experiences, family, friends, analogies, media, teachers and textbooks.

Misconceptions about electricity concept have been recognized in many studies since the 1970s, and in some cases there is some overlies between different misconceptions (Kaltakci-Gurel, Eryilmaz, & McDermott, 2016). Diverse tests have been available to categorize misconceptions about simple electricity. From the literature, the following misconceptions have emerged: the unipolar model, the opposing existing model, the decrease model, current consumption model, the shared current model, the empirical rule model, local and sequential reasoning, the short circuit preconception, the constant-current-source model, the parallel circuit misconception, and the superposition model (Brna, 1998).

Researchers from an assortment of hypothetical perspectives have argued that the most significant characteristic that students bring to their classes are their conceptions (Lin, 2016), most of which be at variance from those of scientists (Risch, 2014). Student conceptions that oppose the scientific view are regularly namely 'misconceptions. Mostly, misconceptions have the common characteristic of being powerfully detained, reasoned conceptual structures which are challenging to modify through conventional instruction and require special notice for students to expand a scientific thoughtful (Liampa, Malandarkis, Papadopoulou, & Pnevmatikos, 2017). Consequently, accurate classification of misconceptions has become a significant first step in order to increase an considerate of student education.

This study aims to investigate elementary school students' conception on electricity concept.

2. Methodology

In this study, the diagnostic instruments on misconception assessment have developed by NeniHermita etc. (Hermita, et al., 2017).It was measured to 20 elementary school students. They were correctly trained on the preceding topics. The substantial corporate of the respondents was established to have an unfortunate kind and misconceptions of the subjects tested.It was measured to 20 elementary school students. They were correctly trained on the preceding topics. The substantial corporate of the respondents was established to have an unfortunate kind and misconceptions of the subjects tested.

3. Result and Discussion

Diagnostic instruments misconceptions was tested to students' elementary school. And to investigate students' conception on electricity concept quantitatively data were expressed in percentage. To identify students' conception through four tier test format and the data analysis used as shown in Table 1.

Table 1. The category of pre-service elementary teachers' misconception with four tier diagnostic test (Hermita, et al. 2017)

No	Category	Combination of answers			
		Option (Tier I)	The first Confidence Rating Scale (Tier II)	Reasons (Tier III)	The Second Rating Scale (Tier IV)
	Scientific Knowledge (SK)	Correct	Sure	Correct	Sure
	Lack of Knowledge (LK)	Correct	Sure	Correct	Not Sure
		Correct	Sure	Incorrect	Not Sure
		Correct	Not Sure	Correct	Sure
		Correct	Not Sure	Correct	Not Sure
		Correct	Not Sure	Incorrect	Not Sure
		Incorrect	Sure	Correct	Not Sure
		Incorrect	Sure	Incorrect	Not Sure
		Incorrect	Not Sure	Correct	Not Sure
	Misconception (M)	Incorrect	Not Sure	Incorrect	Not Sure
		Correct	Sure	Incorrect	Sure
		Correct	Not Sure	Incorrect	Sure
		Incorrect	Sure	Incorrect	Sure
	Error (E)	Incorrect	Not Sure	Incorrect	Sure
		Incorrect	Sure	Correct	Sure

Students' elementary school teachers' conception obtained four tier tests showed scientific conception 9 %, which was likely to have misconceptions 64 %, and the students were lack of knowledge the concept of 25 %, and had an error amounted to 2 %. Table 2 present that the conception percentage profile.

Table 2. Elementary school students' conception profile on electricity concept

M (%)	LK (%)	SC (%)	E (%)
64	25	9	2

Table 2 shown that number of student of elementary school teachers who misconception on electricity concept. The result of students' conception test shows that the learning activity using traditional method of information and the microscopic electricity concept requires visualization media which can model the microscopic phenomena into macroscopic that can be observed.

4. Conclusion

Based on the research that has been done, the elementary school students' inclined to be unwell aware among what they diagnosed and what they do not diagnosed. It might be determined that a Four-Tier Diagnostic Test which has previously been established be able to assess elementary school students' conception on electricity concept.

References

- Brna, P. (1998). Confronting misconceptions in the domain of simple electrical circuit. *Instructional Science* 17 , 29-55.
- Gurel, D. K. (2015). A Review and Comparison of Diagnostic Instruments to Identify Students' Misconceptions in Science. *Eurasia Journal of Mathematics, Science & Technology Education* 11 (5) , 989-1008.
- Hermita, N., Suhandi, A., Syaodih, E., Samsudin, A., Isjoni, & Rosa, F. (2017). Assessing Pre-Service Elementary School Teachers' Alternative Conceptions through a Four-Tier Diagnostic Test on Magnetism Concepts. *Advanced Science Letters*; 23 (11) , 10910-10912.
- Hermita, N., Suhandi, A., Syaodih, E., Samsudin, A., Isjoni, Johan, H., et al. (2017). Constructing and Implementation a Four Tier Test about Static Electricity to Diagnose Pre-Service Elementary School Teacher's Misconceptions. *Journal of Physics: Conference Series* .
- Hermita, N., Suhandi, A., Syaodih, E., Samsudin, A., Isjoni, Johan, H., et al. (2017). Constructing and Implementing a Four Tier Test about Static Electricity to Diagnose Pre-Service Elementary School Teachers' Misconceptions. *IOP Conference Series: Journal of Physics: Conference Series* 895 .
- Kaltakci-Gurel, D., Eryilmaz, A., & McDermott, L. C. (2016). Identifying pre-service physics teachers' misconceptions and conceptual difficulties about geometrical optic. *European Journal of Physics* 37 , 1-30.
- Liampa, V., Malandarkis, G. N., Papadopoulou, P., & Pnevmatikos, D. (2017). Development and Evaluation of a Three-Tier Diagnostic Test to Assess Undergraduate Primary Teachers' Understanding of Ecological Footprint. *Research Science Education* .
- Lin, J.-W. (2016). Development and Evaluation of the Diagnostic Power for a Computer-Based Two-Tier Assessment. *Journal Science Educational Technology* .
- Moodley, K., & Gaigher, E. (2017). Teaching Electric Circuits: Teachers' Perceptions and Learners' Misconceptions. *Research Science Education* , 1-17.
- Risch, M. R. (2014). Investigation about representations used in teaching to prevent misconceptions regarding inverse proportionality. *Risch International Journal of STEM Education* 1 (4) .