Journal of Educational Sciences Vol. 9 No. 6 (Nov, 2025) 4950-4963

Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Measuring The Unseen: Digitalization of Physics Diagnostic Assessment Based on Rasch Model

Nena Setia Nurani*, Fathur Rokhman, Sarwi
Educational research and evaluation, Universitas Negeri Semarang, Semarang, 50229, Indonesia

ARTICLE INFO

Article history:
Received: 19 Sept 2025
Revised: 24 Oct 2025
Accepted: 25 Oct 2025
Published online: 05 Nov 2025

Keywords:
Digital Assessment Diagnostic,
Rasch Model,
Work and Energy Topics

* *Corresponding author:*
E-mail: nenasetia07@students.unnes.ac.id

Article Doi:
https://doi.org/10.31258/jes.9.6.p.4950-4963

A B S T R A C T

This study aims to develop a digital diagnostic assessment on the topic of work and energy using Rasch Model analysis. The instrument is designed to identify students' misconceptions and learning difficulties more accurately. The research applies the Research and Development (R&D) approach with a modified 3-D model, consisting of four main stages: define, design, develop, and implementation. The validity and reliability of the instrument were analyzed using the Rasch Model through Winstep software. The results show that the instrument has a high validity level (V-Aiken > 0.8) and a strong reliability index of 0.89. The analysis also identified five items categorized as high-level, two as medium-level, and three as low-level instruments. Furthermore, the practicality test indicates that the instrument is easy to use, engaging, and accessible through multiple digital devices. Overall, the developed digital assessment tool proves to be effective in supporting teachers to conduct more efficient evaluations, providing a clearer understanding of students' conceptual grasp in physics. This tool not only enhances the accuracy of assessment but also contributes to improving students' comprehension of the work and energy concepts through interactive and technology-based learning approaches.

1. Introduction

Diagnostic assessment plays a vital role in the physics learning process as it allows educators to identify students' initial understanding and potential learning difficulties at an early stage (Firmanzah & Sudibyo, 2021). Early detection of misconceptions is crucial for providing timely interventions, guiding effective teaching strategies, and improving overall learning outcomes. Despite its importance, most assessment instruments currently used in physics education are still paper-based, standardized for general use, and have not yet met high standards of validity and reliability. Consequently, these traditional assessments often fail to capture the depth of students' conceptual understanding and may not provide accurate or actionable insights into their learning difficulties. As education increasingly incorporates digital technologies, there is a growing need for diagnostic assessments that are digital, efficient, and capable of delivering real-time results. Digital assessments offer several advantages, including quick feedback, interactive interfaces, and the ability to track students' progress over time, thereby supporting personalized learning approaches (Himmah et al., 2023).

The topic of work and energy in physics is considered complex and abstract, requiring not only memorization of formulas but also deep conceptual understanding and critical thinking. Students are often challenged by the need to connect theoretical knowledge with practical applications, such as understanding the relationship between force, displacement, and energy transformation. According to Permana (2022), misconceptions in this topic frequently arise because conventional assessments are unable to thoroughly explore students' conceptual understanding. Many students can solve numerical problems mechanically without truly understanding the underlying principles, leading to persistent misconceptions that hinder further learning. Lengkong (2021) found that 63.3% of students had misconceptions in basic physics concepts, illustrating the widespread nature of misunderstandings among learners. These findings highlight the necessity of developing diagnostic assessments that not only evaluate students' knowledge but also reveal their thinking processes. Methods such as essay questions, scenario-based problems, and open-ended tasks allow educators to gain deeper insights into students' reasoning, identify specific misconceptions, and design targeted interventions that address individual learning needs.

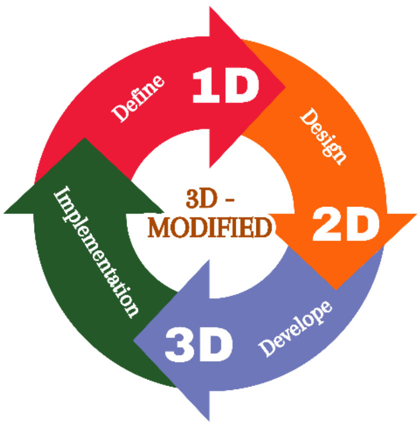
In this regard, the Rasch model provides a robust framework for evaluating the quality of assessment instruments. The Rasch model enables researchers to analyze item validity and reliability systematically while offering an objective perspective on item difficulty and discrimination (Engelhard & Wind, 2021). By applying Rasch analysis to diagnostic assessments, educators can ensure that items accurately measure students' abilities, distinguish effectively between different levels of understanding, and identify which items are most informative for detecting learning difficulties. The combination of Rasch modeling and digital assessment technology represents a significant advancement in educational measurement, as it allows for precise calibration of test items, reliable scoring, and comprehensive analysis of student performance. This integration also facilitates the creation of adaptive assessments that adjust item difficulty based on students' responses, promoting a more personalized and meaningful learning experience.

The development of a digital diagnostic assessment using the Rasch model is particularly relevant for the topic of work and energy. This approach allows educators to examine not only whether students provide correct answers but also the reasoning behind their responses, uncovering misconceptions and cognitive gaps that may impede learning. The primary aim of this research is to develop a valid, reliable, and user-friendly digital diagnostic assessment instrument that can effectively measure students' understanding of work and energy concepts. The instrument is designed to provide immediate feedback to both students and educators, enabling timely interventions and targeted learning strategies. By combining technological innovation with rigorous measurement principles, this study seeks to enhance the effectiveness of physics education, support critical thinking development, and improve problem-solving skills.

Ultimately, this research contributes to the advancement of educational assessment by addressing the limitations of traditional paper-based instruments and leveraging the capabilities of digital technology. The digital diagnostic assessment developed in this study is expected to serve as a practical tool for teachers to monitor learning progress, identify misconceptions, and design instructional strategies that meet students' needs. In addition, it provides students with opportunities to reflect on their understanding, engage more deeply with physics concepts, and develop higher-order cognitive skills. By integrating the Rasch model into digital assessment design, this research demonstrates how educational measurement and technology can work together to improve learning outcomes, making the teaching and learning of complex physics topics more effective, reliable, and engaging.

2. Methodology

This research employs a Research and Development (R&D) approach using a 3D-Modified model. This model is an adaptation of the original 4-D model developed by Thiagarajan, as cited by Sugiyono (2020), which has been modified to better suit the specific objectives and context of the study. The 3D-Modified model retains the core principles of the 4-D framework but introduces adjustments in its stages to allow for more flexible implementation and to address practical challenges encountered during the research process. By utilizing this model, the study aims to systematically define, design, develop, and implement the research product while ensuring both theoretical rigor and practical applicability. This approach facilitates a structured yet adaptable methodology that can capture the nuances of the research environment and improve the overall effectiveness of the development process (Sugiyono, 2020).



Picture 1. 3D – Modified

3D – Modified model (in Picture 1) eliminates disseminate phase, because the research just do until implementation phase. There are four stage to do the research. First one is define, which analize needed through observation and questionnaire for teacher and students. Second is design, which compose instrument assessment diagnostic with essay question type according learning outcome and bloom taksonomi. Third is develop, which measure the instrument and media validity from expert. Then doing limited trial, revision, and data analyze using rasch model. Last stage is implementation the instrumen on physics learning. Research subject is 317 ten grade students from SMA Muhammadiyah 1 Nganjuk and SMAN 1 Rejoso. This research using purposive sampling to choose the proper subject. Instrument using ten assessment diagnostic question with essay type, expert validity questionnaire for instrument and media, practically questionnaire and student responses. Validity analysis using V-Aiken, reliability and item difficulties analized using rasch model with winstep software. Practical test and student reponses result interpreted directly.

3. Results and Discussion

The instrument validation in this study was carried out through a review process involving three experts in the relevant field. The evaluation results showed that all instrument items received a V-Aiken score greater than 0.8, indicating that the instrument possesses strong content validity. In other words, the instrument is considered appropriate and reliable for use in this research because the experts agreed that each item is relevant, clear, and capable of measuring the intended aspects. The V-Aiken threshold of >0.8 is widely accepted in educational measurement as an indicator of professional consensus among experts regarding the quality of the instrument(Tsaniya Tafryda, 2023).

Tabel 1. Instrument Validity

No.	Assessment Aspects	V
1	Instrument Number 1	0,66667
2	Instrument Number 2	0,66667
3	Instrument Number 3	0,55556
4	Instrument Number 4	0,77778
5	Instrument Number 5	0,66667
6	Instrument Number 6	0,66667
7	Instrument Number 7	0,77778
8	Instrument Number 8	0,77778
9	Instrument Number 9	0,77778
10	Instrument Number 10	0,66667
	Total	10
	Average	**1**

The average V-Aiken value of 0.828 across the ten media validity criteria indicates that the tool's content is both appropriate and effectively designed. This score demonstrates that the media items are clear, relevant, and suitable for their intended educational purpose. The results also reflect a strong agreement among experts, suggesting that the tool meets professional standards in educational media development. By aligning with established validation practices for educational technologies, the tool can be considered reliable and capable of supporting effective learning experiences.

Tabel 2. Media Validity

No.	Assessment Criteria	V
1	Effective media when used	0,88889
2	Easy-to-use media	0,88889
3	Interesting media to use	0,77778
4	Media that is easy to store	0,88889
5	The tools chosen to develop the media are appropriate.	1
6	Display	0,66667
7	Button Usage	0,88889
8	Use of font type and size	0,66667
9	Color Composition	0,77778
10	Navigation	0,88889
11	Clarity of Instructions for Use	0,77778
	Total	9,11111
	Average	**0,82828**

Moving to construct validity and reliability analysis using the Rasch model, the item reliability of 0.89 is considered excellent, indicating that the instrument can accurately distinguish between different student ability levels (Tarigan, 2022). The INFIT and OUTFIT statistics further confirm a good model fit for seven out of ten items, showing that most items function according to Rasch assumptions. Rasch analysis is widely appreciated in educational research for providing objective evidence of item functioning and student performance measurement (Sinaga & Saepuzaman, 2025), making this instrument reliable for assessing students' understanding.

Tabel 3. Item Reliability

Item		INFIT		OUTFIT	
		IMNSQ	ZSTD	OMNSQ	ZSTD
MEAN		0.98	-0.5	0.99	-0.4
S.D.		0.30	4.3	0.38	3.9
REAL RMSE	2.92		Item Reliability		0.89

Tabel 4. Item Measure

Item Variabel	Measure	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT MEASURE CORR
Item 1	-0.06	1.24	3.8	1.17	1.9	0.43
Item 2	0.04	0.60	-6.7	0.60	-4.4	0.54
Item 3	0.18	0.75	-3.0	0.93	-0.5	0.31
Item 4	0.10	1.01	0.2	1	0.1	0.32
Item 5	-0.5	0.83	-3	0.72	-3.5	0.55
Item 6	-0.11	0.97	-0.5	0.88	-1.5	0.54
Item 7	0.09	0.86	-1.8	0.87	-1.1	0.37
Item 8	0.05	0.92	-1.1	0.90	-0.9	0.41
Item 9	-0.10	0.85	-2.7	0.75	-3.3	0.57
Item 10	-0.14	1.74	9.9	2.04	9.9	0.23

From ten item, seven item fit with model and three item need revision. In Rasch modeling, INFIT/OUTFIT MNSQ values between approximately 0.7 and 1.3 commonly indicate appropriate fit. Seven items fell within this acceptable range, reflecting that students' responses align well with the latent construct. This result mirrors findings in the Unnes Physics Education Journal, where Rasch-informed item fit guided iterative improvement to strengthen construct validity (Prahani et al., 2022). The three misfitting items warrant review likely due to ambiguous wording or divergent difficulty expectations and could be revised or omitted based on diagnostic fit data. Item difficulties have various level from high, middle and low. It show that instrument could indetify various students ability. Tools with appropriate difficulty spread are essential for accurately profiling student competencies, from struggling learners to those ready for challenge .

The analysis results show that, out of ten items, three items, specifically items 3, 7, and 10 did not fit the Rasch model, as indicated by ZSTD and Pt Measure Corr values outside the recommended range. These items require revision to better assess students' conceptual understanding. The other seven items met the criteria and fit well with the Rasch model, which is consistent with Avinç and Doğan (2024), who emphasize that Rasch analysis reliably differentiates varying levels of student ability. Overall, the findings suggest that while students can handle easier items, they struggle with items requiring deeper conceptual reasoning or written explanation of their problem-solving processes, which aligns with previous research indicating students' tendency to skip intermediate steps in physics problem-solving (Forniawan & Wati, 2024; Walidain, 2020).

1	Menghitung usaha yang dilakukan oleh gaya konstan pada benda.	C3 (Aplikasi)	Benda bermassa 5 kg didorong dengan gaya konstan 20 N sejauh 4 meter di atas permukaan datar licin sehingga gaya gesekan diabaikan. Hitunglah usaha yang dilakukan oleh gaya tersebut!

Figure 2. Item 1

In Figure 2. Item 1, categorized as medium difficulty with a logit value of -0.06, showed that 143 out of 317 students scored 0. Most students wrote only the final answer without showing the calculation process, making it difficult to evaluate their reasoning. This finding is in line with Walidain (2020), who reported that students often provide correct final answers yet fail to communicate their intermediate reasoning steps, leading to incomplete assessment of their conceptual understanding. These results indicate a need for instructional emphasis on explaining calculation steps and reasoning, rather than only focusing on obtaining the correct answer

.

2	Menggunakan rumus energi kinetik untuk menentukan kecepatan benda.	C3 (Aplikasi)	 Arini mendorong sepeda yang massanya 8 kg sepanjang jalan menuju rumah. Ketika sepeda bergerak,energikinetiknya sebesar 400 Joule. Berapakah kecepatan sepeda saat itu ?

Figure 3. Item 2

Item 2 (in Figure 3) classified as difficult with a logit value of 0.04, had 200 students scoring 0. Many students provided only the final answer or wrote merely the "known" and "asked" information, without showing detailed calculations. This pattern reflects a common issue in physics education, where students struggle to express mathematical reasoning clearly in writing (Walidain, 2020; Prastyo et al., 2024). The findings suggest that students need structured guidance on expressing their problem-solving processes to improve both accuracy and conceptual understanding.

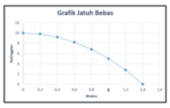
4	Menggunakan rumus energi potensial gravitasi untuk menghitung energi potensial suatu benda.	C3 (Aplikasi)	Grafik berikut menunjukkan perubahan ketinggian bola terhadap waktu selama gerakan jatuh bebas hingga mencapai tanah.  Berdasarkan grafik diatas, tentukan waktu tempuh bola ketika berada pada ketinggian 5 meter ! ($g = 10 \text{ m/s}^2$)

Figure 4. Item 4

Item 4 (in Figure 4) is also a difficult question, with a logit value of 0.18, and 193 students scored 0. The main challenge was interpreting graphical data, which caused many students to leave the item unanswered or provide incomplete responses. This aligns with Küchemann et al. (2023), who emphasized that visual interpretation poses a significant challenge in science assessments. These findings indicate the importance of integrating graph interpretation exercises in physics instruction to help students translate visual information into conceptual understanding effectively.

5	Menjelaskan konsep hukum kekekalan energi mekanik dan penerapannya.	C4 (Analisis)	Perhatikan beberapa kasus dalam kehidupan sehari – hari berikut ini. 1. Seorang pemain ski meluncur menuruni bukit yang licin tanpa mengerem. 2. Ayunan bolak – balik tanpa dorongan. 3. Bola basket dipantulkan sampai berhenti. Tentukan mana yang termasuk hokum kekekalan energi mekanik dan berikan alasannya!

Figure 5. Item 5

Item 5 (in Figure 5) falls into the medium difficulty category, with a logit value of -0.05. Out of 317 students, 151 scored 0. Many answered only “yes” or “no” or left the question blank, indicating difficulty in explaining the law of conservation of mechanical energy. This finding is consistent with Prastyo et al. (2024), who reported that high school students often struggle to articulate conceptual physics knowledge in written form. The students’ inability to provide detailed explanations suggests that they may understand the concept superficially but cannot fully connect it to problem-solving steps. Instruction that integrates guided inquiry or step-by-step demonstration of energy concepts could help bridge this gap and strengthen conceptual understanding.

6	Menghitung energi potensial elastis suatu pegas menggunakan rumus terkait.	C3 (Aplikasi)	Pegas dengan konstanta 500 N/m ditarik sejauh 0,2 meter. Hitunglah energi potensial elastis yang tersimpan dalam pegas!

Figure 6. Item 6

Item 6 (in Figure 6) is categorized as an easy question, with a logit value of -0.11, and 115 students scored 0. Most students wrote only the final answer without showing the calculation steps, which reflects a trend noted by Huda et al. (2022) that even in easier items, students often do not communicate their reasoning. This pattern indicates that students may guess or rely on memorized formulas rather than applying conceptual understanding. Incorporating scaffolded problem-solving tasks and requiring explanation of each step could improve both procedural and conceptual comprehension in physics learning.

8	Menggunakan rumus energi kinetik untuk menghitung energi benda yang bergerak.	C3 (Aplikasi)	Mobil polisi bermassa 1000 kg sedang mengintai penjahat dari kejauhan dan berjalan perlahan dengan kecepatan konstan 20 m/s untuk bersiap mengejar penjahat. Berapakah energi kinetik mobil tersebut?

Figure 7. Item 8

Item 8 (Figure 7), a difficult question with a logit value of 0.05, had 202 students scoring 0. Many students wrote only the final answer, made calculation errors, or confused responses with other items, particularly confusing kinetic and potential energy. Annisa et al. (2025) similarly highlighted that students often experience conceptual confusion when distinguishing between related physics concepts. This finding suggests the need for explicit instructional interventions that differentiate these concepts and include formative assessments to monitor understanding. Additionally, classroom discussions and visual simulations could support students in connecting theoretical concepts with observable phenomena.

9	Menggunakan hukum kekekalan energi untuk menentukan ketinggian maksimum benda.	C3 (Aplikasi)	Bola volley bermassa 280 gram dilempar vertikal ke atas dari permukaan tanah dengan kecepatan awal 20 m/s. Dengan menggunakan hukum kekekalan energi, tentukan ketinggian maksimum yang dapat dicapai bola! (Gunakan percepatan gravitasi g = 10 m/s²).

Figure 8. Item 9

Item 9 (Figure 8) is considered an easy question, with a logit value of -0.10, and 110 students scored 0. Most students provided only the final answer without showing detailed calculations. This aligns with previous research indicating that students often omit intermediate reasoning even in simpler items (Ravika Oktaviani Putri, 2025). The lack of explanation suggests that students may not fully internalize the mathematical steps behind physical processes. Teachers could incorporate exercises that require students to write out step-by-step solutions and justify their reasoning to enhance conceptual clarity.

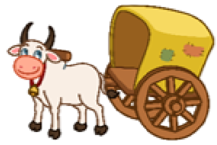
3	Menganalisis hubungan antara usaha dan energi kinetik berdasarkan teorema usaha-energi.	C4 (Analisis)	 Sapi menarik gerobak, sehingga gerobak tersebut berpindah pada jarak tertentuk. Jelaskan hubungan antara usaha dan perubahan energi kinetik!

Figure 9. Item 3

Item 3 (Figure 9), one of the misfitting items and classified as difficult with a logit value of 0.18, had 194 students scoring 0. Many responses were brief, failing to explain the relationship between work and kinetic energy, and some students wrote only the work equation. This is consistent with Pratiwi et al. (2024), who found that conceptual physics questions often result in incomplete written explanations. The data indicate that while students may understand formulas, they struggle to express the underlying concepts clearly. Implementing activities that require explanation of cause-effect relationships and connecting formulas to real-life contexts could help students develop deeper conceptual understanding.

7	Menganalisis pengaruh gaya gesek terhadap energi mekanik benda bergerak.	C4 (Analisis)	  Perhatikan gambar diatas. Jika gaya gesek bekerja pada kereta bayi yang didorong Sasa di jalan aspal dan kereta bayi yang didorong Andi di jalan berkerikil. Jelaskan bagaimana pengaruhnya terhadap energi mekanik kereta bayi Sasa dan Andi ?

Figure 10. Item 7

Item 7 (in Figure 10), also a misfitting item and categorized as difficult (logit value 0.09), showed 189 students scoring 0. Many students left it unanswered or wrote short responses that lacked explanation, such as "both strollers experience a force," without clarifying the effect on each object. Ekawati et al. (2024) similarly reported that students often provide partial or incomplete explanations in physics tasks requiring conceptual reasoning. This suggests that students need guided practice in linking concepts to observable effects, as well as structured feedback to improve their written reasoning. Incorporating peer discussions and model answers could enhance students' ability to articulate their understanding effectively.

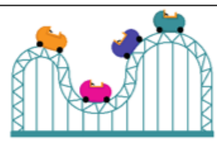
10	Menjelaskan perbedaan energi kinetik dan energi potensial dengan contoh pada kehidupan sehari - hari.	C4 (Analisis)	 Perhatikan gambar roller coaster diatas. Jelaskan Energi kinetic dan Energi Potensial pada posisi tiap roller coaster.

Figure 11. Item 10

Item 10 (in Figure 11*)*, the last misfitting item and considered easy (logit value -0.14), had 113 students scoring 0. Many students explained only a single position of the cart, such as "the green cart has the greatest kinetic energy," without addressing energy changes at all positions. This aligns with Az'ari and Putra (2025), who found that students often provide partial explanations in physics assessments. The finding indicates that students are beginning to develop analytical thinking but still face difficulties in expressing reasoning fully. Providing guided worksheets, multi-step questions, and opportunities for students to explain answers in their own words may help strengthen both analytical and written communication skills in physics.

4. Conclusion

The development of digital-based diagnostic assessment instruments using the Rasch model on work and energy material has resulted in instruments that demonstrate high validity, reliability, and practicality. These instruments are designed to accurately measure students' understanding and can effectively detect misconceptions, providing detailed insights into areas where students struggle. By utilizing an essay-based approach combined with Rasch analysis, the assessment offers deeper diagnostic information compared to traditional multiple-choice tests, allowing educators to tailor their teaching strategies based on precise learning gaps. Furthermore, the digital format enhances accessibility and ease of use, enabling implementation across various school settings and learning environments. The

Rasch model also ensures that the instrument maintains objectivity and fairness in evaluating different student ability levels. Overall, this diagnostic assessment not only supports teachers in identifying student difficulties but also contributes to improving learning outcomes, making it a valuable tool in science education.

Acknowledgement

I would like to express my deepest gratitude to my supervisors, Prof. Dr. Fathur Rokhman, M.Hum., and Prof. Dr. Sarwi, M.Si., for their invaluable guidance, constructive feedback, and continuous encouragement throughout the completion of this research. Their expertise and insightful suggestions have been essential in shaping this study from its early stages to its final form. I also extend my sincere appreciation to all the participants of this research, the students and teachers for their willingness to take part, share their time, and contribute valuable information that made this work possible.

References

Annisa, F., Hidayah Binti Ahmad, N., & Fahira, A. (2025). ORBITA: Jurnal Pendidikan dan Ilmu Fisika Design and validation of a diagnostic test instrument for identifying misconceptions in basic physics. 11(1), 1–11. https://journal.ummat.ac.id/index.php/orbita/index

Avinç, E., & Doğan, F. (2024). Digital literacy scale: Validity and reliability study with the rasch model. In *Education and Information Technologies* (Vol. 29, Issue 17). Springer US. https://doi.org/10.1007/s10639-024-12662-7

Az’ari, L. F., & Putra, N. M. D. (2025). Pengembangan Instrumen Tes Diagnostik untuk Mengidentifikasi Pemahaman Konsep Mahasiswa pada Materi Gelombang Bunyi. *Unnes Physics Education Journal*, 14(1), 71–84. https://doi.org/10.15294/upej.v14i1.24208

Ekawati, E. Y., Sabrilla Almas Azzahra, & Hanun Fithriyah. (2024). Construction of Critical Reasoning Skills Assessment Instruments as Diagnostic Assessments in Physics Learning with Polytomus Scoring. *Journal of Education Research and Evaluation*, 8(2), 338–349. https://doi.org/10.23887/jere.v8i2.69259

Engelhard, G., & Wind, S. A. (2021). A history of Rasch measurement theory. In *The History of Educational Measurement* (pp. 343–360). Routledge.

Firmanzah, D., & Sudibyo, E. (2021). Implementasi Asesmen Diagnostik Dalam Pembelajaran Ipa Pada Masa Pandemi Covid-19 Di Smp/Mts Wilayah Menganti, Gresik. *Pensa E-Jurnal: Pendidikan Sains, 9*(2), 165–170. https://ejournal.unesa.ac.id/index.php/pensa/index

Forniawan, A., & Wati, D. R. (2024). Analisis dan Tindak Lanjut Hasil Asesmen Diagnostik Kognitif Mata Pelajaran Ilmu Pengetahuan Alam dan Sosial Sekolah Dasar. *Al Jahiz: Journal of Biology Education Research*, 4(2), 164–179. https://doi.org/10.32332/al-jahiz.v4i2.7962

Himmah, F., Rufi’i, R., & Wiyarno, Y. (2023). Pengembangan Aplikasi Asesmen Diagnostik Berbasis Computer Based Test (Cbt) Menggunakan Moodle.

JIPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika), 8(3), 1022–1032. https://doi.org/10.29100/jipi.v8i3.4380

Huda, C., Ma'ani, A. L., & Kaltsum, U. (2022). Analysis of Student Misconceptions Using Digital Four-Tier Diagnostics Test on Newton's Law. *Physics Education Research Journal*, 4(1), 17–22. https://doi.org/10.21580/perj.2022.4.1.8631

Küchemann, S., Ubben, M., Dzsotjan, D., Mukhametov, S., Weidner, C. A., Qerimi, L., Kuhn, J., Heusler, S., & Sherson, J. F. (2023). The impact of an interactive visualization and simulation tool on learning quantum physics: Results of an eye-tracking study. 1–14. http://arxiv.org/abs/2302.06286

Lengkong, M., Istiyono, E., Rampean, B. A. O., Tumanggor, A. M. R., & Nirmala, M. F. T. (2021). Development of Two-Tier Test Instruments to Detect Student's Physics Misconception. *Proceedings of the 7th International Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS 2020), 528*(Icriems 2020), 561–566. https://doi.org/10.2991/assehr.k.210305.082

Permana, A. H., Sekartaji, A., & Ambarwulan, D. (2022). Development of Diagnostic Test of Learning Difficulties for High School on Newton's Law Material using Moodle Learning Platform. *Journal of Physics: Conference Series, 2377*(1). https://doi.org/10.1088/1742-6596/2377/1/012070

Prahani, B. K., Amiruddin, M. Z. Bin, Suprapto, N., Deta, U. A., & Cheng, T. H. (2022). The Trend of Physics Education Research during COVID-19 Pandemic. *International Journal of Educational Methodology, 8*(3), 517–533. https://doi.org/10.12973/ijem.8.3.517

Prastyo, A., Fithriyah, H., Rahmawati, A. D., & Ekawati, E. Y. (2024). Identification of Students' Misconceptions using Four-Tier Diagnostic Assessment in Physics Learning Phase F. *Indonesian Journal of Science and Education*, 8(1), 16–25. https://doi.org/10.31002/ijose.v8i1.569

Pratiwi, I. T., Viyanti, & Permadi, D. (2024). The Development of the Two-Tier Diagnostic Test Instrument with Google Form to Measure Student Misconceptions on Energy and Energy Forms. *Impulse: Journal of Research and Innovation in Physics Education*, 4(1), 22–30. https://doi.org/10.14421/impulse.2024.41-03

Ravika Oktaviani Putri, S. (2025). Unnes Physics Education Journal Analisis Miskonsepsi Menggunakan Teknik Four-Tier Diagnostic Test Berbantuan Google. 14(1).

Sinaga, P., & Saepuzaman, D. (2025). Aiken's V analysis and Rasch modeling to determine the quality of physics creative thinking test instruments. *12*(1), 32–40. https://doi.org/10.12928/jrkpf.v12i1.1161

Sugiyono. (2020). *Metodologi Penelitian Kuantitatif, Kualitatif dan R & D*.

Tarigan, E. F., Nilmarito, S., Islamiyah, K., Darmana, A., & Suyanti, R. D. (2022). Analisis Instrumen Tes Menggunakan Rasch Model dan Software SPSS 22.0. *Jurnal Inovasi Pendidikan Kimia, 16*(2), 92–96. https://doi.org/10.15294/jipk.v16i2.30530

Tsaniya Tafryda, W. (2023). Pengembangan Instrumen Daring untuk Mengukur Kemampuan Komunikasi Sains Berbasis Multirepresentasi Peserta Didik pada Materi Gerak Lurus. September 2022. https://doi.org/10.15294/upej.v12i2.59724

Walidain, S. N. (2020). Analisis Kesulitan Belajar dan Miskonsepsi Mata Pelajaran Fisika Peserta Didik Sekolah Menengah Atas dengan Reasoning-Based Diagnostic Test. *Prosiding Seminar Nasional* ..., 538–542. http://e-journallppmunsa.ac.id/index.php/ippemas2020/article/view/205

How to cite this article:

Nurani, N. S., Rokhman, F., & Sarwi. (2025). Measuring The Unseen: Digitalization of Physics Diagnostic Assessment Based on Rasch Model. *Journal of Educational Sciences*, *9(6)*, 4950-4963.