JPPIPA 10(1) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Student Cognitive Learning Outcomes Tests Based on Differentiated Learning

Nur Azizah[1*], Edi Istiyono[2], Insih Wilujeng[3]

[1] Physic Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
[2] Physic Department, Faculty of Mathematic and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.
[3] Science Department, Faculty of Mathematic and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.

Received: August 23, 2023
Revised: November 28, 2023
Accepted: January 25, 2024
Published: January 31, 2024

Corresponding Author:
Nur Azizah
nur0124fmipa.2022@student.uny.ac.id

DOI: 10.29303/jppipa.v10i1.5080

Abstract: Differentiated learning is the core of the independent curriculum now. The aim of this research is to develop an instrument for measuring the cognitive learning outcomes of high school students based on differentiated learning on elasticity material and to obtain its characteristics. Differentiation, in this case, is differentiation of student learning styles. The instrument grid is arranged based on indicators of cognitive learning outcomes, which are then used to compile question items. The test instrument consists of two test sets, each of which has 9 items including two anchor items so that the total number of items is 16 items and has been validated by 6 experts. The validated instrument was tested on 252 respondents spread across high schools in the low, medium and high categories. Dichotomous data were analyzed using the Partial Credit Model (PCM). The trial results showed that all 16 items and the differentiated learning-based student cognitive learning outcomes test instrument were proven to be valid, fit the PCM model, and reliable, which means all items were in the good category. Thus, the test instrument developed meets the requirements for measuring the cognitive learning outcomes of high school students on elasticity material based on differentiated learning.

Keywords: Cognitive Learning Outcomes Tests; Differentiated Learning Styles; Instrument Development

Introduction

Differentiated learning in the independent curriculum is an important focus in education today. The main goal of the independent curriculum is to create an enjoyable learning experience in accordance with the needs of various students (Sh Bekkulov, 2022). The diversity of students includes diversity of cultural backgrounds, competencies, languages, learning styles, interests, and others (Dijkstra et al., 2016). Differentiated learning was chosen because of the fact that the diversity of students continues to increase and develop significantly (Dixon et al., 2014 & Nepal et al., 2021). Based on this reason, the independent curriculum is characterized by differentiated learning.

Differentiated learning is considered successful in addressing students' learning needs (Coubergs et al., 2017 & Pozas et al., 2020). Students who are taught using differentiated learning achieve better results because they provide opportunities to learn in a more natural and efficient way (Valiandes, 2015; Herwina, 2021; Sulistyosari et al, 2022). This certainly has an impact on changes in various learning tools.

Quality learning tools must be in accordance with curriculum demands. This is because the curriculum determines the direction and goals of education. (Budiyanti et al., 2020). One of the demands of an independent curriculum in physics subjects is to achieve the elements of understanding physics. Elements of understanding physics are closely related to cognitive learning outcomes (Angga et al., 2022; Hamilton et al., 2021).

The facts show that students' cognitive learning outcomes in elasticity material are still not appropriate.

How to Cite:
Azizah, N., Istiyono, E., & Wilujeng, I. (2024). Development of Student Cognitive Learning Outcomes Tests Based on Differentiated Learning. *Jurnal Penelitian Pendidikan IPA*, *10*(1), 194–200. https://doi.org/10.29303/jppipa.v10i1.5080

This is due to a lack of understanding of basic concepts related to Hooke's legal material, the lack of effectiveness of the media provided, and learning that still relies on educators or teacher centers (Sudirman & Qaddafi, 2023; Septiyana et al., 2021; Santyasa et al., 2020). Effective learning is the key to improving cognitive learning outcomes.

Cognitive learning outcomes reflect students' understanding of concepts. Where the assessment is evaluated through test scores (Anggraini & Mufit, 2022). Shi et al. (2020) emphasized that cognitive learning outcomes are the main indicator of educational quality, measured through exams or continuous assessments. The importance of supporting students' diverse abilities in cognitive thinking is highlighted by Osborne (2013) through the use of questions classified with Bloom's taxonomy. According to Anderson & Krathwohl (2001), Bloom's taxonomy of cognitive learning outcomes includes six indicators, namely remembering, understanding, applying, analyzing, evaluating and creating.

Assessment of cognitive learning outcomes cannot be done without paying attention to the diversity of students, such as learning styles. This is because each student uses a different type of intelligence during the learning process (Magableh & Abdullah, 2020). Providing special treatment according to learning style provides opportunities for students to learn in a natural and efficient way (Tyas & Safitri, 2017). Students who already recognize their learning styles well will make the learning process easier and have a positive impact on their achievement (Veloo et al., 2015; Matcha et al., 2020; Sinuraya et al., 2017).

Every student has a different learning style. Learning style is a person's way of absorbing, organizing and processing information easily (Rezigalla & Ahmed, 2019; Khamparia & Pandey, 2020). Learning styles are generally divided into three, namely visual, auditory and kinesthetic dominant learning styles. (Huang et al., 2020). The visual learning style is characterized by being sensitive to visual stimuli, multimedia, highlighting, and illustrations of ideas in images (Rogowsky et al., 2015 & Mohd et al., 2019). The auditory learning style is characterized by being sensitive to auditive information, learning strategies through discussion, audio and text material, and learning with music. The kinesthetic learning style is characterized by learning through movement and physical activity, strategies by exploring the environment, observation, practicum, highlighting, and learning while moving (Vasileva-Stojanovska et al., 2015 & Malacapay, 2019). Appropriate assessments are needed to monitor and evaluate the learning outcomes of students with diverse learning styles.

Assessment is the process of giving value based on measurement results according to criteria with certain quality values. Appropriate assessment influences learning achievement results (Tan & Ong, 2020). Assessment can be done either orally or in writing. Written assessment is carried out through written exams. In general, there are two types of tests in written exams, namely those that require selecting answers and those that require writing answers (Istiyono et al., 2014). Tests with answer selection include options such as multiple choice, two choices (true-false, yes-no), matching, and cause-and-effect.

A fact that assessments influence students' cognitive learning outcomes, and teachers need to plan assessments carefully to measure the learning outcomes of those with diverse learning styles. Test questions that are adapted to students' learning styles can influence their cognitive learning outcomes (Purnasari et al., 2021). Aisah and Agustini (2024) emphasize the use of questions that focus on how students understand concepts according to their visual/auditive/kinesthetic learning style, using a set of items that depend on the context of the student's learning style.

Multiple choice tests are still considered an efficient method of educational evaluation until now. This is because of the various advantages it has. However, this test also has weaknesses, such as being prone to cheating. To avoid cheating practices, such as working together with other students, it is recommended that the format of tests taken by students who are close together be different (Istiyono et al., 2014). Therefore, at least two sets of tests are required.

Preliminary survey results at Yogyakarta High Schools with an independent curriculum show that the majority use uniform multiple choice tests for all students, without paying attention to the students' diverse learning styles. This emphasizes that multiple choice tests remain the main choice in evaluating physics learning outcomes, even though they do not take into account the diversity of student learning styles.

The purpose of the test is to determine students' abilities and determine their position in the group. If the tests taken by students are not all the same, the tests consist of two or more sets, then it is difficult to compare test results between students. To enable comparison of test results on different test devices, anchor items are needed for the process of equating test results. Therefore, so that the test results of participants who complete two or more different sets of tests can be compared, it is necessary to carry out a test equalization process.

Based on this description, a test instrument in the form of multiple choices is needed to measure students' cognitive learning outcomes on elasticity material with differentiation or diversity of student learning styles. In line with these problems, research is needed to (1) produce an instrument to measure students' cognitive learning outcomes in visual/auditory/ and kinesthetic learning styles, and (2) obtain the characteristics of an instrument for assessing cognitive learning outcomes based on differentiated learning in the physics subject material elasticity.

Method

This research is Research and Development (RnD) research with the ADDIE development model. ADDIE, developed by Branch (2009), is an abbreviation that refers to the main stages of this development model, namely: Analyze, Design, Develop, Implement, and Evaluate.

The test instrument developed was validated by 2 experts and 4 practitioners. Subjects in this study were high school/equivalent students in Yogyakarta who had studied elasticity material, grade 12 high school, totaling 252 respondents. The schools selected are schools in the low, medium and high categories that use an independent curriculum and have a distribution of students with various learning styles. Data collection techniques were collected using test instruments in the form of test questions. In simple terms, the research flow is presented in Figure 1.

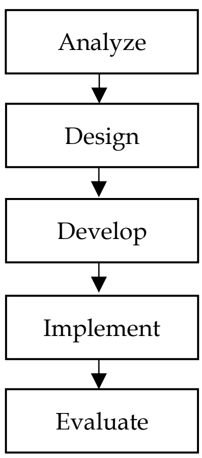

Figure 1. Research Flow

Result and Discussion

Initial Construction of the Instrument

Learning The test instrument for elasticity material consists of two test sets, each of which has 9 items including two anchor items, so there are a total of 16 items. The test instruments are prepared based on indicators of cognitive learning outcomes which include: knowing, understanding, applying, analyzing, evaluating and creating.

The cognitive learning outcomes test instrument based on learning style differentiation consists of two sets, namely set I coded A and set II coded B, with anchor questions coded C*. Each test covers elasticity material with indicators of knowing, understanding, applying, analyzing, evaluating and creating. The distribution of cognitive learning outcome test items based on differentiated learning styles is shown in Table 1.

Table 1. Distribution of Test Items for Cognitive Learning Outcomes Based on Differentiated Learning Styles

Indicator	Learning Style	Item Number
Knowing		1A (1)
		1B (10)
Understanding		2A (2)
		2B (11)
Applying	Visual	3A (3), 4A (4), 8C* (8)
	Auditory	3B (12), 4B (13)
Analyzing	Kinesthetic	5A (5), 6A (6)
		5B (14), 6B (15)
Evaluating		7A (7)
		7B (16)
Creating		9C* (9)

Content Validity

The content validity of the cognitive learning outcomes test instrument is determined by calculating the Aiken's V coefficient from expert and practitioner assessments. This coefficient applies to each item of the cognitive learning outcomes test instrument. The Aiken's V criteria that must be met if the number of raters is 6 people and the rating scale is 4 is 0.78 (Aiken, 1985). The results of the recapitulation of assessments from 6 raters on the cognitive learning outcomes test instrument items can be seen in Table 2.

Based on analysis using the V Aiken equation in table 2, the cognitive learning outcomes test items have a validation coefficient in the range of 0.78-0.89. Because the validity coefficient value for each item is the same and some are more than 0.78, each item of the cognitive learning outcomes test instrument based on content differentiation in the elasticity material developed is declared valid and suitable for use in trials with students.

Table 2. Validity Results of Expert and Practitioner Assessments on Cognitive Learning Outcomes Test Items

Item Number	Aiken's V value	Interpretation
1	0.89	Valid
2	0.78	Valid
3	0.78	Valid
4	0.78	Valid
5	0.83	Valid
6	0.78	Valid
7	0.83	Valid
8	0.78	Valid
9	0.89	Valid
10	0.83	Valid
11	0.78	Valid
12	0.89	Valid
13	0.83	Valid
14	0.83	Valid
15	0.78	Valid
16	0.89	Valid

Construct Validity

The construct validity of the cognitive learning outcomes test instrument aims to determine the suitability between the test items (goodness of fit). The test used uses the Rasch 1PL model or PCM (Partial Credit Model) (Adam & Khoo, 1996). A question item is said to be valid if the Pearson correlation value is > 0.2. The results of the validity analysis of each question item can be seen in Table 3.

Table 3. Construct Validity Results on Cognitive Learning Outcome Test Items Based on Pearson Correlation Values

Item Number	Pearson Correlation Value	Interpretation
1	0.50	Valid
2	0.67	Valid
3	0.38	Valid
4	0.45	Valid
5	0.53	Valid
6	0.56	Valid
7	0.43	Valid
8	0.59	Valid
9	0.55	Valid
10	0.41	Valid
11	0.60	Valid
12	0.55	Valid
13	0.54	Valid
14	0.44	Valid
15	0.55	Valid
16	0.29	Valid

Based on analysis using Parscale by looking at the Pearson correlation value for each item as shown in Table 3, the suitability of the cognitive learning outcomes test items with the model has a Pearson correlation value in the range of 0.298-0.676. Because the Pearson correlation value is more than 0.2, it can be said that each item of the cognitive learning outcomes test instrument based on content differentiation in the elasticity material developed is fit to the model or declared construct valid. The suitability of the test items can also be seen in the curve plot. Figure 2, is the item characteristic curve for item number 15.

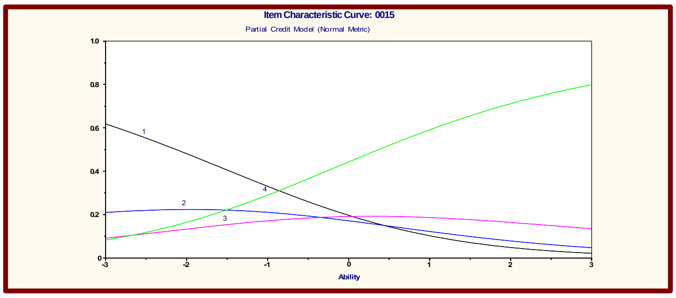

Figure 2. Characteristic curve for item number 15

The item characteristic curve for item number 15 is depicted in Figure 2. The probability of answering correctly for each score category and the student's ability is connected to the ICC curve. Students with a low ability of -3 (see Figure 2) have a chance of getting a score of 1. Students with a low ability of -2 are those who have a chance of getting a score of 2. Students with a medium ability of 1 have a chance of getting a score of 3. Students who are very talented or at their level of ability 3 are those who have a chance of getting a score of 4. The higher the student's ability level, the greater the chance of answering correctly. The characteristic curves for all items are shown in Figure 3.

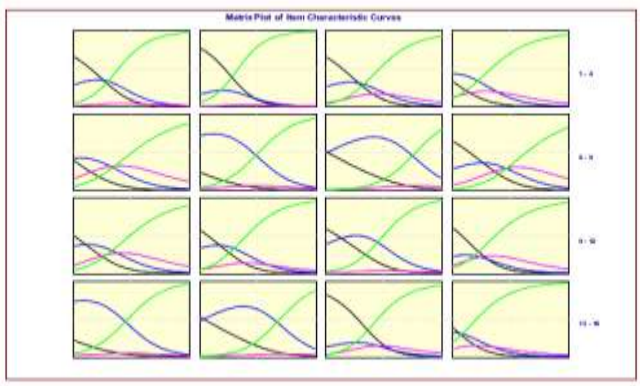

Figure 3. ICC curves for all items

Based on the Pearson correlation and ICC values obtained, all items of the cognitive learning outcomes test instrument match the model used.

Reliability

The reliability of the cognitive learning outcomes test instrument was analyzed using the Parscale program because it is polytomous. This reliability can be seen in the information function graph and SEM (Standard Error Measurement) in Figure 4.

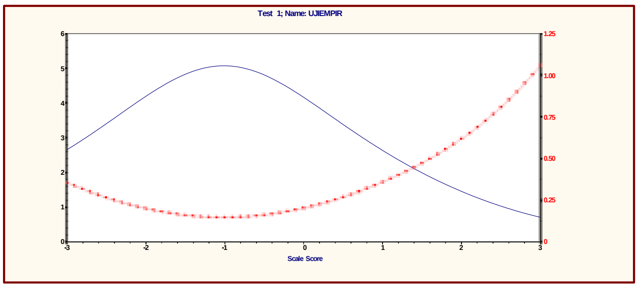

Figure 4. Graph of Information Function and SEM

Based on the information function in Figure 4, it can be said that the cognitive learning outcomes test instrument is reliable for measuring the abilities of students with abilities of -3 to 1.7 on a logit scale with an SEM of 0.45 or in the medium category.

Difficulty Level, Differential Power and Guessing Level

The cognitive learning outcomes test instrument is assessed using scoring guidelines. Each correct answer to an item is given a score of 1 and an incorrect answer to an item is given a score of 0. Each item has its own level of difficulty or what is called difficulty. Instrument items are said to be good if they have a difficulty level in the range -2.00 – 2.00 (Hambleton & Swaminathan, 1985). Based on the results of the analysis using the Parscale program, the level of difficulty, differential power, and level of guessing are shown in Table 4.

Table 4. Difficulty Level, Differential Power, and Guessing Level

Parameter	Average Value	Category
Difficulty Level "b"	-1.34	Currently
Power Difference "a"	0.31	Good
Guessing Level "c"	0.00	Low

Based on table 4, it can be said that the level of difficulty of the items in the cognitive learning outcomes test instrument is classified as medium criteria, the differentiability of each item is also good and the level of students guessing the answers is low or zero. Overall, the characteristics of the cognitive learning outcomes test instrument are in the good category.

Conclusion

Based on the results and discussion, it was found that: the construction of the cognitive learning outcomes test instrument based on differentiated learning on the differentiation of learning styles in elastic material with the type of test, namely multiple choice consisting of two test packages with 9 items each including two anchor items in it so that the total number of items is 16 items, the level of content validity according to experts is in the range of 0.78-0.89 or declared valid or suitable for use in trials with students, the cognitive learning outcomes test instrument is also declared to be construct valid and fit with the PCM model, the estimated reliability is in the medium category, and all questions have a medium level of difficulty, good discrimination and a level of guessing or low guessing. Overall, the cognitive learning outcomes test instrument based on differentiated learning on elasticity material is declared valid and reliable and has good item characteristics and can be used as an assessment instrument for students.

Acknowledgments

These thanks are conveyed specifically to Prof. Dr. Edi Istiyono, as supervisor, and to all parties who have helped the success of this research.

Author Contributions

Conceptualization, N. A., E. I., I. W.; methodology, N. A.; validation, E. I.; I. W.; formal analysis, N. A.; investigation, E. I.; resources, N. A. and. E. I; data curation, N. A: writing—original draft preparation, E. I.,. and N. A.; writing—review and editing, E. I., I.W.; visualization, N. A. and E. I. All authors have read and agreed to the published version of the manuscript.

Funding

This research was independently funded by researchers.

Conflicts of Interest

The authors declare no conflict of interest.

References

Adams, R. J. & Khoo, S. T. (1996). *Quest: The interactive test analysis system version 2.1*. Victoria: The Australian Council for Educational Reearch

Aiken, L. R. (1985) Three Coefficients for Analyzing the Reliability, and Validity of Ratings. *Educational and Psychological Measurement*, 45,131-142

Aisah, S., & Agustini, R. R. (2024). Pengembangan Instrumen Keterampilan Proses Sains Dengan Desain Pembelajaran Berdiferensiasi Di Tingkat Sekolah Dasar. *Jurnal Education and Development, 12*(1), 275-280. https://doi.org/10.37081/ed.v12i1.5746

Anderson, L.W. & D.R. Krathwohl. (2001). *A Taxonomy for Learning, Teaching, and Assesing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Addison Wesley Longman, Inc.

Angga, A., Suryana, C., Nurwahidah, I., Hernawan, A. H., & Prihantini, P. (2022). Komparasi Implementasi Kurikulum 2013 dan Kurikulum

Merdeka di Sekolah Dasar Kabupaten Garut. *Jurnal Basicedu, 6*(4), 5877–5889. https://doi.org/10.31004/basicedu.v6i4.3149

Anggraini, S. F., & Mufit, F. (2022). The Validity of Interactive Multimedia Based on Cognitive Conflict on Elasticity Materials Using Adobe Animate CC 2019. *EDUCATUM-Journal of Social Science (EJOSS), 8*(1), 13–22. https://doi.org/10.37134/ejoss.vol8.1.2.2022

Branch, R. M. (2009). *Instructional Design-The ADDIE Approach*. New York: Springer.

Budiyanti, N., Abdul Aziz, A., & Salim Mansyur, A. (2020). The Formulation of The Goal of Insan Kamil as a Basis For The Development of Islamic Education Curriculum. *IJECA (International Journal of Education and Curriculum Application), 3*(2), 81-90. https://doi.org/10.31764/ijeca.v3i2.2252

Coubergs, C., Struyven, K., Vanthournout, G., & Engels, N. (2017). Measuring teachers' perceptions about differentiated instruction: The DI-Quest instrument and model. *Studies in Educational Evaluation, 53*, 41–54. https://doi.org/10.1016/j.stueduc.2017.02.004

Dijkstra, E. M., Walraven, A., Mooij, T., & Kirschner, P. A. (2016). Improving kindergarten teachers' differentiation practices to better anticipate student differences. *Educational Studies, 42*(4), 357–377. https://doi.org/10.1080/03055698.2016.1195719

Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted, 37*(2), 111–127. https://doi.org/10.1177/0162353214529042

Hambleton & Swaminathan. (1985). *Item Res-ponse Theory Principles and Applications*. Boston: Kluwer Nijhoff Publishing.

Hamilton, D., McKechnie, J., Edgerton, E., & Wilson, C. (2021). Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. *Journal of Computers in Education, 8*(1), 1–32. https://doi.org/10.1007/s40692-020-00169-2

Herwina, W. (2021). Optimalisasi Kebutuhan Murid Dan Hasil Belajar Dengan Pembelajaran Berdiferensiasi. *Perspektif Ilmu Pendidikan, 35*(2), 175–182. https://doi.org/10.21009/pip.352.10

Huang, C. L., Luo, Y. F., Yang, S. C., Lu, C. M., & Chen, A. S. (2020). Influence of Students' Learning Style, Sense of Presence, and Cognitive Load on Learning Outcomes in an Immersive Virtual Reality Learning Environment. *Journal of Educational Computing Research, 58*(3), 596–615. https://doi.org/10.1177/0735633119867422

Istiyono, E., Mardapi, D., & Suparno, S. (2014). Pengembangan Tes Kemampuan Berpikir Tingkat Tinggi Fisika (Pysthots) Peserta Didik SMA. *Jurnal Penelitian dan Evaluasi Pendidikan, 18*(1), 1–12. https://doi.org/10.21831/pep.v18i1.2120

Khamparia, A., & Pandey, B. (2020). Association of learning styles with different e-learning problems: a systematic review and classification. *Education and Information Technologies, 25*(2), 1303–1331. https://doi.org/10.1007/s10639-019-10028-y

Magableh, I. S. I., & Abdullah, A. (2020). On the effectiveness of differentiated instruction in the enhancement of jordanian students' overall achievement. *International Journal of Instruction, 13*(2), 533–548. https://doi.org/10.29333/iji.2020.13237a

Malacapay, M. C. (2019). Differentiated instruction in relation to pupils' learning style. *International Journal of Instruction, 12*(4), 625–638. https://doi.org/10.29333/iji.2019.12440a

Matcha, W., Uzir, N. A., Gasevic, D., & Pardo, A. (2020). A Systematic Review of Empirical Studies on Learning Analytics Dashboards: A Self-Regulated Learning Perspective. In *IEEE Transactions on Learning Technologies, 13*(2), 226–245. https://doi.org/10.1109/TLT.2019.2916802

Mohd, F., Fatin Fatihah Wan Yahya, W., Ismail, S., Abdul Jalil, M., Maizura Mohamad Noor, N., & Malaysia Terengganu, U. (2019). An Architecture of Decision Support System for Visual-Auditory-Kinesthetic (VAK) Learning Styles Detection Through Behavioral Modelling. In *International Journal of Innovation in Enterprise System, 3*(2), 24-30. https://doi.org/10.25124/ijies.v3i02.37

Nepal, S., Walker, S., & Dillon-Wallace, J. (2021). How do Australian pre-service teachers understand differentiated instruction and associated concepts of inclusion and diversity?. *International Journal of Inclusive Education*, 1-15. https://doi.org/10.1080/13603116.2021.1916111

Osborne, J. (2013). The 21st century challenge for science education: Assessing scientific reasoning. *Thinking Skills and Creativity, 10*, 265–279. https://doi.org/10.1016/j.tsc.2013.07.006

Pozas, M., Letzel, V., & Schneider, C. (2020). Teachers and differentiated instruction: exploring differentiation practices to address student diversity. *Journal of Research in Special Educational Needs, 20*(3), 217–230. https://doi.org/10.1111/1471-3802.12481

Purnasari, P. D., Silvester, S., & Lumbantobing, W. L. (2021). Pengembangan Instrumen Asesmen Higher Order Thingking Skills (Hots) Ditinjau Dari Gaya Belajar Siswa. *Sebatik, 25*(2), 571-580. https://doi.org/ 10.46984/sebatik.v25i2.1607

Rezigalla, A. A., & Ahmed, O. Y. (2019). Learning style preferences among medical students in the college of medicine, university of Bisha, Saudi Arabia (2018). *Advances in Medical Education and Practice, 10*, 795–801. https://doi.org/10.2147/AMEP.S219176

Rogowsky, B. A., Calhoun, B. M., & Tallal, P. (2015). Matching learning style to instructional method: Effects on comprehension. *Journal of Educational Psychology, 107*(1), 64–78. https://doi.org/10.1037/a0037478

Santyasa, I. W., Rapi, N. K., & Sara, I. W. W. (2020). Project based learning and academic procrastination of students in learning physics. *International Journal of Instruction, 13*(1), 489–508. https://doi.org/10.29333/iji.2020.13132a

Septiyana, L., Safitri, A., Aminatun, D., & Muliyah, P. (2021). The Correlation Between Efl Learners' Cohesion and Their Reading Comprehension. *Journal of Research on Language Education (JoRLE), 2*(2), 68–74. Retrieved from https://ejurnal.teknokrat.ac.id/index.php/JoRLE/article/view/1154

Sh Bekkulov, Q. (2022). Methodology Of Using Independent Learning In Organizing Extra-Curricular Lessons. In *Galaxy International Interdisciplinary Research Journal, 10*(11), 1295-1304. Retrieved from https://www.giirj.com/index.php/giirj/article/view/3921

Shi, Y., Ma, Y., MacLeod, J., & Yang, H. H. (2020). College students' cognitive learning outcomes in flipped classroom instruction: a meta-analysis of the empirical literature. *Journal of Computers in Education, 7*(1), 79–103. https://doi.org/10.1007/s40692-019-00142-8

Sudirman, S., & Qaddafi, M. (2023). The Application of Student Worksheets Based on PhET Simulation to Increase the Concept Understanding in Hooke's Law. *Jurnal Pendidikan Fisika, 11*(1), 73–85. https://doi.org/10.26618/jpf.v11i1.9505

Sulistyosari, Y., Karwur, H. M., Sultan, H., & Manado, U. N. (2022). Penerapan Pembelajaran Ips Berdiferensiasi Pada Kurikulum Merdeka Belajar. *Harmony: Jurnal Pembelajaran IPS dan PKN, 7*(2), 66-75. Retrieved from https://journal.unnes.ac.id/sju/index.php/harmony/article/view/62114

Sinuraya, J., Panggabean, D. D., & Wahyuni, I. (2019). Analysis Of Relationship Science Process Skills And Creativity With The Cognitive Learning Outcomes Used Of The Icare Practice Based On Worksheet On Learning High School Physics Courses. *Jurnal Pendidikan Fisika, 8*(2), 91-96.

Tan, B., & Ong, D. (2020). Pediatric to adult inflammatory bowel disease transition: The Asian experience. In *Intestinal Research, 18*(1), 11–17. https://doi.org/10.5217/ir.2019.09144

Tyas, P. A., & Safitri, M. (2017). Kinesthetic Learning Style Preferences: A Survey of Indonesian EFL Learners by Gender. *JEES (Journal of English Educators Society), 2*(1), 53–64. https://doi.org/10.21070/jees.v2i1.688

Valiandes, S. (2015). Evaluating the impact of differentiated instruction on literacy and reading in mixed ability classrooms: Quality and equity dimensions of education effectiveness. *Studies in Educational Evaluation, 45*, 17–26. https://doi.org/10.1016/j.stueduc.2015.02.005

Vasileva-Stojanovska, T., Malinovski, T., Vasileva, M., Jovevski, D., & Trajkovik, V. (2015). Impact of satisfaction, personality and learning style on educational outcomes in a blended learning environment. *Learning and Individual Differences, 38*, 127–135. https://doi.org/10.1016/j.lindif.2015.01.018

Veloo, A., Nor, R., & Khalid, R. (2015). Attitude towards physics and additional mathematics achievement towards physics achievement. *International Education Studies, 8*(3), 35–43. https://doi.org/10.5539/ies.v8n3p35