Current Issues on Elementary Education Journal

Journal homepage: https://ejournal.upi.edu/index.php/CIEE

COGNITIVE ASSESSMENT TESTS BASED ON HIGHER-ORDER THINKING SKILLS (HOTS) IN ELEMENTARY SCHOOLS

Hilman Hilmawan[1], Nurani Hadnistia Darmawan[2], Zaima Ulhaq Alkarimah[3]

[1,2,3]Elementary Teacher Education Program, STKIP Bina Mutiara, Sukabumi, Indonesia

*hilmanedu@gmail.com

ABSTRACT

This study aims to design a cognitive domain assessment test grounded in Higher-Order Thinking Skills (HOTS) for elementary school students. The research employs a Research and Development approach using a modified version of the Dick and Carrey model tailored to the study's objectives. This research was carried out in three elementary schools spread across the city and district of Sukabumi for user or teacher validation. Meanwhile, the validity and reliability tests for twelve students (one to one) were carried out in one elementary school. The developed assessment tests consisted of 180 items, including 89 multiple-choice and 91 essay questions for fifth-grade students. The findings indicated that the HOTS-based assessment was 91% valid, falling into the good category. Reliability testing showed that the instrument was consistent, with a Cronbach's Alpha value greater than 0.6. The discrimination index for both multiple-choice and essay items was good, with an average range of 0.40–0.69, and very good for items with an average weight between 0.70–1.00. Additionally, the distractor effectiveness in multiple-choice options was confirmed to be effective, as results exceeded 5%.The implications for teachers are that the HOTS-based assessment tests developed is suitable for use in evaluating learning. As for students, assessment tests can hone and train higher-order thinking skills.

ARTICLE INFO

Article History:
Submitted/Received 27/08/2025
First Revised 25/09/2025
Accepted 12/10/2025
First Available online 01/11/2025
Publication Date 01/11/2025

Keyword:
Cognitive domain
Asessment tests
Higher-Order Thinking Skills
Elementary schools

How to cite: Hilmawan, H., Darmawan, N. H., & Alkarimah, Z. U. (2025). Cognitive assessment tests based on higher-order thinking skills (HOTS) in elementary schools. *Current Issues on Elementary Education Journal, Vol 4 (2), 86-95*.

1. INTRODUCTION

Learning is a structured process planned, carried out, and assessed by teachers in a sequential manner to help students achieve the intended learning goals (Fanani & Kusmaharti, 2018). For effective and structured learning to take place, teachers must ensure that all learning components are fulfilled. According to Fanani & Kusmaharti (2018) the main components consist of learning objectives, , methods and strategies, media, assessment, and instructional materials. Therefore, appropriate instruments or tools are needed to support teachers in evaluating students' learning activities (Fadilah et al., 2021). The purpose of assessment tests is to help teachers identify students' progress, achievements, and areas requiring improvement. As stated by Yasa et al. (2020), assessment allows teachers to monitor the level of student development or achievement. Similarly, Fadilah et al. (2021) explain that assessment tests function as instruments to analyze and determine students' understanding of the learning materials delivered by the teacher. Test-based assessment tools are often used by teachers to evaluate learning outcomes through questions that stimulate creativity (Rohim, 2019). Students' ability to analyze problems and connect them with prior knowledge reflects their Higher-Order Thinking Skills (HOTS). HOTS involves complex thinking processes such as analyzing, evaluating, and creating (Yen & S. H. Halili, 2015), as well as critical, logical, and creative reasoning (Mahanal, 2019; Serevina et al., 2019).Thus, HOTS emphasizes students' capacity to think critically and creatively in solving problems, and such skills can be developed through well-designed HOTS-oriented questions.

Ramadhana et al. (2018) explain that HOTS involves problem-solving, linking new and prior knowledge, and finding creative relationships. These skills help students complete tasks and understand materials more effectively (Heong et al., 2012). HOTS includes critical thinking, knowledge transfer, and solution finding (Driana & Ernawati, 2019; Kwangmuang et al., 2021; Hendriawan et al., 2019). It also supports the development of knowledge, attitudes, and skills (Darmawan & Hilmawan, 2021) and should be nurtured from an early age Laihat (2020). By fostering innovative and independent thinking, HOTS enhances the quality of learning (Singh & Marappan, 2020; Suhaimi et al., 2021). According to Prahasti & Maulana (2022) students need HOTS to meet 21st-century skill demands. HOTS is essential for this era and serves as a key learning model (Mubarok et al., 2019). Rohim (2019) states that 21st-century skills involve creative, critical, innovative, collaborative, and communicative thinking, which can be measured using HOTS-based questions. Providing challenging, problem-based questions helps train these skills. Sofyan (2019) adds that HOTS tests can use various formats, including multiple choice, matching, essays, and explanation-based questions.

Based on initial research findings in six public elementary schools across Sukabumi City and District, it was found that many students lacked higher-order thinking skills (HOTS) due to limited use of HOTS-based assessments. Most existing assessment tools focused on lower- (LOTS) and medium-order thinking skills (MOTS), with only about 15% of test items reflecting HOTS, 45% LOTS, and 40% MOTS. This lack of emphasis on HOTS results in students being less trained to think critically and deeply. From interviews with 15 teachers, 13 agreed on the need to develop HOTS-based assessment tests (particularly for grade 5) to better train students' higher-order thinking, while 2 teachers considered such development unnecessary. Based on the identified gaps between ideal conditions and reality, action is needed to improve students' HOTS and train teachers to develop HOTS-based assessment tools. Such tools are essential for evaluating students' learning outcomes, as emphasized by Hanifah (2019), who stated that teachers require assessment instruments to measure students' understanding. Therefore, this study aims to develop HOTS-based assessment tests for fifth-grade students. Previous studies,

such as Fanani and Kusmaharti (2018), demonstrated that HOTS-based learning in grade 5 achieved about 91% complete learning outcomes, while Cahyaningtyas et al. (2020) found that HOTS-based assessments effectively measured targeted cognitive skills in grade 3 students.

Based on previous related studies, this research aims to: (1) identify and analyze the initial conditions of cognitive assessment tests in elementary schools, and (2) develop HOTS-based cognitive assessment tests for grade 5. The development includes 180 questions in multiple-choice and essay formats, representing a new contribution compared to earlier studies. The research benefits both students and teachers—students can enhance their higher-order thinking skills, while teachers can improve their creativity and competence in developing and applying HOTS-based assessments. Ultimately, this study is expected to help teachers understand current assessment conditions and routinely implement HOTS-based evaluations to foster students' critical and creative thinking.

2. METHODS

This study employs the Research and Development (R&D) method, which involves systematically designing, developing, and evaluating educational interventions to improve learning practices and knowledge (Rahardjanto and Husamah 2022). According to Sugiyono (in Subari, 2022), R&D aims to create, refine, and test the effectiveness of educational products, while Gustiani (2019) emphasizes that R&D focuses on developing practical and efficient tools rather than only testing theory. This research adopts the Dick and Carey model (2015), which has been adjusted to suit the study's context, encompassing stages such as needs analysis, product design, expert validation, and individual (one-on-one) testing. Each phase is conducted systematically and measurably to ensure product quality and alignment with the chosen design model (Suradika et al., 2022). In this model, the initial stage involves needs analysis to determine goals, analyze instruction, learners, and context, and set performance objectives. The next stage includes designing instruction through developing test items, strategies, and materials, followed by formative evaluation. Afterward, revisions are made to improve the design, and finally, a summative evaluation is conducted (Dikmen, 2019). The R&D in this study applies a modified version of the Dick and Carey model tailored to the research needs.

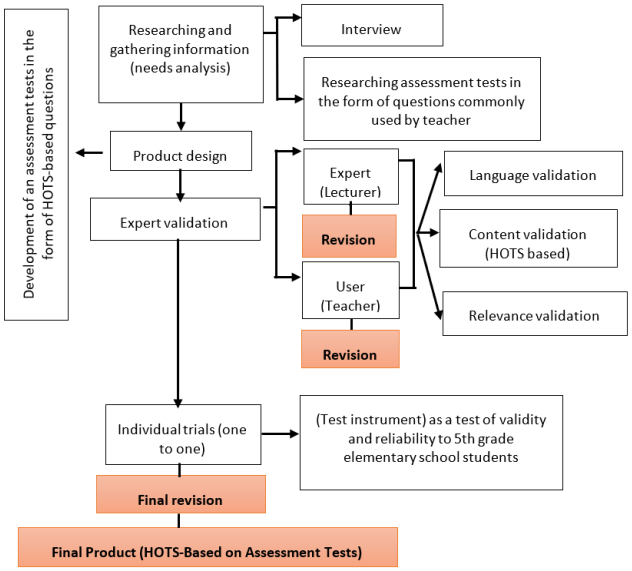

Figure 1. Modification of the Dick and Carey Model

This research was conducted in three elementary schools in Sukabumi for user validation, involving twelve fifth-grade students (six boys and six girls) selected based on varied cognitive levels and gender balance. According to Khaulani et al. (2020), students have diverse thinking characteristics. Data were collected using test and non-test techniques, including HOTS-based tests, interviews, and questionnaires. The questionnaire adapted from Fadilah et al. (2021) included expert and user validation (teachers) using a Likert scale (1–5) to assess language, content, and relevance to learning objectives. Instruments included validation sheets for content experts, subject experts, linguists, and user responses. Structured interviews were also conducted with teachers to explore their understanding of HOTS, commonly used assessment tests, and the need for HOTS-based instruments. Interviews were held three times: to collect initial data, analyze needs, and evaluate the developed HOTS-based assessment tests.

This study employed both quantitative and qualitative data analysis methods. Quantitative data were derived from expert and teacher validation results, along with validity and reliability tests analyzed using SPSS 25. Meanwhile, qualitative data were obtained from expert and user feedback concerning the language, content, and relevance of the HOTS-based assessment. Validation sheets and Likert scale questionnaires (Sugiyono, 2020) were analyzed to evaluate the quality and effectiveness of the developed HOTS-based assessment instruments.

3. RESULTS AND DISCUSSION

RESULTS

The findings on the development carried out are as follows:

Needs Analysis

The first stage of this study involved collecting data on assessment tools commonly used by teachers through structured interviews with teachers from six elementary schools in Sukabumi City and District. Interviews were conducted twice: the first explored frequently used assessments, reference sources, and challenges faced by teachers; the second focused on teachers' understanding of HOTS, its importance, and the need for HOTS-based tools. Results showed that existing assessments were mostly LOTS (45%) and MOTS (40%), with only 15% HOTS-based. From 15 interviewed teachers, 13 agreed that developing HOTS-based assessment tests (especially for grade 5) was necessary to enhance students' HOTS.

Product Design

The development in this study focused on creating HOTS-based assessment tests for fifth-grade students. Prior to constructing the test items, a question blueprint was designed based on the relevant learning materials. As a result, the developed HOTS-based assessment consisted of 180 items, including 89 multiple-choice and 91 essay questions. Each question was created and aligned with the specific subjects covered in each lesson.

Expert and User Validation

After developing the HOTS-based assessment tool, each item was validated by experts and users, including linguists, HOTS content experts, and subject specialists. Validation used questionnaires to assess the tool's accuracy and quality, with revisions made based on validator feedback for low-rated items. Six validators participated (three lecturers and three teachers from different Sukabumi schools). Teachers also completed structured interviews about the tool's strengths, weaknesses, and feasibility. Validation results were analyzed using Microsoft Excel.

Table 1. Results of Validation by Experts (Lecturers)

No.	Assessment Indicators	Total Score Achieved (TSe)	Expected Score (TSh)	Percentage	Ket.
1	Language	853,4	900	95%	Very Valid
2	Content (HOTS)	900	900	100%	Very Valid
3	Relevance (Learning Material)	717,5	900	80%	Quite Valid
Overall Expert Validation		2.470,9	2.700	92%	Very Valid

Table 2. Results of Validation by User (Teachers)

School	Assessment Indicators	Total Score Achieved (TSe)	Expected Score (TSh)	Percentage	Ket.
Elementary School A	Language	841,5	900	94%	Very Valid
	Content (HOTS)	786	900	87%	Very Valid
	Relevance (Learning Material)	798,65	900	89%	Very Valid
Total		2426,15	2.700	90%	Very Valid
Elementary School B	Language	892,35	900	99%	Very Valid
	Content (HOTS)	855,5	900	95%	Very Valid
	Relevance (Learning Material)	900	900	100%	Very Valid
Total		2647,85	2.700	98%	Very Valid
Elementary School C	Language	719,75	900	80%	Quite Valid
	Content (HOTS)	785,75	900	87%	Very Valid
	Relevance (Learning Material)	742,25	900	82%	Very Valid
Total		2247,75	2.700	83%	Very Valid
Overall User Validation		7291,75	8.100	90%	Very Valid

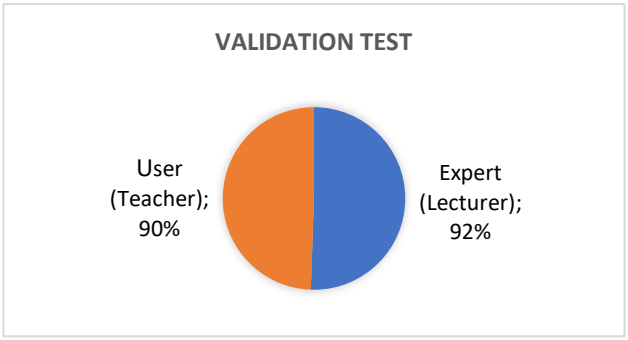

Figure 2. Validation Test Results

Individual Test (One-to-One)

After revisions, the developed HOTS-based assessment tool was tested on 12 fifth-grade students with varying cognitive levels, following Borg & Gall's guideline (in Sugiyono, 2020) for initial field tests. The test contained 180 HOTS-based questions (89 multiple choice and 91 essay). Results were analyzed to determine validity, reliability, discrimination, and distractor quality. Validity testing, conducted using SPSS 25, followed Sugiyono's (2020) criterion that an item is valid if its Pearson correlation value ≥ 0.3. Reliability testing, also with SPSS 25, used Cronbach's Alpha, with a coefficient ≥ 0.6 indicating reliability (Sugiyono, 2020). Thus, valid and reliable instruments are those capable of consistently and accurately measuring the intended constructs.

Table 3. Results of Item Validity of Multiple-Choice Questions

Question Item Number	Validation Test Results (Pearson Correlation)		Decision	Critical r Value	Information
	Highest Validation Value	Lowest Validation Value			
1 - 89	0,875	0,491	>	0,3	Valid

Based on the calculations presented in table 3, the validity test results indicate that the Pearson correlation value for the multiple-choice items exceeds the critical r value, thereby confirming their validity.

Table 4. Results of Item Validity Essay Questions

Question Item Number	Validation Test Results (Pearson Correlation)		Decision	Critical r Value	Information
	Highest Validation Value	Lowest Validation Value			
1 - 91	0,980	0,609	>	0,3	Valid

Based on the data in Table 4, the validity test results reveal that the Pearson correlation value for the essay items is higher than the critical r value, indicating that the items are valid.

The reliability test in this study used IBM SPSS 25, with results based on Cronbach's Alpha values. Reliability was assessed for both multiple-choice and essay items.

Table 5. Reliability Test Results

Cronbach's Alpha	Types of Question Items	Question Items	Decision
0,989	Multiple-choice	89	Reliabel
0,991	Essay	91	Reliabel

The differentiation test aims to identify how well each item distinguishes between students with high and low cognitive levels (Son, 2019; Magdalena et al., 2021).

Table 6. Differentiating Test Results

Item Analysis	Total of Question Items	Results	Decision
Multiple-choice	42	0,40 – 0,69	Good
	47	0,70 – 1,00	Very Good
Essay	25	0,40 – 0,69	Good
	66	0,70 – 1,00	Very Good

The distraction test results for multiple-choice options A, B, C, and D showed an average value above 5%, indicating that the distractors were effective and suitable for use.

DISCUSSION

The HOTS-based assessment tests was developed through four stages: needs analysis, product design, expert validation, and one-to-one testing. Validation involved three experts and teachers from different elementary schools who assessed language, HOTS content, and subject relevance. After being declared valid and feasible, the tool proceeded to the one-to-one testing phase. Based on Figure 2, expert validators scored 92% and teacher validators 90%, resulting in a combined validity score of 91%, categorized as "excellent." These results align with Pulungan et al. (2021), who reported a very good validity level of 89.5%. Expert validation was conducted to gather feedback and ensure the instrument met conceptual, structural, and linguistic standards before limited trials (Fanani, 2018; Pandra et al., 2021; Serevina et al., 2019)

The product trial stage involved a one-to-one test. Based on Table 3, all 89 multiple-choice and 91 essay items showed Pearson correlations above 0.3, indicating validity. Reliability was also high, with Cronbach's alpha values of 0.989 for multiple-choice and 0.991 for essays, exceeding 0.6. Thus, the HOTS-based assessment tool is valid and reliable. These findings align with studies by Putu et al. (2021) and Rahmi et al. (2021), which also found HOTS-based instruments to be highly valid, reliable, and feasible for learning assessment.

The differentiation test showed that 42 of 89 multiple-choice items were in the "good" category and 47 in the "very good" category. Similarly, 25 of 91 essay items were "good" and 66 "very good," with scores of 0.40–0.70 considered good and 0.70–1.00 very good (Son, 2019). The distraction test for multiple-choice options A–D was effective, with an average score above 5%. These findings align with Yudha (2023), who emphasized that HOTS instrument testing enhances measurement accuracy, assessment quality, and students' higher-order thinking skills.

4. CONCLUSION

Based on the data obtained from expert and user validation, validity and reliability testing (one-on-one tests), differentiation tests, and distractor analysis, the HOTS-based assessment tests were found to meet the required standards. The implication for teachers is that the developed HOTS-based assessment tests are appropriate for evaluating learning in fifth-grade elementary students. For students, these assessments serve as a tool to enhance and practice higher-order thinking skills.

5. REFERENCES

Cahyaningtyas, A. P., Sari, Y., & Pradana, A. B. A. (2020). High Order Thinking Skills: How is it Integrated with Cognitive Assessment? *Jurnal Ilmiah Pendidikan Dasar*, *7*(2), 109–120. https://doi.org/10.30659/pendas.7.2.109-120

Darmawan, N. H., & Hilmawan, H. (2021). Problem Based Learning: Can it Improve Higher Order Thinking Skills of Prospective Eelementary School Teacher Student? *Journal of Elementary Education*, *5*(2), 196–209. https://doi.org/10.22460/pej.v5i2.2761

Darmawan, N. H., Hilmawan, H., & Hulwiyah, H. (2021). Profil Konten HOTS dan LOTS dalam Buku Teks Siswa Kelas V Kurikulum 2013. *Jurnal Elementaria Edukasia*, *4*(2), 254–267. https://doi.org/10.31949/jee.v4i1.3290

Dick, W., Carey, L., & Carey, O. J. (2015). The Systematic Design of Instruction (Eight Edition). United State of America: Pearson.

Dikmen, C. H. (2019). The Effect of Web-Based Instruction Designed by Dick and Carey Model on Academic Achievement, Attitude and Motivation of Students' in Science Education. *Journal of Learning and Teaching in Digital Age*, *4*(1), 34–40. https://files.eric.ed.gov/fulltext/EJ1325215.pdf

Driana, E., & Ernawati. (2019). Teachers' Understanding and Practices in Assessing Higher Order Thinking Skills at Primary Schools. *Acitya: Journal of Teaching & Education*, *1*(2). https://doi.org/10.30650/ajte.v1i2.233

Fadilah, D., Kudsiah, M., Karlinda, N., & Haifaturrahmah. (2021). Pengembangan Bank Soal Tematik Berbasis Higher Order Thinking Skills (HOTS) di Sekolah Dasar. *Jurnal Inovasi Pendidikan Dasar*, *5*(1), 6–11. https://doi.org/10.36928/jipd.v5i1.704

Fanani, A., & Kusmaharti, D. (2018). Pengembangan Pembelajaran Berbasis HOTS (Higher Order Thinking Skill) di Sekolah Dasar Kelas V. *JPD: Jurnal Pendidikan Dasar*, *9*(1), 1–11. https://doi.org/10.21009/JPD.091.01

Fanani, M. Z. (2018). Strategi Pengembangan Soal Higher Order Tinking Skill (HOTS) dalam Kurikulum 2013. *Edudeena*, *2*(1), 57–76. https://doi.org/10.30762/ed.v2i1.582

Gustiani, S. (2019). Research and Development (R&D) Method as a Model Design in Educational Research and Its Alternatives. *Holistics Journal*, *11*(2). https://jurnal.polsri.ac.id/index.php/holistic/article/view/1849

Hanifah, N. (2019). Pengembangan Instrumen Penilaian Higher Order Thinking Skill (HOTS) di Sekolah Dasar. *Conference Series Journal*, *1*(1), 1–8. https://ejournal.upi.edu/index.php/crecs/article/view/14286

Hendriawan, D.,& Usmaedi, U. (2019). Penerapan Pembelajaran Higher Order Thinking Skills (HOTS) di Sekolah Dasar. *Jurnal Pendidikan Dasar Setia Budhi*, *2*(2), https://stkipsetiabudhi.e-journal.id/jpds/article/view/19

Heong, Y. M., Othman, W. B., Yunos, J. B. M., Kiong, T. T., Hassan, R. bin, & Mohamad, M. M. B. (2011). The Level of Marzano Higher Order Thinking Skills among Technical Education Student. *International Journal of Science and Humanity*, *1*(2), 121–125. http://www.ijssh.org/papers/20-H009.pdf

Heong, Y. M., Yunos, J. M., Othman, W., Hassan, R., Kiong, T. T., & Mohamad, M. M. (2012). The Needs Analysis of Learning Higher Order Thinking Skills for Generating Ideas. *Procedia - Social and Behavioral Sciences*, *59*, 197–203. https://doi.org/10.1016/j.sbspro.2012.09.265

Khaulani, F., Neviyarni, & Murni, I. (2020). Fase dan Tugas Perkembangan Anak Sekolah Dasar. *Jurnal Ilmiah Pendidikan Dasar*, *7*(1), 51–59. https://doi.org/10.30659/pendas.7.1.51-59

Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The Development of Learning Innovation to Enhance Higher Order Thinking Skills for Students in Thailand Junior High Schools. *Heliyon*, *7*(6), 2–13. https://doi.org/10.1016/j.heliyon.2021.e07309

Laihat, S. (2020). Development of Assessment Instruments Based on Higher Order Thinking Skills (HOTS) for Elementary School Students. *JPSD*, *6*(2). https://jurnal.untirta.ac.id/index.php/jpsd/article/view/7356

Magdalena, I., Fauziah, S. N., Faziah, S. N., & Nupus, F. S. (2021). Nalisis Validitas, Reliabilitas, Tingkat Kesulitan dan Daya Beda Butir Soal Ujian Akhir Semester Tema 7 Kelas III SDN

Karet 1 Sepatan. *BINTANG: Jurnal Pendidikan Dan Sains*, *3*(2), 198–214. https://doi.org/10.36088/bintang.v3i2.1291

Mahanal, S. (2019). Asesmen Keterampilan Berpikir Tingkat Tinggi. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *3*(2), 51–73. https://doi.org/10.36312/e-saintika.v3i2.128

Mubarok, H., Suprapto, N., & Adam, A. S. (2019). Using Inquiry-Based Laboratory to Improve Students' Higher Order Thinking Skills (HOTS). *Journal of Physics: Conference Series*, *1171*(1). https://doi.org/10.1088/1742-6596/1171/1/012040

Pandra, V., Kartowagiran, B., & Sugiman. (2021). Mathematics Test Development By Item Response Theory Approach And Its Measurement In Elementary School Students. *Turkish Journal of Computer and Mathematics Education (Turcomat)*, *12*(5), 464–483. https://doi.org/10.17762/turcomat.v12i5.994

Prahasti, D. P., & Maulana, F. (2022). Keterampilan Berpikir Tingkat Tinggi (HOTS) dalam Menentukan Matriks Laplace dari Hipergraf Hiper-reguler C (k,l,n,m). *Seminar Nasional Hi-Tech (Health, Humanity, Technology)*, *1*(1). https://ejournal.unuja.ac.id/index.php/hitech/article/view/4431

Pulungan, M., Toybah, & Suganda, V. A. (2021). Development of HOTS-based 2013 Curriculum Assessment Instruments in Elementary School. *Journal of Teaching and Learning in Elementary Education (JTLEE)*, *4*(1), 51–64. https://doi.org/10.33578/7858

Putu, N., Diah, S., Bayu, G. W., & Sudatha, I. G. W. (2021). HOTS-based Instrument for Assessing Students Science Learning Outcomes in Elementary School. *Jurnal Ilmiah Sekolah Dasar, 5*(2), 231–241. https://doi.org/10.23887/jisd.v5i2.35143

Rahardjanto, A., & Husamah, H. (2022). Publication Trend of R&D in the Journal of Biological Education in Indonesia (Sinta 2: 2017-2021): A Systematic Literature Review. Prisma Sains : *Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, *10*(1), 21. https://doi.org/10.33394/j-ps.v10i1.4769

Rahmi, Y. L., Dewi, A. T., & Darussyamsu, R. (2021). The Validity of Assessment of Higher Order Thinking Skills (HOTS) About Metabolism. *Bioeduscience*, *5*(3). 201–204. https://doi.org/10.22236/j.bes/535828

Ramadhana, N. A., Rozimela, Y., & Fitrawati. (2018). High Order Thinking Skills-Based Question in the Test Items Developed by Senior High School English Teacher of Padang. *JELT: Journal of English Language Teaching*, *7*(4), 721–731. https://doi.org/10.24036/jelt.v7i4.101757

Rohim, D. C. (2019). Strategi Penyusunan Soal Berbasis HOTS pada Pembelajaran Matematika SD. *BRILIANT: Jurnal Riset Dan Konseptual*, *4*(4), 436–446. https://doi.org/10.28926/briliant.v3i4.374

Serevina, V., Sari, Y. P., & Maynastiti, D. (2019). Developing High Order Thinking Skills (HOTS) Assessment Instrument for Fluid Static at Senior High School. *Journal of Physics: Conference Series*, *1185*(1), 1–9. https://doi.org/10.1088/1742-6596/1185/1/012034

Singh, C. K. S., & Marappan, P. (2020). A Review of Research on the Importance of Higher Order Thinking Skills (HOTS) in Teaching English Language. *Journal of Critical Reviews*, *7*(8), 740–747. https://doi.org/10.31838/jcr.07.08.161

Sofyan, F. A. (2019). Implementasi HOTS pada Kurikulum 2013. *Jurnal Inventa*, *3*(1), 1–17. https://doi.org/10.36456/inventa.3.1.a1803

Son, A. L. (2019). Instrumentasi Kemampuan Pemecahan Masalah Matematis: Analisis Reliabilitas, Validitas, Tingkat Kesukaran dan Daya Beda Butir Soal. *Jurnal Gema Wiralodra*, *10*(1). https://doi.org/10.31943/gemawiralodra.v10i1.8

Subari. (2022). Developing E-Module for English Language Teaching (R & D Study at Tenth Grade Students of SMAN 1 Donggo). *International Journal of Multicultural and Multireligious Understanding (IJMMU)*, *9*(1). 102–117. https://ijmmu.com/index.php/ijmmu/article/viewFile/4128/3540

Sugiyono. (2020). *Metode Penelitian dan Pengembangan* (S. Y. Suryandari, Ed.). Alfabeta.

Suhaimi, Amberansyah, & Wahdini, E. (2021). Development of Competency Packing Higher Order Thinking Skill (HOTS) Teachers Elementary School. *Journal of Advances in Education and Philosophy*, *5*(11), 364–371. https://doi.org/10.36348/jaep.2021.v05i11.005

Suradika, A., Winata, W., Wicaksono, D., & Husainah, N. (2022). Instructional Development of Introduction To Statistics Based on Dick and Carey'S Model. *The Social Perspective Journal*, *1*(2), 111–127. https://doi.org/10.53947/tspj.v1i2.75

Yen T. S & S. H. Halili. (2015). Effective teaching of higher order thinking (HOT) in education. *The Online Journal of Distance Education and e-Learning*, 3(2), 41–47.

Yasa, A. D., Suastika, K., & Zubaidah, R. S. A. N. (2020). Pengembangan E-Assessment Berbasis Aplikasi Hot Potatoes Untuk Siswa Kelas V Sekolah Dasar. *Jurnal Ilmiah Sekolah Dasar*, *4*(1), 26–32. https://doi.org/10.23887/jisd.v4i1.23987

Yudha, R. P. (2023). Higher Order Thinking Skills (HOTS) Test Instrument: Validity and Reliability Analysis With The Rasch Model, *EduMa: Mathematics Education Learning and Teaching, 12*(1), 1-10. doi:http://dx.doi.org/10.24235/eduma.v12i1.9468