

# Development of Science Teaching Materials Using the RADEC Model to Improve Higher Level Thinking Abilities of Elementary School Students

Nofia Henita<sup>1\*</sup>, Ardipal<sup>2</sup>, Desyandri<sup>1</sup>, Zellhendri Zen<sup>3</sup>

<sup>1</sup> Basic Education Study Program (Faculty of Education), Universitas Negeri Padang, Padang, Indonesia.

<sup>2</sup> Music Arts Education Study Program (Faculty of Languages and Arts), Universitas Negeri Padang, Padang, Indonesia.

<sup>3</sup> Educational Technology Study Program (Faculty of Education), Universitas Negeri Padang, Padang, Indonesia.

Received: May 12, 2024

Revised: September 08, 2024

Accepted: December 25, 2024

Published: December 31, 2024

Corresponding Author:

Nofia Henita

[nofiafourth@gmail.com](mailto:nofiafourth@gmail.com)

DOI: [10.29303/jppipa.v10i12.7636](https://doi.org/10.29303/jppipa.v10i12.7636)

© 2024 The Authors. This open access article is distributed under a (CC-BY License)



**Abstract:** The purpose of this study is to create science teaching materials that use the RADEC model to increase HOTS for grade IV elementary school students. This type of research is development or R&D (*Research and Development*). The research model applied is a 4-D model, which consists of the stages of definition, design, development, and deployment. The data collection techniques used are observation, interviews and questionnaires. This research was conducted in January 2024 in three elementary schools. The research subjects consisted of 46 elementary school students in grade IV as primary data. The research instrument used was a validation sheet, which was used to test the level of validity of teaching materials by 5 experts, consisting of 3 material experts, 1 linguist, and 1 media expert. The validation results by 5 experts showed a material feasibility score of 95%, language 93%, and media design 89% (all very valid). The practicality of teaching materials is considered very high by teachers (96%) and students (90%). The effectiveness test showed an N-Gain score of 76.1 (effective), with the average Pre-test of 48.7 increasing to 88.23 on the Post-test. In conclusion, this RADEC-based science teaching material is valid, practical, and effective in improving students' HOTS.

**Keywords:** Development of Learning Media; Elementary school; HOTS; RADEC model

## Introduction

One of the government's efforts to improve education in Indonesia is by making changes to the curriculum. To suit the demands of today's times, the government has ratified the independent curriculum as a national curriculum that is applied at all levels of education. Designing an Independent Curriculum in order to improve educational standards nationally (Nadia et al., 2023). The independent curriculum focuses on improving 21st century abilities, such as skills in solving problems, critical thinking, working together, being creative, and literacy in the digital world (Anugerahwati, 2019; Fakhri Akhmad, 2023;

Wahyudiono, 2023). The Merdeka Curriculum has a special characteristic, namely the integration of Natural Sciences (IPA) and Social Sciences (IPS) into Natural and Social Sciences (IPAS) at the elementary school level (Hasanah et al., 2023; Marwa et al., 2023; Nadia et al., 2023). The aim of this is to prepare students to face the challenges that will come in the future.

In anticipating future challenges, education is directed at preparing students with a variety of important skills, including creative, analytical, communication, collaboration, and information and technology literacy skills (Mardhiyah et al., 2021; Nastiti et al., 2020). These skills are directly related to higher order thinking abilities. Referring to this, one of the

### How to Cite:

Henita, N., Ardipal, Desyandri, & Zen, Z. (2024). Development of Science Teaching Materials Using the RADEC Model to Improve Higher Level Thinking Abilities of Elementary School Students. *Jurnal Penelitian Pendidikan IPA*, 10(12), 10926-10933. <https://doi.org/10.29303/jppipa.v10i12.7636>

abilities that is the key to student success in the 21st century is Higher Order Thinking Skills (HOTS). High-level thinking skills, such as critical, creative, communication and collaboration skills, are essential in facing today's demands. These skills are more developed when individuals are faced with challenges or problems that require deeper thinking (Abidin et al., 2019).

Higher Order Thinking Skills (HOTS) abilities are an important key for students to meet the demands of the times and compete globally (Beddu, 2019; Hamdani et al., 2022). More than just remembering and understanding information, HOTS emphasizes the ability to analyze, evaluate and create (Agustina et al., 2019; Nurfaidah et al., 2023; Putri et al., 2023; Yulisdiva et al., 2023; Zainil et al., 2023). In this concept, HOTS includes various complex dimensions such as logic, reasoning, evaluation, analysis, creativity, problem solving, and decision making. The existence of HOTS has a significant impact in the context of the 21st Century era (Sadijah et al., 2021). Therefore, HOTS teaching is an obligation for educators and students. One of the positive impacts of implementing HOTS is improving performance and reducing weaknesses, which contributes to students' ability to think at a higher level, which in turn influences their ability, speed and efficiency in making decisions (Heong et al., 2011). These HOTS skills can be developed through teaching materials. Teaching materials are various forms of material arranged systematically which are used to help teachers (Nurdyansyah, 2018) and students understand learning materials to achieve optimal learning goals (Daryanto, 2014; Sasmito et al., 2020; Weriyaniti et al., 2020). The availability of quality teaching materials can develop students' activeness in learning independently (Priscylio, 2019; Sinta et al., 2022). Without adequate teaching materials, students will find it difficult to adapt to the learning process (Ardipal et al., 2020; Hasanatul, 2023; Widiastuti, 2020).

However, the results of field observations conducted on grade 4 students in three elementary schools in the period 02-09 August 2023 showed that the teaching materials used did not fully cover HOTS skills. This is caused by the use of teaching materials which are limited to teacher books and student books. Furthermore, in interviews with fourth grade teachers at the same school, it was found that they felt that students were less able to analyze the questions given, with concise answers. Apart from that, students also experienced difficulty in providing arguments during question and answer activities. In the learning process, it appears that teachers have not provided sufficient variation in providing teaching materials as learning resources, so that students' analytical, critical and creative thinking abilities have not been fully explored. This can be seen from the content of the teaching

materials which only include material and practice questions at a level of understanding and application that is still at the Low Order Thinking (LOTS) level.

Furthermore, researchers also carried out an analysis of the need for teaching materials through the use of questionnaires given to teachers and students. The teaching material needs analysis questionnaire for students consists of seven statements with three answer choices: agree, doubtful, and disagree. These statements include the availability of teaching materials in the classroom, learning satisfaction with teaching materials, interest in teaching materials that contain reading texts that stimulate curiosity, interest in interesting teaching materials, preference for teaching materials in printed form, preference for teaching materials that provide questions both in written and electronic form, desire to have challenging practice questions. Based on the results of the statement above, students gave a high percentage of answers, namely 91% for statement 2, 93% for statement 4, and 91% for statement 5. This shows that students are happy with the presence of interesting teaching materials in printed form in class. In addition, for other indicators in the "agree" category, the general response percentage was more than 79%. Meanwhile, for the "doubtful" and "disagree" categories, the percentage of answers tends to be less than 15%.

The process of analyzing teaching material needs was also carried out at three schools involving three teachers. The results of the analysis of teaching material needs for teachers show that all teachers agree on the importance of using teaching materials. This can be seen from the questionnaire filled out by the teachers, where they marked the option "agree" for each statement listed. Therefore, the results of the two questionnaires analyzing the needs for teaching materials, both from teachers and students, show that there is the same need from both parties to have teaching materials that are able to improve students' high-level thinking abilities.

Based on the description above, the lack of teaching materials that do not accommodate HOTS abilities at the elementary school level is a problem that must be overcome. Research conducted by Mufit et al. (2020) shows that low levels of literacy play a role in reducing students' abilities in HOTS. This finding is supported by the PISA (Program for International Student Assessment) study, which shows that Indonesia's literacy level in the last three years is still low. In 2012, Indonesia was ranked 62nd out of 65 countries with a score of 396, in 2015 with a score of 397 it was ranked 61st out of 69 countries and in 2018 it obtained a score of 371 with a score of 6th from the bottom with 79 countries following (Hewi et al., 2020; Pratiwi, 2019; Sari et al., 2023).

Therefore, a solution is needed related to teaching materials that can improve students' high-level thinking

abilities, namely using teaching materials developed using the RADEC model, which stands for Read, Answer, Discuss, Explain, and Create (Imran et al., 2021). This learning model has a sequence of steps according to its name, making it easier for teachers to remember the learning process. This RADEC learning model can foster students' high-level thinking abilities. This is supported by several previous studies that have proven its use. Among previous research carried out by Fitri et al. (2023) shows that one of the positive impacts of implementing the RADEC learning model is increasing high-level thinking abilities. Another opinion is supported by research from Nurliana et al. (2023) and Pratama et al. (2020) showing that the application of the RADEC learning model can have a positive impact on students' high-level thinking abilities compared to using the inquiry learning model.

Another opinion is strengthened by research Tulljanah et al. (2021) explaining the results of their research, namely that the RADEC model can develop students' high-level thinking skills and also supports the ability to create at the HOTS stage, which is the highest level of critical thinking skills. Another supporting theory is research conducted by Nadia et al. (2023), explaining the results of her research that the RADEC learning model has a significant effect on students' learning activities and high-level thinking skills in science education in grade IV elementary school.

Based on the previous information, it can be concluded that the RADEC learning model is an effective choice to increase student engagement in learning and develop their higher-order thinking skills. Through this model, students can be active in finding their knowledge about learning materials. By giving students the opportunity to discover for themselves, higher-order thinking skills such as analysis, evaluation, and creativity can be improved. Based on the analysis of the field study carried out, the importance of this research is carried out to develop teaching media in accordance with the needs of students, besides that through the development of this media will be able to provide facilities to students in learning. In addition, through the development of this media, students are able to improve learning outcomes, learning skills and are able to think critically in any situation, be it in learning or outside of learning. So based on this, the researcher formulated the title "Development of Science Teaching Materials Using the RADEC Model to Improve Higher Level Thinking Abilities of Elementary School Students" The newness in this study is that in its creation it integrates the development of the RADEC model into elementary school learning, especially science subjects, besides that the creation of this teaching material is different from other research because this development is devoted to grade VI. This research aims to create

science teaching materials using the RADEC model to improve the high-level thinking skills of elementary school students.

## Method

This research is a type of development research, where the method used aims to create a special product and test its effectiveness (Sugiyono, 2021). The goal is to create a product (Desyandri et al., 2019). This research will use a 4-D model consisting of four stages: define (analysis of needs, students, and curriculum), design (preparation of instruments and design of teaching materials), develop (development of Learning Implementation Plan, teaching materials, and validity testing), and dissemination (distribution of teaching materials to teacher working groups in clusters) which can be seen in figure 1.

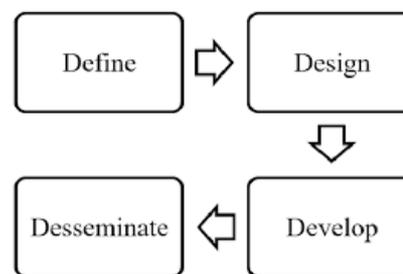


Figure 1. 4D Media development flow (Thiagarajan, 1974)

Data collection techniques in this research include observation, interviews and questionnaires. Observations were carried out to observe field conditions using observation sheets, while interviews were carried out directly with teachers and students using prepared questions. Apart from that, data was also collected through questionnaires. This research was conducted in the period January 2024 in three elementary schools. The research subjects consisted of 46 fourth grade elementary school students. The main data source is primary data obtained directly from the first source. This research instrument uses a validation sheet which was evaluated by five experts, consisting of three material experts, one language expert, and one media expert.

After validation by experts, the results are evaluated based on a percentage score which is then interpreted using the criteria in the validity test score to determine feasibility or infeasibility. As an alternative, in data analysis, this research uses quantitative descriptive techniques to compare and analyze the collected data.

## Results and Discussion

One strategy to overcome the need for improved teaching materials so that students have higher order thinking abilities (HOTS) is to develop RADEC Model Based Teaching Materials for Class IV Elementary School Students. For this reason, it is necessary to develop teaching materials based on the RADEC model which has been proven effective in previous research in dealing with this problem. The process of developing RADEC model teaching materials is carried out through four stages known as the 4D learning model, namely Define, design, develop and disseminate.

The first step, namely Define, starts with analyzing student needs, student analysis and curriculum analysis. Needs analysis includes a review of available teaching materials in accordance with the applicable curriculum. The student book is used as the main guide by the teacher in the learning process. Student analysis includes an evaluation of the number of grade IV students in the three schools that are the focus of the research, with the number for each school being 15 students for the first school, 18 students for the second school, and 13 students for the third school.

Meanwhile, the ages of all students are in the 11-12 year range, which indicates that they are at the concrete learning stage (Nuryati et al., 2021). In general, fourth grade students show high interest in playing and they have an enthusiastic attitude. However, in the learning context, they are rarely involved in group activities and are not invited to think critically. In addition, students often have difficulty expressing opinions individually or in groups. This can be seen when the teacher asks students to speak in front of the class, but students tend to appoint other friends to take that role. This shows that students lack confidence in making presentations.

Apart from that, students' attention to teachers in the learning process is also lacking. When asked by the teacher, students tend to answer briefly, and sometimes they just copy answers from the reading text without carrying out in-depth analysis or evaluation. This definition stage involves analysis of the curriculum and learning outcomes to formulate learning objectives. Based on the evaluation of learning achievements that have been carried out, learning objectives for students have been formulated. The learning objectives are prepared in accordance with the content standards in the applicable curriculum, and are explained in detail to enrich the development of teaching materials, especially in learning science chapter 6, "My Indonesia is Rich in Culture," which is taught in semester II.

The second step is the design stage, which involves preparing instruments and designing teaching materials. The instruments prepared include validation sheets which are used to assess the validity of the

teaching materials that have been developed, which are then assessed by the relevant experts or validators. This validation sheet covers material, language and media aspects. The process of designing teaching materials involves adjustments to the results of analysis of learning achievements and previously studied material. The researcher is responsible for creating the overall content of the teaching materials, while also utilizing images from the internet to provide visual support that clarifies the concepts of the material in the teaching materials. The font types in this teaching material vary, including Poppins, Handy Casual, and Mont, which are available on the Canva application because they are attractive, suitable, and easy to read by teachers and students. The font size is adjusted so that the teaching material is easy to read. Teaching materials include information about learning achievements, learning objectives, material titles, RADEC model steps, practice questions, and evaluations. Researchers chose to use the Canva application to design all teaching materials. The design of teaching materials can be seen in table 1.

**Table 1.** Design of Teaching Materials Using the RADEC Model

Design	Information
	<p>Contains mapping of Learning Achievements and Learning Objectives</p>
	<p>Contains reading text for students to read</p>

**Design**

**Information**

Contains questions to be answered by student

**Information**

Contains questions to be answered by student

---

**Design**

**Information**

Contains discussion prompts for students to discuss

**Information**

Contains discussion prompts for students to discuss

---

**Design**

**Information**

Load commands to create products

**Information**

Load commands to create products

The third stage was developed by validating the teaching module and validating the teaching materials using RADEC. When compiling teaching modules, researchers created 3 teaching modules based on the RADEC model. Each meeting consists of one teaching module with sequential learning. The first teaching module is for topic A regarding the unique habits of local communities. The second teaching module is for topic B regarding Indonesian Cultural Wealth. The third teaching module for topic C is regarding the Benefits of Diversity and Preserving Cultural Diversity.

**Table 2.** Results of Expert Validation of Language and Media Materials

Assessment motion phase	Category
Media 95%	Very valid
Media 89%	Very valid
Language 93%	Very valid
Average 92%	Very valid

From the table presented, it can be concluded that the validation results from material experts show a score of 95%, indicating that the teaching material is categorized as "very valid". Likewise, the validation results from language experts were 93%, and from media experts were 89%, which also indicates that the teaching materials have a high level of validity. The overall validation average reached 92%, so it can be concluded that overall this teaching material is "very valid" for use in elementary school learning. This conclusion is in line with previous research findings by Rindiana et al. (2022), which confirmed that the RADEC model is effective in improving students' high-level thinking abilities through various activities such as reading, answering questions, discussing, presenting and creating.

The stages in this model play a role in forming students' high-level thinking abilities because this learning model requires students to analyze and create. Research by Tulljanah et al. (2021) shows that one learning model that is effective in improving students' high-level thinking skills in science learning in elementary schools is RADEC. Furthermore, the fourth stage of this model, namely the distribution or dissemination of teaching materials, can be carried out after the teaching materials have been tested or implemented. The practicality test is carried out using instruments that are evaluated by teachers and students on the teaching materials that have been used. If the evaluation results show a good practicality category, then the teaching materials can be distributed through the cluster Working Group.

## Conclusion

Based on the results and analysis that have been described, the development of science teaching materials using the RADEC model to improve high-level thinking abilities (HOTS) of elementary school students shows satisfactory validity test results. The material aspect achieved a score of 95%, classified as "very valid". Likewise, the language aspect which received a score of 93% and the media aspect with a score of 89%, both of which are also in the "very valid" category. Thus, the development of science teaching materials using the RADEC model to increase HOTS for fourth grade elementary school students is considered valid (feasible) to be used as teaching materials in the learning process for fourth grade elementary school students .

## Acknowledgments

Thank you to all parties who have supported and facilitated the writing of this article. This research ran smoothly thanks to the help of the elementary school, Padang State University, supervisors, class teachers, validators and peer researchers.

## Author Contributions

His contribution to the preparation of this paper included Ardipal as the compiler of the concept of writing and media validation. Desyandri contributes as a linguist validator. Zelhendri Zen is the linguistic validator of the paper and Nofia Henita contributed to compiling the paper.

## Funding

This research only uses internal funding.

## Conflict of interest

The authors declare no conflict of interest.

## References

- Abidin, Z., & Tohir, M. (2019). Keterampilan Berpikir Tingkat Tinggi Dalam Memecahkan Deret Aritmatika Dua Dimensi Berdasarkan Taksonomi Bloom. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 1(1), 44–60. <https://doi.org/10.35316/alifmatika.2019.v1i1.44-60>
- Agustina, D. R., & Wibawa, R. P. (2019). Peran Pendidikan Berbasis Higher Order Thinking Skills (Hots) Pada Tingkat Sekolah Menengah Pertama di Era Society 5.0 Sebagai Penentu Kemajuan Bangsa Indonesia. *EQUILIBRIUM: Jurnal Ilmiah Ekonomi Dan Pembelajarannya*, 7(2), 137. <https://doi.org/10.25273/equilibrium.v7i2.4779>
- Anugerahwati, M. (2019). Integrating the 6Cs of the 21st Century Education into the English Lesson and the School Literacy Movement in Secondary Schools. *KnE Social Sciences*, 3(10), 165. <https://doi.org/10.18502/kss.v3i10.3898>
- Ardipal, A., Machfauzia, A. N., & Zikri, A. (2020). Pengembangan Bahan Ajar Menggunakan Literasi Musik di Sekolah Dasar. *Jurnal Basicedu*, 4(4), 899–906. <https://doi.org/10.31004/basicedu.v4i4.375>
- Beddu, S. (2019). Implementasi Pembelajaran Higher Order Thinking Skills (HOTS) Terhadap Hasil Belajar Peserta Didik. *Jurnal Pemikiran Dan Pengembangan Pembelajaran*, 1(3), 71–84. Retrieved from <https://ejournal-jp3.com/index.php/Pendidikan/article/view/78>
- Daryanto. (2014). *Menyusun Modul (Bahan Ajar untuk Persiapan Guru dalam Mengajar)*. Yogyakarta: Gava Media.
- Desyandri, D., Muhammadi, M., Mansurdin, M., & Fahmi, R. (2019). Development of integrated thematic teaching material used discovery learning model in grade V elementary school. *Jurnal Konseling Dan Pendidikan*, 7(1), 16–22. <https://doi.org/10.29210/129400>
- Fakhri Akhmad. (2023). Kurikulum Merdeka dan Pengembangan Perangkat Pembelajaran : Menjawab Tantangan Sosial dalam Meningkatkan Keterampilan Abad 21. *Confrence Of Elementary Studies*, 1(1), 32–40. Retrieved from <https://journal.um-surabaya.ac.id/Pro/article/view/19711/6716>
- Hamdani, A. D., Nurhafzah, N., & Rustini, T. (2022). Pengaruh Penerapan Model Problem Based Learning (PBL) dalam Pembelajaran IPS terhadap Kemampuan Berpikir Tingkat Tinggi (HOTS) pada Siswa Sekolah Dasar. *Journal on Education*, 5(1), 460–468. <https://doi.org/10.31004/joe.v5i1.620>
- Hasanah, A., Amelia, C. R., Salsabila, H., Agustin, R. D., Setyawati, R. C., Elifas, L., & Marini, A. (2023). Pengintegrasian kurikulum merdeka dalam pembelajaran ipas: Upaya memaksimalkan pemahaman siswa tentang budaya lokal. *Jurnal Pendidikan Dasar Dan Sosial Humaniora*, 3(1), 89. Retrieved from <http://www.nber.org/papers/w16019>
- Hasanatul, F. (2023). Pengembangan Bahan Ajar Berbasis Model RADEC untuk Meningkatkan Keterampilan Berpikir Tingkat Tinggi Siswa Kelas V Sekolah Dasar. *Repository UNP*, 9(1), 108–116. <https://doi.org/10.31949/jcp.v9i1.3847>
- 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 Students. *International Journal of Social Science and Humanity*, 121–125. <https://doi.org/10.7763/IJSSH.2011.V1.20>
- Hewi, L., & Shaleh, M. (2020). Refleksi Hasil PISA (The Programme For International Student Assesment):

- Upaya Perbaikan Bertumpu Pada Pendidikan Anak Usia Dini). *Jurnal Golden Age*, 4(01), 30-41. <https://doi.org/10.29408/jga.v4i01.2018>
- Imran, M. E., Sopandi, W., Mustafa, B., & Riyana, C. (2021). Meningkatkan kompetensi guru sekolah dasar dalam mengajarkan multi literasi melalui program pelatihan berbasis RADEC. *Jurnal Pendidikan Siprus Ilmu*, 16, 3033-3047. Retrieved from <https://eric.ed.gov/?id=EJ1321734>
- Mardhiyah, R. H., Aldriani, S. N. F., Chitta, & Zulfikar, M. R. (2021). Pentingnya Keterampilan Belajar di Abad 21 sebagai Tuntutan dalam Pengembangan Sumber Daya Manusia. *Lectura : Jurnal Pendidikan*, 12(1), 29-40. <https://doi.org/10.31849/lectura.v12i1.5813>
- Marwa, N. W. S., Usman, H., & Qodriani, B. (2023). Persepsi Guru Sekolah Dasar Terhadap Mata Pelajaran IPAS Pada Kurikulum Merdeka. *Metodik Didaktik*, 18(2), 54-64. <https://doi.org/10.17509/md.v18i2.53304>
- Mufit, M., & Wrahatnolo, T. (2020). Faktor yang Mempengaruhi dan Cara Meningkatkan Keterampilan Berpikir Tingkat Tinggi Siswa SMK Kompetensi Keahlian TITL. *Pendidikan Tehnik Elektro*, 9(2), 411-418. <https://doi.org/10.26740/jpte.v9n2.p%25p>
- Nadia, D. O., Solfema, S., Miaz, Y., & Ardipal, A. (2023). Effect of RADEC Learning Model on Student Learning Activities and HOTS on Science Learning in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 364-371. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.6702>
- Nastiti, F., & Abdu, A. (2020). Kajian: Kesiapan Pendidikan Indonesia Menghadapi Era Society 5.0. *Edcomtech Jurnal Kajian Teknologi Pendidikan*, 5(1), 61-66. <https://doi.org/10.17977/um039v5i12020p061>
- Nurdyansyah, N. (2018). *Pengembangan Bahan Ajar Modul Ilmu Pengetahuan Alambagi Siswa Kelas Iv Sekolah Dasar*. Universitas Muhammadiyah Sidoarjo. Retrieved from [http://eprints.umsida.ac.id/1607/http://eprints.umsida.ac.id/1607/1/Nurdy nahdi.pdf](http://eprints.umsida.ac.id/1607/http://eprints.umsida.ac.id/1607/1/Nurdy%20nahdi.pdf) NS -
- Nurfaidah, S. S., & Mahardika, L. (2023). Penerapan Model Project Based Learning Untuk Meningkatkan Kemampuan Berpikir Tingkat Tinggi Peserta Didik Kelas IV. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 08 Nomor 0, 2477-2143. <https://doi.org/10.23969/jp.v8i1.7663>
- Nurliana, N., & Sukmawati, W. (2023). Stacking Analysis on the Application of the RADEC Model to the Creativity of Fifth Grade Elementary School Students on Water Cycle Material. *Jurnal Penelitian Pendidikan IPA*, 9(8), 5964-5970. <https://doi.org/10.29303/jppipa.v9i8.3951>
- Nuryati, N., & Darsinah, D. (2021). Implementasi teori perkembangan kognitif jean piaget dalam pembelajaran matematika di sekolah dasar. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*, 3 no. 2, 153-162. <https://doi.org/10.36232/jurnalpendidikdasar.v3i2.1186>
- Pratama, Y. A., Sopandi, W., Hidayah, Y., & Trihatusti, M. (2020). Pengaruh model pembelajaran RADEC terhadap keterampilan berpikir tingkat tinggi siswa sekolah dasar. *JINoP (Jurnal Inovasi Pembelajaran)*, 6(2), 191-203. <https://doi.org/10.22219/jinop.v6i2.12653>
- Pratiwi, I. (2019). Efek Program Pisa Terhadap Kurikulum Di Indonesia Pisa Effect On Curriculum In Indonesia. *Jurnal Pendidikan Dan Kebudayaan*, Vol. 4, No, 51-71. <https://doi.org/10.24832/jpnk.V4i1.1157>
- Priscylio, G. (2019). Pengembangan Bahan Ajar Mandiri Pokok Bahasan Suhu Dan Kalor Menggunakan Software Camtasia. *Journal of Teaching and Learning Physics*, 4(1), 50-64. <https://doi.org/10.15575/jotalp.v4i1.4093>
- Putri, R. S., Sanjaya, W., & Fitria, Y. (2023). Penyusunan Instrumen Penilaian Hots dalam Pembelajaran IPS Sekolah Dasar. *Jurnal Ilmiah Universitas Batanghari Jambi*, 23, 1318-1322. <https://doi.org/10.33087/jiubj.v23i2.3475>
- Rindiana, T., Arifin, M. H., & Wahyuningsih, Y. (2022). Model Pembelajaran Radek Untuk Meningkatkan Higher Order Thingking Skill Dalam Pembelajaran IPS Di Sekolah Dasar. *Autentik: Jurnal Pengembangan Pendidikan Dasar*, 6(1), 89-100. <https://doi.org/10.36379/autentik.v6i1.186>
- Sadijah, C., Murtafiah, W., Anwar, L., Nurhakiki, R., & Cahyowati, E. T. D. (2021). Teaching higher-order thinking skills in mathematics classrooms: Gender differences. *Journal on Mathematics Education*, 12(1), 159-179. <https://doi.org/10.22342/jme.12.1.13087.159-180>
- Sari, D. A. K., & Setiawan, E. P. (2023). Literasi Baca Siswa Indonesia Menurut Jenis Kelamin, Growth Mindset, dan Jenjang Pendidikan: Survei PISA. *Jurnal Pendidikan Dan Kebudayaan*, 8, 1-16. <https://doi.org/10.24832/jpnk.v8i1.3873>
- Sasmito, L. F., & Asfuri, N. B. (2020). Pengembangan Modul Bahasa Indonesia Menggunakan Pendekatan Local Wisdom Dengan Materi Menulis Puisi Untuk Mahasiswa. *Jurnal Mitra Swara Ganesha*, 7(2), 1-12. Retrieved from <https://ejournal.utp.ac.id/index.php/JMSG/article/view/1009>
- Sinta, U. A., Roebyanto, G., & Nuraini, N. L. S. (2022). Analisis Kesulitan Guru dalam Menyusun Soal

- Evaluasi Berbasis Hots Pada Pembelajaran Matematika di SDN Torongrejo 2. *Jurnal Pembelajaran, Bimbingan, Dan Pengelolaan Pendidikan*, 2(1), 45-53. <https://doi.org/10.17977/um065v2i12022p45-53>
- Sugiyono. (2021). *Metode Penelitian Luantitatif, Kualitatif*. Bandung: Alfabeta.
- Thiagarajan, S. (1974). *Instructional development for training teachers of exceptional children: A sourcebook*. Bloomington: Indiana University.
- Tulljanah, R., & Amini, R. (2021). Model Pembelajaran RADEC sebagai Alternatif dalam Meningkatkan Higher Order Thinking Skill pada Pembelajaran IPA di Sekolah Dasar: Systematic Review. *Jurnal Basicedu*, 5(6), 5508-5519. <https://doi.org/10.31004/basicedu.v5i6.1680>
- Wahyudiono, A. (2023). Perkembangan Kurikulum Merdeka Belajar Dalam Tantangan Era Society 5.0. *Education Journal : Journal Educational Research and Development*, 7(2), 124-131. <https://doi.org/10.31537/ej.v7i2.1234>
- Weriyaniti, W., Firman, F., Taufina, T., Taufina, T., & Zikri, A. (2020). Pengembangan Bahan Ajar Tematik Terpadu dengan Strategi Question Student Have di Sekolah Dasar. *Jurnal Basicedu*, 4(2), 476-483. <https://doi.org/10.31004/basicedu.v4i2.374>
- Widiastuti, N. L. G. K. (2020). Pengembangan Bahan Ajar Ipa Berbasis Kontekstual Dengan Konsep Tri Hita Karana Untuk Meningkatkan Pemahaman Konsep Siswa. *Jurnal Ilmiah Pendidikan Dan Pembelajaran*, 4(3), 479-490. <https://doi.org/10.23887/jipp.v4i3.28436>
- Yulisdiva, A., Sodikin, C., & Anggraeni, P. (2023). Perbandingan Model Pembelajaran Read, Answer, Discuss, Explain, and Create (Radec) Dengan Model Pembelajaran Inquiry terhadap Kemampuan Berpikir Tingkat Tinggi Siswa Pada Materi Gaya. *Jurnal Edukasi Sebelas April (JESA)*, 7(1), 16-25. Retrieved from <https://ejournal.unsap.ac.id/index.php/jesaTlp>.
- Zainil, M., & Kenedi, A. K. (2023). The influence of a STEM-based digital classroom learning model and high-order thinking skills on the 21 st -century skills of elementary school students in Indonesia. *Journal of Education and E-Learning Research*, 10(1), 29-35. <https://doi.org/10.20448/jeelr.v10i1.4336>