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Validity of Salt Hydrolysis E-Module Based on PBL with Teaching at the Right Level Approach

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Abstract
The Independent Curriculum is an innovation introduced by the Ministry of Education, Indonesia, under regulation No. 56/M/2022. This curriculum concentrates on the core subjects while giving special attention to character development and flexible learning that is adjusted to meet the requirements of individual pupils. One of the chemistry topics in the Independent Phase F Curriculum is salt hydrolysis. The purpose was to determine the level of validation of the PBL-based salt hydrolysis e-module using the TaRL approach. This research employs the Plomp model as part of the educational design research (EDR) framework, encompassing the stages of preliminary research, prototyping, and evaluation, but is limited to Prototype III. This study used five validators to evaluate the module based on language, presentation, content, graphics, and media components using a validation questionnaire. The results obtained from this study are PBL-based salt hydrolysis e-modules with a valid TaRL approach, with a validation value of the content component of 0.92, presentation of 0.91, language of 0.97, graphics of 0.95, and media average of 0.90.

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INTRODUCTION

The Ministry of Education in Indonesia has introduced the Independent Curriculum as an innovative program by regulation No. 56/M/2022 (Kemendikbud, 2022). This curriculum concentrates on the core subjects while giving special attention to character development and flexible learning that is adjusted to meet the requirements of individual pupils (Kemendikbud, 2024). One of the chemistry topics covered in Phase F of the Independent Curriculum is salt hydrolysis (Kemendikbud, 2023).

Salt hydrolysis is a chemical material that has an abstract nature that makes students find it difficult to understand (Nurfalah & Aini, 2023). The concepts that students find hardest to understand include ionic balance in salt solutions, identifying acids and bases in salt solutions, understanding the properties of salt solutions, and determining the pH of salt solutions (Pratami et al., 2023). In addition, salt hydrolysis material is also difficult to understand because students do not understand the prerequisite material (Febriani et al., 2018). Overcome these problems, learning enhances students' critical thinking and problem-solving abilities (Afrianis, 2019). One of the learning models developed by the independent curriculum is problem-based learning (Salhuteru et al., 2023). According to research conducted by Fitriana et al (2017), learning salt hydrolysis using the PBL model can improve students' understanding.

PBL is a model that guides students in investigating problems and enhances their problem-solving skills through the stages of the scientific method (Syamsidah & Suryani, 2018). It helps students become more adept at applying critical thinking in their learning (Cahyani et al., 2021). However, current teaching practices often assume that all students have the same abilities by grouping learners heterogeneously. In heterogeneous groups, students with higher-level abilities frequently take the lead in group assignments. It is evident from the learning outcomes of individual students compared to their group discussion results that some learners achieve high group scores while their scores individuals remain relatively low (Annadzili et al., 2024). This view opposes the concept of the Independent Curriculum, which tailors learning to suit students' needs (Lestari et al., 2023). Therefore, learning activities require a more flexible approach to address the demands of learners and overcome obstacles in education (Rosmana et al., 2024). The Teaching at the Right Level (TaRL) strategy can be employed to accommodate the varying traits and skill levels of students (Syerlinda et al., 2023).

TaRL is an approach that divides students into ability-based groups (Fitriani, 2022). A teacher must be fair when implementing the TaRL approach to teaching by assigning students to groups according to their skill levels and providing support according to each student's unique learning needs (Faradila et al., 2023). Rahmayanti et al (2023) claim that combining PBL with TaRL increases students' interest in learning. In addition, Izzah et al (2023) state that applying the PBL model with the TaRL approach in learning can enhance student outcomes in chemistry. When putting curriculum-driven learning activities into practice, teachers require supplementary teaching resources. Modules are the instructional resources that are available for use. The creation of electronic instructional resources like e-modules is made possible by recent technical advancements (Syahrial et al., 2019).

E-modules from modified modules of traditional printed modules are commonly used by students (Rahmadhani et al., 2021). E-module development can utilize various applications or platforms, one of which is Heyzine, a web-based tool. According to Erawati et al (2022), the creation of e-modules through the use of the Heyzine application considerably aids in the rapid advancement of information technology and the most recent learning.

Observations were conducted on 66 students from class XII Phase F at SMAN 1 Batang Anai, SMAN 2 Batang Anai, and SMAN 1 Ulakan Tapakis by questionnaires. The following results were obtained : (1) 64% of students have difficulty understanding the material on salt hydrolysis material. This difficulty arises because students have not mastered the prerequisite material, do not understand the concept of salt hydrolysis, the properties of salt solutions, and how to calculate the pH of salt solutions; (2) The teaching materials used in the learning process for salt hydrolysis consist of printed books and LKPD; (3) 91% of students prefer electronic teaching materials because they are practical and accessible, include images and colors, feature videos and animations, and are available at no cost.

Interviews with three chemistry teachers of grade XI phase F from SMAN 1 Batang Anai, SMAN 2 Batang Anai, and SMAN 1 Ulakan Tapakis stated: (1) teachers use printed books and LKPD as their learning resources for salt hydrolysis material. The electronic version of the teaching materials is not yet available, (2) teachers have not used the PBL model in the salt hydrolysis subject matter, and (3) teachers have not applied the TaRL approach to classroom learning. Therefore, it is essential to develop a PBL-based salt hydrolysis e-module utilizing the TaRL approach. Based on the background provided, this research aims to determine the validity level of the PBL-based salt hydrolysis e-module developed using the TaRL approach.

METHOD

This study employs the Plomp model, developed by Tjeerd Plomp, using an Educational Design Research (EDR) approach. Educational Design Research (EDR) involves systematically investigating the planning, development, and assessment of academic interventions, such as curricula, teaching strategies, materials, systems, and products, to address challenging problems in education. EDR aims to enhance understanding of the features of interventions and the processes used in their planning and development (Plomp & Nieveen, 2013). The research consists of the preliminary research stage and the prototype development stage. The study progressed until the developed e-module was tested for validity, resulting in Prototype III being a valid e-module. The stages of the Plomp model are in Figure 1. The research at SMAN 2 Batang Anai and Padang State University in July-December of the 2024-2025 academic year. The research subjects were three chemistry lecturers and two chemistry teachers. The object of research was a PBL-based salt hydrolysis e-module with TaRL Phase F approach for grade XI students.

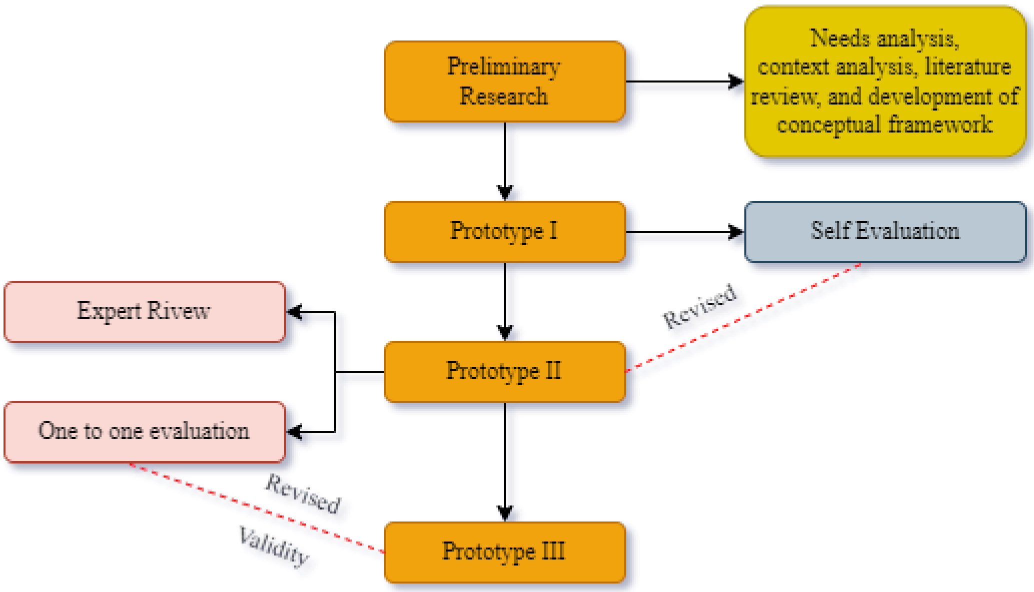

Figure 1. Research Desain

The preliminary research stage will involve conducting a needs and context analysis in the field of education based on identified problems. Following this, a literature review will undertaken to find solutions to the issues identified in the needs analysis, drawing from various sources of previous research and developing a conceptual framework.

After conducting preliminary research, the prototype design will developed using Tessmer's formative evaluation. Prototype I represents the initial design for the product, which consists of an e-module created using the Heyzine application. This e-module is aligned with the PBL syntax and adheres to the components specified in the Ministry of Education and Culture regulations. Additionally, adjustments will made to the fonts, colors, images, tables, and videos used in the e-module.

Prototype II will be developed based on a self-assessment of the completeness of the teaching material components created in Prototype I. Prototype III will be based on expert reviews and individual assessments (one-to-one evaluations) of the results from Prototype II, aiming to produce a valid e-module.

The instrument used in this research is a validation questionnaire. This questionnaire contains questions regarding the validation of material, presentation, language, graphics, and media on the e-module. Validity can be analyzed using the Aiken V validity index, as follows.

$$V = \frac{\sum s}{[n(c-1)]}$$

$$s = r - l_o$$

Description:
V= Validity
S = Score reduction of r with lo
r = The acquisition score of the assessor
lo = Lowest assessment score
c = The highest assessment score
n = Number of raters

Aiken validity values range from 0 to 1, with the validity of the product developed determined by the highest Aiken index score.

Table 1. Validity Based on Aiken's V Scale

Aiken's V Scale	Validity
V < 0,80	Invalid
V ≥ 0,80	Valid

(Abhi Purwoko et al., 2021).

RESULTS AND DISCUSSION

This stage aims to analyze and identify problems that support the development of PBL-based salt hydrolysis e-modules using the TaRL approach. The results are as follows:

Preliminary Research

This stage involves analyzing and identifying problems to support the development of PBL-based salt hydrolysis e-modules using the TaRL approach. The results are as follows:

Needs Analysis

Needs analysis based on teacher interviews and student questionnaires showed that 64% of students struggled with the salt hydrolysis material. The teaching materials used were printed books and LKPD, the electronic version of which was not yet available. Teachers expressed a desire for more engaging and practical teaching resources, such as electronic teaching materials combined with a flexible approach to enhance students' understanding of salt hydrolysis through the independent curriculum.

This need is further supported by the fact that 100% of students already own electronic devices, which complete assignments and search for learning materials. Learning models teachers use in school are discovery learning, problem-based learning, and the lecture method. According to Istiqoma et al (2023) electronic modules can function as independent learning media and boost students'. Meanwhile, Fakhri (2023) states that learning with a flexible approach can improve students' understanding of the material.

Curriculum Analysis

The results of the curriculum analysis by analyzing CP related to salt hydrolysis material stated that "students can understand the relationship between the pH of salt solutions and their application in everyday life". Based on this analysis, the learning objectives (TP) were derived as follows: 1) Learners can accurately explain the meaning of salt hydrolysis through e-modules; 2) Learners can appropriately explain the types of salt hydrolysis through e-modules; 3) Learners can correctly distinguish the properties of salt solutions through e-modules; 4) Learners can accurately calculate the pH of salt solutions through the e-modules. To achieve TP, a learning objective flow (ATP) is created: 1) Learners can explain ion equilibrium in salt solutions through e-modules; 2) Learners can appropriately explain hydrolyzed salts through e-modules; 3) Learners can accurately explain non-hydrolyzed salts through e-modules; 4) Learners can distinguish between partially hydrolyzed and hydrolyzed salts through e-modules; 5) Learners can identify the properties of salts based on their constituent components through e-modules; 6) Learners can classify examples of salts based on their properties through e-modules; 7) Learners can correctly calculate the pH of hydrolyzed salt solutions through e-modules; 8) Learners can appropriately calculate the pH of non-hydrolyzed salt solutions through e-modules; 9) Learners can identify the pH of salt solutions in experimental videos through e-modules.

Literature Review

The literature review shows that the PBL-based salt hydrolysis e-module using the TaRL approach provides an effective solution to contemporary learning challenges. The application of e-modules has demonstrated positive results in improving student learning outcomes. Research conducted by Afriani et al (2022) supports this, finding that students who used e-modules achieved higher learning outcomes compared to those who did not.

Desriyanti & Lazulva (2016) also explored the use of e-modules for salt hydrolysis materials within the PBL model. However, in implementing the PBL program, teachers often divide groups randomly without considering the diverse characteristics of their students. One important aspect that has not been addressed is student learning readiness. As a result of this random grouping, some students do not contribute effectively to their groups (Afiefah, 2014). Therefore, the TaRL approach is expected to enhance student motivation and learning outcomes (Gempita et al., 2023). This expectation is further supported by research conducted by Izzah et al (2023) which states that the application of the TaRL approach, in conjunction with the PBL model, can significantly improve student motivation and learning outcomes in chemistry.

Development of Conceptual Framework

The conceptual framework encompasses key concepts derived from the previously conducted needs analysis, curriculum analysis, and literature review. Figure 2 illustrates the conceptual framework.

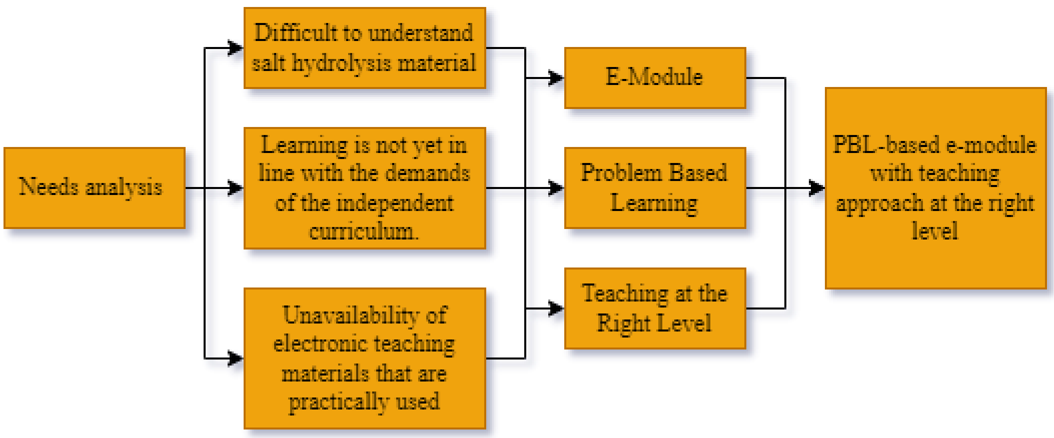

Figure 2. Conceptual Framework

Prototyping Phase

Prototype I

This prototype was developed based on the findings from the preliminary research design, leading to the creation of a PBL-based salt hydrolysis e-module with the TaRL approach. The module was structured using the PBL learning stages alongside the TaRL approach. The learning steps followed by students remained consistent across groups of varying abilities. However, among the five PBL syntaxes, the key difference lies in the steps guiding individual or group investigations and exercises, adapted to suit students' ability levels.

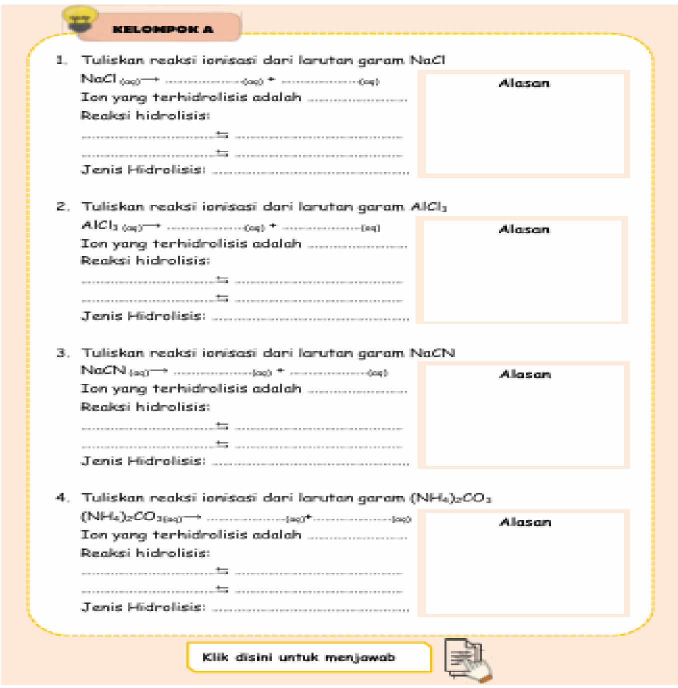

Figure 3. Syntax Guiding Individual or Group Inquiry Low (A)

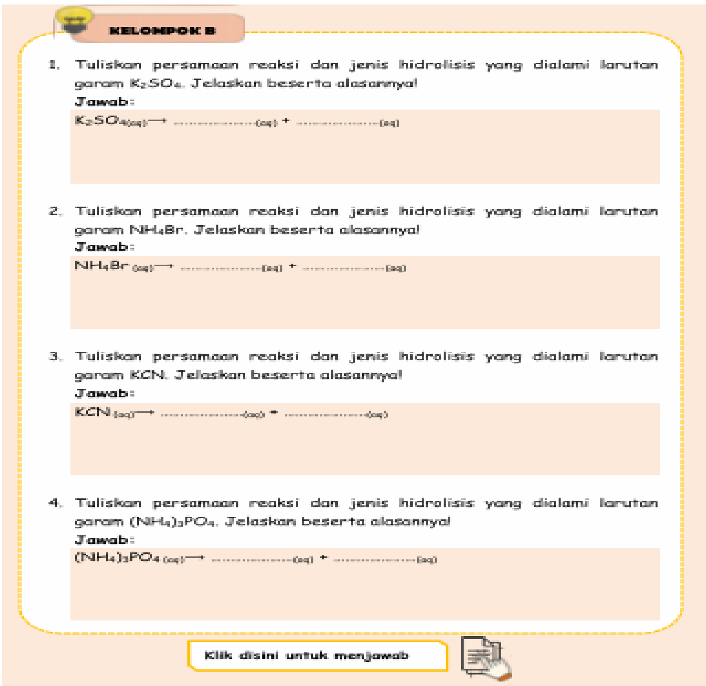

Figure 4. Syntax Guiding Individual or Group Inquiry Medium (B)

Figure 5. Syntax Guiding Individual or Group Inquiry High (C)

Prototype II

Prototype II was developed based on a self-evaluation of the completeness of the e-modules designed in Prototype I. The evaluation results from Prototype I indicate that the salt hydrolysis e-modules align with the e-module components set by Kemendikbud (2017).

Prototype III

Prototype III was developed based on expert review and one-to-one assessment of Prototype II, with the aim of determining the validity category of the resulting prototype. Figure 6 presents the findings of the validity analysis.

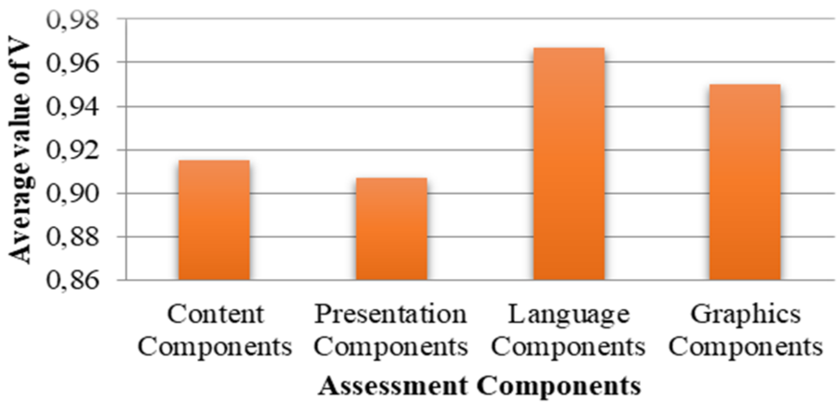

Figure 6. Content Validity Results of PBL-Based Salt Hydrolysis with TaRL Approach

The validity test assessment consists of four components: content, presentation, language, and graphic elements (Depdiknas, 2008). The content component of the salt hydrolysis e-module produced has an average validity value of V = 0.92, which indicates that the e-module is in the valid category based on Aiken's V index (Abhi Purwoko et al., 2021). According to Cahyadi (2019), effective teaching materials are designed based on learning objectives and are typically derived from relevant textbooks to achieve these competencies.

The presentation component of the salt hydrolysis module is considered valid, with an average score of 0.91. Based on these findings, the e-modules have been prepared based on the established e-module guidelines (Kemendikbud, 2017). In addition, the stages of the PBL model in the e-modules follow the PBL syntax from Arends (2012).

The language section of the salt hydrolysis e-module was rated valid with an average score of 0.97. These results show that the language used is well structured, easy to understand, and Indonesian language rules. The questions are easy to understand. According to Lasmiyati & Harta (2014), teaching materials that employ simple, communicative language enhance students' understanding of concepts and boost their motivation to learn.

The graphic component of the e-module is 0.95, which is valid. This finding indicates that the visual elements of the e-module, such as colors and graphics, are visually appealing, and the fonts are easy to read. In addition, the placement of images, graphics, and illustrations is appropriate. Based on data processing, the average result for content validity is 0.93. This means that, by the validity categories established by Aiken's V, the constructed e-module fits into the valid category, as indicated in Table 1.

Media validity tests have also been conducted on display aspects, programming aspects, and utilization aspects, yielding an average V of 0.90. The results of the media validation are presented in Figure 7.

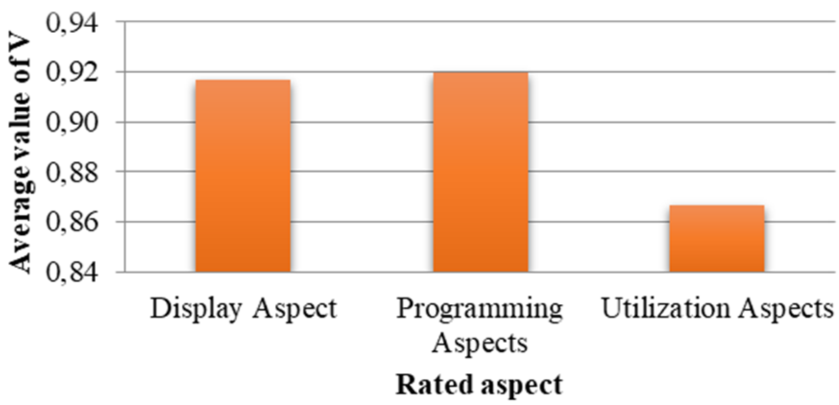

Figure 7. PBL-based Salt Hydrolysis Media Validity Results with TaRL Approach

The display aspect e-module has a validity of 0.92, indicating that the typeface, font, images, video quality, and cover are well organized. According to Nurrita (2024), Students will be stimulated during the learning process by attractively presented instructional media. According to additional research by Rendra et al (2018) students prefer learning when there are videos included since it piques their interest in the subject matter. The module's programming component has a validity of 0.92. This demonstrates the balance of the text, picture, and video composition. Icons, symbols, and usage instructions are easily comprehensible.The aspect utilization of the e-module has a validity of 0.87, indicating that the images and videos included promote understanding and facilitate student learning. According to Herawati & Muhtadi (2018), interactive e-modules can improve students' chemistry learning outcomes.

In the one-on-one assessment phase, three Phase F students representing high, medium, and low ability levels were involved. The learners found the language used in the produced e-module to be easy to understand, and they appreciated its attractive cover, design, color, and overall appearance.

CONCLUSION

With an average content validity value of V = 0.93 and medium validity of V = 0.90, the research conducted leads to the conclusion that the PBL-based salt hydrolysis e-module, employing the TaRL Phase F approach for Class XI, fits into the valid category.

RECOMMENDATIONS

Suggested that future researchers can test the practicality of teaching materials in classroom learning.

BIBLIOGRAPHY

Abhi Purwoko, A., Burhanuddin, Andayani, Y., Hadisaputra, S., Yulianti, L., Nudia Fitri, Z., & Pariza, D. (2021). Validitas Instrument dalam Rangka Pengembangan Metode Pembelajaran Inovatif untuk Meningkatkan Minat Belajar Siswa. *LPPM University of Mataram*, *3*(0), 94–102. http://jurnal.lppm.unram.ac.id/index.php/prosidingsaintek/article/view/271

Afiefah, N. (2014). Pembelajaran dengan Metode Diskusi Kelas. *Jurnal Tarbawiyah*, *11*(1), 53–65.

Afriani, N., Haris, M., Rudyat, L., Savalas, T., Fara, B., & Sofia, D. (2022). Pengaruh Modul Elektronik Kimia terhadap Hasil Belajar Siswa Kelas XI MIPA SMAN 1 Jonggat pada Materi Termokimia. *Jurnal Ilmiah Profesi Pendidikan*, *7*(1).

Afrianis, N. (2019). Analisis Hubungan Hasil Belajar dengan Keterampilan Berpikir Kritis Pada Materi Hidrolisis Garam. *Jurnal Pendidikan Kimia Dan Terapan*, *3*(2), 93–98. https://doi.org/http://dx.doi.org/10.24014/konfigurasi.v3i2.7622

Annadzili, M. D., Nursangaji, A., & Kalsum, U. (2024). Upaya Peningkatan Aktivitas Belajar Peserta Didik dengan Pendekatan TaRL pada Pembelajaran Matematika. *Jurnal Education and Development*, *12*(2), 129–134.

Arends, R. I. (2012). *Learning to Teach* (9th ed.). New York: The McGraw Hill Companies.

Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, *3*(1), 35–42. https://doi.org/10.21070/halaqa.v3i1.2124

Cahyani, H. D., Hadiyanti, A. H. D., & Saptoro, A. (2021). Peningkatan Sikap Kedisiplinan dan Kemampuan Berpikir Kritis Siswa dengan Penerapan Model Pembelajaran Problem Based Learning. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(3), 919–927. https://edukatif.org/index.php/edukatif/article/view/472

Depdiknas. (2008). *Panduan Pengembangan Bahan Ajar*. 28.

Desriyanti, R. D., & Lazulva, L. (2016). Penerapan Problem Based Learning pada Pembelajaran Konsep Hidrolisi Garam untuk Meningkatkan Hasil Belajar Siswa. *JTK (Jurnal Tadris Kimiya)*, *1*(2), 70–78. https://doi.org/10.15575/jta.v1i2.1247

Erawati, N. K., Purwati, N. K. R., & Saraswati, I. D. A. P. D. (2022). Pengembangan E-Modul Logika Matematika Dengan Heyzine untuk Menunjang Pembelajaran di SMK. *Jurnal Pendidikan Matematika (JPM)*, *8*(2), 71–80. https://doi.org/10.33474/jpm.v8i2.16245

Fakhri, A. (2023). Kurikulum Merdeka dan Pengembangan Perangkat Pembelajaran : Menjawab Tantangan Sosial dalam Meningkatkan Keterampilan Abad 21. *C.E.S*

(Confrence Of Elementary Studies), *1*(1), 32–40.

Faradila, A., Priantari, I., & Qamariyah, F. (2023). Teaching at The Right Level sebagai Wujud Pemikiran Ki Hadjar Dewantara di Era Paradigma Baru Pendidikan. *JPN: Jurnal Pendidikan Non-Formal*, *1*(1), 1–10. https://doi.org/https://doi.org/10.47134/jpn.v1i1.101

Febriani, G., Marfu'ah, S., & Joharmawan, R. (2018). Identifikasi Konsep Sukar, Kesalahan Konsep, Dan Faktor-Faktor Penyebab Kesulitan Belajar Hidrolisis Garam Siswa Salah Satu SMA Blitar. *J-PEK (Jurnal Pembelajaran Kimia)*, *3*(2), 35–43. https://doi.org/10.17977/um026v3i22018p035

Fitriana, N., Supardi, K. I., & Sudarmin. (2017). Pengaruh Model Problem Based Learning Terhadap Hasil Belajar Kimia Hidrolisis dan Keterampilan Generik Sains. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *6*(1), 54–59.

Fitriani, S. N. (2022). Analisis Peningkatan Kemampuan Literasi Siswa Dengan Metode ADABTA Melalui Pendekatan TaRL. *BADA'A: Jurnal Ilmiah Pendidikan Dasar*, *4*(1), 69–78. https://doi.org/10.37216/badaa.v4i1.580

Gempita, L. E., Alfiandra, & Murniati, S. R. (2023). Penerapan Model TaRL untuk Meningkatkan Motivasi Belajar dan Hasil Belajar Peserta Didik SMP. *Jurnal Basicedu*, *7*(3), 1816–1828. https://doi.org/10.31004/basicedu.v7i3.5592

Herawati, N. S., & Muhtadi, A. (2018). Pengembangan modul elektronik (e-modul) interaktif pada mata pelajaran Kimia kelas XI SMA. *Jurnal Inovasi Teknologi Pendidikan*, *5*(2), 180–191. https://doi.org/10.21831/jitp.v5i2.15424

Istiqoma, M., Nani Prihatmi, T., & Anjarwati, R. (2023). Modul Elektronik Sebagai Media Pembelajaran Mandiri. *Prosiding SENIATI*, *7*(2), 296–300. https://doi.org/10.36040/seniati.v7i2.8016

Izzah, N., Djangi, M. J., & Mansur. (2023). Penerapan Model Problem Based Learning Terintegrasi Teaching at the Right Level untuk meningkatkan Motivasi dan Hasil Belajar Peserta Didik. *Jurnal Pemikiran Dan Pengembangan Pembelajaran*, *5*(3), 1000–1008.

Kemendikbud. (2017). *Panduan Praktis Penyusunan E-Modul*. 1–57.

Kemendikbud. (2022). Pedoman penerapan kurikulum dalam rangka pemulihan pembelajaran. *Menpendikbudristek*, 1–112. https://jdih.kemdikbud.go.id

Kemendikbud. (2023). Surat Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan. *Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi*, *1152/H3/SK*.

Kemendikbud. (2024). Kurikulum Pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, Dan Jenjang Pendidikan Menengah. *Badan Pengembangan Sumber Daya Manusia Pendidikan Dan Kebudayaan Dan Penjaminan Mutu Pendidikan*, 1–26.

Lasmiyati, L., & Harta, I. (2014). Pengembangan Modul Pembelajaran untuk Meningkatkan Pemahaman Konsep dan Minat SMP. *PYTHAGORAS Jurnal Pendidikan Matematika*, *9*(2), 161–174. https://doi.org/10.21831/pg.v9i2.9077

Lestari, D. P., Joharmawan, R., & Purwati, Y. (2023). Penerapan Pembelajaran Berdiferensiasi dengan Model Pembelajaran Project Based Learning untuk Meningkatkan Hasil Belajar Siswa SMP Negeri 1 Ngasem kelas VII Mata Pelajaran IPA. *Jurnal MIPA Dan Pembelajarannya*, *3*(1), 12–18. https://doi.org/10.17977/um067v3i1p12-18

Nurfalah, H., & Aini, S. (2023). Efektivitas Media Pembelajaran Power Point Interaktif Berbasis Inkuiri Terbimbing Pada Materi Hidrolisis Garam Terhadap Hasil Belajar Peserta Didik Man 2 Kota Padang. *Prima Magistra: Jurnal Ilmiah Kependidikan*, *4*(3), 355–361. https://doi.org/10.37478/jpm.v4i3.2880

Nurrita, T. (2024). Urgensi Pengembangan Media Pembelajaran Lingkaran Untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Literasi Digital*, *4*(1), 73–80. https://doi.org/10.54065/jld.4.1.2024.448

Plomp, T., & Nieveen, N. (2013). Educational Design Research Educational Design Research. *Netherlands Institute for Curriculum Development: SLO*, 206. http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ815766

Pratami, H. M., Masriani, Erlina, Muharini, R., & Rasmawan, R. (2023). Pengembangan E-Modul Berbasis STEM Pada Materi Hidrolisis Garam Untuk Menumbuhkan Keterampilan Pemecahan Masalah Peserta Didik. *Eksakta : Jurnal Penelitian Dan Pembelajaran MIPA*, *8*(2), 142–156.

Rahmadhani, S., Efronia, Y., & Tasrif, E. (2021). Penggunaan E-Modul Di Sekolah Menengah Kejuruan Pada Mata Pelajaran Simulasi Digital. *JAVIT : Jurnal Vokasi Informatika*, *1*(1), 5–9. https://doi.org/10.24036/javit.v1i1.16

Rahmayanti, S. M., Hadi, F. R., & Suryanti, L. (2023). Penerapan Model Pembelajaran PBL Menggunakan Pendekatan TaRL. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *8*(1), 4545–4557. https://doi.org/10.23969/jp.v8i1.7914

Rendra, G. R., Darmawiguna, G. M., & Sindhu, G. P. (2018). Pengembangan E- Modul Berbasis Project Based Learning Menggunakan Schoology. *Karmapati*, *7(2)*(2), 50–58.

Rosmana, P. S., Ruswan, A., Nabilah, L., Fitriani, D., Nurhaliza, Y., Oktaviani, A., & Sari, T. F. P. S. (2024). Pembelajaran Paradigma Baru di SD pada Kurikulum Merdeka. *Jurnal Pendidikan Tambusai*, *8*(1), 4665–4671.

Salhuteru, J. S., Rumahuru, O., Kainama, L., Unitly, M. U., & Amanukuany, R. (2023). Model- Model Pembelajaran Dalam Implementasi Kurikulum Merdeka. *Jurnal Pendidikan DIDAXEI*, *1*(5), 730–737. https://doi.org/10.59407/jpki2.v1i5.118

Syahrial, Asrial, Kurniawan, D. A., & Piyana, S. O. (2019). E-Modul Etnokontruktivisme: Implementasi Pada Kelas V Sekolah Dasar Ditinjau Dari Persepsi, Minat Dan Motivasi. *Jurnal Teknologi Pendidikan*, *21*(2), 165–177. https://doi.org/10.21009/jtp.v21i2.11030

Syamsidah, & Suryani, H. (2018). *Buku Model Peoblem Based Learning (PBL)*. Yogyakarta: Deepublish Publisher.

Syerlinda, Sitti, S., Djumriah, & Hatimah. (2023). Implementasi Pendekatan Teaching at The Right Level Terhadap Hasil Belajar Peserta Didik SMP Negeri 23 Barru. *Jurnal Pemikiran Dan Pengembangan Pembelajaran Implementasi*, *5*(2), 991–997.