Development of Teaching Material to Support Merdeka Curriculum on the Acid-Base of Phase F

Rahmi Fadila[1]; Mawardi[2]; Okta Suryani[3]

[1,2,3]*Chemistry Education, Universitas Negeri Padang, Indonesia*
[2]*Corresponding Email: mawardianwar@fmipa.unp.ac.id, Phone Number: 0812 xxxx xxxx*

Article History:
Received: May 29, 2023
Revised: Jul 09, 2023
Accepted: Jul 18, 2023
Online First: Jul 24, 2023

Keywords:
Acid-Base,
Fase F,
Merdeka Curriculum,
Teaching Materials.

Kata Kunci:
Asam-Basa,
Bahan Ajar,
Fase F,
Kurikulum Merdeka.

How to cite:
Fadila, R., Mawardi, M., & Suryani, O. (2023). Development of Teaching Material to Support Merdeka Curriculum on the Acid-Base of Phase F. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(3), 1531-1547.

Abstract: This research aims to develop teaching materials to support Merdeka curriculum learning on acid-base phase F SMA/MA material that is valid and practical. This educational development research uses the Plomp model developed by Tjeerd Plomp. The development procedure includes the initial investigation and development or prototyping stages. The subjects in this study were UNP chemistry lecturers, SMA Negeri 2 Padang teachers, and Phase F students of SMA Negeri 2 Padang. The research instruments used validation sheets and teacher and learner response questionnaires. The results of this study indicate that teaching materials to support Merdeka curriculum learning on acid-base phase F SMA / MA material that has been developed and assessed by five expert validators are on valid criteria with an average of 0.86, an efficient category in teacher responses by obtaining a percentage of 87%, and student responses by obtaining a percentage of 97%. This teaching material is proven to increase students' learning motivation and understanding, as well as facilitate teachers and students in the learning process of the Merdeka curriculum.

Abstrak: Penelitian ini bertujuan mengembangkan bahan ajar untuk menunjang pembelajaran kurikulum merdeka pada materi asam-basa fase F SMA/MA yang valid dan praktis. Penelitian ini merupakan penelitian pengembangan pendidikan dengan menggunakan model Plomp yang telah dikembangkan oleh Tjeerd Plomp. Prosedur pengembangan meliputi tahap investigasi awal dan tahap pengembangan atau pembuatan prototipe. Subjek pada penelitian ini yaitu dosen kimia UNP, guru SMA Negeri 2 Padang, dan peserta didik Fase F SMA Negeri 2 Padang. Istrumen penelitian menggunakan lembar validasi, lembar angket respon guru dan peserta didik. Hasil penelitian ini menunjukkan bahwa bahan ajar untuk menunjang pembelajaran kurikulum merdeka pada materi asam-basa fase F SMA/MA yang telah dikembangkan dan dinilai oleh lima validator ahli berada pada kriteria valid dengan rata-rata sebesar 0,86, kategori sangat praktis pada respon guru dengan memperoleh persentase 87 % , dan respon peserta didik dengan memperoleh persentase sebesar 97 %. Bahan ajar ini terbukti dapat meningkatkan motivasi belajar dan pemahaman peserta didik, serta memudahkan guru dan peserta didik dalam proses pembelajaran kurikulum merdeka.

https://doi.org/10.51276/edu.v4i3.635

A. Introduction

The Covid-19 pandemic has become a dangerous global virus outbreak, spreading throughout the world. In the years 2020-2021, the Covid-19 pandemic caused significant changes in the education sector (Herpika & Mawardi, 2021). These changes affected various educational components, including students, teachers, learning media, school environments, and learning methods and content. Failure to adapt to these changes resulted in less effective learning, leading to learning loss (Jojor & Sihotang, 2022). Learning loss is characterized by decreased learning achievement, interest, ability, understanding, and widening knowledge gaps among learners (Muzdalifa, 2022). To address the post-pandemic conditions and new ways of learning, the curriculum needed refinement. Hence, the Ministry of Education and Culture introduced the Merdeka curriculum and the driving school program (Kemendikbudristek, 2021).

The driving school program aims to optimize the quality of teaching and learning in schools and later expand the successful practices to other schools (Malikah et al., 2022). It offers several benefits, including optimizing the quality of learning outcomes in students over three years, accelerating the achievement of the Pancasila learner profile, providing intensive assistance, and securing additional budget allocation for purchasing teaching materials using the new curriculum (Munawar, 2022). The driving school program is a government priority as it is specifically formulated to implement the Merdeka curriculum (Balkist et al., 2022).

The Merdeka curriculum is designed to offer diverse extracurricular and optimal content in the learning process, allowing students ample time to strengthen their competencies and explore learning concepts. This curriculum grants teachers the freedom to choose various teaching tools that cater to students' learning needs and interests (Permendikbud, 2022). Implementing the Merdeka curriculum encourages a fun learning process, fostering innovative and creative thinking among both teachers and students (Alfath et al., 2022). It provides flexibility for students to actively explore and engage in fostering critical thinking and complex problem-solving skills, aligning with the development of competencies and character profiles based on Pancasila principles (Arisanti, 2022).

The Merdeka curriculum possesses several principal characteristics that play a crucial role in revitalizing the education system. It focuses on designing learning activities to develop soft skills and character profiles based on Pancasila principles. The teaching and learning process in this curriculum is project-based, and the learning materials concentrate on deepening numeracy and literacy skills as fundamental student abilities. Additionally, the curriculum grants teachers the freedom to compile and design learning materials synchronized with the students' competencies and contextual and local content (Rosmana et al., 2022). One of the strengths of implementing the Merdeka curriculum is that it allows teachers to be creative and innovative in their teaching methods. However, the successful implementation of the curriculum requires the availability of appropriate teaching materials to ensure that students achieve their learning outcomes (Fadhila et al., 2022).

https://doi.org/10.51276/edu.v4i3.635

Teaching materials are systematically arranged materials that represent concepts to guide students in achieving learning competencies (Magdalena et al., 2020). They are integral to the teaching and learning process and serve as a means for students to acquire knowledge (Kosasih, 2021). Effective teaching materials should be prepared based on learning objectives and needs to ensure a smooth learning process (Fadhila et al., 2022). The role of teaching materials for students is to enable independent learning without the presence of a teacher, providing flexibility in learning anywhere (Magdalena et al., 2020). These materials facilitate systematic and structured knowledge-seeking, and they help develop students' competence through interactive lessons, motivating their learning progress. Furthermore, teaching materials often include exercises and problem presentations to reinforce and evaluate students' understanding (Kosasih, 2021). They also save teachers time in preparing for lessons, as students can be assigned specific topics or materials in advance, reducing the need for detailed explanations during class. Additionally, engaging teaching materials can evoke enthusiasm and interest in the learning process (Magdalena et al., 2020).

However, the teaching materials used in implementing the Merdeka curriculum still have some shortcomings, notably the limited availability of resources and the need to improve material content to support the learning process (Iryanto, 2021). This limitation is evident on the Kemendikbud platform, where no science or chemistry textbooks are provided for certain phases (Kemendikbud, 2022). Consequently, teachers often need to search for additional teaching materials from various references, such as other textbooks and the internet (Astari, 2022). The absence of suitable teaching materials may disrupt the learning process, as teachers have to spend time preparing materials or evaluation tools (Kosasih, 2021).

Based on the results of a field survey, including interviews with chemistry teachers at SMAN 2 Padang, SMAN 3 Padang, and SMAN 7 Padang, it was revealed that the Merdeka curriculum had been implemented for two years. However, the acid-base material in the teaching materials for phase F chemistry learning was found to be incomplete and insufficient in improving students' understanding. Moreover, it failed to spark students' interest in learning. The teaching materials used in the learning process for acid-base material still followed the 2013 curriculum, which does not align with the Merdeka curriculum. Furthermore, the textbook used lacked explanations and visual aids, making it challenging for students to grasp the concepts effectively.

Chemistry is a subject where students often require clarification, and many learners at different education levels face difficulties in understanding the concepts. Research indicates that many students need assistance in comprehending basic chemistry concepts accurately. The concepts in chemistry learning are hierarchical, ranging from simple to complex (Agatha et al., 2022). These concepts are interconnected, requiring students to make connections between them. Mastery of the fundamental concepts is crucial in building more advanced ones. A key goal of chemistry learning is for students to master the chemical concepts they have learned and relate them to the material being studied. However, in

https://doi.org/10.51276/edu.v4i3.635

reality, learning chemistry often prioritizes obtaining results without students fully grasping the underlying concepts, which is a concerning issue. Thus, reinforcing concepts in chemistry learning is essential (Mentari, 2014). One of the topics in chemistry, the acid-base material, is prone to misconceptions among students.

Acid-base material is characterized as abstract content, making it challenging for students to comprehend (Fani & Mawardi, 2022). This difficulty in understanding the material has been noted by Kardena & Mawardi (2021). In the context of chemistry learning, acid-base material is a key subject, involving contextual concepts and descriptions, where learning is connected to real-life situations (Mawardi et al., 2021). Contextual learning allows students to independently build concepts and explore information relevant to their daily lives. Due to the complex nature of acid-base material, which encompasses various chemical representation levels (macroscopic, submicroscopic, and symbolic), students may find it particularly intricate to grasp (Andriani et al., 2019). To effectively master the concept and application of acid-base in daily life, appropriate learning models and teaching materials are necessary. Tamara et al (2022) emphasize that teaching materials play a crucial role in enhancing the quality of learning, benefiting both teachers and students in achieving effective learning outcomes.

Baan & Dewi (2021) assert that developing teaching materials is essential to enhance students' understanding. Asmaningrum & Jusmiati (2022) conducted research on environmental chemistry teaching materials focused on environmental pollution, using an Ethno-STEM approach. The validity test results for the developed teaching materials, assessed based on four aspects, received an average score of 4.17 and 4.07, categorized as good. The average validation scores for presentation, material, graphics, and language aspects were 4.29 (very good), 4.20 (very good), 4.00 (good), and 4.12 (good), respectively. Similarly, Helsy & Andriyani (2017) worked on developing teaching materials for chemical equilibrium materials with multiple chemical representations. The results indicated that the teaching materials were highly valid, receiving a very feasible feasibility value. Students' responses to the teaching materials for chemical equilibrium were positive, with 88.5% stating that they were good, and 11.5% stating that they were enough. As a result, the teaching materials for chemical equilibrium, with multiple chemical representations, were categorized as good and could serve as valuable learning resources.

The implementation of the Merdeka curriculum necessitates specialized teaching materials to enhance the learning experience. These materials for acid-base learning include essential content, comprehension tests, six types of questions, QR scans to improve students' digital literacy, activities based on the Pancasila student program, engaging illustrations, and coherent material organization. The development of these teaching materials aims to support the learning process under the Merdeka curriculum, with a specific focus on acid-base material. The study's objectives encompass evaluating the validity and practicality of the developed products, as well as analyzing the characteristics of the teaching materials supporting the Merdeka curriculum's learning process for acid-base materials.

https://doi.org/10.51276/edu.v4i3.635

B. Method

This study follows the Educational Design Research (EDR) approach, utilizing the Plomp model developed by Tjeerd Plomp (Plomp & Nieveen, 2013). Plomp's research model comprises three main stages:

1. The initial investigation stage involves needs and context analysis, literature review, and conceptual framework development.
2. The development or prototyping stage is carried out through formative evaluation, which includes self-evaluation, expert review, one-to-one evaluation, and small group evaluation.
3. The trial or assessment stage (Syafei & Mawardi, 2022) follows, where the teaching materials are tested for validity and practicality in supporting Merdeka curriculum learning on acid-base materials.

The research scope is specifically focused on examining the validity and practicality of the developed teaching materials for acid-base materials under the Merdeka curriculum. The study includes three lecturers from the Chemistry Department at UNP, two teachers from SMAN 2 Padang, and phase F students from SMA Negeri 2 Padang as the subjects of the research.

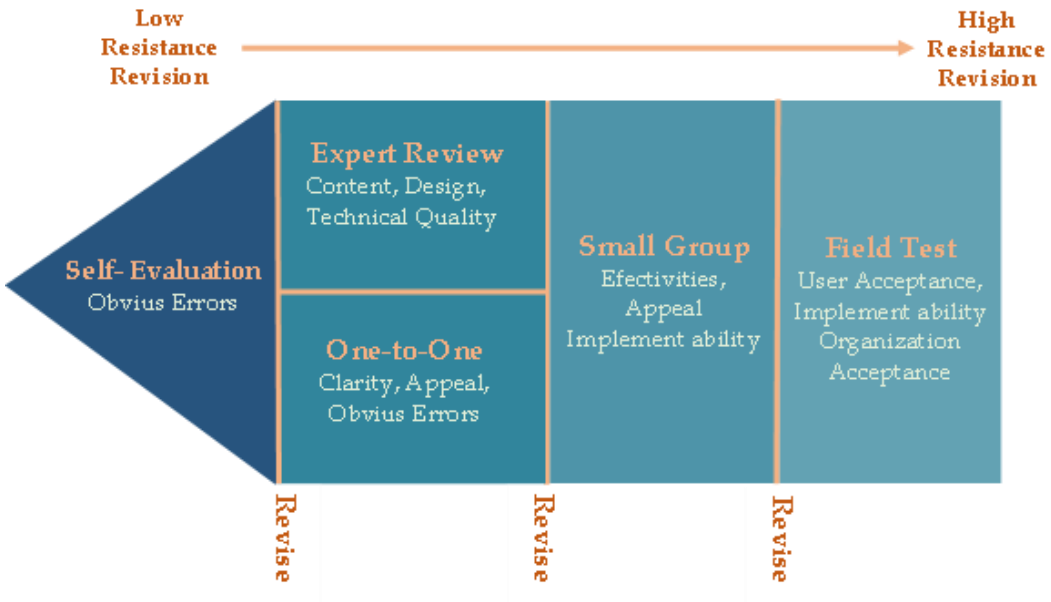

Figure 1. Stages of Formative Evaluation Research

The data used in this study consists of primary data collected through data collection instruments, specifically validity and practicality instruments. For the validity aspect, a validity questionnaire was administered to three lecturers and two teachers who acted as expert validators for assessing the content and construct validity of the teaching materials. The data obtained from this questionnaire provides insights into the level of validity of the developed teaching materials.

https://doi.org/10.51276/edu.v4i3.635

On the other hand, the practicality aspect was assessed through a response questionnaire given to both teachers and students who interacted with the teaching materials. This questionnaire helped to evaluate the level of practicality of the teaching materials in real-world settings.

To analyze the validation of the teaching materials, the researchers used Aiken's V scale. Each statement provided by the validators was analyzed using the Aiken's V formula to determine the degree of agreement or disagreement among the experts on the validity of the teaching materials.

$$V = \frac{\sum S}{n(c-1)}$$

$$S = r - Io$$

Description:

S : The validator's assigned score minus the minimum score in the category used
r : validator's preferred category
Io : Minimum score in the scoring category
n : total number of validators
c : number of categories selected by the validator

After converting the data, the level of validity of the teaching materials aimed at supporting Merdeka curriculum learning on acid-base phase F in SMA/MA will be assessed based on the categories presented in the table below:

Table 1. Criteria index validated by Aiken 5 Validator

Skala Aiken's V	Category
V ≥ 0,80	Valid
V < 0.80	Invalid

Source :(Aiken, 1985; Siregar & Mawardi, 2022)

The practicality of the developed teaching materials will be analyzed using a modified formula by Purwanto (2010) as applied in the study conducted by Yunus & Sardiwan (2019). The formula used for the practicality assessment is as follows:

$$NP = \frac{R}{SM} \times 100$$

Description:

NP : the sought or expected percent value
R : the raw score obtained by the student
SM : the corresponding maximum score
100 : fixed number

The practicality level of the teaching materials aligned with the Merdeka curriculum for phase F in SMA / MA, focusing on acid-base material, will be determined and categorized according to the table presented below:

https://doi.org/10.51276/edu.v4i3.635

Table 2. Conversion of the Level of Practicality of Teaching Materials to Support Merdeka Curriculum Learning on Acid-Base Phase F SMA/MA Material

Nilai	Kategori
86% - 100%	Highly Practical
76% - 85%	Quite Practical
60% - 75%	Practical
55% - 59%	Less Practical
≤ 54%	Not Practical

Source : (Purwanto, 2010; Yunus & Sardiwan, 2018)

C. Results and Discussion

Result

The products produced in this study are teaching materials to support Merdeka curriculum learning on acid-base phase F SMA/MA material that has been valid and practical. The research that has been carried out uses the Plomp model, which consists of several stages and is described as follows.

Preliminary Research

The preliminary stage of this research is conducted to identify educational issues in the field by conducting needs and context analysis, reviewing relevant literature, and developing a conceptual framework (Ismail & Mawardi, 2021). The needs analysis involved interviews with three chemistry teachers and 84 phase F students from SMAN 2 Padang, SMAN 3 Padang, and SMAN 7 Padang to identify problems related to chemistry learning. These schools have been implementing the Merdeka curriculum for two years. Respondents emphasized the necessity for teaching materials that support chemistry learning, particularly in the acid-base content, to align with the requirements of the Merdeka curriculum. Out of the 84 students surveyed, 57.1% expressed difficulties in understanding acid-base material. This was attributed to 69% of the students finding the acid-base concept too abstract, while 22.6% believed that the teaching materials used were not engaging enough.

Context analysis was conducted to systematically identify and compile learning objectives based on phase F learning outcomes in acid-base material. The formulated learning objectives for phase F acid-base material are as follows: (1) Explaining the concept of acid-base, (2) Determining the pH of acid-base solutions, (3) Applying the stoichiometry of acid-base solutions, (4) Determining acid-base reactions, and (5) Determining the concentration of acid-base solutions using titration result data.

Additionally, a literature review was conducted, analyzing journals and references to address the challenges and issues encountered in the chemistry learning process. As a result of these findings, it becomes essential to develop teaching materials that can effectively support Merdeka curriculum learning for phase F acid-base material in

https://doi.org/10.51276/edu.v4i3.635

SMA/MA, ensuring both validity and practicality. Based on the needs and context analysis, as well as the literature study, the conceptual framework presented in Figure 2 is formulated.

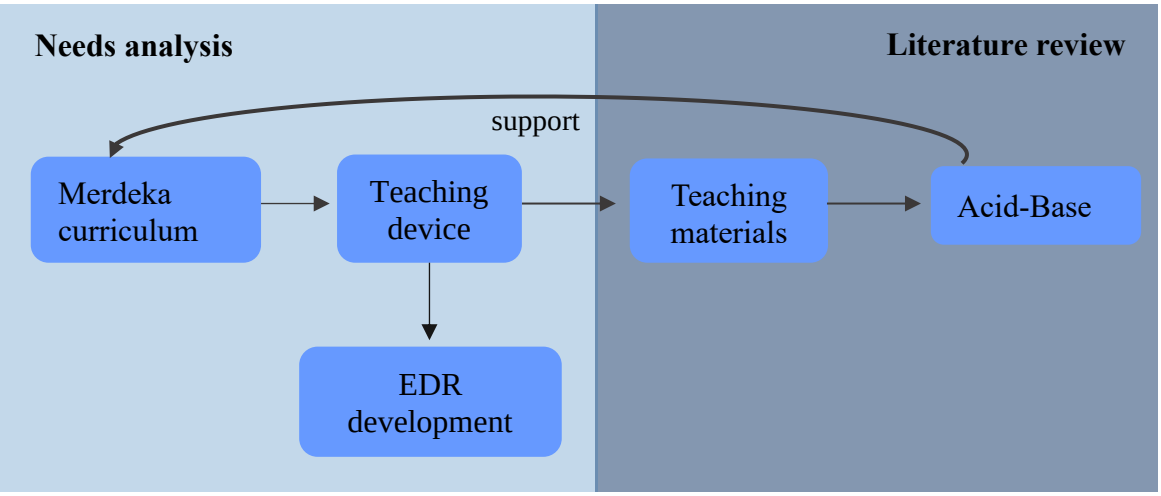

Figure 2. Conceptual Framework

Prototyping phase

Prototype I

The initial development stage involves designing acid-base teaching materials with visually appealing layouts and illustrations to enhance students' engagement and enthusiasm for learning (Piawi et al., 2018). The acid-base teaching materials are specifically designed to support the implementation of the Merdeka curriculum by transforming learning outcomes into well-defined learning objectives. The components of these teaching materials include the cover page, Pancasila student profile, concept map, keywords, table of contents, an introduction about the teaching material, the core material, various learning activities, sample questions and discussions, a comprehension test, exercises to improve understanding, a summary, end-of-chapter practice questions, opportunities for self-reflection, an answer key, a glossary, and an index.

https://doi.org/10.51276/edu.v4i3.635

Figure 3. Display Learning Objectives and Create a Concept Map

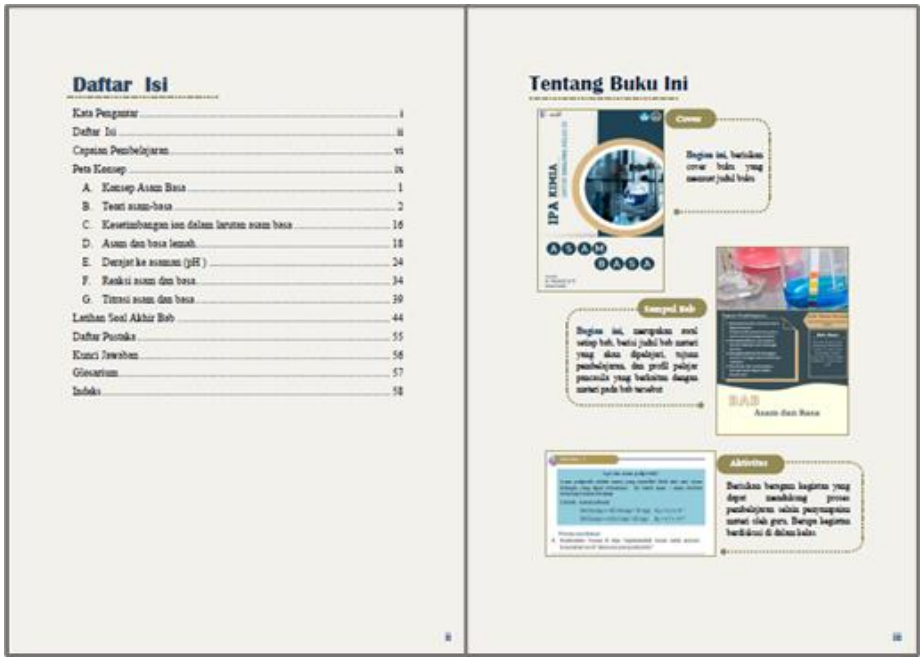

Figure 4. Display of Table of Contents and Instructions for the Use of Materials

Prototype II

Prototype II involved the assessment and evaluation of the teaching materials created in Prototype I. Self-evaluation was conducted using a checklist to review all components and ensure the alignment of the teaching material content with the objectives of the Merdeka curriculum. In case any components were found unsuitable, necessary revisions were implemented to produce Prototype II.

https://doi.org/10.51276/edu.v4i3.635

Prototype III

Prototype III comprised a formative evaluation, specifically an expert assessment conducted by five validators, including three chemistry lecturers from UNP and two teachers from SMA Negeri 2 Padang. The results of the validity assessment are depicted in Figure 4.

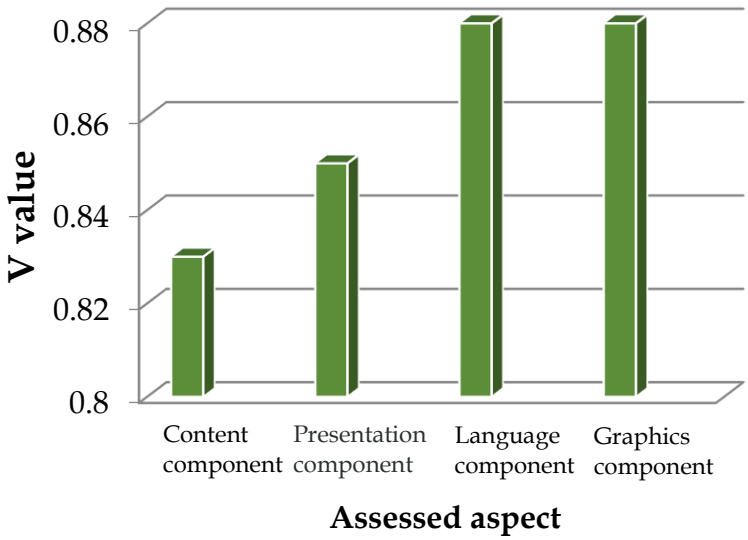

Figure 5. Results of Expert Assessment Validity

The expert assessment was conducted to identify the strengths and weaknesses of the developed product. The content component was evaluated by comparing the teaching materials with the actual curriculum content. The validator's validity test confirmed the teaching materials' content, presentation, and graphics as valid. The qualitative assessment from the expert also emphasized the importance of consistent coloring in the illustrations, particularly in the molecular images.

Additionally, during this stage, individual evaluations were carried out by interviewing three phase F students from SMA Negeri 2 Padang. The purpose was to gauge the students' responses to Prototype II. The interview results indicated that the teaching materials developed were engaging and succeeded in capturing students' interest. The language used in the teaching materials was also found to be easily understandable by the students. Subsequently, based on the suggestions obtained from the students' feedback, necessary revisions were made to further enhance the teaching materials and produce a valid Prototype III.

https://doi.org/10.51276/edu.v4i3.635

Figure 6. Revised Instructions for the Use of Materials

Figure 7. Revise Learning Objectives and Pancasila Student Profile

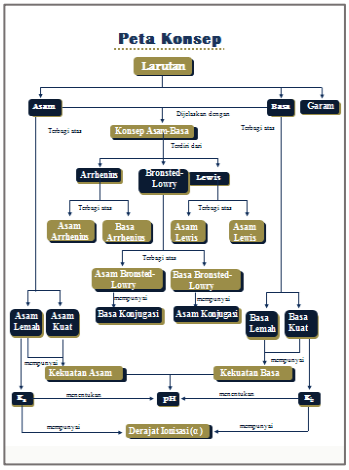

Figure 8. Revise Concept Map

Prototype IV

The practicality of the teaching materials can be evaluated through limited trials that assess their practicality and suitability for use. To determine the practicality of teaching materials supporting Merdeka curriculum learning on acid-base phase F in SMA/MA, an assessment instrument in the form of a practicality questionnaire was given to two chemistry teachers from SMA Negeri 2 Padang and phase F students. The assessment of the practicality includes four components: ease of use, appearance, efficiency of learning time, and benefits. The data analysis of the practicality test results from both teachers and students is presented in Figure 9.

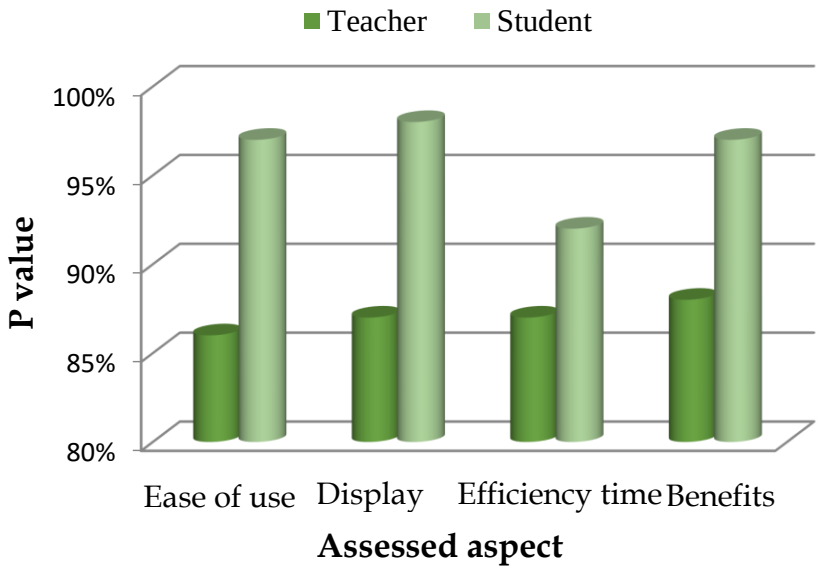

Figure 9. Practicality Results of Teachers and Students

https://doi.org/10.51276/edu.v4i3.635

Discussion

During the preliminary research stage, a comprehensive needs and context analysis, literature review, and conceptual framework development were conducted. The purpose of the analysis and context activities was to identify the existing teaching materials used in chemistry learning for the Merdeka curriculum, particularly focusing on acid-base material. Consequently, it became evident that there was a necessity to create teaching materials that would support the Merdeka curriculum's acid-base learning. The needs and context analysis also emphasized the importance of presenting essential acid-base material in the Merdeka curriculum, incorporating the PROPELA (Pancasila student program) approach. This requirement could be fulfilled by utilizing teaching materials from the Merdeka curriculum.

Subsequently, the developed teaching materials underwent a validation test, encompassing four key components: content, presentation, language, and graphics. The overall assessment by the validators yielded an average value of 0.86, indicating that the teaching materials fall within the valid category and are deemed appropriate for use. Figure 5 illustrates that the validation of the content component obtained a valid assessment with a value of 0.83. This signifies that the content presented in the teaching materials aligns with the acid-base material's learning outcomes (CP), teaching objectives (TP), and curriculum. In essence, the content is valid as per the curriculum guidelines (Utomo, 2022).

Furthermore, the validation of the presentation component received a valid score of 0.85. This implies that the manner in which the teaching materials are presented effectively guides students towards achieving the specified learning objectives. The presentation component's valid categorization confirms that the teaching materials are designed with clear learning objectives in mind (Yerimadesi, 2016).

Moreover, the language component underwent validation and achieved a value of 0.88, falling within the valid category. This indicates that the choice of font type and size, layout, and information presented in the teaching materials are easily comprehensible for readers familiar with Indonesian spelling. The validation of the language component also confirms that the language utilized in the teaching materials aligns with the students' level of proficiency and developmental stage (Khotim et al., 2015).

Following the confirmation of valid teaching materials, a practicality test was conducted. The feedback from teachers indicated that the teaching materials were highly efficient, with an 86% approval rating for ease of use, while students rated it at 97%. This illustrates that the language employed in the teaching materials is straightforward and easily understood, the material is systematically arranged, the layout is organized, and the illustrations are relevant to the acid-base subject matter. The presentation aspect of the teaching materials received a very practical rating, with 87% approval from teachers and 97% from students. The materials' cover design is attractive and in line with the acid-base content, featuring clear illustrations.

Furthermore, the practicality test demonstrated that the teaching materials were highly efficient in terms of time, with 87% approval from teachers and 92% from students. The materials supported teachers in their role as facilitators, enabling them to deliver the

https://doi.org/10.51276/edu.v4i3.635

content in a structured and curriculum-compliant manner (Kosasih, 2021). Additionally, the teaching materials were highly practical in their benefits, with an 88% approval rating from teachers and 97% from students. The components within the teaching materials empowered students to independently solve problems. Overall, the data strongly indicates that the teaching materials designed to support Merdeka curriculum learning on acid-base for phase F SMA / MA are practical in terms of ease of use, appearance, time efficiency, and educational advantages.

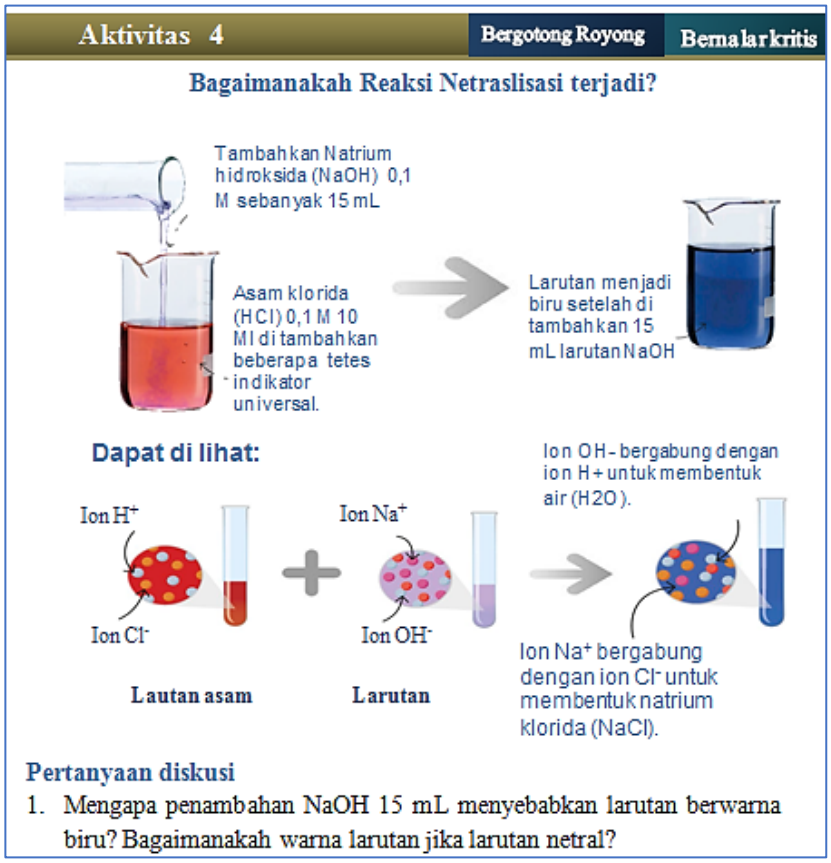

Figure 10. Questions in Teaching Materials

Figure 10 presents one of the model questions that learners must answer. In this question, students are tasked with determining the effect of adding NaOH to an HCl solution. According to the results obtained from interviews conducted with students, it was found that adding NaOH solution with a higher concentration to the HCl solution causes the initially acidic solution to turn basic, leading to a visible color change in the problem.

This stage aimed to gauge students' responses to the developed teaching materials. Based on the outcomes of this stage, it became evident that the visual presentation of images in the teaching materials was clear and engaging, facilitating students' comprehension of the material and questions within the teaching materials. Furthermore, the use of chemical multi-representations contributed to enhancing students' understanding of chemical

https://doi.org/10.51276/edu.v4i3.635

concepts. Notably, no obstacles were encountered in utilizing the developed teaching materials.

D. Conclusion

Based on the conducted research, the development of teaching materials focused on acid-base material incorporates components tailored to the requirements of the Merdeka curriculum learning. These components consist of learning objectives, learning outcomes, concept maps, essential material, comprehension-enhancing section ("let us improve your understanding"), activities aligned with the Pancasila student profile, sample questions and discussions, comprehension tests, summaries, end-of-chapter questions employing a six-question model, answer keys, and reflections.

The developed teaching materials have been deemed valid and practical, demonstrated by an average validity score of 0.86 with a valid rating, an average student practicality score of 96%, and an average teacher practicality score of 87% with an efficient rating. These teaching materials are complemented with questions that have proven to enhance students' comprehension and facilitate their learning process.

As a result, the creation of teaching materials for acid-base materials significantly contributes to augmenting students' interest and attractiveness in learning. Furthermore, these teaching materials can facilitate students in their chemistry learning journey as they incorporate diverse chemical multi-representations that are relevant to acid-base material.

References

Agatha, B., Amiza, R. F., & Sulistyaningsih, Y. (2022). Analisis Miskonsepsi Calon Guru Kimia dengan Menggunakan Two-Tier Multiple Choice Diagnostic Test pada Materi Kesetimbangan Kimia. *Dalton: Jurnal Pendidikan Kimia dan Ilmu Kimia, 5(2), 9-21.*https://doi.org/10.31602/dl.v5i2.6323

Aiken, L. R. (1985). Three Coefficients for Analyzing the Reliability and Validity of Ratings. *Educational and Psychological Measurement,* 45, 131–141. https://doi.org/10.1177/0013164485451012

Alfath, A., Azizah, F. N., & Setiabudi, D. I. (2022). Pengembangan Kompetensi Guru dalam Menyongsong Kurikulum Merdeka Belajar. *Jurnal Riset Sosial Humaniora, dan Pendidikan*, *1*(2), 42–50. https://doi.org/10.56444/soshumdik.v1i2.73

Andriani, M., Muhali, M., & Dewi, C. A. (2019). Pengembangan Modul Kimia Berbasis Kontekstual untuk Membangun Pemahaman Konsep Siswa pada Materi Asam Basa. *Hydrogen: Jurnal Kependidikan Kimia*, *7*(1), 25-36. https://doi.org/10.33394/hjkk.v7i1.1653

Arisanti, D. A. K. (2022). Analisis Kurikulum Merdeka dan Platform Merdeka Belajar untuk Mewujudkan Pendidikan yang Berkualitas. *Jurnal Penjaminan Mutu*, *8*(02), 243–250. https://doi.org/10.25078/jpm.v8i02.1386

https://doi.org/10.51276/edu.v4i3.635

Asmaningrum, H. P., & Jusmiati, J. (2022). Validasi Bahan Ajar Kimia Lingkungan pada Topik Pencemaran Lingkungan dengan Pendekatan Etno-Stem. *Jurnal Ilmiah Kanderang Tingang*, *13*(2), 235–245. https://doi.org/10.37304/jikt.v13i2.174

Astari, T. (2022). Pengembangan Buku Teks dalam Implementasi Kurikulum Merdeka di Sekolah Dasar. *Madako Elementary School*, *1*(2), 163-175.

Baan, A., & Dewi, R. (2021). Pengembangan Buku Ajar Mata Kuliah Bahasa Indonesia untuk Implementasi Merdeka Belajar Kampus Merdeka Anastasia. *Jurnal Onoma: Pendidikan, Bahasa dan Sastra, 7*(1), 327–331. https://doi.org/10.30605/onoma.v7i1.1407

Balkist, P. S., Patimah, S., & Perlita, N. (2022). Analisis Pembelajaran Matematika di Sekolah Penggerak dalam Menjalankan Kurikulum Merdeka di Masa Pandemi. *PRISMA*, *11*(2), 619-629. https://doi.org/10.35194/jp.v11i2.2640

Fadhila, N. A., Setyaningsih, N. W., Gatta, R. R., & Handziko, R. C. (2022). Pengembangan Bahan Ajar Menggunakan Model ADDIE pada Materi Struktur dan Fungsi Jaringan Tumbuhan SMA kurikulum 2013. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, *13*(1), 1-8. https://doi.org/10.24127/bioedukasi.v13i1.5298

Fani, V. G., & Mawardi, M. (2022). Flipped Classroom Learning System based on Guided Inquiry Using Moodle on Acid-Base Solutions. *Jurnal Pijar Mipa*, *17*(3), 361-368. https://doi.org/10.29303/jpm.v17i3.3476

Helsy, I., & Andriyani, L. (2017). Pengembangan Bahan Ajar pada Materi Kesetimbangan Kimia Berorientasi Multipel Representasi Kimia. *Jurnal Tadris Kimiya*, *2*(1), 104-108.

Herpika, F., & Mawardi, M. (2021). Validity of the Flipped Classroom Learning System Based on Guided Inquiry on Molecular Forms using Augmented Reality for Class X SMA/MA Students. *International Journal of Progressive Sciences and Technologies*, 27(1), 232–236. https://doi.org/10.52155/ijpsat.v27.1.3062

Iryanto, N. D. (2021). Komparasi Implementasi Kurikulum 2013 dan Kurikulum Merdeka di Sekolah Dasar. *Jurnal Basicedu, 5(5), 3829–3840*. https://doi.org/10.31004/basicedu.v6i4.3149

Ismail, I. A., & Mawardi, M. (2021). Flipped Classroom Learning System Guided Inquiry on Thermochemical Materials for High School Students Class XI. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, 30(1), 280–287. https://doi.org/10.52155/ijpsat.v30.1.3907

Jojor, A., & Sihotang, H. (2022). Analisis Kurikulum Merdeka dalam Mengatasi Learning Loss di Masa Pandemi Covid-19 (Analisis Studi Kasus Kebijakan Pendidikan). *Edukatif : Jurnal Ilmu Pendidikan, 4*(4), 5150–5161. https://doi.org/10.31004/edukatif.v4i4.3106

https://doi.org/10.51276/edu.v4i3.635

Kardena, H., & Mawardi, M. (2021). The Development of Guided Inquiry based Student Worksheet of Chemical Equilibrium Towards Student Activities. *Journal of Physics: Conference Series, 1788*(1), 1-9.https://doi.org/10.1088/1742-6596/1788/1/012037

Kemendikbud. (2022). *Buku Saku Kurikulum Merdeka; Tanya Jawab.* Jakarta: Kementerian Pendidikan dan Kebudayaan.

Kemendikbudristek. (2021). *Kurikulum Untuk Pemulihan Pembelajaran (1st, Februar ed.)*. Jakarta: Pusat Kurikulum dan Pembelajaran Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Khotim, H. N., Nurhayati, S., & Hadisaputro, S. (2015). Pengembangan Modul Kimia Berbasis Masalah pada Materi Asam Basa. *Chemistry in Education, 4*(2), 63-69.

Kosasih, E. (2021). *Pengembangan Bahan Ajar*. Jakarta: Bumi Aksara.

Magdalena, I., Sundari, T., Nurkamilah, S., Nasrullah, N., & Amalia, D. A. (2020). Analisis Bahan Ajar. *NUSANTARA*, *2*(2), 311-326.

Malikah, S., Winarti, W., Ayuningsih, F., Nugroho, M. R., Sumardi, S., & Murtiyasa, B. (2022). Manajemen Pembelajaran Matematika pada Kurikulum Merdeka. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(4), 5912–5918. https://doi.org/10.31004/edukatif.v4i4.3549

Mawardi, M., Fitriza, Z., Suryani, O., Syafei, S. S., & Aumi, V. (2021). Penerapan Model Pembelajaran Flipped Classroom Berbasis Guided Inquiry (FGIL) pada Pembelajaran Kimia SMA di Kabupaten Agam sebagai Model untuk Pembelajaran Digital di Masa Pandemi Covid 19. *Pelita Eksakta*, *4*(2), 176. https://doi.org/10.24036/pelitaeksakta/vol4-iss2/170

Mentari, L., Suardana, I. N., & Subagia, I. W. (2014). Analisis Miskonsepsi Siswa SMA pada Pembelajaran Kimia untuk Materi Larutan Penyangga. *Jurnal Pendidikan Kimia UNDIKSHA*, *2*(1), 76-78.

Munawar, M. (2022). Penguatan Komite Pembelajaran dalam Implementasi Kurikulum Merdeka pada Pendidikan Anak Usia Dini. *Tinta Emas: Jurnal Pendidikan Islam Anak Usia Dini*, *1*(1), 65–72. https://doi.org/10.35878/tintaemas.v1i1.390

Muzdalifa, E. (2022). Learning Loss sebagai Dampak Pembelajaran Online saat Kembali Tatap Muka Pasca Pandemi Covid 19. *GUAU: Jurnal Pendidikan Profesi Guru Agama Islam*, *2*(1), 187-192.

Permendikbud. (2022). *Permendikbud RI Nomor 7 tahun 2022*. Jakarta: JDIH Kemendikbud.

Piawi, K., Kalmar Nizar, U., & Mawardi, M. (2018). Development of Student Worksheet Based on Guided Inquiry with Class Activity and Laboratory in Thermochemistry Material. *International Conferences on Education, Social Sciences and Technologi*, 679–683. https://doi.org/10.29210/20181100

https://doi.org/10.51276/edu.v4i3.635

Plomp, T., & Nieveen, N. (2013). An Introduction to Educational Design Research. Educational Design Research Educational Design Research. In *Tjeerd Plomp & N. Nieveen (Eds.) Netherlands Institute for Curriculum Development: SLO*. Netherlands Institute for Curriculum Development (SLO).

Purwanto. (2010). *Evaluasi Hasil Belajar*. Yogyakarta: Pustaka Pelajar.

Rosmana, P. S., Iskandar, S., Fauziah, H., Azzifah, N., & Khamelia, W. (2022). Kebebasan dalam Kurikulum Prototype. *As-Sabiqun, 4*(1), 115–131. https://doi.org/10.36088/assabiqun.v4i1.1683

Siregar, F. R., & Mawardi, M. (2022). Development of the Learning System of Flipped-Guided Inquiry-Based Learning (FGIL) Using Moodle on Chemical Equilibrium material. *Indonesian Journal of Educational Studies, 25(1), 31–49.*

Syafei, S. S., & Mawardi, M. (2022). POGIL Model Integrated Flipped Classroom Assisted Learning Management System (LMS) for Learning Solution in ERI 4.0. *Jurnal Penelitian Pendidikan IPA, 8(2), 444–451.*https://doi.org/10.29303/jppipa.v8i2.1298

Tamara, D. A., Hadeli, M., & Sanjaya, S. Pengembangan Bahan Ajar Kimia Unsur Golongan VIIIA (Gas Mulia) dan Topik Khusus Zeolit Berbasis PBL. *Jurnal Penelitian Pendidikan Kimia: Kajian Hasil Penelitian Pendidikan Kimia, 9(1), 52–62.* https://doi.org/10.36706/jppk.v9i1.17890

Utomo, B. (2022). Analisis Validitas Isi Butir Soal Sebagai Salah Satu Upaya Peningkatan Kualitas Pembelajaran di Madrasah Berbasis Nilai-Nilai Islam. *Jurnal Pendidikan Matematika (Kudus)*, *1*(2). https://doi.org/10.21043/jmtk.v1i2.4868

Yerimadesi, Y., Bayharti, B., Handayani, F., & Legi, W. F. (2016). Pengembangan Modul Kesetimbangan Kimia Berbasis Pendekatan Sanitifik untuk Kelas XI SMA/MA. *Journal of Sainstek*, *8*(1), 85-97.

Yunus, Y., & Sardiwan, M. (2018). Perancangan dan Pembuatan Media Pembelajaran Berbasis Android pada Mata Pelajaran Sistem Komputer. *Jurnal Pti (Pendidikan Dan Teknologi Informasi) Fakultas Keguruan Ilmu Pendidikan Universita Putra Indonesia "Yptk" Padang, 5(2), 31–41.* https://doi.org/10.35134/jpti.v5i2.11