



Developing STREAM Based Pancasila Student Profile Strengthening Project (P5) Module on Chemical Bond Lesson

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Abstract

The implementation of Merdeka curriculum has not long been established as the national curriculum, so many schools still lack teaching materials with limited textbooks. This research aimed at developing STREAM (Science, Technology, Religion, Engineering, Art, and Mathematics) based Pancasila student profile strengthening project module on Chemical Bond lesson, and it was conducted with validity test by media and material experts, teacher practicality test, and student response test. Research and Development (RnD) method was used in this research with Design and Development Research (DDR). This research was conducted at State Senior High Schools 14 and 1 Pekanbaru. The research findings showed that the validity scores were 82.6% by media experts with very valid category and 87.45% by material experts with very valid category. The result of teacher practicality test showed that the mean was 93.84%, and it was on very practical category. The last test was student response test, the result was 83.58%, and it was on very valid category. The research findings showed that STREAM-based P5 teaching module developed was very valid, practical, and interesting for students.

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INTRODUCTION

Humans rely heavily on education because the application of knowledge is integral to life. In Article 3 of Law Number 20 of 2003, which describes the National Education System, it is emphasized that to educate the life of the nation, the function of national education is to shape the character and develop the abilities and civilization of a dignified nation, with the aim that the potential of students develops and can grow. To become a human being who is devout and has faith in God Almighty, healthy, has noble character, is capable, knowledgeable, independent, creative, and a citizen with a responsible and democratic attitude (Pelawi, 2021). Therefore, updates in the world of education continue to be carried out while following developments with the times, namely by increasing the variety of learning activities (Setiawati, 2022) and developing the curriculum.

Nadiem Anwar Makarim as Minister of Education, Culture, Research, and Technology (Mendikbudristek) on August 2 determined that the Merdeka Curriculum was the national curriculum to replace the 2013 curriculum (Rosmana et al., 2023). The Merdeka Curriculum is a curriculum system that relies on developing student competencies by implementing learning in the school curriculum and increasing Pancasila values to strengthen students' natural abilities and character. The independent curriculum is an improvement on the 2013 curriculum and

emphasizes the comprehensive development of students' literacy, numeracy, and character skills (Dewi et al., 2021).

Currently, many schools in Indonesia have started implementing the independent curriculum in learning and are currently in a transition period between the K13 curriculum and the independent curriculum. Based on Riau Smart data on July 29, 2022, the Head of the Riau Education Quality Assurance Center (BPMP) said that he had received data on 3,657 schools in Riau Province that had registered as implementers of the Independent Curriculum Implementation (IKM) independently; only the remaining 20 schools had not registered due to an ID learning account that the school in question does not yet have (Hendra, 2022). This change in curriculum is, of course, a new task for teaching staff to prepare learning tools that are by the Independent Curriculum.

Henny Sitanggang and his friends (2023) revealed that the core learning plan for the Independent Curriculum (Kumer) is a learning module. Kumer's teaching modules include various tools, materials, methods, guides, and instructions that are carefully prepared and adapted to student needs. The Merdeka Curriculum teaching module is aligned with the Learning Objectives Flow (ATP), which develops from Learning Achievements (CP), with a focus on the Pancasila Student Profile. Teaching modules are designed to suit students' developmental stages, have clear learning objectives, and can keep up with developments in the rapid progress of science and technology.

The rapid progress of science and technology (IPTEK) has had a significant impact on various aspects of human life, including the education sector. Advanced technological developments require individuals who can work collaboratively, be creative, and think analytically so that they can adapt to developments in industrial and technological progress (Yuliari et al., 2020). Kurniawan et al., (2020) emphasized that, following the development of the era of globalization, of course increasing creativity in children must be done by including current developments in learning. This can be realized through the use of appropriate learning models, for example by integrating Science, Technology, Religion, Engineering, Art, and Mathematics (STREAM).

The STREAM approach is an innovation from the Science, Technology, Engineering, and Mathematics (STEM) approach, which combines learning not only in the field of science but also integrates technology, religion, engineering, art, and mathematics holistically through real practice (Kurniawan et al., 2021; Melati & Hadi, 2022). The STREAM approach provides important support for the progress of science and technology (IPTEK) because it combines several fields of science. In this approach, students are encouraged to study and understand the relationships between these fields to develop the analytical, creative, and collaborative skills necessary for the advancement of science and technology. So, amidst the need for teaching modules and teaching materials that are in line with advances in science and technology, this can be done by creating STREAM-based independent curriculum teaching modules.

In the results of observations carried out on 15 high schools and MAs in Pekanbaru, it was found that learning was changing the curriculum to an independent curriculum. Thus, each school still has limitations in the teaching materials of the newly implemented independent curriculum. The independent curriculum prioritizes learning by implementing the Pancasila student profile so that students grow by adhering to Pancasila principles and maximizing projects in learning known as the Pancasila Student Profile Strengthening Project (P5). Therefore, additional teaching materials are needed that are in accordance with the independent curriculum to complement teaching materials so as to enrich students' reading and insight.

Related research was carried out by Indri Anja Melati and Kuncoro Hadi in 2022. The aim of this research was to determine the level of validity and practicality of the media being

developed, namely STREAM-based e-modules on chemical bonding material. The validation results obtained by material expert validators and media experts obtained an average percentage of 92.7%, with a very valid category. The practicality test of chemistry teachers obtained a percentage result of 92.8%, which was included in the very practical category, and the student response test obtained a percentage result of 91%, which was included in the very practical category. This research has similarities with research conducted by researchers, namely the development of STREAM-based module teaching materials for chemistry learning and the targeted chemical material, namely chemical bonding. The difference between this research and that of researchers is in the curriculum applied in developing teaching modules.

Other research has also been carried out by Rini Indriyani et al., which aims to develop a STREAM-Based Buffer Solution E-Module on Instagram whose validity is tested based on the validity of material experts, media experts, teacher practicality tests, and student response tests. The material expert validation results obtained were 92.185% with a very valid category; the media expert validation results obtained a value of 97.36% with a very valid category; the results of the teacher practicality test obtained a value of 93.745% with a very valid category; and the results of the student response practicality test obtained a value. Amounting to 86.80% with a very valid category. This research has similarities with research conducted by researchers, namely the development of STREAM-based teaching materials in the form of modules for chemistry learning, but has differences with the research material, namely buffer solution material.

The author wants to maximize chemistry learning, so the author developed a learning module that is by the independent curriculum based on STREAM as teaching material in learning chemical bonding material and with the following research objectives: to find out how to develop a STREAM-based P5 module on chemical bonding material, to find out the validity of the material and media of the STREAM-based P5 module on chemical bonding material, to find out the practicality of P5 based on the STREAM approach to chemical bonding material, and to find out students' responses to the P5 module based on the STREAM approach to chemical bonding material.

METHOD

The research carried out was Research and Development (R&D) research using the Design-Development Research (DDR) model (Borg & Gall in Setyosari, 2016). Virawanti, T. (2022), stated that DDR is a study approach carried out systematically to understand the process design development, and evaluation with the goal of establishing an empirical basis in order to create new products or develop existing ones. In this research, a new product was developed, namely the project teaching module.

Strengthening the Pancasila Student Profile (P5) based on STREAM (Science, Technology, Religion, Engineering, Art, and Mathematics) on Bond Material Chemistry. The following are the procedural stages of developing learning media using the DDR model, with stages of needs analysis, design-development and evaluation.

Need Analysis

The initial step in the DDR model is analysis, namely identifying which learning components need to be repaired, added, modified, enhanced, and developed to improve the quality of learning. The implementation of needs analysis in this research was carried out in three stages: analysis of the curriculum used by SMA/MA in Pekanbaru, analysis of the flow of learning objectives (ATP) and learning achievements (CP) applied by SMA/MA in Pekanbaru, and analysis of learning media in the form of textbooks used by SMA/MA in Pekanbaru in 10th Grade chemistry lessons.

Design and Development

Design

In this step, the main focus is to design the product or project to create clear specifications. The design process begins with designing content or concepts that will be implemented in the product being developed. The steps in the STREAM-based P5 module design stage are selecting the editing application to be used, preparing the necessary references, identifying learning outcomes, and designing appropriate forms of learning activities.

Development

The next step in the DDR model is the development stage. At this stage, the product concept or design that has been prepared previously will be realized into an actual product.

Evaluation

The final step in this research is evaluation, which is the final stage of the research. The main purpose of evaluation is to evaluate the product that has been developed and identify potential weaknesses in the product.

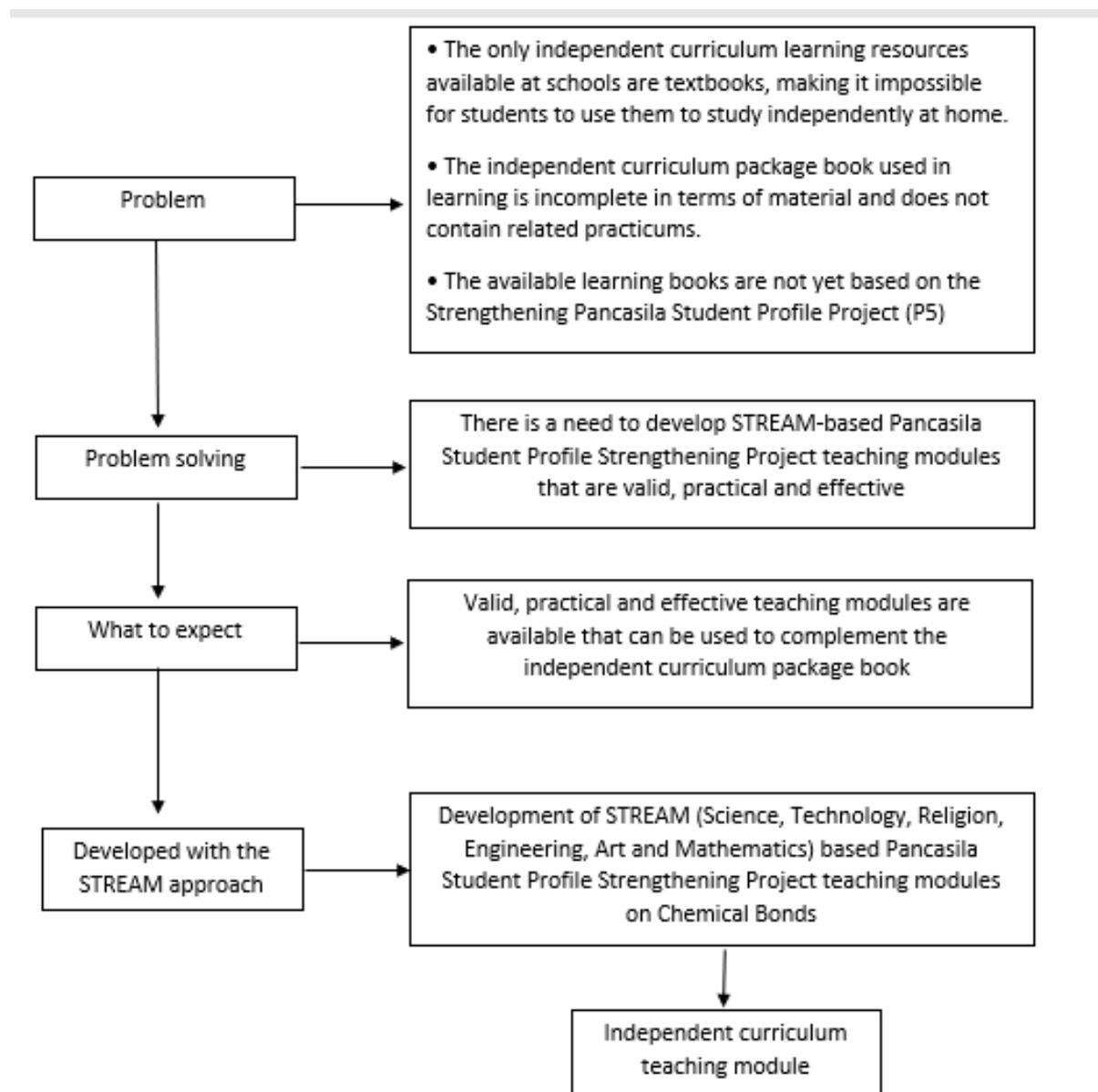


Figure 1. Framework of Thinking

RESULTS AND DISCUSSION

The product of this research is a chemistry teaching module in the independent curriculum or using the principles of the Pancasila Student Profile Strengthening Project (P5) in Chemical Bonds material. The P5 value is also adjusted to the main focus of the Merdeka Curriculum, namely character development through learning that reflects student profiles based on Pancasila values (Khoirotun, 2023). This chemistry learning module is also structured on a STREAM basis to form a teaching module using multiple fields of science. So, we know the correlation between chemistry and other sciences, and it is up-to-date following current developments.

Need Analysis

The research was conducted at one of the schools that have established an independent curriculum in Pekanbaru, namely SMAN 1 and SMAN 14 Pekanbaru. The module creation process uses the pro-based Canva application. After looking at the CP and ATP from the two schools and reviewing the chemistry material in the independent curriculum in chemical bonding material, it was found that the sub-materials in chemical bonding material were ionic bonds, covalent bonds, and metallic bonds.

At SMAN 14 Pekanbaru, the learning media provided by the school are only independent curriculum package books, which are used alternately by each class when studying chemistry. So, based on interviews with teachers, they said that additional learning media were needed to complete the textbook. This is different from at SMAN 1 Pekanbaru, which allows students to bring cellphones and can provide technology and internet access to students. At SMAN 1 Pekanbaru, although the learning resources provided by the school are only textbooks, students have the freedom to search for references using their cellphones. Based on an interview with this school teacher, he said that he needed learning media that students could take home with an attractive appearance and lots of pictures to increase students' enthusiasm for learning because students had little interest in reading books that were dominated by writing only. Based on the explanation above, the needs analysis concluded that there was a need for student learning media that the researchers developed in the form of a STREAM-based P5 teaching module on chemical bonding material.

Design and Development

Of the total P5 scores in the independent curriculum, there are six key dimensions: faith, devotion to God Almighty, and noble character; independence; working together; global diversity; critical reasoning; and creativity. Of all the key dimensions of P5, researchers included 5 key dimensions that are relevant to learning chemistry regarding chemical bonds, namely: believe, have faith in God Almighty, and have noble character; be independent; work together; use critical reasoning; and be creative. The researcher entered the P5 values at each learning meeting. In the STREAM values included in the module, all STREAM aspects consisting of Science, Technology, Religion, Engineering, Art, and Mathematics are also included in this teaching module. The results of the analysis of STREAM values can be seen in Table 1 below:

Table 1. Analysis of STREAM Values on Chemical Bond Materials

Chemical Bonding Material	Introductory Material and Ionic Bonding	Covalent Bond Material	Metal Bond Material
<i>Science</i>	Table salt (NaCl) is composed of Na and Cl, ceramics are composed of silicon dioxide	Oxygen gas is a covalent molecule because each oxygen atom requires two	The metal bond is very strong. This strong bond makes metals such as iron very strong and

	particles, and urea fertilizer is composed of carbon, oxygen, nitrogen, and hydrogen atoms.	valence electrons to complete its octet.	flexible. So it is not brittle and can be forged into various shapes.
<i>Technology</i>	The principle of the sensor in the ionization smoke detector	oxygen sensor electronic device and SiO ₂ chip.	Metals used in making cellphones and airplanes
<i>Religion</i>	The interactions that exist between us and other humans are connected by chemical bonds. So, just as religion dictates that humans pair up, this is also shown by the way the elements bond	The relationship in a covalent bond is the same as the concept between a seller and a buyer, who need each other and benefit from each other. A covalent bond is formed when two atoms decide to "share" their valence electrons so that they share each other's electrons.	We can learn from metal bonds that they are flexible or soft but strong, the same as humans, who can be soft and strong in facing trials when they understand the nature of a servant who will definitely be tested.
<i>Engineering</i>	The ion bond project is a series of experiments on what's wrong with water.	The covalent bond project, in practical steps, knows the difference between polar and non-polar compounds.	The project forms a compound using used materials and is uploaded to youtube (YT)
<i>Art</i>	Let's Assignment Practice drawing Lewis Structures	Let's Assignment with practice drawing types of covalent bonds.	The project forms a compound design using used materials.
<i>Mathematics</i>	Calculation of the ionic bond formula that occurs between the elements Ca and Cl	Calculation of the formation of covalent bonds in CH ₄ compounds	–

The P5 teaching module is based on learning in the independent curriculum, which uses projects. So for each material covered, there is a simple project that can be an option for the teacher to use in learning, and there is a main project available, namely a group project, which is done from the start. The material on chemical bonds begins, then is collected and presented during the lesson on chemical bonds. Explanations of the projects displayed in the module are listed in Table 2 as follows:

Table 2. Description of P5 Projects in the Teaching Module

project	Explanation
Ion Bond Project What's wrong with salt water?	This project was carried out to know the reaction products if the bonds in water molecules are broken, which aims to explain the process of forming ionic bonds. Using a battery and salt water, observations were made of a series of pencils in salt water.
Covalent bond project Polar and non-polar covalent practicum	This project was carried out to see the differences between materials that have polar covalent bonds and those that have non-polar covalent bonds, so that the differences between the two types of covalent compounds are known. The materials used consist of household ingredients such as oil, petrol, margarine, vitamin C, petrol, and vinegar. Practical work is done by mixing water with the ingredients and seeing what happens. The result of this activity is

	that students group each material as polar covalent or non-polar covalent.
Metal Bond Project Metal Gilding	This project aim is to determine the electrolysis process that occurs in the plating of copper and iron metals. In this project, batteries, cables, alligator clips, metal, and nails were used. This was done by looking at the reaction of nails and copper metal, which were added to the copper sulfate solution
Main Project (for projects from the beginning of the meeting to the end of the chemical bonding chapter) Chemical Compounds	This project aims to provide an understanding of the formation of compounds when elements bond. The task in this project is for each group to create a bond form of 10 compounds using used materials according to their creativity. The chemical compounds and main items used must not be the same. The project is made on paper, and a video of making and assembling it is uploaded on YT..

Module Parts

Opening Part

The initial part of the module consists of a cover page, module identity, foreword, table of contents, general information, and special information (Sulistiyowati & Putri, 2018).

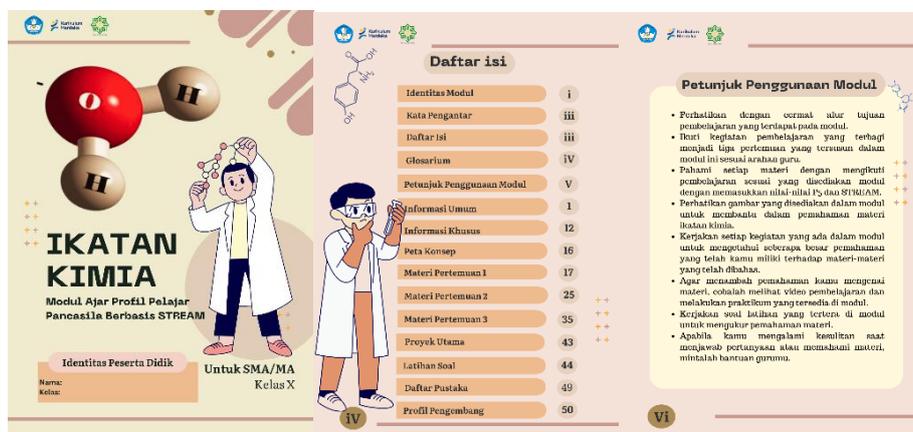


Figure 2. View of the Initial Part of the Module

Core Section

The core part is a concept map and material, which are divided into three learning meetings. In the teaching module, the sequence is arranged based on the sub-material of each meeting, with the titles Learning Activity 1, Learning Activity 2, and Learning Activity 3.





Figure 3. The core part of the module contains learning material.

Final Part

The final part of this teaching module consists of practice questions used to train students' understanding, a bibliography of several abbreviations in the module, and a profile of the module developer, namely general information related to researchers.



Figure 4. Module cover section

Based on the research objectives, the first is to find out how to develop a STREAM-based P5 module on Chemical Bond Material. From the development of this module, it was found that the way to do this is to use appropriate development research methods, such as the RnD (Research and Development) research method that the author uses. Based on this method, the research stages are carried out, starting with needs analysis, and then continuing with design and development. After the product is complete, an evaluation is carried out.

The second research objective is to determine the validity of the material and media from the P5 module based on the STREAM approach to chemical bonding materials. Based on the results of the validity test of material experts and media experts, the results of the P5 teaching module based on the STREAM approach on chemical bond material were obtained with a material percentage of 91% and a media percentage of 82%. From the results obtained, it can be concluded that the teaching module developed is very valid. The diagram of the percentage results of media expert analysis can be seen in Figure 5, and the diagram of the percentage results of material expert analysis can be seen in Figure 6, as follows:

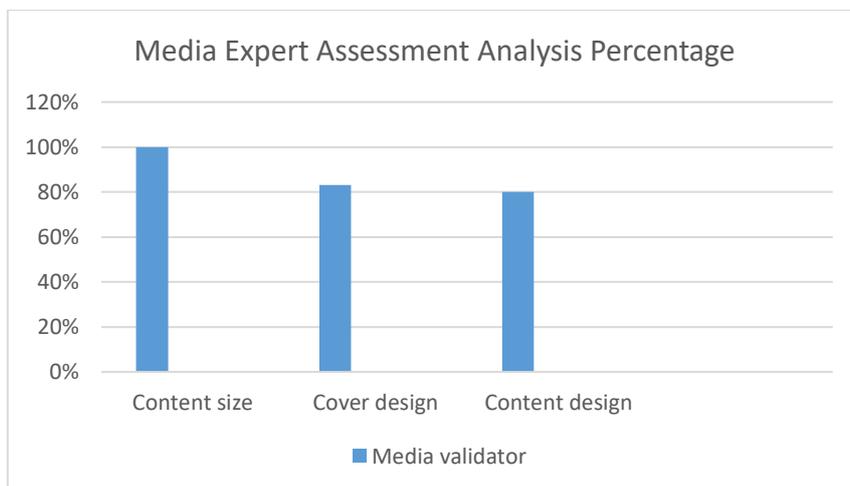


Figure 5. Diagram of material expert validation results

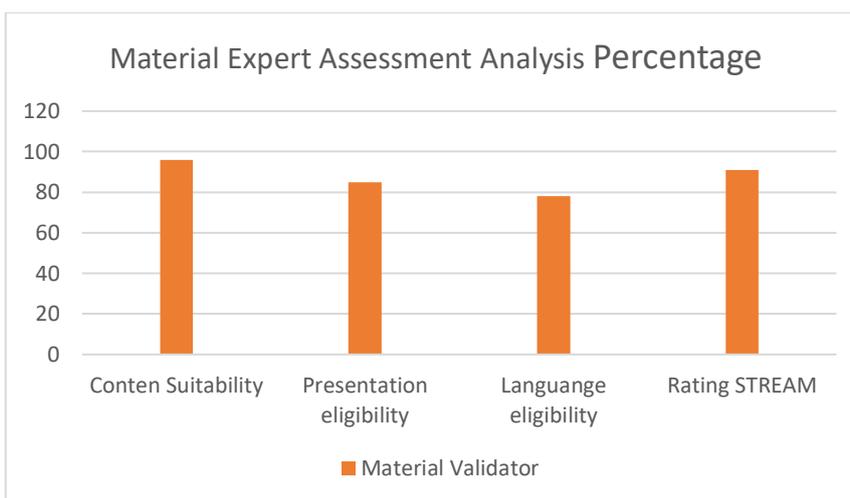


Figure 6. Diagram of material expert validation results

The next research aim is to determine the practicality of the P5 module based on the STREAM approach to chemical bonding materials. Based on the results of the practicality test on four teachers at SMAN 1 Pekanbaru and SMAN 14 Pekanbaru, the results of the practicality test were 83%, 98%, 96%, and 98% respectively. From the average value, it can be concluded that the practicality test obtained a result of 93%. From the results obtained, it can be concluded that the teaching module developed is very practical. The presentation diagram of the results of the practicality test assessment analysis can be seen in Figure 7 as follows:

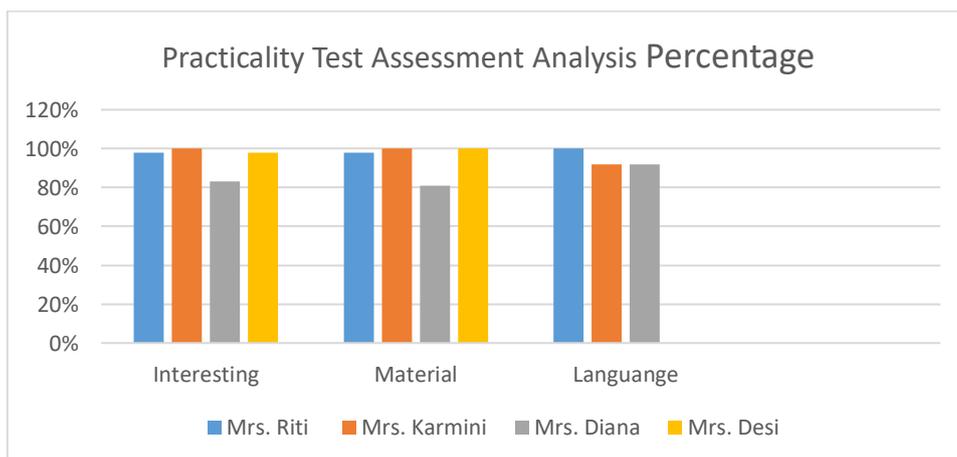


Figure 7. Diagram of practicality test validation results

The final research objective is to determine students' responses to the P5 module based on the STREAM approach to chemical bonding materials. Based on the results of responses to a total of 60 students at SMAN 1 Pekanbaru and SMAN 14 Pekanbaru, the response test results for SMAN 1 students out of 10 respondents were 79%, and the response test results for SMAN 14 students out of 10 respondents were 83%. From these results, the average of the student response test results from both schools is 81%. So, it can be concluded that the teaching module developed is liked by students.

From these results, it can be seen that the practicality test and student responses were higher than those given by SMAN 14 Pekanbaru. From SMAN 1 Pekanbaru, the results on the highest practicality test for one teacher were 83%, and the low student response test was 79%. This difference is by the results of the needs analysis of the two schools. This is because the SMAN 1 Pekanbaru school allows its students to use cell phones for learning, so the school more often uses electronic-based learning media for learning. Meanwhile, the need for physical-based textbooks is more needed by SMAN 14 Pekanbaru because this school does not allow students to bring cellphones, and the independent curriculum has only been running for one year, so there are still problems with having sufficient textbooks.

In line with this research, relevant research has been carried out by Indri Anja Melati and Kuncoro Hadi (2022) with the title "Design and Testing of STREAM (Science, Technology, Religion, Engineering, Art, and Mathematics) Based E-Modules on Chemical Bond Materials. It is said that STREAM-based e-module teaching materials are one of the multidisciplinary learning media that aim to increase students' knowledge mindset by combining the main fields of study of science (science), technology (technology), religion (religion), engineering (engineering), art (art), and mathematics (mathematics) in real life. The integration of STREAM into the independent curriculum, which has recently been implemented, is an innovation and an additional solution for teaching materials to maximize learning. The STREAM-based module developed also emphasizes the P5 aspect (Pancasila Student Profile Strengthening Project) contained in the Pancasila learning of the independent curriculum.

In research entitled E-Module for STREAM-Based Buffer Solutions in Instagram by Indriyani et al. in 2023, the module results will be categorized as very suitable for use as teaching materials. This is based on the results of material expert validation, which obtained a value of 92.185% with a very valid category; the media expert validation results obtained a value of 97.36% with a very valid category; the teacher practicality test results obtained a value of 93.745% with a very valid category; and the test results. The practicality of student responses obtained a score of 86.80%, which is a very valid category.

These results are not much different from the results obtained by researchers, namely a percentage of material experts of 87% and media experts of 82% in the very valid category, practicality test results of 94%, so they are in the very practical category, and results of 84%, so they are in the very interesting category. From the overall results of the development of STREAM-based independent curriculum teaching modules based on the assessments of material experts and media experts, as well as practicality tests and response tests, it was found that the results of the modules developed were valid according to experts, practical, and interesting for students. So, it can be concluded that the teaching modules developed can be used as STREAM-based teaching materials to meet the need for independent curriculum materials that are in line with current developments.

CONCLUSION

The level of validity of the material and media from the STREAM-based P5 module on Chemical Bond Material obtained a percentage of material experts 87% and media experts

82%. From the results obtained, it can be concluded that the teaching module developed is very valid. The practicality test results obtained for the module were 94%, so the teaching module was included in the very practical category. Based on the response results, it was found that the response test results for students from both schools were 84%. So, it can be concluded that the teaching modules developed in this category are very interesting.

RECOMMENDATIONS

Based on the research that has been carried out, researchers suggest that the P5 module based on the STREAM approach on chemical bond material should be tested for its effectiveness in the learning process.

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