

# Chemistry Craft and Entrepreneurship Practicum Module Based on Semi-Solid Preparations as a Learning Resource for High School Students

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## ABSTRAK

Kegiatan pembelajaran yang diterapkan masih di dominasi dengan buku paket, sehingga diperlukan sumber belajar tambahan untuk mendukung kegiatan pembelajaran yang lebih kreatif dan inovatif. Penelitian ini bertujuan untuk menciptakan modul praktikum prakarya dan kewirausahaan (PKWU) kimia berbasis sediaan semi padat sebagai sumber belajar siswa SMA/MA. Jenis penelitian yang digunakan adalah penelitian pengembangan (R&D) dengan model pengembangan 4D. Subjek penelitian yaitu satu ahli materi, ahli media, empat reviewer, dan sepuluh siswa MIPA SMA/MA. Penilaian kualitas dilakukan menggunakan lembar angket skala Likert dan angket skala Guttman. Teknik analisis menggunakan analisis kuantitatif dan kualitatif. Hasil penilaian menunjukkan ahli materi sebesar 90,77% dengan kategori Sangat Baik, penilaian produk oleh ahli media sebesar 96,7% dengan kategori Sangat Baik, dan penilaian dari reviewer (guru kimia) mendapatkan skor rata-rata dengan persentase 90,25% dengan kategori Sangat Baik. Hasil respon siswa terhadap modul menunjukkan persentase sebesar 95%. Hasil menunjukkan modul praktikum PKWU berbasis sediaan semipadat layak digunakan sebagai alternatif sumber belajar dalam menaikkan pemahaman siswa. Implikasi penelitian ini diharapkan guru dapat menggunakan modul praktikum yang dapat mempermudah siswa dalam melaksanakan kegiatan praktikum.

## ABSTRACT

The learning activities applied are still dominated by textbooks, so additional learning resources are needed to support more creative and innovative learning activities. This study aims to create a semi-solid preparation-based chemical practicum module for craft and entrepreneurship (PKWU) as a learning resource for SMA/MA students. The type of research used is development research (R&D) with the 4D development model. The research subjects included one material expert, a media expert, four reviewers, and ten SMA/MA MIPA students. Quality assessment was carried out using a Likert scale questionnaire sheet and a Guttman scale questionnaire. The analysis technique uses quantitative and qualitative analysis. The results of the assessment show that material experts are 90.77% in the Very Good category, product ratings by media experts are 96.7% in the Very Good category, and the reviewer's assessment (chemistry teacher) gets an average score of average with a percentage of 90.25% in the Very Good category. The results of student responses to the module show a percentage of 95%. The results show that the PKWU practicum module based on semisolid preparations is feasible to use as an alternative learning resource in increasing student understanding. This research implies that teachers are expected to be able to use practicum modules that can facilitate students in carrying out practicum activities.

## 1. INTRODUCTION

The curriculum has a very close relationship with educational theory. The curriculum component implements learning at all education levels in Indonesia (Sri Rahayu et al., 2017). One is the education level of Senior High School (SMA) or Madrasah Aliyah (MA). The curriculum currently implemented in Indonesia at the SMA/MA education level is the 2013 curriculum. Implementing learning in the 2013 curriculum emphasizes creativity for students, especially SMA/MA. The 2013 Curriculum is hoped that it can train

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students to play an active role in finding out so that the teacher will act more as a facilitator (Hariadi, 2017; Rohiat et al., 2017). The 2013 curriculum framework places to craft and entrepreneurship education as a compulsory subject that emphasizes aspects of the utilization of science and technology as well as local cultural wisdom (Kuncahyono & Aini, 2020; A. Lestari, 2019). This craft and entrepreneurship subject combines craft and entrepreneurship (Suwarsa, 2020; Tahara & Pujiati, 2018). Crafts are subjects that provide students with training to produce a preliminary work or prototype (Setiaji et al., 2018). Entrepreneurship is the ability to observe and take opportunities by utilizing and processing existing resources to gain profit (Haneberg et al., 2022; Tahara & Pujiati, 2018). Craft and entrepreneurship subjects are classified into trans science knowledge, namely developing knowledge and training skills and life skills based on art and economical technology (Humaeroh, 2017; Kustitik & Hadi, 2016). Craft and entrepreneurship subjects are taught to all high school students in grades ten, eleven, and twelfth in the 2013 curriculum. Craft and entrepreneurship learning aims to instill an entrepreneurial spirit, provide provision of knowledge about entrepreneurship, and equip students with skills in the field of goods/services, as well as encourage and create new entrepreneurs through a learning process that is supported by the world and industry, business partners and agencies, to create jobs or new businesses (Ardana, 2019; Purbaningrum & Soenarto, 2016). Entrepreneurship education is currently directed at creating innovative and creative entrepreneurs (Walmsley & Wraae, 2022).

But in reality, the applied learning activities are still dominated by textbooks, so it is necessary to make additional learning resources to support more creative and innovative learning activities expected to encourage students' entrepreneurial attitudes, which can be carried out independently or with teacher guidance. Based on interviews conducted with Chemistry teachers who teach PKWU at SMA N 1 Pleret. Applied learning still often uses conventional learning. Conventional learning that does not follow the objectives of the 2013 curriculum results in a low quality of education which can affect the quality of human resources. It is following the reason for implementing the 2013 curriculum because there are concerns from the government of the Republic of Indonesia (RI) regarding the declining quality of human resources and decreased self-confidence to develop themselves through activities that are useful for life. However, in reality, applied learning activities are still dominated by textbooks. So it is necessary to make additional learning resources to support more creative and innovative learning activities expected to encourage students' entrepreneurial attitudes, which can be carried out independently or with teacher guidance. Based on interviews conducted with Chemistry teachers who teach Crafts and Entrepreneurship at SMA N 1 Pleret. Applied learning still often uses conventional learning. Conventional learning that does not follow the objectives of the 2013 curriculum results in a low quality of education which can affect the quality of human resources. It is following the reason for implementing the 2013 curriculum because of the concerns of the government of the Republic of Indonesia (RI) regarding the declining quality of human resources and decreased self-confidence to develop themselves through activities that are beneficial to life (D. D. Lestari & Muchlis, 2021; Suardana & Juniartina, 2020). Based on data from the Central Statistics Agency, unemployment for high school graduates ranks second with the open unemployment rate for high school graduates as of February 2020 of 6.77% of the total unemployment rate of 6.88 million people. Based on these data, it is necessary to make efforts to prepare high school students to become quality graduates and have the skills so that they can fill employment opportunities in Indonesia. One of the factors associated with unemployment is the educational level of alumni who are not absorbed in the labor market. High school graduates face unequal competition with vocational graduates regarding skills and work mentality. One way to reduce unemployment is to develop the entrepreneurial character of students.

The solution to overcome these problems is innovative learning. One of the effective learning media so that students can learn according to their abilities and not depend on the teacher is a module (Silberman et al., 2021; Yetti & Ahyanuardi, 2020). Modules are learning media designed systematically and attractively so students can use them independently (Herawati & Muhtadi, 2018; Ismi, 2019; Puspitasari et al., 2020). Practicum is an important activity in learning (Kirana, 2020; Siagian, 2021). Practical activities convey abstract material conceptually to increase student understanding (Syifaunnida & Kamaludin, 2022). Learning modules oriented to contextual learning in Craft and Entrepreneurship subjects are effectively used in learning and gain several advantages in fostering self-confidence and student independence (Nathalia Angelina & dkk, 2021). The effectiveness of contextual learning-oriented learning modules is known based on increased learning outcomes. The chemo-entrepreneurship-oriented colloidal printing module (CEP) that has been developed meets the valid, practical, and effective criteria and can foster students' entrepreneurial interest (Cep et al., 2019). In addition, teachers and students gave positive responses with good ratings so modules could be used as learning resources.

This craft and entrepreneurship education can be related to processing, including creating basic materials as finished product objects that can be utilized, or in other words turning raw materials into mature products by mixing and modifying these materials, which then these products can become business

opportunities for entrepreneurial activities (Wikanta & Gayatri, 2017). One of the subjects that can be integrated with craft and entrepreneurship subjects is chemistry. Chemistry, considered difficult and only academically oriented, can be utilized in chemistry-based craft and entrepreneurship learning processing activities (Y. Lestari & Wisudawati, 2019). One of the products often found and close to everyday life is semi-solid dosage products. Semi-solid preparation products in everyday life that will be included in the practicum module that will be developed include liquid soap, solid soap, liquid detergent, lotion, hand sanitizer gel, and shampoo. This semi-solid preparation is between solid and liquid, making the product practical and easy to use. High school chemical materials connected with semi-solid finished products are saponification and colloid materials. The chemical material approach to craft and entrepreneurship learning that can benefit human life is the Chemo-Entrepreneurship (CEP) approach. CEP is a contextual chemistry learning approach that relates the material studied to real objects and has the opportunity to process the material into a useful product, has economic value, and fosters an entrepreneurial spirit (Sumarti et al., 2018). This semi-solid preparation product can be used for entrepreneurship education by manufacturing semi-solid products.

Some findings state that practicum activities can improve skills and understanding of chemical material through experiments related to life (Sumarti et al., 2018). In the previous learning method, students were limited to studying chemical material without linking it to life applications, so students' ability to understand the material would also be reduced (Herawati & Muhtadi, 2018; Raharjo et al., 2017). Based on this research, the chemical entrepreneurship and craft modules based on semi-solid preparations can be used as learning resources to foster an entrepreneurial spirit and understanding and make students more enthusiastic about learning. Chemistry learning with the CEP approach can increase student motivation in entrepreneurship (Mutiah et al., 2020). The students are equipped with entrepreneurial concepts and chemistry based on semisolid preparations in developing products that are useful in everyday life. It will train students to improve their understanding of chemistry to improve student learning outcomes because students can conduct experiments in making a product based on semisolid preparations (Diniaty & Atun, 2015). In previous research, the development of an entrepreneurship-based chemical separation practicum module was also carried out. However, the development of the chemical separation module has yet to be explained in detail regarding its application in everyday life. This study aimed to create a semi-solid preparation-based chemical practicum and entrepreneurship practicum module as a learning resource for high school students. The learning media is in the form of practicum modules to improve students' understanding skills, enhance students' entrepreneurial spirit, and help them understand the concepts of chemical material related to products.

## 2. METHOD

Developing semi-solid preparation-based Chemistry practicum and entrepreneurship modules is a Research and Development (R&D) project. The development model is the 4D model (define, design, development, disseminate). This development research is limited to the development stage. The subjects of this research product assessment are three peer reviewers, a subject matter expert lecturer, a media expert lecturer, four reviewers, and responded by ten high school MIPA students from several schools in Yogyakarta. This study used data analysis in the form of changing qualitative data on product quality assessment results from media experts, material experts, and reviewers (chemistry teacher/ high school craft and entrepreneurship teachers) into quantitative data with a Likert scale Converting qualitative data from student responses to quantitative data using the Guttman scale Calculating the total average score according to the formula, changing the average score for all aspects and each aspect of the assessment to be qualitative based on the ideal score, calculating the ideal percentage for the whole and each aspect. The type of data is product validation data in the form of suggestions and input obtained from material expert lecturers, media expert lecturers, peer reviewers, and reviewers (high school crafts and entrepreneurship teachers). Product quality assessment data were obtained from material experts, media experts, and reviewers using quantitative and qualitative data. The qualitative data used is in the form of category values, namely SB (Very good), B (Good), C (Enough), K (Poor), and SK (Very Poor). At the same time, the qualitative data of student responses are in the form of values in the Yes (good) and No (not good) categories. Product quantitative data is in the form of an assessment score, namely SB=5, B=4, C=3, K=2, and SK=1. At the same time, the students' quantitative data is in the form of assessment scores, namely Yes = 1 and No = 0.

### 3. RESULT AND DISCUSSION

#### Result

The semi-solid preparation-based chemical practicum module was developed using a 4-D development model limited to three stages: the define stage, the design stage, and the development stage. However, this research was only carried out until the development stage. The dissemination stage is the field test stage extensively, so it was not carried out in this study. The first product development stage is the define stage. The define phase includes curriculum analysis and analysis of student characteristics. Curriculum analysis was carried out using literature studies and interviews. Curriculum analysis shows that the curriculum used is the 2013 curriculum. The Craft and Entrepreneurship subject can be linked to Chemistry based on interviews. Chemistry subjects have material that can be applied to technology that can be found in everyday life. The material used in the semi-solid preparation chemical craft and entrepreneurship module is the Core competencies and Basic Competencies obtained from the high school chemistry syllabus. In addition, in Craft and Entrepreneurship, learning only use textbook learning resources from the government. So it is necessary to add additional modules as supporting learning resources so that learning is more innovative and creative. Student characteristics were analyzed using observation and interviews, namely the lack of skills in taking advantage of opportunities in everyday life as ideas for entrepreneurship. There is still limited sensitivity to making something useful and its application in everyday life, such as chemistry lessons, and ignorance of Craft and Entrepreneurship learning can be linked to other subjects, one of which is chemistry.

The second stage is the Design stage (design). The design stage includes instrument making, media selection, format selection, and initial design creation—the manufacture of instruments used to assess the product being developed. The manufacture of product research instruments refers to module quality standards according to the Ministry of Education and Culture. Several aspects of the assessment are produced, including content feasibility, language feasibility, presentation aspects, graphic aspects, aspects of the chemical approach to semisolid preparations-based products, and aspects of module characteristics. Media selectors to identify the media developed in practicum and chemical entrepreneurship modules based on semi-solid preparations. The selection of teaching material media in this study is a module. The software used in making the modules are Corel X7, Adobe In Design, Adobe Photoshop, Adobe Illustrator, and Microsoft Word. Selection of format, adjusted to the selected media (print module). The module components developed include titles, subtitles, learning aspects such as objectives, methods, production cost analysis, and real examples of the use of chemistry in the field of entrepreneurship in everyday life. They are making the initial design, starting with designing activities and making designs according to the module components that have been determined. The initial design was made using Adobe Illustrator for the book cover and layout, which was then converted into PNG format and processed using Microsoft Word 2016. This product is initially (draft 1) designed and then consulted by the supervisor for suggestions and input, followed by researcher revision.

The third stage is the development stage, the product that has been developed (draft 1), which has been consulted with the supervisor, gets input and suggestions that are used to improve the module that has been developed (revision 1). The revised product (draft 2) was then validated and assessed by three peer reviewers, one material expert lecturer, and one media expert lecturer. Suggestions and input are used as material for the second revision and to improve the developed module. The product developed was revised using the Adobe InDesign application, then the file was converted to pdf format. Furthermore, the product resulting from the second revision (draft 3) was assessed by four reviewers and responded to by ten MIPA students. The development results obtained are the semi-solid preparation-based chemical Craft and Entrepreneurship practicum module using the Corel X7 application, Adobe In Design, Adobe Photoshop, Adobe Illustrator, and Microsoft Word. The front page (cover) and back cover of the module can be seen in [Figure 1](#), and [Figure 2](#).



Figure 1. Front Cover



Figure 2. Back Cover

The components of the developed module include the initial part of the module (consisting of book identity, preface, table of contents, introduction to semi-solid preparation material, and the working principles of the product being developed, which is linked to chemistry), chapter II of craft and entrepreneurship products (consisting of information on practicum product titles, product introduction, chemical material, objectives, product manufacturing composition, product manufacturing steps, as well as product business analysis), chapter III cover (contains a bibliography, glossary, and author identity). At the beginning of the module, there is a book identity that provides information regarding the author and parties involved in doing the module. The foreword is an introduction from the author regarding the creation of the module. The table of contents helps the reader find the topic of discussion and page numbers. The introduction to semi-solid preparations contains an explanation regarding the meaning of semi-solids and examples of products based on semi-solid preparations. The working principles in this practicum module contain the principles of making products related to chemical materials. The products in the practicum module developed contain products that are classified as various soaps. This principle contains the notion of saponification, how soap removes dirt/cleanse, and the saponification reactions are presented in Figure 3, and Figure 4.



Figure 3. Introduction to Semi-Solid Preparations

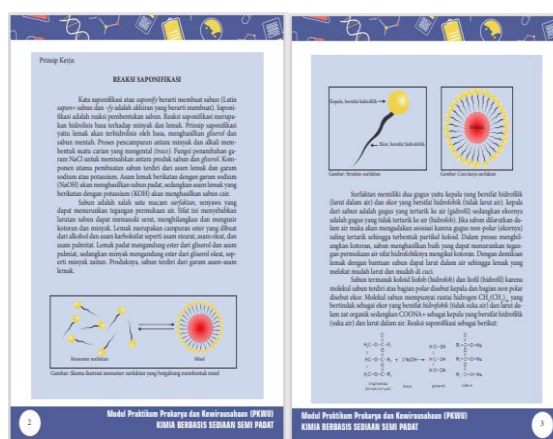


Figure 4. The Working Principle of the Product Contained in the Module

The content section consists of six craft and entrepreneurship products related to chemistry. The six practicum products are liquid detergent, solid soap, liquid soap, lotion, hand sanitizer gel, and shampoo. Each practicum title includes information related to practicum products and descriptions of making craft and entrepreneurship products (which consists of an introduction linked to chemical material, objectives, composition for making products, and steps for making products. In addition, this practicum and entrepreneurship module is also equipped with business analysis that aims to foster an entrepreneurial attitude and spirit. The analysis of production costs contained in this module, namely there is an estimate of the price list for each material used, there is an estimate of the total amount of production costs required in making entrepreneurial products, there is an estimate of the selling price and the profit obtained from the sale of the product. Modules of one of the product titles are presented in Figure 5, Figure 6, and Figure 7.



Figure 5. One of the Practicum Titles

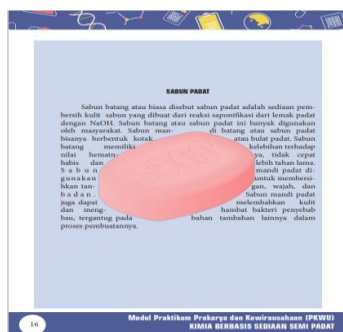


Figure 6. One of the Introductions to the Practicum Title Material

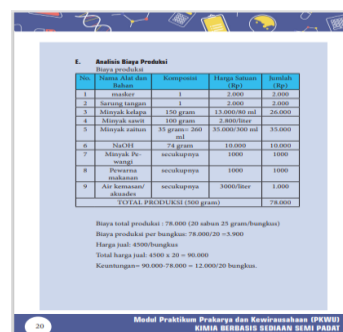


Figure 7. One of the Practicum Module Business Analysis

The closing part of the module consists of a bibliography, glossary, and author biography. The bibliography contains a list of books used as references in writing modules, a glossary containing explanations regarding foreign words/languages, and an author's biography containing the identity and educational history of the author. This development stage includes revision of suggestions and input and assessment of the quality of practicum modules and validation by peer reviewers, subject matter expert lecturers, media expert lecturers, reviewers (chemistry teacher/craft teacher and high school entrepreneurship), and student responses. Products developed are consulted with supervisors, then validated and assessed by peer reviewers, material expert lecturers, and media expert lecturers. After validation, assessment, and revision, the developed module was assessed by four reviewers (a high school chemistry/crafts and entrepreneurship teacher) and responded to by ten students from various high schools in Yogyakarta. The reviewers' ratings came from chemistry teachers/chemistry teachers who teach crafts and entrepreneurship at SMA N 1 Depok, MAN 2 Yogyakarta, and MAN 2 Bantul. While the student response data obtained came from MAN 2 Yogyakarta and MAN 2 Bantul. Module quality assessment by reviewers is presented in [Table 1](#).

**Table 1. Reviewer's Assessment Data**

Assessment Aspect	$\Sigma$ Score	$\Sigma$ Ideal Max Score	Ideal percentage (%)	Category
Content Eligibility	55	60	91.6	Very Good
Language Eligibility	70	80	87.5	Very Good
Presentation	55	60	91.6	Very Good
graphics	55	60	91.6	Very Good
Semi-solid product preparations	36	40	90.0	Very Good
Module Characteristics	90	100	90.0	Very Good
<b>Total</b>	<b>361</b>	<b>400</b>	<b>90.25</b>	<b>SB</b>

Based on the data obtained following [Table 1](#) shows that the aspects of content feasibility, language feasibility, graphic presentation, semi-solid dosage product approach, and module characteristics successively get an ideal percentage of 91.6%, 87.5%, 91.6%, 91.6%;91.6%;90%. The calculation results from the assessment of the four reviewers obtained an average score of 90.25 with a maximum score of 100 with an ideal percentage of 90.25%, so the Very Good category (SB) was obtained. The modules developed were responded to by ten students who obtained data, as seen in [Table 2](#).

**Table 2. Student Response Data**

No.	Assessment Aspects	$\Sigma$ Score	$\Sigma$ Ideal Max Score	Ideal Percentage (%)
1.	Cover design and layout	19	20	95
2.	Material	17	20	85
3.	Language	19	20	95
4.	Semi-solid product preparations	20	20	100
5.	Completeness of information	20	20	100
	<b>Total</b>	<b>95</b>	<b>100</b>	<b>95</b>

[Table 2](#) shows the response data from ten students who obtained an average score of 95 with a maximum ideal score of 100, so an ideal percentage of 95% is obtained, which is in the Very Good category. The results of the validation and assessment of this practicum module from material experts, media experts, and reviewers show that the product developed is in the Very Good category and is suitable for use.

## Discussion

The semi-solid preparation-based chemical practicum module was developed using a 4-D development model limited to three stages: the define stage, the design stage, and the development stage. The research results show that the product being developed is in the Very Good category and is suitable for use. Several aspects cause this. First, the semi-solid preparation-based chemical practicum module is feasible from a material perspective. The material presented in the module follows the learning objectives. This semi-solid preparation product can be used for entrepreneurship education by manufacturing semi-

solid products. One of the effective learning media so that students can learn according to their abilities and not depend on the teacher is a module (Yetti & Ahyanuardi, 2020). Modules are learning media designed systematically and attractively so students can use them independently (Khairunnufus et al., 2019; Puspitasari et al., 2020). Practicum is an important activity in learning (Junarti et al., 2018; Khairunnufus et al., 2019). Practical activities convey abstract material conceptually to increase student understanding (Syifaunnida & Kamaludin, 2022). Developing craft and entrepreneurship modules can be a source of student learning, improving understanding of concepts, and fostering student entrepreneurial interest. Crafts and entrepreneurship are associated with processing, including creating basic materials as finished product objects into mature products by mixing or modifying these materials, which can then become opportunities in entrepreneurship (Anggraini, 2020; Haneberg et al., 2022). The practicum module makes it easier for students to understand better abstract and concrete chemical material (Aryawan et al., 2018; Gerhardt-Szép et al., 2017). Thus, the semi-solid preparation-based chemical Craft and Entrepreneurship practicum module can be used in the practicum process.

Second, the semi-solid preparation-based chemical practicum module is feasible from the design and language aspects. The language used in the module is very simple, so students can easily use the module. The grammar in the module must be simple, use proper punctuation, have clear, concise, and concise paragraphs, and the sentences are not convoluted (Pramana et al., 2020; Romayanti et al., 2020). Learning modules must be presented clearly and specifically so that learning becomes directed (Gustinasari, M., Lufri, 2017). The illustration or selection of images on the cover of the module must be able to reflect the contents of the module, the layout of the contents of the module must be consistent, and the typeface used is the same, simple, and follow the character of the material and the age level of the reader so that it is easy to read (Ramadhani & Mahardika, 2015). The results of module development can motivate students to become entrepreneurs (Mutiah et al., 2020).

The semi-solid preparation-based practicum and entrepreneurship practicum module based on the results of assessments from material experts, media experts, and reviewers received the Very Good category. This finding is reinforced by previous research stating that the resulting STEM-loaded modules can be used in the learning process (Zulaiha & Kusuma, 2020). It shows that the developed practicum and entrepreneurship practicum modules received a positive response from students. Modules that get positive values or responses are appropriate for use as learning media (Aisyah et al., 2021; Jofrisha & Seprianto, 2020). The semi-solid-based Craft and Entrepreneurship practicum module explains several preparations in life applications so that this can be a source of student learning in linking chemical material to everyday life applications (Hariadi, 2017). This research implies that teachers are expected to be able to use practicum modules that can facilitate students in carrying out practicum activities. However, this research was only carried out until the development stage. The dissemination stage is the field test stage extensively, so it was not carried out in this study. Future research is expected to develop this product to the last stage.

#### 4. CONCLUSION

The subject matter expert lecturers, media expert lecturers, and reviewers (high school chemistry teachers) assessed the semi-solid preparation-based chemical practicum and entrepreneurship practicum modules. Chemistry makes it suitable for use as a support for independent learning. In addition, the craft and entrepreneurship modules presented in the module can also be used in chemistry learning. The craft and entrepreneurship practicum module are based on semi-solid preparations based on the results of assessments from material experts, media experts, and reviewers in the Very Good category.

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