



Exploring Integrated Instrument Complement at Practical Approach at MAN 4 Tanah Datar

Ulfa Mutia, Elvy Rahmi Mawarnis*

Department of Chemistry Education, FTIK, UIN Mahmud Yunus Batusangkar, Jl. Jendral Sudirman No. 137, Sumatera Barat, Indonesia 27217

* Corresponding Author e-mail : elvyrakhmimawarnis@gmail.com

Article History

Received: 02-03-2024

Revised: 08-04-2024

Published: 30-04-2024

Keywords: 4-D, design, exploring, components thermochemical

Abstract

The purpose of this research is to produce Integrated Instrument Components. Exploring integrated instrument complement at practical approach at MAN 4 Tanah Datar which is valid and practical. This study uses the Research and Development research method with the 4-D development model (define, design, develop, and disseminate). But the stages in research with this 4-D model are only carried out from the first to the third stage, namely the define stage to get conditions in the field. design stage to prepare a simple practicum kit on Thermochemistry material, and the develop stage to get the results of the initial practicum IIC that has been designed followed by validity and practicality tests. The research instruments used were validation sheets and response questionnaire sheets. The validation sheet was filled in by 2 lecturers and 1 chemistry educator. The response questionnaire sheet was filled by 17 of in 11th grade students of MAN 4 Tanah Datar. The results showed that: 1) Simple Practical IIC on Thermochemical Material has met the valid criteriawith 92% validation results, 2) Simple Practical IIC on Thermochemical Material has met the practical criteria with the results of the student response questionnaire.

How to Cite: Mutia, U., & Mawarnis, E. (2024). Exploring Integrated Instrument Complement at Practical Approach at MAN 4 Tanah Datar. *Hydrogen: Jurnal Kependidikan Kimia*, 12(2), 218-225. doi:<https://doi.org/10.33394/hjkk.v12i2.10992>



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INTRODUCTION

In general, chemistry learning activities at the high school level can be divided into two, namely learning carried out in the classroom and learning carried out in the laboratory. During the learning process in the classroom the teacher emphasizes more on concepts that are memorized and practice questions while in the learning process in the laboratory students carry out activities in the form of practicum that is actively involved and real object observation. According to (Andani, Mawarnis, and Herman 2023) Practicum can be used as an effective learning media to improve students' understanding. To do a practicum, a supporting facility is needed, namely a laboratory. (Mauliza and Nurhafidhah 2018). The laboratory is one form of chemical learning resources that are needed in providing facts or realistic things for students. Learning resources like this are one form of learning support factors. Modern science education requires schools to have chemistry laboratories. The application of laboratory learning strategies can bring up and improve achievement, interest, and motivation to learn (Kit and Kimia 2017).

Laboratories in educational institutions act as a means of academic support. In addition, the laboratory is a permanent laboratory that is systematically managed in practicum activities using tools and materials based on methods in chemistry. So that it can carry out education, research and community service. The role of this laboratory has various problems in the world

of education, especially in laboratory management. These problems include difficulties in processing practicum waste (Kimia et al. 2021), the availability of tools and materials that are expensive and difficult to obtain (Ipa et al. 2022) unsupportive school facilities and infrastructure (Langsa 2022) and the absence of protocols or guidelines in entering laboratories that use many hazardous materials that endanger the health of students. (Diah 2023).

The laboratory conditions that researchers encountered when conducting interviews on February 27, 2023 with one of the chemistry teachers at MAN 4 Tanah Datar were not much different from the problems above. Based on the results of observations of researchers at MAN 4 Tanah Datar School that the school does not have a special laboratory for chemistry subjects, so it greatly affects student learning outcomes. Based on the description above MAN 4 Tanah Datar has low learning outcomes. Student learning outcomes have not reached the intended KKM of 75, according to observations and interviews with class XI chemistry teachers on February 27, 2023. In the last 2 years, it has a low percentage of odd semester final exam scores, in 2021 the percentage of completeness is 50% of 23 students and in 2022 with a percentage of completeness of 35% of 17 students. (Mawarnis, Khaira, and Abd 2023)

Research states that learning supported by practicum implementation can improve student learning outcomes (Mawarnis, Ramadhani, and Herman 2023). Practicum makes it easier for students to get the concept of material through a series of direct experimental processes so that student learning outcomes increase. (Novikasari 2017) emphasized in their research is proven to help students understand concepts so that it can significantly improve student learning outcomes. practicum can stimulate students to actively participate in learning and improve student learning outcomes (Merlinda 2019).

Overcoming the above problems, innovative development is needed in the use of chemical tools and materials that are safe in practicum, and easy to carry everywhere without the need for a special room to carry out practicum without reducing practicum objectives. For this reason, it is necessary to develop a practicum design or prototype that is easy to carry, one of which is the development of an Integrated Instrument Component practicum is an equipment instrument that is packaged or arranged in units that contain practicum equipment, practicum materials and guidelines for their use in certain materials. Practical IIC in the learning process can produce a pleasant learning atmosphere so that it can create active students because they are involved in learning activities. In addition, practicum IIC can reduce the risk of laboratory accidents (Mawarnis et al. 2018) Based on some of the above problems in this study, the development of Integrated Instrument Components Simple Practicum on Thermochemical Material at MAN 4 Tanah Datar was carried out (Nadila et al. 2023). IIC is an instrument of equipment that is packaged or arranged in units that contain practicum worksheets in certain materials. Practical IIC in the learning process can produce a pleasant learning atmosphere so that it can create active students because they are involved in learning activities. In addition, practicum IIC can reduce the risk of laboratory accidents

METHOD

The research method used in this study is the research and development method, or commonly known as Research and Development (R&D). The development model in this research is the 4-D model. The stages in the 4-D model consist of define, design, develop and disseminate. The data collection instruments used were interviews, validity and practicality questionnaires. Questionnaires were used to measure the validity and practicality of the products developed.

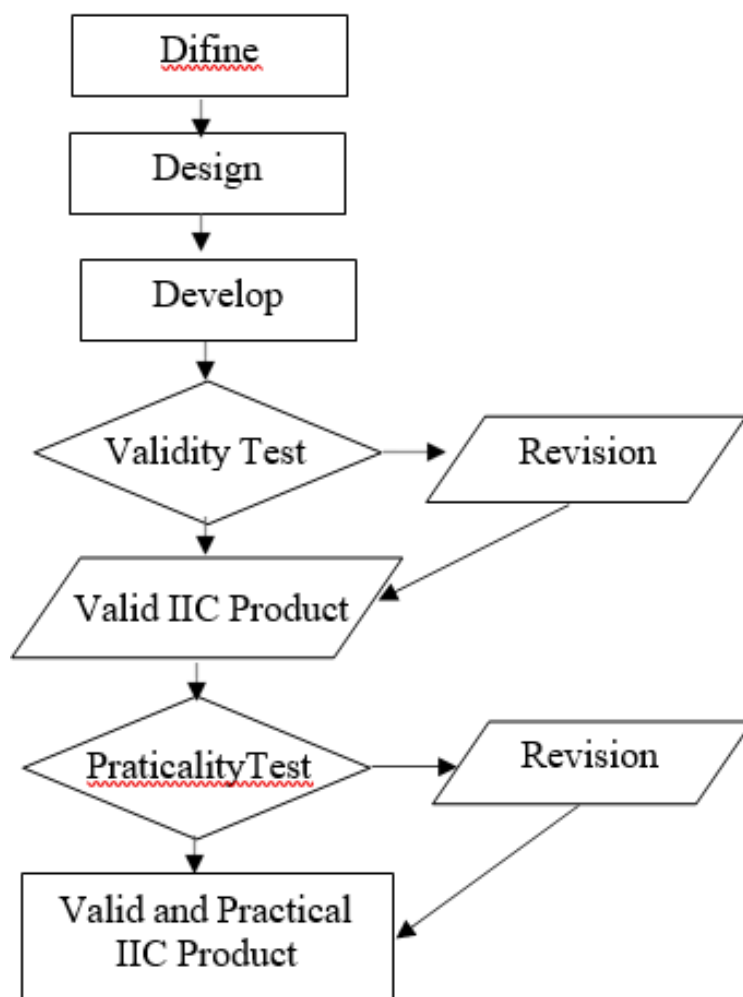


Figure 1. Research procedures

The data analysis technique used to express the results of the study is validity analysis and practicality analysis. Validity analysis Used to analyze the aspects of the questionnaire that will be assessed by each validator against the chemistry practicum IIC that the researcher developed so that its validity can be known. Aspects on the validity questionnaire sheet include content quality aspects, instructional quality aspects and technical quality aspects. Practicality analysis is used to analyze aspects of the practicality questionnaire so that theKIT developed is practical in its use by teachers and students. To analyze the results of validity and practicality in the analysis using the formula.

$$P = \frac{\text{Score of each item}}{\text{maximum of each item}} \times 100 \%$$

The results obtained are presented using criteria based on the provisions in table 1 (Lidra,Mawarnis & Herman, 2023).

Table 1. Scoring categories

Categories	Score
Not Valid/Practical	0%-20%
Less Valid/Practical	21%-40%
Fairly Valid/Practical	41%-60%
Valid/Practical	61%-80%
Highly Valid/Practical	81%-100%

RESULTS AND DISCUSSION

The research results are presented based on the 4-D development model which includes define, design, and develop.

Define

The define stage is the initial stage carried out to find out the general picture at school, analyze the problems that occur and identify problems by providing solutions to these problems, to find out that all of this is done at several stages. First, curriculum analysis, the curriculum used by MAN 4 Tanah Datar is the 2013 curriculum. Where this curriculum emphasizes the scientific approach with more student-centered learning methods.

Thermochemistry is one of the materials studied by XI grade high school students in odd semester. Thermochemical material consists of factual, conceptual and procedural knowledge, this material contains many concepts that must be understood by students. Based on the characteristics of thermochemical material, to solidify the concept so that it can be understood by students, it is necessary to have a direct practicum.

The second stage is the initial analysis of the end which consists of analyzing students and educators, from this analysis Educators and students said that chemistry learning at school had been carried out in accordance with the demands of the curriculum used at school. One example is that the teacher has used a learning model that is centered on students (student centered). The learning model used by educators in delivering material is good. During learning, educators use teaching materials such as textbooks, student worksheets and Power points. Educators also convey learning media that are used already varied, such as whiteboards, learning videos, image media and presentation files. Learning carried out in the classroom has been maximally carried out, but educators have limited facilities and infrastructure in carrying out practicum where the chemistry learning process requires practicum as a tangible manifestation of what is learned in class. In connection with practicum activities carried out at school, practicum is rarely carried out due to difficulties in obtaining tools and materials this happens because the school does not have a laboratory. With this, students very rarely even almost never do practicum.

Furthermore, namely literature analysis, the practicum integrated instrument complement that researchers developed used several sources such. To support experimental learning, learning media (integrated instrument components) are needed for simple and environmentally friendly chemistry practicum without reducing the designed practicum objectives.

Practicum is interpreted as a learning method that aims to clarify concepts through direct contact with tools, materials, or natural phenomena combined with the stages of the scientific method in its implementation. Practical learning is carried out not only to help students understand the theory learned but also to improve students' psychomotor competence so that they have good practical skills.

Design

At the design stage, the first thing that needs to be prepared is the tools and materials needed such as knives, scissors, rulers, pencils, saws, wood, nails, paint, flannel cloth, steroform, fox glue. Furthermore, the stage of making the practicum integrated instrument complement box (box) is made of wood with a size of 50cm x 50cm x 20cm as shown in Figure 2. After that, both sides of the box are coated with steroform in accordance with the size of the box that has been made as seen in Figure 3. The shape of the steroform, based on the shape of the tools and materials used for practicum as seen in Figure 4. Inside the practicum integrated instrument complement which is lined with flannel, the tools and materials for thermochemical practicum are arranged as shown in Figure 5.



Figure 2. Assembled Practicum IIC Box



Figure 3. IIC box lined with Steroform



Figure 4. Practical IIC that has been IIC covered with Flannel Fabric



Figure 5. Tools and Materials in Practical

The Design stage aims to design the initial design of the practicum integrated instrument complement and design research instruments. The instrument is a validation sheet and a practicality response questionnaire. The first stage of designing practicum integrated instrument complement is to collect the tools and materials needed. The tools used are saws, scissors, knives, rulers, pencils while the materials used are wood, nails, paint, felt, steroform and fox glue. After all the tools and materials are available, proceed with the manufacture of practicum integrated instrument complement with the following steps: 1) Box (box) Practical integrated instrument complement is made of wood with a size of 50cm x 50cm x 20cm, 2) After that, both sides of the box are coated with steroform adjusted to the size of the box that has been made, 3) The shape of the steroform is based on the shape of the tools and materials used for practicum, 4) Then coat with flannel cloth, 5) Then the tools and materials for practicum are arranged according to the shape that has been made and coated with flannel cloth, 6) After all the tools and materials are arranged according to the size that has been made, then label the name of each tool and material.

Develop

At this stage of development, researchers validate chemistry practicum integrated instrument complement with several experienced experts or experts to assess the products that have been designed, after validating and revising the practicality test of practicum integrated instrument complement to see its practicality (Lampung, Prof, and Brojonegoro 2016)

Researchers used a practical KIT validation sheet on Thermochemical material to measure the validity of the media developed. This is done by giving a validation sheet to the validator which contains aspects of content, instructional aspects, and technical aspects as shown in table 2.

Table 2. Validation results of simple practical KIT on thermochemical material

Aspects that were validated	Sum	Max Score	%	Remarks
aspects of content	53	60	88%	Highly valid
instructional aspects	66	72	92%	Highly valid
technical aspects	46	48	96%	Highly valid
Total	165	180	92%	Highly valid

Based on the results of the validation of the chemistry practicum integrated instrument complement that has been carried out, when viewed from the aspect of content quality, the results are very valid with a percentage of 88%. In terms of content made in chemistry integrated instrument complement is in accordance with chemistry learning, Basic Competencies (KD), learning objectives. Chemistry practicum integrated instrument complement is also easy to use or easy to operate and raises students' curiosity about Thermochemical material. According to the characteristics of a product that can be said to be valid if it meets certain criteria. Product characteristics that can be said to be valid if the product reflects the soul of knowledge, this is said to be content validity. (Mawarnis, Herman, and Barat 2023)

When viewed from the instructional quality the results obtained are very valid, namely with a percentage of 92%. In terms of instructional media practicum developed is easy and simple in design, use and maintenance. Validity in this aspect aims to determine the quality of learning that can be provided by the media developed.

Furthermore, the technical quality aspect of the value obtained is also very valid with a percentage of 96%. In this technical requirement, there are four statement indicators that are used as a reference to see the advantages and disadvantages of the product. These include tools and materials in the practical integrated instrument complement developed can be found in everyday life, do not endanger the safety of students during practicum and the practical integrated instrument complement designed is very simple and can arouse students' interest in learning chemistry material.

To see the practicality of the products that researchers develop, using limited practicality means only using a few students in conducting experiments from the chemistry practicum IIC. In this experiment, class XI students totaled 17 people, at this stage students and educators will be given a response questionnaire to the practicality of the chemistry practicum IIC. The results of the practicality of the thermochemical practicum integrated instrument complement can be seen in table 3

Table 3. Practicality results of practical KIT based on student response

No	Practicality Aspect	Sum	Max score	%	Kategori
1	Ease of use	303	340	89%	Highly practical
2	Media appeal	370	408	91%	Highly practical
3	Benefits	267	272	98%	Highly practical
	Total	313	340	92%	Highly practical

CONCLUSION

This research is a development of exploring integrated instrument complement at practical approach at MAN 4 Tanah Datar. Based on the development that has been carried out, the researcher can conclude that the Development of Integrated Instrumental Components. Simple Practicum on Thermochemical Material at MAN 4 Tanah Datar which has been designed and validated from the aspects of content, instructional aspects, and technical aspects obtained an

average value of 92% with a very valid category. Based on the average obtained, it can be concluded that the simple practical integrated instrument complement on Thermochemistry material is very valid. Simple practical integrated instrument complement on Thermochemistry material designed by researchers is very practical in terms of ease of use, media attractiveness and benefits obtained with an average student response of 92% with a very practical category and an average teacher response of 95% with a very practical category.

RECOMMENDATIONS

Based on the results of the research that has been done, it can be suggested that further research is expected to see the level of effectiveness and practicum integrated instrument complement can be developed again on other chemical materials.

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