SMALL SCALE LABORATORY KIT FOR CHEMISTRY LEARNING USING THE INDEPENDENT CURRICULUM

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ABSTRACT

The independent curriculum applies a variety of intracurricular learning in the form of more optimal content so that students deepen concepts and strengthen competencies. Apart from that, the independent curriculum also has the characteristics of project-based learning which focuses on hands-on activity. One of them is practical activities. However, practicum activities have not been carried out optimally due to limited time, infrastructure and human resources. So practical activities and practical guides are needed that are simple, practical and easy to understand. The solution to the problem that can be created is the development of a small scale laboratory KIT product for chemistry learning using the independent curriculum. The process of developing small scale laboratory KITs in chemistry learning using the independent curriculum through the ADDIE development stages, namely; Analysis Stage, Design Stage and Development Stage (KIT small scale laboratory accompanied by a practical guidebook obtained material validation results of 3.8, including in the very feasible category and media validation of 3.67, including in the very feasible category and for small scale trials obtained a teacher response of 90%, meaning the response regarding this product was very good, while the student response was 93%, meaning the students gave a very good response.

Keywords: KIT Small Scale Laboratory, Chemistry Learning, Chemical Reactions.

INTRODUCTION

The independent curriculum implements a variety of intracurricular learning in the form of more optimal content so that students explore concepts and strengthen competencies (Barlian, et al. 2022). The independent curriculum contains updates from the previous curriculum, such as phases at each level, learning outcomes

(CP), learning objectives (ATP), and teaching modules. In addition, the independent curriculum has a project-based learning orientation where students become *learning centers* The independent curriculum is also applied to every level and the material, one of which is chemistry.

Chemistry learning at the phase E level refers to learning outcomes, one of which is that students are able to observe, investigate and explain phenomena according to scientific work rules in explaining chemical concepts in daily life, as well as writing down chemical reactions that occur. Chemistry learning in the independent curriculum is focused on materials that are related to phenomena in daily life, one of which is chemical reaction material.

The phenomenon that occurs in phase E of class X when the chemical reaction material is that the teacher still conducts the lecture learning method using ppt media, whiteboards and occasionally learning videos, this makes it difficult for students to understand and describe what is being learned. (Astutik, 2017) Students have difficulties in understanding chemistry learning because chemistry has abstract and complex concepts that require a deep understanding to learn them (Sariati, et al. 2020). Some of the difficulties experienced by students in learning chemistry tend to be because students do not know the right way to learn, connect between concepts, and need the usefulness of logic, mathematics, and language skills (Zakiya, et al. 2018). The problems include the unavailability of funds for the implementation of laboratory activities, laboratory class conditions, the absence of laboratory staff, implementation barriers related to the process including duration, lack of tools and materials, lack of teachers' lab experiences, and poor laboratory governance (Bell and Bradley, 2012; Tsaparlis, 2016 ; Hidayah, 2022).

One of the alternatives that can be done by teachers is practicum activities. Theimplementation of practicum can increase students' motivation in learning, and improve psychomotor abilities as well as prove the theoretical aspects (Wahyudi, 2020). SSC is an effective chemistry teaching innovation that requires engineering on conventional procedures to become a much smaller scale practicum. Thus, this process needs to be trained and taught in teacher training programs that are oriented towards handson learning activities (Imaduddin et al., 2020, Hidayah, et al 2022). The implementation of practicum still experiences several challenges, namely the lack of motivation for teachers in innovating learning, this is because teachers are worried about not being able to complete the teaching

material on time if they want to do practicum, and the availability of budget factors for supporting infrastructure Several cottage-based schools located in Klaten, Demak, and Lamongan are experiencing similar obstacles.

The solution offered to the constraints of conventional practicum activities is to upgrade conventional-based practicum activities to *small scale laboratories*. In addition, in order to be in accordance with the learning orientation of the independent curriculum, the KIT small scale laboratory practicum media needs to be integrated with the independent curriculum material.

KIT practicum research has been carried out at the State High School level, namely in the research on the Development of KIT Chemistry Practicum for High School on Electrolyte and Non-Electrolyte Solution Materialst (suryani, I, G. 2021). There has been no research on the KIT *small scale laboratory* practicum on chemical reaction materials as a chemistry practicum tool for high school students in Islamic Boarding School in learning chemistry with *a hands-on activity* method that supports students to carry out project-based practicum activities. So the researcher conducted a study with the title KIT *Small Scale Laboratory* on chemistry learning using an independent curriculum.

METHOD

This research was carried out in the period of March – August in several high schools that have the same background, namely based on pondok in the Demak, Klaten, Lamongan, and Semarang areas.This research is an R&D research using the ADDIE model which consists of five stages, namely *Analysis, Design, Development, Implementation, and Evaluation*. In this study, the ADDIE stage will be carried out in three stages, namely up to the development stage. This is because the researcher wants to focus on the design and development of KIT *small scale laboratory* as well as a practicum guide pocket book that can later be used and utilized in high school. In addition, each stage will be evaluated to monitor and correct the shortcomings of each stage so as to produce a KIT *Small Scale Laboratory* practicum product that is validated and tested for feasibility.

Data collection techniques are carried out by observation, interviews, questionnaires and documentation. Data analysis techniques are carried out. that is, qualitative and quantitative analysis. Qualitative analysis uses stages, namely: analysis, data reduction, data presentation, conclusion drawing and data validity.

Quantitative analysis uses two stages, namely validation, and response to research objectives.

Expert validation

The expert validation sheet is used to assess the feasibility of the KIT *Small Scale Laboratory* practicum on chemical reaction materials carried out by material and media experts using the following formula:

Written with $= \underline{x} = \frac{\Sigma x}{N}$

$\underline{x}$ = eligibility value
Σx = total score
N = number of subjects (Sugiyono, 2015)

Based on the research, product validation is determined using the following criteria (Zikrullah, et al. 2016)

Table 1 :
Eligibility Criteria Interval

Interval (P)	Eligibility criteria
>3,25 - 4,00	Very worthy
>2.50 - 3,25	Proper
>1.75 - 2,50	Less feasible
1,00 -	Not eligible

Student and teacher response sheets are used to find out the responses of teachers and students to the KIT *Small Scale Laboratory* practicum products of chemical reaction materials

NP = NP = $\frac{R}{SM}$ x 100 %

NP = the value sought
R = total score
SM = maximum number of scores (Arkunto. 2013)

Based on the research, the criteria for the response level are determined using the following criteria (Nursari, et al. 2019):

Table 2:
Percentage of student and teacher response scores

Score percentage (%)	Level criteria Response
75 - 100	Excellent
50 - 75	Good
25 - 50	Not good
0 - 25	Bad

FINDINGS AND DISCUSSION

Research on product development is carried out by conducting several stages of ADDIE model development, namely first, analysis of curriculum, materials, and media. Second, product design, and experimental. Third, development with material and media validation tests. As well as limited feasibility tests for teachers and students in grade XI. The results obtained from the several stages of development of the ADDIE model are small *scale labratory* KIT products accompanied by a practicum guidebook focused on supporting chemistry learning on chemical reaction materials in the independent curriculum with an attractive and easy-to-use appearance design, and a form that is easy to use, so as to increase students' enthusiasm and interest in learning chemical reactions. In addition, the researcher hopes that this product can make students more active in learning, and can better understand the concept of chemical reactions by relating phenomena in the surrounding environment.

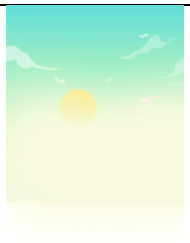
The material raised is the chemical reaction material of the sub-chapter which is discussed related to the concept of chemical reactions associated with phenomena in the surrounding environment. Based on the learning outcomes of phase E in the independent curriculum, students are able to observe, investigate and explain phenomena according to scientific work rules in explaining chemical concepts in daily life, as well as writing down chemical reactions that occur (Puspaningsih, et al. 2021). Chemistry learning in the independent curriculum is focused on materials that are related to phenomena in daily life. Therefore, to support learning that is in accordance with the independent curriculum and to empower students in visualizing learning with practicum. The practice provided in the KIT small scale laboratory practicum box has 4 types of reaction practicum, namely, deposition reaction, CO_2 gas identification test, iron rust reaction, combustion reaction, and acid-base reaction

Table 3 :
KIT product display

	
View in KIT practicum	Exterior view of the KIT practicum

The tools and materials used in KIT *small scale laboratory* products are small bottles / tubes of blood samples of 2 mL used as a place for DNA reagents for acid-base reactions, pomade can containers are used as places for combustion, *softlens* containers are used as rust reaction containers, 1 mg measuring spoons are used to take samples, straws are used to blowCO_2 tests A 1 mL dropper of litmus pH paper is used to check for pH changes, a small 5 mL vial and a tube rack are used as a sedimentation reaski container to identifyCO_2. In addition, the materials used are HCl 1%, clothes bleach, ulcer medicine, safety pin, betel lime, matches, and paper. In addition, because this practicum guidebook will be placed in a KIT box for a size of 11.5 cm long and 8 cm wide, the contents for the practicum guidebook are 1). Learning outcomes, 2) . Objectives of practicum, 3). Intermezo chemical reactions, 4) trigger questions, 5). Work procedure.

Table 4:
Display of the practicum guidebook

	
Front cover view of the practical guide book	Back view of the practical manual

The results and discussion part can be written in the same part to avoid the extensive quotation. Tables or graphs must present different results. The results of data analysis must be reliable in answering research problems. References to the discussion should not repeat the references

in the introduction. Comparisons to the findings of previous studies must be included. The results of KIT *small scale laboratory* products and practicum guidebooks have been validated in the early stages and tested for limited responses to teachers and students. The initial stage of validation was carried out by two material experts and two media experts, the results of material validation of 3.8 were included in the very feasible category and media validation of 3.675 was included in the very feasible category. Based on the results of previous research, it was stated that the KIT practicum media on acid-base material had been declared valid with details of obtaining a material validation score of 90% and media 88.5% with a very feasible category (jelita, et al. 2021)

This shows that KIT *small scale laboratory* products and practicum guidebooks can be tested in the next stage, namely limited scale trials to see the response of teachers and students. The results of the KIT *small scale laboratory* product trial and the practicum guidebook show that students feel interested and happy because this practicum activity is something new for them, especially when there are changes in rust, precipitation, color changes in the litmus, besides that students also find it easier to understand the concept and writing of chemical reaction equations. This result is evidenced by the results of the response questionnaire given by the researcher. The teacher's response of 90% means that the response related to this product is very good, while the student response is 93%, which means that the student gives a very good response

The results of the study are in accordance with the previous research stating that students feel helped and happy to use the chemistry practicum KIT. Another resource Students who have experimental experience with the SSC approach can develop better scientific reasoning skills by engaging in small group discussions and reflections during micro-scale practical activities (Mafumiko, 2008) and The existence of microscale chemistry can make chemistry practicum activities easier, providing an alternative to chemistry practicum for those who are hampered by laboratory problems. (hidayah, et al. 2023).

In addition, students also feel enthusiastic when carrying out KIT practicum activities, especially when there is a color change in the solution tested using natural indicators. The results of the same study stated that the KIT *small scale laboratory* practicum on electrolysis material had a very good response from teachers and students with an average score of 5 including the very good category (Jazuli, Imam. 2022)

Based on the results of interviews with chemistry teachers, currently in the implementation of the independent curriculum in phase E, teachers still rarely carry out practicum activities, learning still uses conventional media such as whiteboards, books and several videos, so that it causes a boring effect on students and a decrease in interest in learning chemistry. Chemistry is synonymous with abstract and complex lessons that are difficult to understand. In addition, it is also necessary to understand that the process of learning chemistry for students is not enough to memorize the material but also needs experience and practice to develop competencies (Lestari, et al. 2021). One way that can be done is by providing experience in practicum activities. However, conventional practicum activities still have several obstacles such as; The lack of infrastructure, and the limited time of teachers in designing and preparing learning make teachers prefer to do just that.

One way to solve the above problems in order to provide new learning experiences and practices to children by carrying out *small scale laboratory* practicum activities by developing practical products KIT *small scale laboratory* provides new experience to students so as to increase students' interest in learning chemistry and make it easier for teachers to do practicum. Based on previous research, the KIT *small scale laboratory* practicum media has several advantages, including: (1) It can save more money on practicum, (2) It increases safety during practicum because it uses materials made of plastic, (3) It is easy to use so that it increases students' interest in practicum. (4) Practicum is perceived by students as an easier and more enjoyable thing so that it makes it easier for students to understand scientific concepts [Hidayah, et al. 2019) .

In addition, producing KIT *small scale laboratory* products, this research produced a practicum guidebook as a complement to the implementation of the KIT *small scale laboratory* practicum for chemistry learning using an independent curriculum. The practicum guidebook is based on design with an attractive appearance and with easy-to-understand words. Thus, increasing enthusiasm, collaboration, and hard work, as well as student independence in chemistry learning so as to make learning student-centered.

Based on the results of interviews and observations of schools A and B in the application of learning, they still focus on teachers, and still rely on conventional lecture or learning methods. Conventional learning only focuses on teacher explanations, this is not in line with the character or characteristics of the independent curriculum, to

facilitate the process of teacher adaptation, the researcher provides a reference to the practicum guidebook

CONCLUSION

KIT *small scale laboratory* media products needed by schools that have obstacles to carry out conventional practicum activities and this media product can be developed because it has received a validation score and a good response, as evidenced by obtaining material validation results of 3.8 included in the very feasible category and media validation of 3.675 included in the very feasible category and for small-scale trials obtained the results of the teacher's response 90% means that the response related to this product is very good, while the student response is 93%, which means that students give a very good response..

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