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The Development Practicum Based e-Module Local Wisdom in Acid-Base Chemistry Subject

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Abstract

The subject matter of acids and bases in the chemistry learning syllabus for class XI IPA is KD 3.10 and KD 4.10. In reality, many teachers do not carry out KD 4.10 activities for various reasons, especially the limited tools, and materials in the laboratory. This study aims to create a practicum e-module based on local wisdom in acid-base chemistry subject. Most of the tools and materials used were obtained from the surrounding environment. The research method used was a qualitative description, namely analyzing several sources of literature and the results of practicum e-modules that have been prepared before being applied in learning activities. This study resulted in an interactive practicum e-module and fulfilled the criteria set by the Ministry of Education and Culture in 2003 regarding guidelines for writing good modules. In general, the resulting e-modules are divided into learning activities in theory to recall the learning material that has been carried out to support practicum activities and practicum activities which are the main activities of creating the e-module. In conclusion, the use of tools and materials in the form of local wisdom for practicum activities in acid-base courses can increase students' insight that learning chemistry practices are not always expensive and use hazardous chemicals.

1. INTRODUCTION

Chemistry subject is one of the main subjects at the secondary education level. Chemistry learning is intended to equip students with the ability to think critically, logically, creatively, systematically, and analytically (Rosa, 2015). Permendiknas 2006 Number 22, states that Chemistry is part of the science and technology lessons at the intended SMA/MA/SMALB to acquire advanced competence in science and technology

and a culture of scientific thinking creatively, critically, and independently. Thus, the subject matter of Chemistry should be mastered by students. However, in reality, students' learning creativity in Chemistry is still low, which affects the results study.

Acid-base material in the chemistry learning syllabus for XI IPA class is found in KD 3.10 Explain draft acid and base and its strength and balance the ionizer in solution, and KD 4.10 Analyzing change route multiple pH which indicators are extracted from natural material through trials (Revised High School Chemistry Class XI Syllabus for 2022). Therefore, during the learning process in Acid-Base subject, learning activities do not only focus on explaining the theory of Acid-Base concepts, in this case, cognitive understanding, but also practical learning must be carried out to realize KD 4.10. However, in reality, many teachers do not carry out KD 4.10 activities for various reasons, including the lack of tools and materials available in the school laboratory, so that learning is only limited to theory, not real and makes the learning process less meaningful.

The lack of implementation of KD 4.10 in which students conduct experiments using red litmus paper, blue litmus or universal indicator paper immersed in acidic or basic sample solutions. Time and equipment are two things that restrict freedom in practicum. (Masitoh, S. & Nursalim, M. 2023). As a result, students are limited to observing color changes on litmus paper or universal indicator paper. On one side, this experiment is quite effective in fulfilling the implementation of KD 4.10, but from several aspects, the learning activities are less creative. This can be seen from the relatively high cost of practicum because the use of litmus paper, which can only be used once seems wasteful. On the other hand, because students are confronted with ready-to-use tools and materials, the development of 4C skills, especially creativity, is less than optimal.

Local wisdom is a characteristic of particular area or region that has cultural value, growing within the local scope of an area. (Damayanti, et al, 2013). Local wisdom is part of an object that must be preserved, so it needs to be protected, maintained, and used to increase the use value of its existence (Kormasela, 2020). Therefore, at school, it is necessary to have learning that contains wisdom-based subject matter to increase its utilization and prevent the extinction of local wisdom in an area.

E-modules or electronic modules are documents or written works in electronic format, which have many benefits as learning media and teaching materials for students (Batubara, 2021). The use of e-modules in practical activities can make learning activities more interesting and meaningful. Many studies have been conducted regarding the practicum e-module, and the results are quite satisfactory, including: the use of the Basic Chemistry Practicum E-module with the Canva application shows that the average respondent score is more significant than 8.00 for each questionnaire items and the basic chemistry practicum e-module is good and suitable for teaching materials in the online learning process (Puspita, et al. 2021). Through E-Mdoul chemo entrepreneurship-based (CEP) practicum questionnaire, the student response is 98.3% with very practical criteria and increased learning outcomes (Annisa, & Sari. 2021). The STEM-based chemistry practicum e-module with an ethnoscience approach is included in the category of feasible and practical use in learning (Nurhayati, et al. 2021). The expert assessment shows that the Chemistry Practicum e-module on acid-base material as a whole is "Very Eligible" to be used as a learning medium and improves student learning outcomes (Daeli. 2023). The practicum e-Module developed is very feasible to be implemented in Basic Chemistry learning because it receives an assessment in the "very good" category (Wahyuningsih. 2017). The Android-based e-modules are in very good and very appropriate criteria according to expert judgment, and can be used as chemistry learning media (Al Rasyid & Partana, 2021) and many other studies.

The e-module developed in this study is a practicum e-module for the local wisdom-based Acid-Base course. The tools and materials used are local wisdom, namely plants

found in the surrounding environment. The result is that KD 4.10 can be applied in the learning process even though the school lacks laboratory equipment. For students, the benefits can improve 21st-century learning skills (4C) by developing research results on several other types of plant species.

2. METHOD

Research and Development (R&D) used ADDIE (Analyze, Design, Development, Implementation and Evaluation) model because the ADDIE model is general in nature, suitable for development research in the field of education and class oriented, providing opportunities to evaluate each stage of development process. (Hamzah, 2019: 39). The ADDIE model R&D development procedure is carried out in five stages, namely:

1. Analysis
   The analysis is the initial stage of research and development (R&D) activities. The analysis is carried out because of the gap between the situation it should be and the existing statement. What should be conducted is to analyze the problems and the cause of the problems. The stages of analysis are carried out in the form of needs and curriculum analysis. The expected output is in the form of the identification of gaps and needs.
2. Design
   The next activity is the design stage. In addition to paying attention to the results of the analysis that has been carried out, the design also pays attention to other supporting elements, material and non material. The activity carried out is to formulate a specific learning design based on the KD of the subject. Formulate indicators and learning objectives, design product development in the form of storyboards, and design practicum e-module development products. The expected output produces design practicum e-module development products.
3. Development
   Level of development is to realize the results of the plan to be reality. Developing products in the form of practicum e-modules based on local wisdom to increase creativity in learning chemistry in the subject of Acid-Base. The expected output is to produce e-module practicum development products based on local wisdom that is suitable for use in the next research step.
4. Implementation
   The implementation level is the concrete steps from research and development activities, after trials, evaluations, and revisions of previous activities. The expected output is to produce e-module practicum development products based on local wisdom that is feasible to use to increase student learning creativity which is expected to increase.
5. Evaluation
   In fact, evaluation is carried out at each stage of activity for the needs of revision and improvement. The expected output is the product of e-module practicum development based on local wisdom to increase creativity in learning chemistry of acid-base subject matter which is suitable for use as a learning medium and teaching material for acid-base subject.

3. RESULTS AND DISCUSSION

Practicum Learning Model

Practicum activities are an important element in the learning process. In the Kamus Besar Bahasa Indonesian (KBBI), practicum is defined as an activity that has a purpose that students can carry out and test to gain direct experience related to the theory that has been obtained. In learning in practicum, students directly carry out activities to observe and

analyze an object problem or prove a theory that has been studied before.

The practicum model is a way of delivering teaching materials by providing practice opportunities for students to improve skills as the application of knowledge that has been previously learn. Practicum aims to improve cognitive skills, affective skills, and psychomotor skills (Rizqi, F. 2021). In cognitive skills, students train themselves so that theory can be understood, other theories can be integrated, and can apply the theory to real situations. Affective skills are intended so that learning participants can learn to plan activities independently, cooperatively, appreciate, and communicate information regarding the field. Psychomotor skills aims to prepare tools, install and use certain instruments.

When carrying out practicum activities, one can achieve a scientific attitude by carrying out independent activities, so there is no need for excessive supervision from the teacher. Maximum intellectual value can be achieved by practicing a lot in the laboratory with scientific work procedures. Emotional value, creativity, curiosity, and never giving up when fail can be developed.

The practical method has advantages and disadvantages. The advantages of the practical method are:

1. Proving theories on the previous subject matter.
2. Engage physically active, thoughts, and emotions of students to enhance curiosity, and increase creativity, and learning outcomes.
3. Develop students' psychomotor skills.
4. Increase motivation and self-confidence
5. In general, practicum activities produce good and beneficial products.

The disadvantages of the practical method are:

1. Often requires a reasonably high cost and many facilities.
2. Requires special skills to avoid human error and good quality equipment to avoid material error.
3. certain practicum activities require quite a long time.
4. In large classes, supervision is only effective if the number of instructors is limited.

Guidance is needed in its implementation so that practicum activities can run well and optimally. The practicum e-module is a digital practicum module that contains, in addition to containing learning content, planning, implementation, data analysis, and reports on the results of practicum activities (Dinata, et al, 2021).

Local wisdom

Local wisdom, in a broad sense, is not only in the form of cultural values and norms but also all ideas, including those with implications for aesthetics, health care, and technology (Sedyawati, 2016). Local wisdom is very important to include in the context of teaching materials because it occupies an important position in the world of education. Local wisdom-based education is strongly related to the development of life skills centered on local potential regions (Nadlir, 2016). The utilization and selection of local wisdom as teaching materials aims to maximize the local potential to develop student character education. This is useful for implementing character education in learning activities as specified in the curriculum. Thus, the utilization of local wisdom is appropriate for use in the development of teaching materials to improve student character education.

Government Regulation Number 32 of 2013 Concerning National Standard Education Article 77N paragraph 9 states (1) local content in each educational unit contains payload and learning process about local potential and uniqueness, (2) Content locally developed and implemented in each education unit. Thus, education integrated with local wisdom

makes students able to know, love, and develop local wealth and culture in their area (Enawaty, 2021). Integrating practicum activities based on local wisdom in learning can be applied to increase the use value and results of local wisdom.

Designing e-Module Development Products

According to the Directorate of Vocational Secondary Education, Ministry of National Education in 2003 concerning guidelines for writing modules, states that a module is declared to be good if it meets the following criteria:

1. Self-instructional, the module can create participants tempted to study independently. This means not depending on other parties.
2. Self-contained material in one competency section or sub competence is integrated into one module as a whole.
3. Stone alone is a model developed independently without having to rely on other teaching materials or media.
4. Adaptive, the module should have an adaptive power that high against science and development technology
5. User friendly modules are supposed to be friendly or familiar with the user, meaning easy to use, and consistent, for example, in the use of language and other instructions.

Designing Local wisdom-based practicum e-Module development products have the following specifications:

1. The material discussed in the e-Module development is Acid-Base, especially the application of KD 4.10 in analyzing change route of multiple pH indicators extracted from natural materials through trials.
2. Teaching material contests are carried out in theory and practice.
3. Many tools and materials in practical activities use local wisdom, but the results of these practicum activities are still of good quality.
4. The E-Module is equipped with interesting pictures, tables, videos, and animations, making it easier for students to understand the content of the lesson
5. The subject matter contained in the development of the practicum e-Module is connected with a hyperlink, so students do not need to open the sheet by sheet every page contained in the e-module.

The following are some pages contained in the development of local wisdom-based practicum e-modules in the acid and base chemistry course.

1. E-Module Home Page
   - The cover page contains information about the identity of the e-module which consists of: title, subject matter, author, and several animations of chemical laboratory equipment.
   - Motivation page aims to provide motivation to students to keep the spirit of seeking knowledge.
   - A learning content page contains teaching materials found in the e-module.
   - Table of contents page, list of tables, and list of figures.

Figure 1. Cover Page, Motivation, Contents of the e-module

2. Standard Competency Page and Concept Map
   - Consists of Competence Standard (SK), Core Competence (KI), and Basic Competence (KD), indicators, and learning objectives.
   - The concept of teaching material will be discussed theoretically and practically.
   - Picture of the Periodic System of Elements as a characteristic of chemistry learners.

Figure 2. Competency Standards, Concept Map, Periodic System of Elements

3. Main Page of Discussion and Apperception
   - The subject matter page contains the subject matter and sub-topics that will be discussed.
   - Apperception is a probing question in the form of a real problem that aims to determine the extent to which students are able to analyze a phenomenon that occurs.
   - The addition of a chemical magic video to provide refreshment that the concept of acids and bases can be used in magic games.

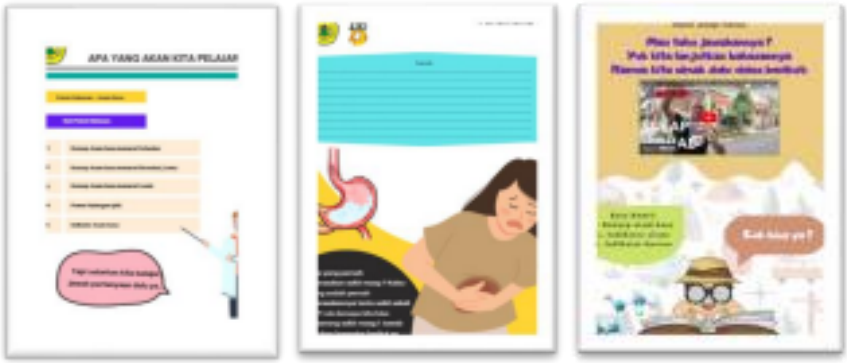

Figure 3. Main Subject Page, Apperception, and Chemistry Magic Video Page

4. Subject Matter Page

The main material page consists of several applications used in the form of interactive videos, animated videos, videos of practicum activities, images of the results of practicum activities, and other images required to support the discussion of the material presented.

Figure 4. Lesson Material Page

5. Practical Activity Page

The practicum page consists of several activities:

- Instructions for practicum activities in the form of experimental objectives, tools and materials used, and work procedures.
- Instructions for practicum activities in the form of experimental objectives, tools and materials used, prosedur kerja.
- The observation results are in the form of columns that must be filled in accordance with the observation results.
- Some questions that discuss about practicum activities that have been carried out.

Figure 5. Practicum Activity Page

6. Evaluation page

The evaluation page is in the form of a link connected to the Google form which consists of essay questions and problem-solving to know the extent of student creativity in understanding and solving a problem.

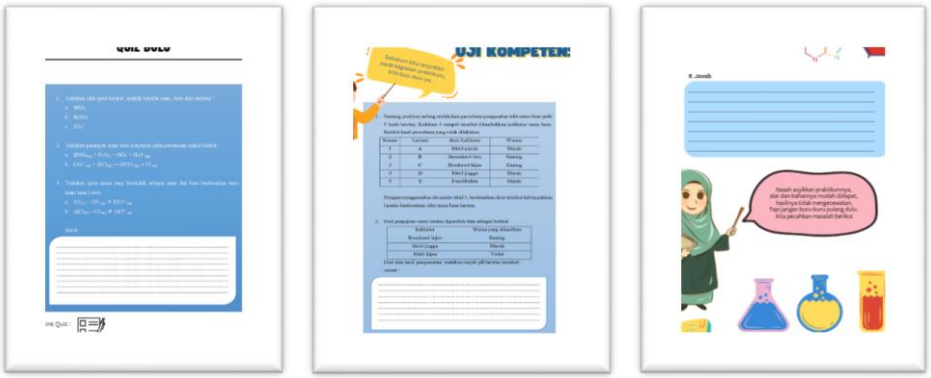

Figure 6. Evaluation page

7. Closing Page

The closing page consists of columns of self and group reflection, conclusions, glossary, author profile, and back cover of the e-module.

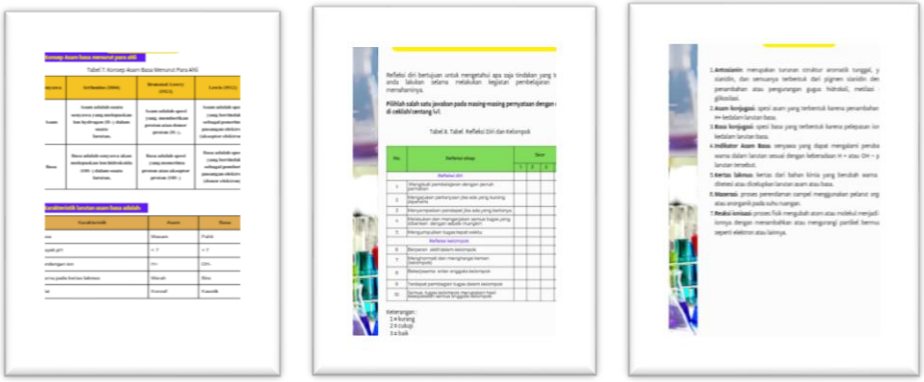

Figure 7. Closing Page

The urgency of digital learning media has four main functions: (1) to improve learning quality, (2) claim new paradigm, (3) meet market needs, and (4) part of the vision of global education. In addition, the urgency of digital educational media also greatly influences the attitudes, knowledge, and skills of students in solving global based problems (Azhar in Batubara. 2021). Development of local wisdom-based practicum e-Modules on the subject of Acid and Base, so far it can be developed and applied in accordance with the urgency. Using the practicum e-Module, students can more easily and quickly understand the subject matter, because they are not only fixated on textbook models but also combined with other more interactive models (Azka, et al, 2019).

4. CONCLUSION

Chemistry laboratory activities do not have to be expensive and use hazardous chemicals. Utilization of tools and materials found around the environment with the use of practicum e-modules can add insight and creativity to students in developing further research using other plants. Therefore, students can improve their 21st-century learning

skills, namely 4C (Critical Thinking, Creativity, Communication, and Collaboration).

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