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Needs Analysis of PBL-based Chemical Bonding Student Worksheets Development for Differentiated Learning

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Abstract:Needs Analysis of PBL-based Chemical Bonding Student Worksheets Development for Differentiated Learning. This study aims to analyze the needs of teaching materials that are expected to help the learning process on chemical bonding material. The subjects of this study were 2 chemistry teachers and 30 students of class XI SMAN 2 Padang and 18 students of class X SMA Pembangunan Laboratorium UNP. This research method is the first step in the Plomp model development process, namely preliminary research where thera are stages of needs analysis, literature review and development of conceptual framework. The instruments in this study were interviews with 2 chemistry teachers and a need analysis questionnaire given to students. The results showed that differentiated learning was still not applied by teachers and the unavailability of teaching materials according to the needs of students on chemical bonding matrial using liveworksheets. This conclusion of this study requires PBL-based student worksheets using liveworksheets which are expected to help teachers and students during the differentiated learning process on chemical bonding material.

Keywords: PBL, Chemical Bonds, Differentiated Learning, Liveworksheets.

Abstrak:Analisis Kebutuhan Pengembangan LKPD Ikatan Kimia berbasis PBL untuk Pembelajaran Berdiferensiasi. *Penelitian ini bertujuan untuk menganalisis kebutuhan bahan ajar yang diharapkan dapat membantu proses pembelajaran pada materi ikatan kimia. Subjek penelitian ini adalah 2 orang guru kimia serta 30 orang peserta didik kelas XI SMAN 2 Padang dan 18 orang peserta didik kelas X SMAN Pembangunan Laboratorium UNP. Metode penelitian ini merupakan langkah pertama dalam proses pengembangan model Plomp, yaitu penelitian awal dimana terdapat tahap analisis kebutuhan, tinjauan literatur dan pengembangan konseptual. Instrumen dalam penelitian ini adalah wawancara dengan 2 orang guru kimia dan angket analisis kebutuhan yang diberikan kepada peserta didik. Hasil penelitian menunjukkan bahwa pembelajaran berdiferensiasi masih belum diterapkan oleh guru serta belum tersedianya bahan ajar sesuai dengan kebutuhan peserta didik pada materi ikatan kimia menggunakan* liveworksheets. *Kesimpulan dari penelitian ini dibutuhkan LKPD berbasis PBL menggunakan* liveworksheets *yang diharapkan dapat membantu guru dan peserta didik selama proses pembelajaran berdiferensiasi pada materi ikatan kimia.*

Kata kunci: *PBL, Ikatan Kimia, Pembelajaran Berdiferensiasi,* Liveworksheets.

▪ INTRODUCTION

Merdeka Curriculum is a curriculum approach that offers variety in intracurricular learning. In this system, learning materials are taught in greater depth, giving learners sufficient time to understand concepts and strengthen their competencies. Teachers in Merdeka Curriculum are given the freedom to choose various teaching aids, allowing for customization of learning according to learners' needs and interests. This curriculum approach emphasizes freedom and creative thingking (Rahayu et al., 2022). One method to meet the needs and interests of learners in the Merdeka Curriculum is through the implementation of differentiated learning (Aprima & Sari, 2022).

Differentiated learning refers to the attempt to customize the learning process in the classroom by taking into account the individual needs of learners (Tomlinson, 2001). Differentiated learning is one of the most effective approaches to use (Bayumi, 2021). In the concept proposed by Tomlinson (1999), differentiated learning includes incorporating individual differences to achieve better understanding, idea development and expression. The individual needs of each learner may vary, one of which is related to learning style. There are three types of learning styles, namely auditory, visual and kinesthethic (Marlina, 2019). Nevertheless, the inadequacy of learning media caused teachers to use lecture and question and answer methods, which resulted in a lack of enthusiasm from the learners and some of them had difficulty adjusting their learning styles to the methods applied by the teacher (Hafizha et al., 2022). In line with this view, it can be concluded that the application of differentiated learning can increasr students interest during learning, such as increased student involvement in asking questions or providing answers (Umbara, 2017). The results of Az & Aini (2023), show that the learning outcomes of students using differentiated learning have increased significantly.

Wahyuni (2022) notes that the integration of differentiated learning with learning models such as problem-based learning (PBL), taking into account learning styles. Can give learners the opportunity to combine their knowledge.This aims to achieve deeper understanding and facilitate more effective problem solving. PBL not only gives learners the opportunity to hone their problem-solving skills, but also helps the identify and seek the necessary knowledge. The advantage of PBL, compared to other learning models, lies in encouraging learners to take full responsibility for their own learning process, while increasing motivation through the application of real-life scenarios.

One of the topics in chemistry learning in class XI phase F is chemical bonding, which involves concepts that tend to be abstract. According to Fitria & Sutiani (2022), in-depth understanding of concepts and analysis is needed in learning chemical bonding material, so this material is considered a difficult material. According to Malik (2019), learners' intersts in this material is lacking from the beginning, and their understanding of the concept is also limited. As an applicative material, alternatives are needed to increase students' learning motivation, one of which is through the use of interactive teaching materials. One option is an interactive student worksheets.

Interactive student worksheet is included in information technology that can be utilized by teachers to develop student worksheets through a web-based application called liveworksheets. According to Suryaningsih (2021), liveworksheets is a website that allows teachers to convert printed student worksheets into electronic versions for free. The advantage of liveworksheets lis in the ease of accessibility, where teachers can create student worksheets independently. This website provides an additional advantage, namely learners can access it easily in various places and at any time. In addition, learners can also receive immediate feedback after completing the tasks on the student worksheets.

▪ METHOD

This research is the first step in the development process of the Plomp model. Plomp suggest that in development research there are three stages, namely preliminary research, development or prototyping phase and assessment phase (Nieveen & Folmer, 2013). In the preliminary research, a needs analysis, literature review and development of conceptual framework were carried out, this was done to find out the learning problems in schools, especially on the topic of chemical bonds.

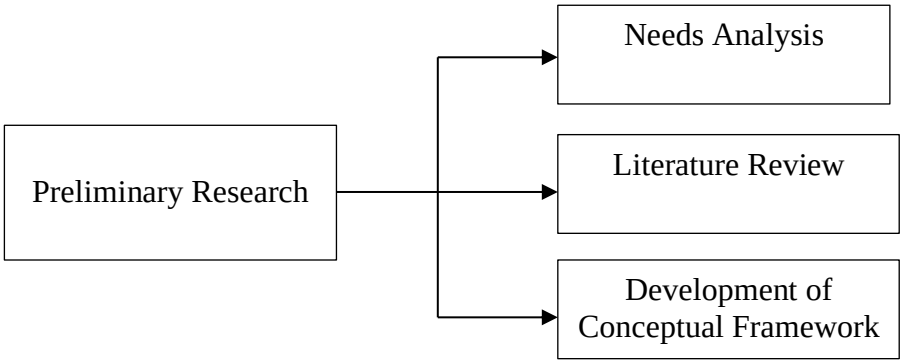

Figure 1. Stage of Preliminary Research

This research was conducted in the even semester of the 2022/2023 academic year at two high schools, SMAN 2 Padang and SMA Pembangunan Laboratorium UNP. The subjects of this study were teachers and students of class XI Phase F. Data collection techniques were carried out by interviewing teachers and distributing questionnaires to students to obtain information. Data analysis techniques for this research used qualitative descriptive analysis techniques. Interviews to teachers conducted for teacher needs analysis and distributing questionnaires to students for student need analysis. After that, the results of interview given by teachers in interviews and answers given by students in answering questionnaires. The results of the interviews and questionnaires were analyzed to determine the needs of students for the student worksheets that ws developed where this student worksheets was able to increase student learning motivation.

Then continued the literature review and conceptual framework, the literature review is an effort to find and understand relevant information about the product to be designed, as well as analyze the surrounding conditions related to the learning process of chemical bonding material. Meanwhile, the conceptual framework includes the results of the needs analysis and literature review that has been carried out. This conceptual framework contains concepts that have been identified, serving as guidelines in the development of student worksheets.

▪ RESULT AND DISCUSSION

Preliminary research began with evaluating needs, conducting a literature review and developing a conceptual framework. The results of this stage were used as the basis for designing the initial student worksheets.

Needs Analysis

The needs analysis was obtained from the results of interviews with 2 chemistry teachers at SMAN 2 Padang and SMA Pembangunan Laboratorium. The results of the interview found that the learning methods implemented were still discussion and lecture methods. Then, the implementation of differentiated learning has not been implemented due to limited teacher knowledge related to differentiated learning and the unavailability of teaching materials that are in accordance with the needs of students. Teachers need adequate teaching materials of facilitate the implementation of differentiated learning (Putri, 2024). One of the materials that are difficult to understand is chemical bonding, the teacher said that students have difficulty when determining valence electrons and reaction equations. Learners also revealed that his material has many reactions, can be seen Table 1.

Table 1. Results of Analysis of Difficulty Questionnaire on Chemical Bonding Material for Students

Statement	Results (%)
Materi bersifat abstrak	33,4%
Materi bersifat hafalan	37,5%
Materi memiliki banyak reaksi	64,6%

Literature Review

The purpose of the literature review is to find and understand the literature and references related to the development project to be carried out. Based on the literature review, it was found that Merdeka curriculum has a close relationship with differentiated learning (Sulistyosari et al., 2022). Apriyantini (2023) found that if mathematics learning is applied using E-LKPD and a differentiated approach, there will be an increase in student learning activeness. In addition, research conducted by Sutinah & Ristiana (2023) found that the use of differentiated student worksheets can effect the improvement of students mathematical understanding according to their learning style.

According to Wahyuni (2022), the integration of differentiated learning with learning models such as PBL, by paying attention to learning style, can give students the opportunity to combine their knowledge. Student worksheets is one of the teaching aids utilized bye teachers during the learning process. The tasks presented in the student worksheets aim to facilitate concept understanding for students (Prastowo, 2014). Student worksheets can alsi be made interactively using a website called liveworksheets. Ramdani (2022) stated in his research that liveworksheets media in the PBL model has an influence on student learning outcomes.

Development of Conceptual Framework

The problems obtained based on the needs analysis and literature review that the implementation of differentiated learning has not been implemented due to limited teacher knowledge related to differentiated learning and the unavailability of teaching materials that are in accordance with the needs of students, especially in terms of learning profiles such as learning style. Therefore, there is a need for teaching materials in the form of student worksheets that can guide students to understand chemical bonding material according to the learning style of students. Chemical bonding material is considered difficult to understand by because students think there are many reactions in this material. To overcome this problem, a PBL student worksheets was develop as support for differentiated learning on phase F chemical bonding material.

▪ CONCLUSION

Based on data analysis at SMAN 2 Padang and SMA Pembangunan Laboratorium, it was found that although both schools have implemented the Merdeka Curriculum, they have not implemented differentiated learning. This is due to the limited knowledge of teachers regarding differentiated learning. So far, teachers provide learning materials without making adjustments according to students needs. The results of the preliminary research also show that the learning model used is still discovery learning or inquiry learning. Teachers and students hope that the development of interesting teaching materials, in accordance with technological developments, can help them implement differentiated learning. In addition, it is expected that the material in the teaching materials can also be adapted to the PBL model ini everyday life so that learning becomes more meaningful.

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