



The Need Analysis of E-Module Development Combined with KingDraw Application on Isomer Material at SMA Al Islam 1 Surakarta

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Abstract: This research was conducted with the aim of analyzing the need for the development of a chemistry e-module combined with the KingDraw application on isomer material at SMA Al Islam 1 Surakarta. This study uses a survey methodology with a qualitative approach. Data were obtained from interviews with chemistry teachers and the results of filling out questionnaires by 84 students. The results of this study indicate that teachers have not developed technology-based teaching materials that can help students in learning chemistry. The teaching materials used are in the form of textbooks containing writings and several two-dimensional images. Thus, it can be said that learning is still conventional and has not followed the development of the digitalization era. This is indicated by the minimal use of technology in learning activities. In learning, teachers only rely on lecture and discussion methods. Therefore, it can be concluded that the development of a chemistry e-module collaborated with the KingDraw application needs to be implemented to motivate students to learn and improve their understanding of chemical concepts independently. This module can also be used anytime and anywhere.

Keywords : E-modul, KingDraw, Isomer

1. INTRODUCTION

The development of information and communication technology (ICT) has had a significant impact on the world of education. In this digital era, teachers must be able to apply technology and information in learning activities. The application of technology in learning is an important part of supporting education today. Technology has become an inseparable part of the learning process, including in chemistry learning (Prasetyo, 2021).

Chemistry learning has its own challenges because it involves many abstract concepts, such as molecular structure, chemical reactions, and properties of matter (Santoso & Lestari, 2020). This is what causes chemistry to be one of the materials considered difficult by students at school. This difficulty is caused by students' lack of interest and activity in learning (Iswara et al., 2020).

One of the chemistry materials taught at the 12th grade high school level is isomer material. Isomers material in chemistry learning is an important topic because it is closely related to the concept of molecular structure and the properties of organic compounds. Isomers include various types, such as structural isomers and stereoisomers, which require a deep understanding of the spatial arrangement of molecules and the relationships between atoms in a compound. However, in practice, students often have difficulty understanding this material.

This is due to the abstract nature of the isomer concept which is difficult to visualize without the help of adequate learning media (Hidayati & Wibowo, 2020).

The main difficulties faced by students in learning isomer material include limitations in understanding the representation of molecular structures in two and three dimensions, lack of understanding of the differences in properties between isomers, and challenges in identifying the types of isomers correctly (Sutrisno, 2019). In addition, conventional learning methods that often only rely on verbal explanations and representations on the blackboard are less effective in helping students understand the spatial concepts in this material.

In an effort to improve the quality of chemistry learning, the use of educational technology is one of the solutions that is widely developed. One relevant innovation is e-module, which is a digital-based learning module that can present material in a more interesting, interactive, and flexible way (Haryanti et al., 2021). With this, learning can be more interesting by applying technology, information, and communication as constructive learning aids to increase motivation and stimulate students' curiosity (Hoftein & Lunetta, 2004). One of the challenging topics for students to understand and teachers to teach is the three-dimensional (3D) visualization of molecules and their stereochemistry (Abdinejad et al., 2021). Visualizing 2D images into 3D in a module, teaching materials, and textbooks is a competency needed to make it easier for students to understand chemistry. The existence of conventional and limited learning resources is an obstacle for students in obtaining material.

The lack of varied learning media makes learning activities less interesting so that students feel bored and less enthusiastic. In teaching and learning activities, teachers use more lecture methods in delivering material. Because students only listen and take notes, the results of learning activities in the classroom are less than optimal. The existing modules are still conventional such as textbooks, so that with the addition of illustrations integrated with the website, it can improve the readability of a learning module (Yusro & Sasono, 2016).

Website-based chemistry e-modules are expected to be an effective solution to overcome the limitations of conventional methods, especially because they are able to integrate various media formats such as text, animation, video, simulation, and interactive exercises (Santoso & Lestari, 2020). This media provides students with the opportunity to understand isomer material through a more in-depth visual and practical approach combined with the KingDraw application. The KingDraw application is a digital-based software for drawing and visualizing chemical structures, and has great potential for use in isomer learning. With interactive 2D and 3D visualization features, this application can help students understand molecular structures and relationships between isomers more clearly (Pratama & Nugroho,

2022). The combination of e-modules and the KingDraw application is expected to provide a more interesting and effective learning experience for students. In addition, website-based learning encourages students to learn independently and increases their involvement in the learning process. With its interactive features, students can explore chemical concepts that are difficult to understand in class, such as visualizing molecular structures in 3D. Several studies have shown that the use of websites in chemistry learning not only improves students' learning outcomes but also their interest in learning (Rahmawati et al., 2022).

The development of e-modules integrated with the KingDraw application requires a comprehensive needs analysis. This analysis aims to ensure that the e-modules developed are in accordance with student needs, the applicable curriculum, and challenges in chemistry learning. Therefore, this needs analysis is important to identify obstacles and potentials in learning isomer material. This study aims to examine the need for developing e-modules that are collaborated with the KingDraw application, so that they can support a more interactive, innovative, and relevant chemistry learning process to students' needs.

2. METHODS

This study is a development research that aims to develop an e-module that is combined with the KingDraw application. The development has been done by following the Borg and Gall development model. The method used in this study is a qualitative descriptive method. Data obtained and collected through interviews and questionnaires. The subjects in this study were chemistry teachers and 84 students of SMA Al Islam 1 Surakarta who had studied isomer material. Data were obtained from the results of interviews with chemistry teachers and questionnaires distributed to students.

3. RESULTS

The results of teacher and student needs obtained are presented in Tables 1 and 2.

Tabel 1. The Students Needs Quetionnaires

No	Statement	Answer Choice	
		Yes (%)	No (%)
1.	In the teaching and learning process, teachers often use lecture and discussion methods.	97.6	2.4
2.	So far, my activities in learning chemistry have mostly involved writing theories.	58.3	41.7
3.	With the learning module, it can increase my motivation in learning.	91.7	8.3
4.	In addition to printed chemistry books, teachers also have other teaching materials or textbooks that are used in the teaching and learning process.	95.2	4.8
5.	I have difficulty in learning the concept of isomer material contained in printed books.	70.2	29.8
6.	Chemistry is one of the subjects that I find difficult to learn.	75	25
7.	The teacher uses teaching materials equipped with visual aids to help me understand chemical concepts.	77.4	22.6
8.	With the existence of interesting and innovative learning modules, it can increase my motivation in learning.	96.4	3.6
9.	I need other learning media such as interactive modules or e-modules combined with the KingDraw application on isomer material so that I can understand the material more easily.	98.8	1.2
10.	I have an android smartphone and sometimes I bring it to school	95.2	4.8
11.	I agree with the development of innovative, interesting and easy to understand learning media, for example e- modules combined with the KingDraw application.	97.6	2.4

Tabel 2. Chemistry Teacher Need analysis

No	Questions	Answers
1.	Based on your observations, what is the cause of students' difficulties in chemistry material? Is it the part of students' understanding of the material/understanding of concepts?	Some students have difficulty understanding the concept of isomerism because it is abstract.
2.	How is the students' understanding of the isomer material?	Some students have poor understanding.
3.	What difficulties do teachers and students experience during learning?	Understanding the types of isomers, some students have insufficient basic knowledge of IUPAC.

4.	What efforts have you taken to overcome students' learning difficulties?	Teaching concepts in an easy way, starting from easy to difficult.
5.	What methods are often used in the learning process? Are the methods used effective enough in classroom learning?	Discovery learning, but combined with teacher center, considering the lack of initial understanding in students.
6.	Do you use teaching materials in teaching chemistry?	Yes, using chemistry texts and other references from the internet.
7.	Have you ever created your own modules and shared them with students to help them understand chemistry material?	Create a discussion worksheet.
8.	In the process of learning chemistry in class, do you often use learning media?	Not often.
9.	In your opinion, do the learning resources used contain the three levels of chemical representation?	A well-utilized chemistry textbook already contains all three levels, but not to the maximum.
10.	Can the learning resources used encourage students' motivation and enthusiasm in learning chemistry?	Has not reached students optimally.
11.	Do you know about the KingDraw application for depicting chemical structures in 3D?	Not very familiar yet.
12.	Do you allow students to use smartphones/laptops in class?	Only the learning syntax is required.
13.	Do you need a teaching module that is collaborated with the KingDraw application to visualize in 3D to teach isomer material?	It is very necessary, because one of the obstacles for students in understanding the material is the lack of visualization of this material.

4. DISCUSSION

The results of the analysis of student and teacher needs show that the chemistry learning process, especially on isomer material, still faces various challenges. The majority of teachers tend to use lecture and discussion methods (97.6%), which although useful, are less effective in helping students understand abstract chemical material such as isomers. Most students stated that learning activities so far tend to focus on writing theories, while the use of visual aids is still not optimal. This condition has implications for student understanding, where 70.2% of students admit that it is difficult to learn the concept of isomers through printed

books.

Based on the interview results, the main difficulty for students in learning isomer material lies in understanding the concept, which is abstract and requires good visualization skills. Students tend to have a less in-depth understanding, especially in recognizing the types of isomers and molecular structures, due to limited basic knowledge such as IUPAC nomenclature which is an important foundation in studying isomers. This difficulty is in line with the findings of Hidayati & Wibowo (2020) which states that the abstract nature of chemical material is a major challenge in learning.

Teachers try to overcome these difficulties by teaching concepts gradually, starting from easy concepts to more complex ones. The use of teaching materials such as printed books and discussion worksheets has also been used, but is not yet fully adequate. This approach is taken because students have a lack of initial understanding. However, limitations in the use of learning media are a significant obstacle. Media such as chemistry textbooks already contain all three levels of chemical representation (macroscopic, microscopic, and symbolic), but their use has not been maximized in encouraging student understanding (Putri & Kurniawan, 2022).

As many as 96.4% of students agreed that interesting and innovative learning modules can increase their learning motivation. Students also stated that they need other learning media, such as interactive e-modules collaborated with the KingDraw application to facilitate understanding of the concept of isomers through 3D structure visualization. This is in line with the results of interviews with teachers, the use of teaching modules collaborated with technology such as the KingDraw application is considered very necessary. This application has the ability to visualize chemical structures in 3D so that it can help overcome students' difficulties in understanding abstract concepts. In line with Susilo's opinion (2019), the use of technology in chemistry learning, such as interactive e-modules and visual applications, can improve conceptual understanding and motivate students in learning. In addition, Wibowo & Triyono (2020) emphasized that innovative learning media can clarify complex material, so that students find it easier to understand and apply it.

5. CONCLUSION

From the results of this study, it is concluded that it is necessary to develop an interactive e-module that is collaborated with the KingDraw application to facilitate understanding of the concept of isomers through 3D structure visualization. This can help students overcome the low understanding and interest of students in chemistry. Through this

e-module, submicroscopic material can be viewed statically, so that it can facilitate teachers in the learning process. Students can achieve conceptual understanding because it displays levels that cannot be observed. In addition, it can help teachers to carry out optimal learning by actively involving students in learning activities. Therefore, this study will develop a chemistry e-module that is collaborated with the KingDraw application on isomer material.

LIMITATION

This study is limited to analyzing the need for an e-module combined with the KingDraw application for isomer material at SMA Al Islam 1 Surakarta, restricting the generalizability of its findings. The small sample size and lack of diversity further narrow its applicability to other educational settings. Reliance on qualitative data introduces subjectivity, while the exclusive focus on the KingDraw application overlooks alternative technologies. Additionally, the study does not include the development or evaluation of the proposed e-module, nor does it address potential barriers such as limited technology access or digital literacy. These limitations suggest the need for broader and more comprehensive future research.

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