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Relevance and Consistency of Lithium Application Learning Media for High School Students on Chemical Equilibrium Material

***Dewi Masyitha & Afadil**
Program Studi Pendidikan Kimia / FKIP – Universitas Tadulako, Palu - Indonesia 94119

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Abstract

Conditions of the Covid-19 pandemic require teachers and students to innovate starting from the preparation, process, and assessment of learning. This study aims to design and determine the relevance and consistency of Lithium application learning media for high school students on chemical equilibrium in the form of e-modules as a solution to reduce misconceptions. This type of research is a part of research and development (R&D) starting from product design to determining its theoretical relevance and consistency by experts. The product produced is in the form of an e-module on chemical balance material using Android with the Lithium application which is used by students in online learning during the Covid-19 pandemic. The instrument used was a questionnaire on the feasibility of learning media, the suitability of the material, and the Lithium application. The results of the evaluation of the media expert validator and the material expert respectively obtained the value of relevance and consistency of 3.15 (valid); 3.00 (valid); and 3.65 (very valid). This means that the Lithium application can be used as an online learning medium by utilizing Android as a solution to reduce high school students' misconceptions of chemical equilibrium material.

Keywords: Lithium applications, learning media, chemical equilibrium

Introduction

Technology creates opportunities for innovation and development of learning media that makes valuable contributions to various institutions and is considered the future of education (Abaidoo & Arkorful, 2014; Haleem et al., 2022). In the current era of globalization, learning tools are very important to support a good and effective learning process (Carreon, 2018; Malik, 2018). The use of media in education plays an important role in the learning process. Learning media can help teachers optimize the learning process, and concrete concepts, motivate students, and bridge critical thinking skills (Masykur, 2017).

The role of independent learning media during the Covid-19 pandemic is urgently needed by teachers and students in the learning process. The use of multimedia in the learning process can be applied to the preparation of teaching materials, Student Worksheets (LKPD), and the assessment process (Suryani, 2020; Hasanah et al., 2021). One of the independent learning media that can be used by teachers and students via Android is the application *Lithium*.

Learning media that make use of the Lithium application is an application that makes it easy for students to open, read, and manage digital books. The Lithium application can open books or learning modules to make it easier for students to learn at home, school, and anywhere. This application has various types of features, including: (1) Lithium can scan files that are compatible with smartphones. This application makes it easy for students to learn online without having to search for books manually, (2) this application is included in the EPUB (Electronic Publication) Reader. EPUB is an international open document format for digital publication which is increasingly being used because it has no license restrictions and is easy to use, and (3) the Lithium application functions as a long-term file storage in the form of text, metadata, and multimedia contained in EPUB files that can be easily exported to another file format (Chang, 2018). Therefore, the use of Lithium application learning media can be used by teachers in developing teaching materials and assessment processes *online*.

This research is to develop learning media for applications *Lithium* by utilizing technology on Android by designing and validating the media so that it can be used as a solution in reducing the misconceptions of high school students on chemical balance material.

*Correspondence:
Dewi Masyitha
e-mail: dewimasyitha08@gmail.com

Method

The type of research is Research and Development (R & D). Sugiyono (2016) explains that R & D is a type of research used to produce certain products and test the quality of these products. According to Nieveen (2007), one of the qualities of learning products is it a model, method, or strategy must have validity that includes relevance (content validity) and consistency (construct validity). This research was conducted at the Chemistry Education Study Program, FKIP, Tadulako University, Palu. The results of the e-module design in the Lithium application are then theoretically validated. The instruments used were in the form of a feasibility questionnaire for instructional media, the suitability of the material, and the Lithium application which were assessed by media expert validators and chemists.

The research design was adapted from the Research and Development (R & D) stage of research referring to the stages of Borg and Gall (1983) which were modified by Sukmadinata (2012) following the stages: (1) preliminary study, (2) model development, (3) product testing/implementation. And this research was conducted up to product validation to determine the validity of the product in reducing student misconceptions about chemical equilibrium material.

Validation data from media experts and material experts are categorized based on the degree of validity reference.

Table 1. Criteria and category degree of validity

Criteria	Category
$3.25 < S \leq 4$	Very Valid
$2.5 < S \leq 3.25$	Valid
$1.75 < S \leq 2.5$	Less Valid
$1 \leq S \leq 1.75$	Invalid

Device learning has a good degree of validity if the average expert judgment of each aspect (S) is within the minimum valid criteria or $S \geq 2.5$ (Dwiningsih, 2018).

Result and Discussion

Development of instructional media starts from a preliminary study related to e-module design, the design process, and validation of e-modules in the Lithium application. The e-module designed and designed in this application contains chemical equilibrium material that can be used to reduce student misconceptions. The following shows the average results of the validators regarding the feasibility of learning media.

Table 2. Data on the results of the validation of instructional media experts.

Assessment Aspect	Average per Aspect of	Category
Technical Quality	3.10	Valid
Media Aspect	3.20	Valid
Average	3.15	Valid

Aspects of technical quality assessment obtained an average of 3.10; the aspect of media assessment obtained an average of 3.20; so the total average validation of instructional media experts is 3.15 in the valid category.

Table 3. Data on the results of the validation of material experts

Assessment Aspect	Average per Aspect of	Category
Media	3.00	Valid
Material Conformity	3.00	Valid
Average	3.00	Valid

Aspects of media assessment obtained an average of 3.00; the aspect of conformity assessment of the material obtained an average of 3.00; so the total average validation of material experts is 3.00 in the valid category.

Table 4. Data on the validation results of application media experts' lithium

Assessment Aspect	Average per Aspect of	Category
Physical display	4.00	Very Valid
Consistency and relevance to learning using applications of *lithium*	3.70	Very Valid
Interaction in learning using applications of *lithium*	3.25	Very Valid
Usefulness/support for learning using applications of *lithium*	3.70	Very Valid
Average	3.65	Valid

The aspect of assessment in terms of physical appearance obtained an average of 4.00; the aspect of assessing the consistency and relevance of learning using applications *lithium* an average of 3.70; aspects of interaction assessment in learning using applications *lithium* obtained an average of 3.25; the last aspect of the assessment, namely the use/support of learning using applications *lithium* obtained an average of 3.70; so that the total average obtained is 3.65 in the very valid category.

Understanding the concept of chemistry in chemistry learning is very important. Students often have difficulty understanding various chemical materials that are generally abstract (Raisul et al., 2020). According to Suparno (2013), the factors that cause student misconceptions include (a) student preconceptions (b) associative thinking, (c) wrong intuition, (f) cognitive development stage, (g) IQ ability, and (h) interest to learn. Efforts to handle it can be done by finalizing the material concept and designing an attractive learning media (Astuti et al., 2017; Arofah & Rinaningsih, 2021) so that students who take part in learning with great enthusiasm and enthusiasm both at school and home during the Covid-19 pandemic conditions. Therefore, in the learning process during the Covid-19 pandemic, online learning media that are content-valid (relevance) and construct-valid (consistency) are needed.

The relevance and consistency of Lithium application learning media are one of the requirements for developing learning tools that must be met to obtain good quality learning media. Based on the results of the media expert's validation regarding the feasibility and form of the Lithium application developed, the average values were 3.15 and 3.65. This means that from the physical aspects and functions of this media, it is suitable to be used in the online learning process in the Chemical Equilibrium material. This is following the statement of Nieveen (2007) that the development of learning tools must have relevance and consistency. Relevance means that the components of the learning device are based on strong theoretical rationale *(state-of-the-art knowledge)*, while the consistency of a tool is good if the components are *internally consistent* without contradicting each other (Diani & Hartarti, 2018).

The design of the Lithium application which contains the e-module of chemical equilibrium material is intended to reduce student misconceptions about the material. To achieve the design objectives, a relevance and consistency test was carried out. Based on the results of the theoretical validation carried out by the chemical expert validator, the average value is 3.00 or is in the valid category. This shows that the chemical equilibrium e-module developed in the Lithium application contains material that is relevant to everyday life, is clear, is interesting for high school students, and is under the 2013 Curriculum. This condition helps students understand the concept well so that it can reduce misconceptions about chemical equilibrium material (Meliza et al., 2021). According to Afadil & Diah (2018) and Mentari et al. (2014), the occurrence of misconceptions about a chemical concept generally occurs because of the abstract nature of the material provided by the teacher. Therefore, this Lithium application learning media is designed by the conditions that are relevant to the real conditions faced by teachers and students. Based on the value of relevance and consistency obtained in this study, it shows that the *lithium* application can be used as a good learning medium for high school students as a solution to reduce student misconceptions online.

Conclusions

Value of the relevance and consistency of learning media with Lithium applications in theory by media experts and material experts from the aspects of the feasibility of learning media, material suitability, and Lithium application, respectively, is 3.15 (valid); 3.00 (valid); and 3.65 (very valid). This means that the Lithium application can be used as an online learning medium by utilizing Android as a solution to reduce high school students' misconceptions of Chemical Equilibrium material densification process at 100 °C after delignification increases elasticity, flexural fracture resistance, and surface hardness. This result is supported by the morphological analysis of wood which shows better pore density by delignification before the thermomechanical densification process.

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