



## Validity and Response to the Go-Lab ILS Platform Assisted E-Module on Light Wave Material

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### Key Words:

e-module  
go-lab ILS platform  
light wave material  
response

### Abstract:

This study aims to determine the validity and response to e-modules assisted by the ILS Go-Lab platform on light wave material. This research is an R&D (research and development) study with the ADDIE model. The product has been validated by three experts. Responses to the use of e-modules assisted by the ILS Go-Lab platform on light wave material were obtained from the responses of MA Siti Mariam Banjarmasin students. Data was collected using a questionnaire instrument. The data were analyzed using qualitative and quantitative descriptive analysis. The e-module was declared very valid, with an average percentage of 90.40% from material experts and 95.56% from media experts. The ILS Go-Lab platform is declared very valid, with an average percentage of 94.17% from material experts and 96.67% from media experts. Student responses to the use of the E-module and ILS Go-Lab Platform were stated to be very good, with an average percentage of 90.51% for the e-module and 90.08% for the ILS Go-Lab platform. It can be concluded that the ILS Go-Lab platform-assisted learning e-module on light waves material is stated to be very valid and gets a very good response from students.

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## Introduction

Learning that implements the 2013 curriculum (K13) emphasizes student-centered learning ([Iftirani et al., 2019](#); [Pertiwi et al., 2022](#)). Implementation of K13 in learning activities provides more active and enjoyable learning. The K13 curriculum makes teachers act as facilitators in implementing learning activities in the classroom. As a facilitator, the teacher designs learning strategies, models, methods, and teaching materials so innovative that learning activities will be varied and interesting. Varied and interesting learning will increase students' desire and enthusiasm for learning, including learning physics at school.

Physics learning is a process of learning activities that discusses matter and its interaction with the environment, which includes motion and energy. Abstracts, complex discussion topics, and many formulas make learning physics difficult for many students ([Yoshua et al., 2022](#)). Light waves are one of the physics materials that some students consider difficult. According to [Siallagan, Jufrida, and Pathoni \(2018\)](#) dimana 68% of students stated that light waves were material that was difficult to learn.

Teacher creativity is needed in designing learning, including teaching materials that utilize various teaching media to make light wave material easy to understand. According to [Abdullah \(2019\)](#), teacher creativity still needs to improve in maximizing learning media. Apart from that, laboratory media is also vital in learning light waves because light wave material is difficult to visualize without supporting media ([Farida, 2023](#)), so it is important to have laboratory facilities and infrastructure in schools.

Based on the results of interviews with physics teachers, the use of teaching materials in schools is not yet varied, and the implementation of learning activities still uses image media contained in printed LKS. Meanwhile, the physics teacher stated that light wave material is difficult to teach without supporting media, such as visual media. The lack of laboratory facilities and infrastructure is also an obstacle to implementing practical activities at school. Other teaching materials are needed, such as learning e-modules containing virtual laboratories so that learning about light waves is easy to understand and learning can be in-depth.

An e-module or electronic module is a digital form of a module. The module itself is one of the teaching materials that students can study. Because it is studied independently, the module must be arranged systematically and presented clearly and completely in one piece ([Pratiwi et al., 2020](#)). Therefore, the character of the module itself is self-instructional (can be studied independently), self-contained (presented completely and thoroughly), stand-alone (stands alone without relying on other sources/media), adaptive (can adapt to developments in science and technology), and user-friendly (considering the user's circumstances) ([Kokasih, 2021](#)). E-modules as digital teaching materials also need to pay attention to the criteria for good digital teaching materials, namely: subject matter (related to the topic of discussion), auxiliary information (additional information that supports), affective consideration (related to media that motivates learning), interface (related to with appearance), navigation (related to how to move pages), pedagogy (related to interaction and media to add/check understanding), robustness (related to product durability to avoid errors) ([Kokasih, 2021](#)).

E-Modules can be presented with various interactive media such as audio, video, images, or hyperlink access to connect to a website. With these advantages, e-modules can be integrated with the ILS Go-Lab platform, which includes inquiry-based learning. According to Aslan & Wahyudin (2020) e-modules are more efficient to use than printed modules. Based on research by [Asda & Andromeda \(2021\)](#) -modules supported by the inquiry learning model can improve student learning outcomes. Apart from that, E-modules that apply the inquiry model can increase understanding of concepts and interest in learning ([Aulia, 2022](#)). Guided inquiry-based e-modules can also improve students' critical thinking abilities ([Triandini et al., 2021](#)).

The Go-Lab ILS platform is one of the platforms in the Go-Lab ecosystem. Go-Lab (Global Online Science Labs for Inquiry Learning) is a digital learning ecosystem that includes virtual laboratories, multimedia, and inquiry learning applications ([de Jong et al., 2021](#)). ILS is an abbreviation for inquiry learning space, often called inquiry learning space. Inquiry Learning Space (ILS) is a digital space where students interact with learning materials, including applications, virtual laboratories, and other multimedia (text, video, and images). Inquiry Learning Space is a digital space in which Inquiry-Based Learning is integrated. In ILS, there are learning phases called inquiry phases. Inquiry phases consist of 5 phases: orientation, conceptualization, investigation, conclusion, and discussion ([Pedaste et al., 2015](#)). The relationship between the phases in inquiry phases is called inquiry cycles.

ILS can contain a virtual laboratory for students to carry out experiments. Learning using virtual laboratory media will clarify abstract physical concepts ([Kalsum et al., 2019](#)). It aligns with research conducted by [Muzaki et al. \(2022\)](#) who found that using Go-Lab increases students' conceptual understanding. Using the ILS Go-Lab platform makes learning easier for students and presents the latest, fun learning ([Coenders et al., 2020](#)). The applications available in Go-Lab, such as hypothesis, scratchpad, table tool, file drop, question column, and others, facilitate students' learning experience to learn actively and creatively because they are supported by investigative activities ([Sierra et al., 2020](#)). Thus, using Go-Lab supports students in learning the science process ([Tamami & Rahmatullah, 2021](#)).

Based on this review, a learning e-module on light waves, assisted by the ILS Go-Lab platform, was developed. This research aims to determine the validity and response to the e-module assisted by the ILS Go-Lab platform on light wave material. It includes the validity of the e-module, the validity of the ILS Go-Lab platform, and the response to product use.

## Research Method

This research used a field research method. This field research uses data obtained from informants, respondents, documentation, and observations of research participants ([Abdussamad, 2021](#)). This research is in the form of R&D (research and development) research with the ADDIE Model (analyze, design, define, develop, and evaluate). The participants in this research were three validators (two physics lecturers and one physics teacher) and class XI and XII students at MA Siti Mariam Banjarmasin, with 18 students.

Data was collected using a questionnaire instrument. The questionnaires used are validity questionnaires and student response questionnaires regarding product use. The data obtained will be analyzed using qualitative and quantitative descriptive analysis techniques. Qualitative descriptive data analysis techniques are used to analyze suggestions and comments from validators regarding products developed to improve products (Perwitasari dkk., 2018). Meanwhile, quantitative descriptive data analysis is used to analyze data in the form of scores from both validity data acquisition scores and data acquisition scores from student responses (Perwitasari et al., 2018).

The ADDIE model used is a model developed by Mollenda in 1990. The ADDIE model is shown in the scheme in Figure 1.

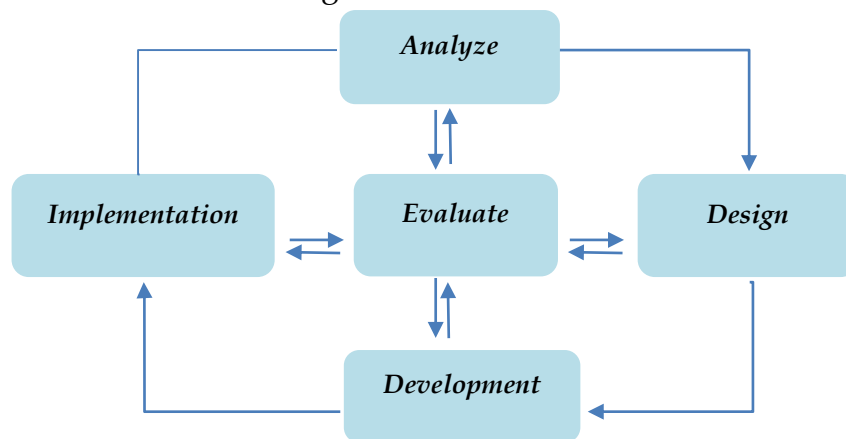


Figure 1. ADDIE Design Model

### Analyze stage

The analysis stage includes teaching needs analysis activities (instructional needs assessment), clarification of teaching needs and determining targets, and analysis of student character (Siswono, 2019). Evaluation at this stage involves selecting solutions to problems found in the field. One of the solutions offered is the development of multimedia teaching materials that are assisted by virtual laboratories integrated with technological developments. Thus, researchers are developing digital modules or e-modules that can contain interactive multimedia and are assisted by the ILS Go-Lab platform as a forum for students to conduct experiments using a virtual laboratory.

### Design stage

The design stage includes an analysis of teaching tasks. What is done is determining the material, writing learning objectives, designing learning strategies (presentation of information, practical activities, self-testing and feedback, and follow-up), and developing assessment instruments (Siswono, 2019). Evaluation at this stage is obtained based on adjusting the design of the product discussion topics to the curriculum and suggestions from the supervisor.

**Development stage**

The development stage includes content writing and graphic design activities arranged to produce the expected product (Siswono, 2019). The results of this development are e-modules and the ILS Go-Lab platform. Evaluation at this stage takes the form of suggestions by the supervisor regarding the product being developed. The results of the development of the Go-Lab e-module and ILS platform are presented respectively in Figure 2 and Figure 3.

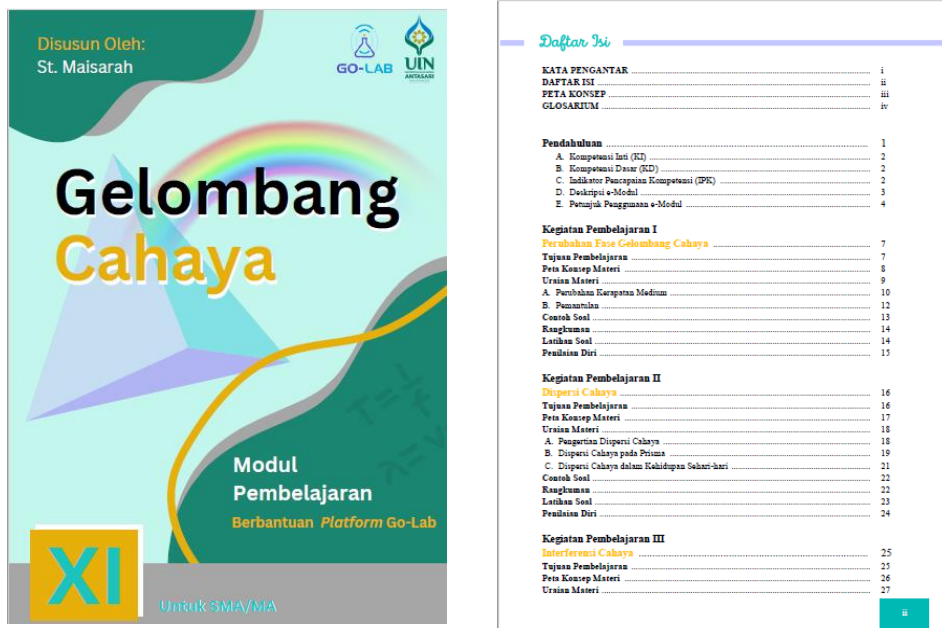


Figure 2. Draft E-Module Assited by Platform ILS Go-Lab on Light Wave Material



Figure 3. Draft Platform ILS Go-Lab on Light Wave Material



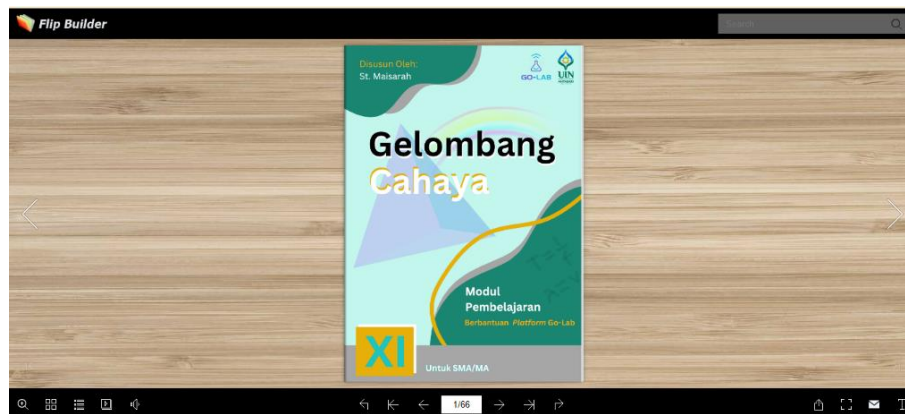


Figure 4. E-Module interface in *Flip PDF Professional Software*

At this stage, product validation is carried out using the Formula offered by [Akbar \(2016\)](#) as follows :

$$V_a = \frac{\sum x}{\sum x_i} \times 100\%$$

Explanation :

$V_a$  : Validity percentage

$\sum x$  : Total assesment score from experts on each aspect

$\sum x_i$  : Maximum total score for each aspect

The product validity criteria based on expert reviews are in Table 1

Table 1. Product Validty Criteria

No.	Validity percentage	Level validity
1	85,01 - 100,00	Very Valid, can be used without revision
2	70,01 - 85,00	Fairly Valid, usable minor revision
3	50,01 - 70,00	Less Valid, can be used with major revision
4	01,00 - 50,00	Invalid, should not be used

Source: (Akbar, 2016)

### Implementation stage

The implementation stage includes activities to revise and deliver the product to students ([Siswono, 2019](#)). Revision activities include revisions to the Go-Lab e-module and ILS platform based on validator comments and suggestions. After the product is revised, the product is delivered to students, and students' responses to product use are taken. According to [Akbar \(2016\)](#), students' responses to product use are analyzed using the following formula and criteria on Table 2:

$$R = \frac{TSe}{TSh} \times 100\%$$

Information :

$R$  : Response percentage

$TSe$  : Total score obtained from each aspect

$TSh$  : Maximum total score on each aspect

Table 2. Student Response Criteria

No.	Response Percentage	Criteria
1	81,00 - 100,00	Very Good
2	61,00 - 80,00	Good
3	41,00 - 60,00	Less
4	21,00 - 40,00	Not good
5	00,00 - 20,00	Very not good

Source: (Akbar, 2016)

Evaluate stage





This evaluation stage includes evaluations related to determining product values based on discussions or improvements (Siswono, 2019). Evaluation includes formative evaluation and summative evaluation. Formative evaluation includes evaluation at the analysis, design, development, and implementation stages, as previously explained.

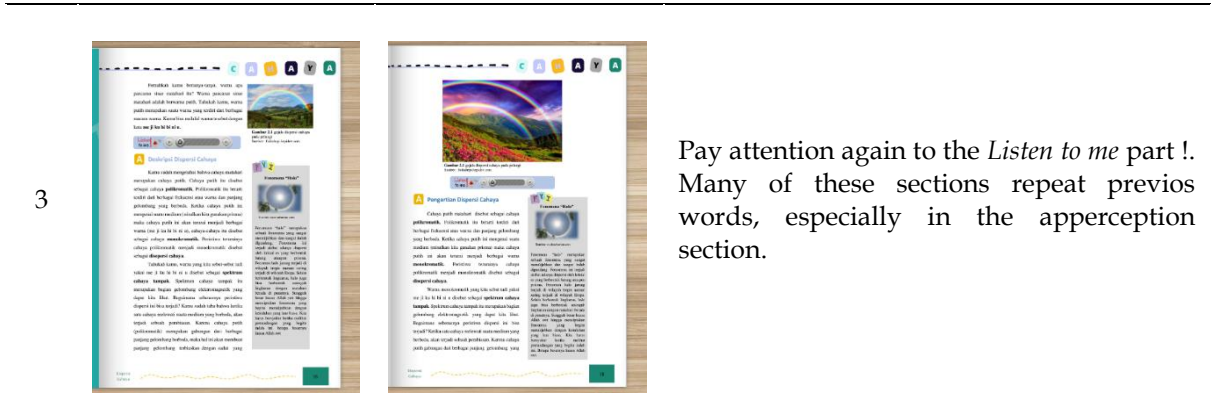
Finding and Discussion

Validity of the e-module assisted by the Go-Lab ILS platform on light wave materials

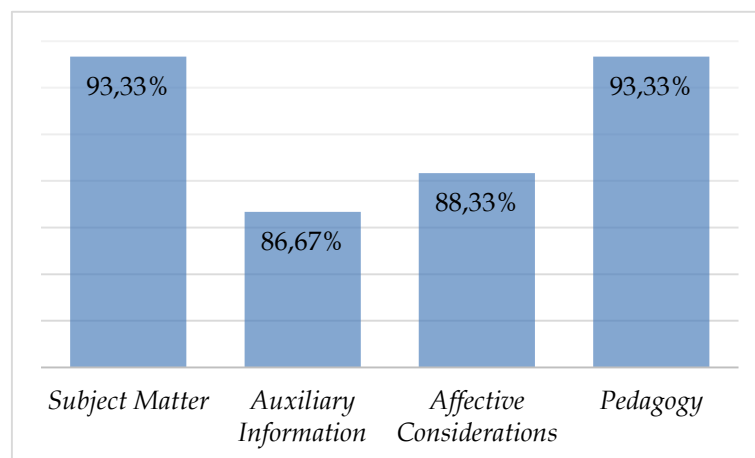
The validity of the e-module based on material expert review is divided into four aspects: subject matter, auxiliary information, affective consideration, and pedagogy. The comments and suggestions from validators are presented in Table 3 below.

Table 3. Validator Comments on the Go-Lab ILS Platform

No.	Before Revision	After Revision	Comment and Suggestion
1			Each objective adds that experiment using Go-Lab's ILS platform.
2			The implement of light wave in technology is presented in video



The results of the validity of the e-module are presented in Figure 5. Overall, the material aspect has an average validity percentage of 90.40% with very valid criteria. If we look at each aspect, the subject aspect gets a percentage of 93.33%. These results show that the concepts contained in the e-module are presented systematically and with scientific concepts, and the depth of the material is presented very well.



Picture 5. E-Module Validity Results in Terms of Material in each aspect

The e-module is presented with illustrative components of practice questions, exploration activities, summaries, self-assessments, and others. These components are used to support independent learning. It follows the module's characteristics, namely self-instruction (Kokasih, 2021). Apart from that, this e-module is also packaged without needing media or other teaching materials and does not require other parties to carry out the learning. Thus, e-modules fulfill module characteristics such as being self-contained and stand-alone (Kokasih, 2021). In the auxiliary information aspect, the percentage is 86.67%. These results show that additional information, such as the FYI column, concept map, glossary, introduction, summary, audio, video, etc., is presented well and appropriately. Additional information needs to be considered because it is helpful for inspiring students' enthusiasm for learning (Pramana & Dewi, 2020). Then, the effective consideration aspect has a percentage of 88.33%. These results indicate that the media contained in the e-module provides motivation for students to learn. The e-module is presented in communicative, easy-to-understand, and friendly language, making it easy for students to learn. It also shows the module's user-friendly



character ([Limbong et al., 2022](#)). In the e-module, there is the ILS Go-Lab platform, where inquiry-based experimental activities will be carried out on the platform. Based on research by [Padallingan et al., \(2022\)](#) experiments will increase students' motivation to learn. In the pedagogy aspect, the percentage was 93.33%. These results show that the e-module has good user control ([Gevi & Andromeda, 2019](#)). In the question practice e-module, practice questions and feedback in Google Forms are presented.

The validity of the e-module based on media expert review is divided into three aspects: interface, navigation, and robustness. The results of the validity of the e-module are presented in Figure 6.

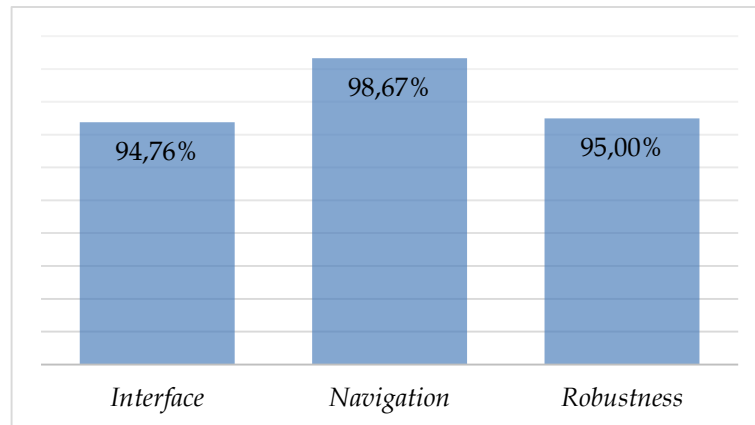


Figure 6. E-Module Validity Results in Terms of Media in Each Aspect

Overall, the media aspect has an average validity percentage of 95.56% with very valid criteria. If we look at each aspect, the interface aspect gets 94.76%. According to [Gevi & Andromeda \(2019\)](#), if aspects related to multimedia display have very valid criteria, then the use of fonts, layout, display between module parts, content layout, media quality, placement of illustrations, images, graphics, and the overall appearance of the e-module design is said to be able to attract the attention of users. According to [Candra & Masruri \(2015\)](#) interactive e-modules designed with a good pattern will make it easier for students to understand the learning material. In the navigation aspect, the percentage was 98.67%. These results show that the navigation in this e-module is easy to use. By utilizing technological developments, this e-module can adapt according to the characteristics of the module, namely adaptive ([Kokasih, 2021](#)). Finally, the robustness aspect obtained a validity percentage of 95.00%. These results show that the e-module has very good durability and minimal error occurrence.

#### Validity of the Go-Lab platform on Light Wave Materials

The validity of the Go-Lab ILS platform based on review by material experts is divided into three aspects: the Quality of Content and Objectives, Instructional Quality, and Use of Language. The comments from validators are presented in Table 4.

Table 4. Validator Comment on ILS Go-Lab Platform

No.	Before revision	After revision	Comment and Suggestion
1	<p>Tujuan Percobaan</p> <ol style="list-style-type: none"> <li>1. Memahami perubahan kecepatan fase gelombang cahaya akibat perbedaan kerapatan medium</li> <li>2. Memahami pembalikan fase gelombang cahaya akibat pemantulan</li> </ol>	<p>Tujuan Percobaan</p> <ol style="list-style-type: none"> <li>1. Mengetahui perubahan kecepatan fase gelombang cahaya akibat perbedaan kerapatan medium</li> <li>2. Memahami pembalikan fase gelombang cahaya akibat pemantulan</li> </ol>	The first objective was replaced with “knowing change”
2	<p>Rumusan Masalah:</p> <ol style="list-style-type: none"> <li>1. Bagaimana perubahan kecepatan fase gelombang cahaya akibat perbedaan kerapatan medium?</li> <li>2. Bagaimana pembalikan fase gelombang cahaya akibat pemantulan?</li> </ol> <p>Ruang Hipotesa:</p> <p>Berikan jawaban sementara kamu terkait rumusan masalah pada kolom di bawah ini!</p>	<p>Rumusan Masalah:</p> <ol style="list-style-type: none"> <li>1. Bagaimana perubahan kecepatan fase gelombang cahaya akibat perbedaan kerapatan medium?</li> <li>2. Bagaimana pembalikan fase gelombang cahaya akibat pemantulan?</li> </ol> <p>Ruang Hipotesa:</p> <p>Tuliskan hasil analisis kalian terkait dengan rumusan masalah pada kolom di bawah ini!</p>	In the hypothesis space, replace “write the results to the problem formulation in the column below!”

The results of the validity of the e-module are presented in Figure 7. Overall, the material aspect has an average validity percentage of 94.17% with very valid criteria. If we look at each aspect, the Quality of Content and Objectives aspect gets 93.33%. According to Walker & Hess dalam [Saadah & Suhartini \(2017\)](#), the quality aspect of content and objectives is related to accuracy, importance, completeness, balance, attractiveness, reasonableness, and suitability to the student's situation. These results indicate that the ILS platform.

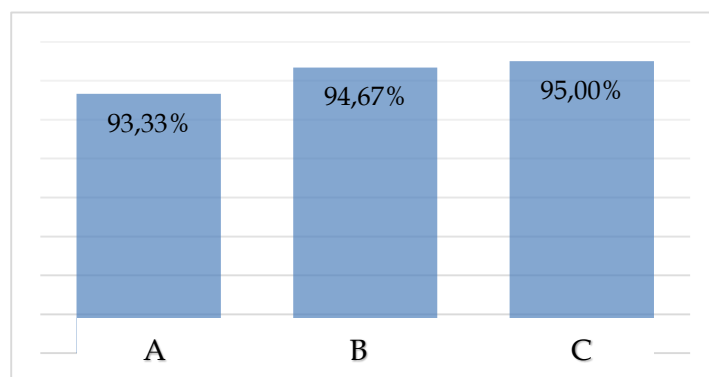


Figure 7. Go-Lab ILS Platform Validity result in terms of material in each aspect

**Description:**

- A : Quality of content and purpose
- B : Quality of instructional
- C : Using of Language

Go-Lab presents the material and objectives of the experimental activities that were carried out using virtual laboratory media, as shown in Figure 8.

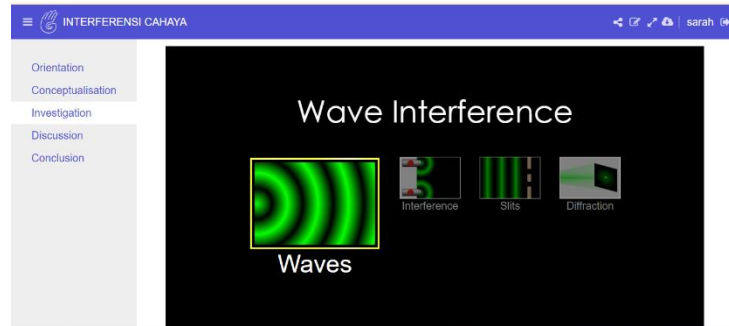


Figure 8. Virtual Laboratory Interface on the Go-Lab ILS Platform

The Go-Lab ILS platform presented has the appeal of attracting students' interest in learning more deeply independently because, through the virtual laboratory, students' independence in learning will be realized (Wati, 2021). In the aspect of instructional quality, the validity percentage was 93.67%. Instructional quality relates to ease of media use, assisting with learning, instructional flexibility, evaluation quality, and motivating quality (Susilo dkk., 2017). The validity results mean that the Go-Lab ILS platform provides flexibility in learning more deeply (Rahmawati & Susilowibowo, 2020) and makes learning easier for students (Fitri & Ardipal, 2021). In the aspect of language use, the percentage was 95.00%. These results show that the Go-Lab ILS platform language presented is very good, easy to understand, by EYD rules, has good readability, and does not give rise to many interpretations.

The validity of the ILS Go-Lab platform based on media experts' review is divided into three aspects: Writing Format, Display Quality, and Correlation of the platform with E-Modules. The results of the validity of the e-module are presented in Figure 9. Overall, the media aspect has an average validity percentage of 96.67% with very valid criteria. If we look at each aspect, the writing format aspect obtains a validity percentage of 96.67%. The validity results from this aspect show that the writing format developed on the ILS Go-Lab platform is very good, precise, and proportional. The proper writing format and proportional visual display will provide good readability (Bagiyono, 2018). Good readability will influence how the media increases interest in learning (Anggraeni dkk., 2018). In display quality, a validity percentage of 95.00% was obtained. These results show that the features on the Go-Lab ILS platform operate well and are easy to use.

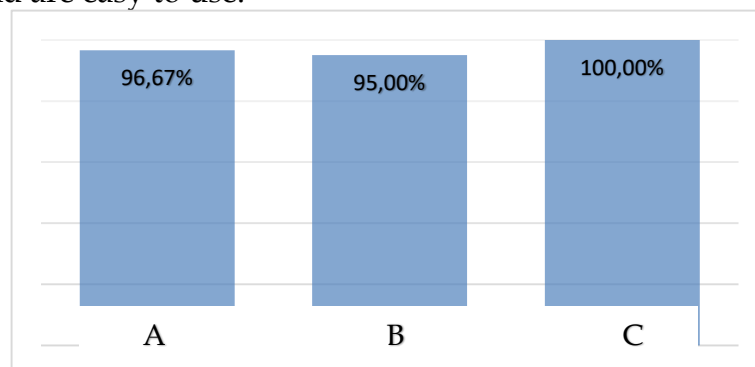


Figure 9. Go-Lab ILS Platform Validity Results in Terms of Media in each aspect

**Description:**

A : writing format

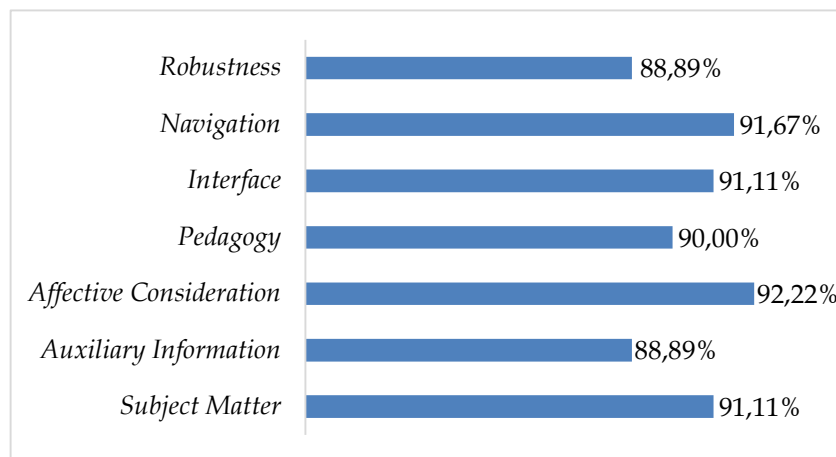
B : display quality

C : platform and e-module correlation

In order to make it easier for users, the features presented on this platform are often used in platform development. According to [Suryandari dkk., \(2022\)](#), the features or applications often used in developing the Go-Lab ILS platform are input boxes, table tools, file drops, calculators, and virtual laboratories. Finally, the correlation aspect of the platform with the e-module obtained a validity percentage of 100%. These results state that the Go-Lab ILS platform and e-module have a good correlation or similarity.

**Student Responses to the Use of E-Module and the Go-Lab ILS Platform in Light Wave Material**

Student responses to using the product are divided into responses to using the e-module and responses to using the ILS Go-Lab platform contained in the e-module. The results of students' responses to using e-modules assisted by the ILS Go-lab platform on light wave material are presented in Figure 10.



**Figure 10. Result of Student Responses to E-Module on each aspect**

Several aspects are discussed in the use of orientation modules in module products, which contain seven aspects relating to systematic writing, display, and information. Robustness and auxiliary information have a percentage in the 80% range. *Robustness* is an aspect relating to a product's reliability level when unexpected conditions occur during product use ([Kokasih, 2021](#)). The percentage of 88.9% in this aspect shows that the e-module assisted by the ILS Go-Lab platform provides information to students regarding cognitive variants and students' conditions when using the e-module. In line with this, the e-module also occupies a percentage of 88.89% in the auxiliary information aspect, which shows that the e-module has accurate material to explain to students the material being discussed ([Yulianto, 2022](#)).

Five other aspects managed to get a percentage above 90%. *Pedagogy* is an aspect that explains the learning syntax of the module and the systematic presentation of the module by the planned learning chronology ([Kokasih, 2021](#)). This aspect received a percentage of 90%, indicating that the e-module succeeded in presenting the material

in stages, from learning materials to learning indicators and how to use the module to present the material well.

Meanwhile, the navigation, interface, and subject matter aspects got a percentage on a scale of 91% in the e-module category assisted by the ILS Go-Lab platform. It is very good at explaining the module's use, providing interesting and relevant visual modules, and presenting wave material. The light corresponds to indicators of learning achievement and e-module characteristics, namely, using the ILS Go-Lab platform (Setiyowati et al., 2018).

The results of students' responses to using e-modules assisted by the ILS Go-Lab platform on light wave material obtained an overall average of 90.51%. These results obtain very good criteria based on Table 2. If you look at each aspect based on Figure 9, each aspect has a percentage that is still categorized as very good. Then, the results of students' responses to using the ILS Go-Lab platform contained in the e-module are presented in Figure 11.

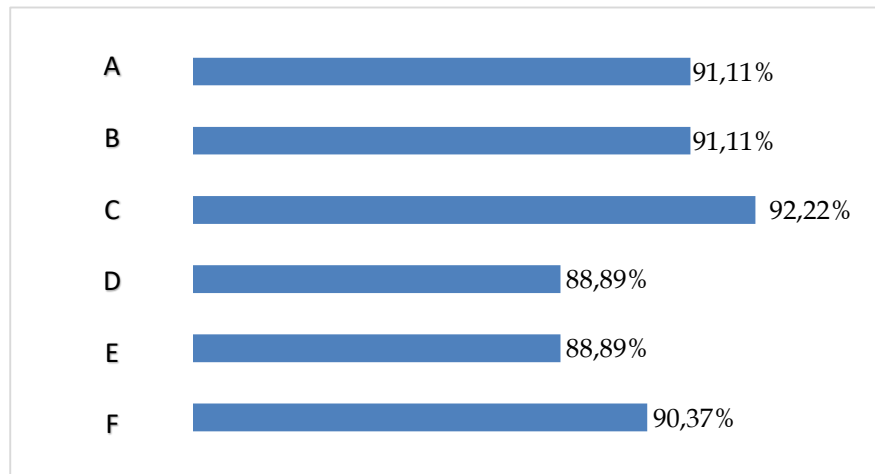


Figure 11. Results of Student Responses to the Go-Lab ILS Platform in each aspect

Description:

A : platform and e-module correlation

B : display quality

C : writing format

D : using of language

E : quality of instructional

F : quality of content and purpose

The results of student responses to using the Go-Lab ILS platform on light wave material obtained an average percentage for all aspects of 90.08%. These results obtain very good criteria based on Table 2. If you look at each aspect based on Figure 9, each aspect has a percentage that is still categorized as very good. However, some aspects are of concern, namely the use of language and instructional quality, which receive a lower percentage than others. This aspect received a lower score because the Go-Lab platform is a virtual laboratory page that is relatively unfamiliar to the learning process in high school, especially in research settings. Students must focus because apart from understanding the material about light waves, students must also pay attention to the



instructions for use on the Go-Lab platform. These two focuses are why the instructional and language aspects get a percentage on a scale of 80%. However, this percentage category still shows that the ILS Go-Lab platform is still good for use in the learning process.

### Conclusion

The module's validity of the e-module is very valid in subject matter, auxiliary information, affective consideration, interface, navigation, pedagogy, and robustness, with an average percentage of 90.40% for material experts and 95.56% for media experts. It shows that the e-module developed meets the criteria for good digital teaching materials. Apart from that, the Go-Lab ILS platform contained in the e-module was also declared very valid, with a validity percentage of 94.17% from material experts and 96.67% from material experts. Student responses to using E-modules and the Go-Lab ILS Platform were very good, with an average percentage of 90.51% for e-modules and 90.08% for the Go-Lab ILS platform. So, this e-module can be used as intended. For further research, researchers recommend testing the effectiveness of product use in improving student learning outcomes. Apart from that, the ILS Go-Lab platform being developed requires additional features and designs to make it look more attractive and not monotonous.

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