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# E-MODULE DEVELOPMENT USING 3D PAGEFLIP PROFESSIONAL WITH IBSE (INQUIRY BASED SCIENCE EDUCATION) APPROACH IN STATIC FLUID MATERIALS

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**Abstract**: The study aims to develop a physics e-module on static fluids using 3D PageFlip Professional with an Inquiry-Based Science Education (IBSE) approach. The research employed a Research and Development (R&D) method following the ISI-ARE model, which includes investigate, strategy, improve, assessment, realization, and estimation stages. The e-module was validated by experts in materials, media, and language, achieving high feasibility ratings. Material validation averaged 93%, media validation 94%, and language validation 95%, all categorized as "very feasible." Educator responses to the e-module indicated an average score of 94% under "very interesting" criteria. Small group trials showed an 86% score, and field tests yielded 91%, both under "very interesting" criteria. These results demonstrate the e-module's effectiveness and potential to enhance physics learning using an innovative digital format.

**Keywords:** Physics E-Module, IBSE Approach, 3D pageflip professional

***Abstrak**: Penelitian ini bertujuan untuk mengembangkan e-modul fisika pada materi fluida statis menggunakan 3D PageFlip Professional dengan pendekatan Inquiry-Based Science Education (IBSE). Penelitian ini menggunakan metode Research and Development (R&D) dengan mengikuti model ISI-ARE, yang meliputi tahap investigasi, strategi, perbaikan, penilaian, realisasi, dan estimasi. E-modul divalidasi oleh para ahli materi, media, dan bahasa dengan tingkat kelayakan yang tinggi. Validasi materi rata-rata 93%, validasi media 94%, dan validasi bahasa 95%, semuanya dikategorikan "sangat layak". Tanggapan pendidik terhadap e-modul menunjukkan skor rata-rata 94% dengan kriteria "sangat menarik". Uji coba kelompok kecil menunjukkan skor 86%, dan uji coba lapangan menghasilkan 91%, keduanya di bawah kriteria "sangat menarik". Hasil ini menunjukkan keefektifan dan potensi e-modul untuk meningkatkan pembelajaran fisika dengan menggunakan format digital yang inovatif.*

***Kata Kunci:** E-Modul Fisika, Pendekatan IBSE, 3D pageflip profesional*

## INTRODUCTION

Entering the technological era, many new technologies are capable of providing more information. Technology develops following the times that continue to develop. Relationship with technology that is increasingly sophisticated and easily available at affordable prices. Currently modules are generally presented in printed form, so that by using electronic technology using computer modules they can now be presented in digital form or are called e-modules (Malik et al. 2021). E-modules are a set of digital or non-printed teaching media that are systematically arranged to be used for independent learning purposes (Ariasa 2016). The electronic module is a module that can display pictures, video, audio, animation, and formative quizzes to create active learning (I M. Suarsana 2013). Electronic modules can present information in a structured, interesting way and have a high level of interactivity. In addition, the learning process no longer depends on the instructor as the only source of information (Rhesta Ayu Oktaviara 2014). E-modules are digital

media that are effective, efficient, and prioritize student independence in carrying out learning activities so that students are able to solve problems in their own way. Electronic modules can be implemented in independent learning resources that can help students improve their competence or cognitive understanding and no longer rely on information alone (Sugianto et al. 2013). E-modules are modules in the form of soft files that students can open and read anywhere and anytime (Wulandari, Octaria, and Mulbasari 2021). It's more practical to carry everywhere, no matter how many modules you store and carry, it won't be a burden for us to carry it. Its production costs are cheaper than printed modules (Sunarya and Putrama 2016).

Today's rapidly changing world brings new requirements for education and thus for science education. The importance of traditional knowledge and skills is diminishing as they age. In addition, it is necessary to motivate students to be interested in science. This requires changes in science education. Need to revise science content and apply appropriate modern teaching/learning methods. These teaching/learning methods include inquiry-based science education (IBSE). Inquiry-Based Science Approach (IBSE) is an approach that is synonymous with the subject of science. The word inquiry comes from the word inquire or inquire which intends to search, investigate, study and test a rule to obtain a decision (Ahmad Nadri 2017).

IBSE Is a representative application of Inquiry Based Learning (IBL) for a domain of learning and teaching science Inquiry Based Science Education (IBSE) is an innovation that can be applied in education (Dunne, Reilly, and Mahdi n.d.). IBSE is often interpreted as a scaffolding structure for designing learning environments (Trna 2014). IBSE addresses students' curiosity and enables them to formulate research questions on scientific topics of interest to them (Uum and Verhoeff 2017).

IBSE is an innovative educational method that has a strong motivational impact on students as well as on educators. IBSE was born through a deep understanding of the science learning process. The core principles of IBSE are engaging students in discovering natural laws, linking information into meaningful contexts, developing critical thinking, and promoting positive attitudes towards science (Istichomah, Utaminingsih, and Ismaya 2022).

One of the uses of technology that can support the creation of this e-module is to use the 3D PageFlip Professional application (Nim and Pathoni 2017). In making e-modules, a computer application is needed that can combine reading text with various media (such as music, animation, video, flash) into one unified whole. One such application is 3D Pageflip Professional (Hammiyati Fitri, Maison 2019). The Pageflip Professional 3D application is a software that can be used to create teaching materials with 3D effects. 3D PageFlip Professional is a type of computer software that can create animated displays so as to create interactive learning media for students (Hammiyati Fitri, Maison 2019). 3D Pageflip Professional is a flash flipbook application that can be used to create files, pdf, word, power point and excel in flipbook form. The function of this software is magazines, catalogs, e-brochures, e-books, or e-newspapers in attractive 3D shapes (Agustina 2021). 3D PageFlip Professional is a type of Flipbook software to convert PDF files into page flipping digital publications. This allows us to insert videos (yuotube, videos), images, audio, graphics, slides, buttons, flash, hyperlinks, hotspots and other multimedia objects to Flipbook pages (Elga Amelia, Maison 2021). Each generated PDF page can be flipped/flipped like a real book (Rusdi 2018).

Based on the results of pre-research at SMA N 15 Bandar Lampung, which were obtained from pre-research questionnaires via Google form to students, it was found that students had not used e-modules using professional 3D pageflip with the ibse approach, students also lacked learning media in the form of software / new multimedia that is fun and innovative, learning is still monotonous using print media in the form of books so it is less attractive to students. Based on the results of an interview with one of the educators, it is known that educators have not used e-modules and the ibse approach in learning, educators also experience difficulties in developing electronic learning media so that learning is still monotonous using printed book media. even though facilities and infrastructure such as computers, laptops and projectors are already available, educators still use print media in carrying out the learning process which requires quite a lot of time, so educators do not maximize time in delivering material that has an impact on students.

Based on the results of pre-research at Gajah Mada High School in Bandar Lampung, which were obtained from pre-research questionnaires via Google form to students, it was found that students had not used e-modules using professional 3D pageflip with the ibse approach, learning still used print media in the form of books and worksheets. Students also do not get learning media in the form of software/multimedia that is interesting and can facilitate the learning process independently. Based on the results of interviews with one of the educators, it is known that educators have not used e-modules and the ibse approach in learning. Educators only use print media in the form of books and LKS and rarely use electronic media. Even though at Gajah Mada High School there are also quite complete facilities such as computers and LCD projectors.

Based on the results of pre-research at SMA Persada Bandar Lampung, which were obtained from pre-research questionnaires via Google form to students, it was found that students were known that the learning process at school still did not use e-modules using professional 3D pageflip with the ibse approach and learning was still monotonous using LKS and ppt. Based on the results of interviews with one of the educators, it is known that educators have not used e-modules and the ibse approach in learning, educators only use print media in the form of worksheets and ppt. and students are also less interested in physics because they think physics is difficult. Therefore, it takes teaching materials that are interesting and innovative.

Based on the problems described above, the researcher intends to conduct research entitled "Development of e-modules using professional 3D pageflips with an ibse (inqury based science education) approach to static fluid material. The advantages of this e-module are can be accessed online on Google Chrome or offline if accessed via 3D pageflip professional software, uses an Inquiry Based Science Education (IBSE) approach, so that it can make it easier for students to understand static fluid material because the material is presented using the ibse approach, and allows students to learn independently according to their visual, auditory and kinesthetic talents and abilities.

## METHOD

This development design uses a Research and Development (R & D) design and development research approach (Pahrudin et al. 2019). The development research approach and methods are guided by the ISI-ARE model development research design, this development design model is modified from the Borg and Gall and ADDIE models. The development model has 6 stages, namely: (1) Investigate stage (gathering information), (2) Strategy (planning) stage, (3) Improve stage (product development), (4) Assessment stage (assessment), (5) stage realization (product testing), (6) Estimation stage (product distribution) (Creswell 2010).

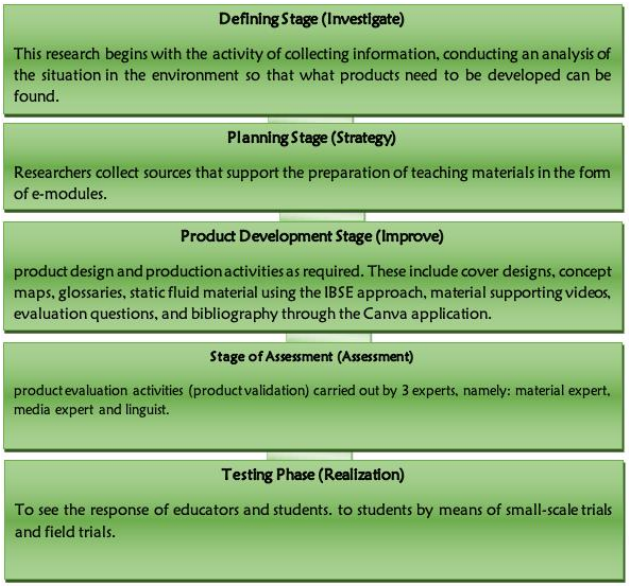



Figure 1. Development Stages

In this development research the steps were limited and simplified to the 5th step, this was because the researcher only tested the product's attractiveness to students, and did not reach the deployment stage.

In this study, data collection conveys the role of the researcher in determining the explanation of the data or problems that may arise or be obtained. The data collection process was carried out in several ways, namely distributing questionnaires, interviews, documentation. The data analysis technique in this study is to use qualitative analysis techniques. Qualitative data were analyzed using quantitative data, in the form of numerical data interpreted in the form of words. The questionnaire in this study was analyzed using a Likert scale. In using a scale of 1 to 5, with a score of 1 the lowest and the highest score 5. This data is validator input at the validation stage, input from media experts, material experts, and linguists besides that obtained through observation, interviews, and the responses of educators and participants educate.

## RESULT AND DISCUSSION

This development research produced a product in the form of an e-module using a professional 3D pageflip with an IBSE (inquirybased science education) approach on static fluid material. This development research requires six development steps to produce a final product that is ready to be applied in educational institutions.

### Defining Stage (Investigate)

The Investigate stage, related to information gathering activities, analyzes the situation in the environment so that what products need to be developed can be found. Before determining the choice of product planning to be developed, the researcher conducted an analysis of the situation and needs that could be used to provide solutions to the problems faced by the school where the research was conducted. The Investigate stage carried out by the researcher was by observing and interviewing Physics subjects at SMAN 15 Bandar Lampung, Gajah Mada High School Bandar Lampung, Persada High School Bandar Lampung regarding the use of professional 3D pageflip e-modules. In addition, the researchers also distributed questionnaires regarding the use of professional 3D pageflip e-modules using Google forms for class XI MIPA students at SMAN 15 Bandar Lampung, Gajah Mada High School Bandar Lampung, SMA Persada Bandar Lampung.

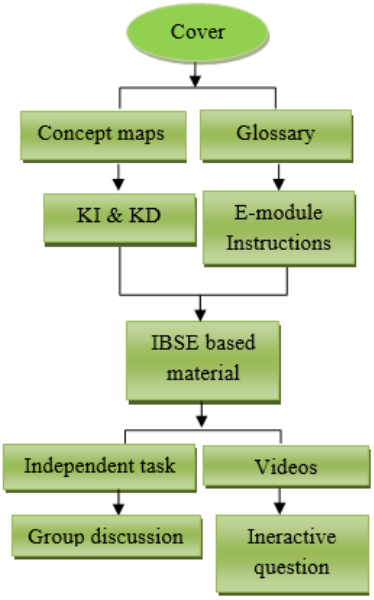



**Figure 2**. E-module Display Flowchart

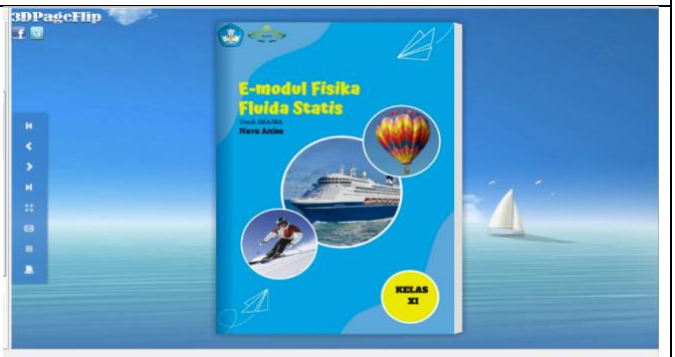
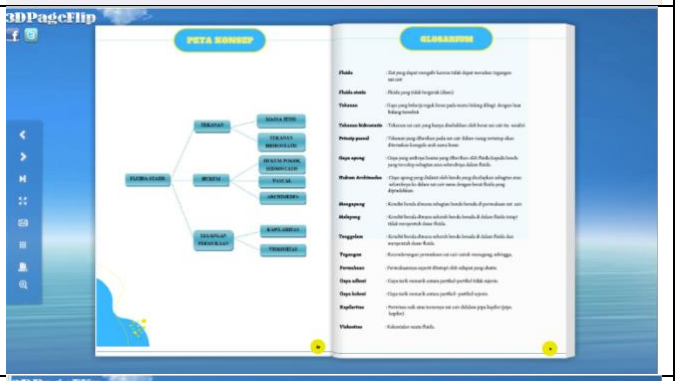
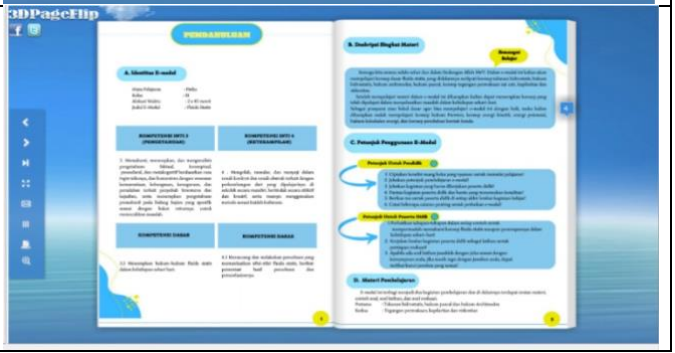
Planning Stage (Strategy)

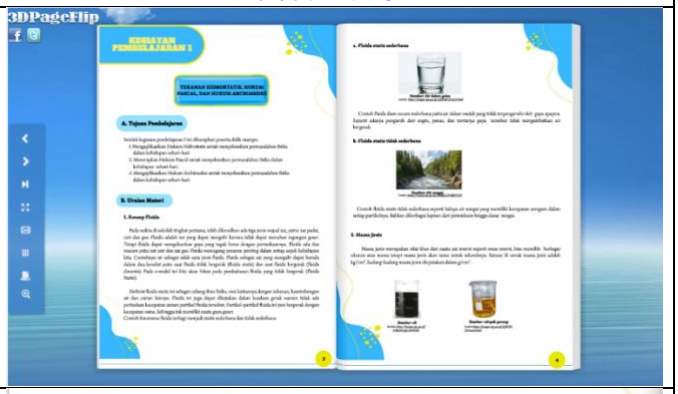
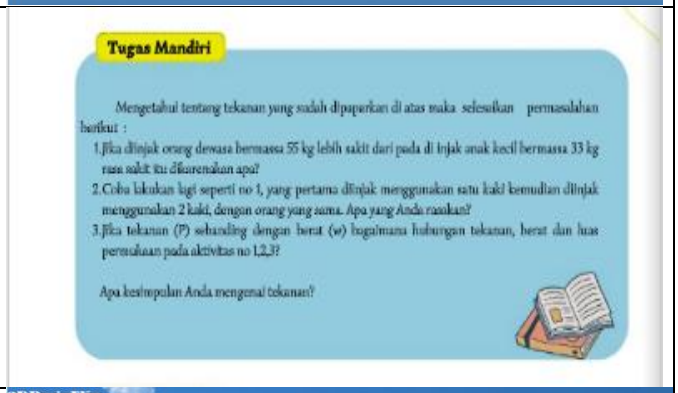
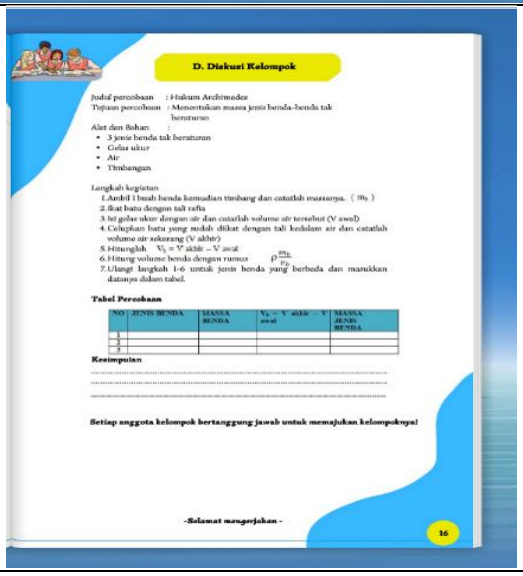
After carrying out the next preliminary research stage, namely the planning stage in the form of supporting resources in the preparation of teaching materials in the form of e-modules, namely pre-research in schools, journals regarding teaching materials in the form of e-modules, journals regarding professional 3D pageflip, several relevant previous studies as supporting sources regarding learning media in the form of e-modules using professional 3D pageflip, as well as reference books.

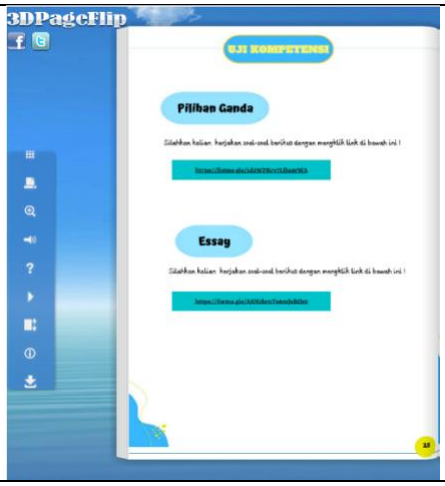
Product Development (Improve)

The product development stage is the activity of designing and manufacturing products according to what is needed. After doing the development stage next planning e-module with IBSE approach on static fluid material was developed using 3D pageflip professional. Then determine the design including cover designs, concept maps, glossaries, KI and KD, static fluid material with the IBSE approach, independent assignments, videos, group discussions, interactive questions through the applications Canva, Photoshop, Ms.Word, 3D Pageflip Professional.

**Table 1.** Storyboards that contain e-modules

| Description | Visualization |
|---|---|
| Cover page: contains the identity of the book. |  |
| Concept map page and glossary: contains material sections and important terms of fluid static material. |  |
| KI&KD page: contains core competencies and basic competencies to be achieved and e-module guide pages. |  |

| Description | Visualization |
|---|---|
| Material page: which contains ibse-based static fluid material, which includes the first ibse component, namely teroxa (explore), where students are familiar (familiar) with the phenomena being studied. |  |
| Independent assignment page: contains independent evaluation of students. |   |
| Video page: contains videos that support static fluid content. |   |
| Group discussion page: contains the ibse-based Archimedes' law experiment, which includes the second ibse component to investigate, namely students design and carry out an investigation. The third component builds conclusions, namely students synthesize what they have learned and can form conclusions. The fourth component, communicate, namely students present the results of the experiment. |   |

| Description | Visualization |
|---|---|
| Competency test page: contains interactive questions about static fluids. |  |



## Stage of Assessment (Assessment)

The Assessment stage is the activity of assessing products that have been developed according to specifications or not. The assessment stage is usually called the product validation stage. Product validation is an activity process to evaluate product design rationally. Rationally said, because validation here is still an assessment based on rational thinking, not facts on the ground. The e-module is validated by experts, and is the focus of this research. E-Module is said to be feasible if it is in accordance with the assessment characteristics of each expert. The process of validating the feasibility of the physics e-module was carried out by three experts, namely material experts, media experts, and linguists. The validation results by several experts are explained in Figure 3.

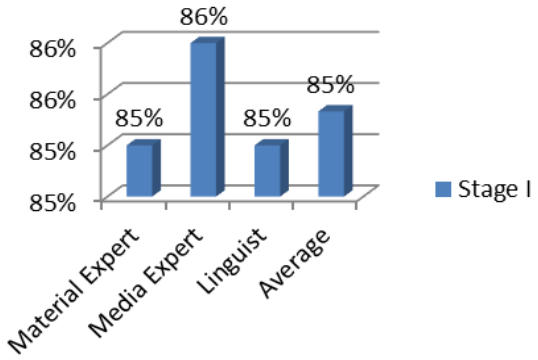



**Figure 3.** Graph of Expert Validation Assessment Results

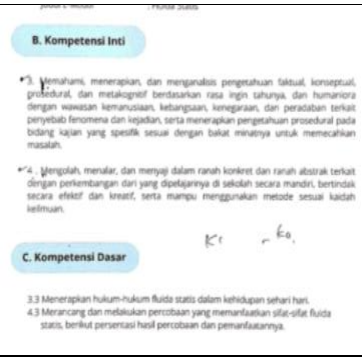
The assessment was carried out by 2 material expert lecturers. The assessment carried out by an expert includes 3 aspects, namely presentation, content, ibse approach which consists of 15 indicator items evaluation. Assessments from material experts get an average score of 85% in the "very feasible" category so that materially the e-module is very feasible for use and testing field. The assessment carried out by media experts covered 5 aspects, namely aspects of visual appearance, use of letters, physical criteria, sound and ease of use which consisted of 16 achievement indicators. In the initial product validation stage, a score of 86% was obtained in the "very feasible" category with several notes. The assessment carried out by linguists includes 1 aspect, namely the linguistic aspect which consists of 9 assessment indicators. in the initial product validation stage, it gets a score of 85% in the "very decent" category with several notes.

After carrying out the initial validation stage, the product is said to be very feasible but with some notes of improvement. Improvements made by the material validator, namely adding sources to images and videos. Improve writing in formulas. The improvements provided by the

media validator regarding that are replacing videos with videos of their own work and minor revisions. Improvements given by the language validator. Improve the writing of alphabetical order and numbers according to EBI rules. Improve writing of KI and KD.

After making improvements, the researcher re-validated the results to the experts. Product evaluation after revising has increased. The following is table 5, namely the results of the revised e-module.

**Table 2**. E-module Revision Results

| Before Revision | After Revision |
|---|---|
|  |  |
|  |  |
|  |  |

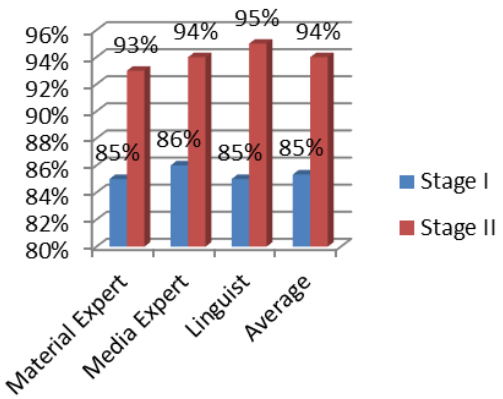



**Figure 4**. Graph of Validation and Revision Assessment by Validators

Based on the graph in Figure 4, we can see that after completing the revision of the assessment from the material experts, the average score rose to 93% in the "very feasible" category so that materially the e-module is very feasible to use and in field trials. Assessments from media experts get an average score of 94% in the "very feasible" category so that in terms of media the e-module is very feasible for use and in field trials. while the assessment of linguists gets an average score of 95% in the category "very feasible" so that in terms of language the e-module is very feasible for use and in field trials.

## Testing Stage (Realization)

The Realization stage is product testing activities. The trial phase is carried out after revisions and improvements by the validator, so the next step is product trials. This trial aims to see the attractiveness of the product being developed. Product development can be directly tested, after being validated and revised by the validator. The results of this field trial are used as material for repairs and improvements to the media made. Deficiencies during the trial run must still be revised in order to improve the product further. Product trials were conducted on two users. The first user is the educator as a teacher of the learning process. Educators were asked to provide responses through a research questionnaire about the attractiveness of the physics e-module with the IBSE approach as a physics learning medium. From the educator's input, it can be used as a consideration for improving media development. The second trial was conducted on students, a small group of 30 students in class XI MIPA at SMAN 15 Bandar Lampung, SMA Gajah Mada Bandar Lampung, SMA Persada Bandar Lampung. Field trials totaled 77 students. The product in the form of an e-module with the ibse approach is considered very feasible to use and be tested by an expert validator. Furthermore, the product is tested on a small scale and field trials to assess the attractiveness of the product by educators and students.

At the educator response stage regarding the physics e-module, it was carried out by physics educators from SMA 15 Bandar Lampung, SMA Gajah Mada Bandar Lampung, and SMA Persada Bandar Lampung. The assessment aspect consists of 3 aspects, namely: content and objective quality, instructional quality, and technical quality. Educators provide an assessment with a total of 20 questions in all aspects. The results of the teacher's response obtained an average of 94% in the "very interesting" category.

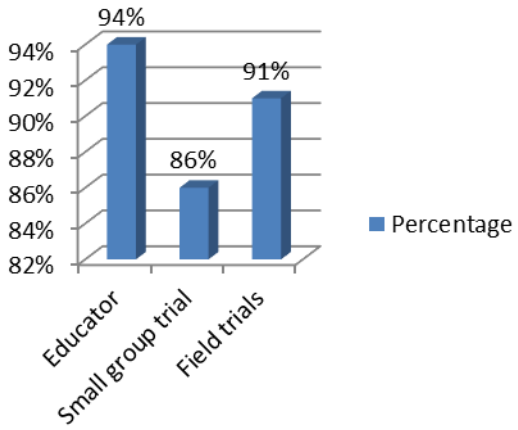



**Figure 5**. Graph of Educator and Participant Response Results

Small group trials were carried out at SMAN 15 Bandar Lampung, SMA Gajah Mada Bandar Lampung, and SMA Persada Bandar Lampung with the participation of 10 students from the three schools. Based on the graphs of the results of small group trials on 5 aspects, including aspects of interest, material, language, usability and graphics, an average of 86% was obtained in the "very interesting" category.

Field trials were carried out at SMAN 15 Bandar Lampung, Gajah Mada High School Bandar Lampung, and Persada High School Bandar Lampung with the participation of 77 students from

the three schools in filling out questionnaires. Based on the graph of the field trial results above, the percentage of each aspect was obtained and also the average field test with an average of 91% in the "very interesting" category.

After conducting the trial, the following is Figure 4 graph of the results of the responses of educators and students. Based on its components, the e-module includes at least the following elements: Learning Instructions (teacher/student instructions), Competence to be achieved, content or material content, supporting information, exercises, Evaluation, feedback on evaluation results (Mina Syanti Lubis, Syahrul R 2015). The function of e-modules for educators is to reduce dependence on the availability of textbooks, e-modules are compiled from various references so that they can broaden teacher insights, increase knowledge and experience in writing teaching materials, create effective communication between teachers and students considering that learning activities are not always must be face to face. While the function for students is that students have the opportunity to train themselves to learn independently, learning is more interesting because it can be studied outside the classroom and outside class hours, students have the opportunity to express themselves by adjusting their interests and abilities about how to learn, students have a place to test abilities through exercises contained in the module, students can practice independent learning, as well as develop students' abilities to interact directly with environment and other learning resources (Hamdani 2011).

The characteristics of the IBSE Approach are Guess (Explore) where students will be familiar with the phenomena being studied, Investigate where students design and carry out investigations, Building Conclusions (Draw Final Conclusions) where students synthesize what they have learned and can form conclusions, and Communicate where students can share their understanding with others (Eliza 2014).

IBSE is a learner-centred learning approach that on an inquiry basis integrates theory and practice, and develops knowledge and skills for the solution of defined problems. Students in IBSE learning are encouraged to be able to solve problems independently and competently (Trna and Trnova 2015). There are several functions of the inquiry approach, which are build commitment among students to learn, which is manifested by involvement, sincerity, and loyalty towards seeking and finding something in the learning process, build an active, creative, and innovative attitude in the learning process in order to achieve learning objectives, and build self-confidence and be open to the findings (Hanafiah, Nanang 2009).

Based on the research results, it is proven that e-module development using 3D pageflip Professional with the IBSE approach to static fluid material is feasible and valid. Eligibility is obtained based on material experts, media experts, and language experts and is supported by the responses of educators and students. This research is supported by the results of research by Itha Masithah, A. Wahab Jufri, Agus Ramdani (2022) which states that based on the results of the validity analysis using the Aiken index and reliability analysis using the agree percentage, it is known that the inquiry-based science teaching materials developed have criteria valid and reliable (Masithah, Jufri, and Ramdani 2022).

This research is in line with relevant research by Denno Kristian Garry Pratama, Nury Yuniasih, Concerned Sulistyowati (2019) which states that Inquiry-based e-modules use the Lectora Inspire Software application "Very Valid" and "Very Good" used in the Field (Denno Kristian Garry Pratama, Nury Yuniasih 2019). According to Daniel Juli Kristian Telaumbanua, Imansudi Zega, Arozatulo Bawamenewi (2022) in his research shows that the development of Indonesian language e-modules for class X SMA Negeri 1 Gunungsitoli based on inquiry on learning material from biographies is very feasible, practical and effective for use in the process of learning Indonesian (Daniel et al. 2022). Ira Lestari (2015) in his research shows that inquiry-based teaching materials are very suitable for use in learning (Sapta Hadi Lesmana, Hairida 2015). According to Karmila Suryani, Iga Setia Utami, Khairudin, Ariska, Ade Fitri Rahmadani (2020) in her research it shows that the digital module of the STEM-based Operating System is very valid and practical so that it can be used in the learning process (Suryani, Utami, and Rahmadani 2020). The deficiencies in the

products that have been developed are, the use of simulations and animations is still not optimal in each chapter of static fluid material.

## CONCLUSION

Based on the results of research and development of e-Modules physics using professional 3D pageflip with an inquiry based science education (IBSE) approach on static fluid material it is declared feasible to use because it has passed the validation test by material experts, assessments from material experts get an average score of 93% with the category of "very feasible". Assessments from media experts get an average score of 94% in the "very decent" category. assessments from linguists get an average score of 95% in the "very decent" category. As well as having been declared feasible and interesting to use based on trials on educators obtaining an average of 94% in the "very interesting" category, small group trials obtained an average of 86% in the "very interesting" category. And field trials with an average of 91% in the "very interesting" category.

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