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Integrating Lectora Inspire into Physics Learning: A Pathway to Enhance Critical and Creative Thinking Abilities through Interactive Learning Media

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ABSTRACT

In the process of education, the utilization of effective learning media is crucial for conveying knowledge to students. Therefore, it is important to develop interactive learning media with various features and easy online access, capable of enhancing students' critical and creative skills. This study revolves around development research using the ADDIE model. The interactive learning media developed with the Lectora Inspire application aims to enhance critical and creative thinking skills among high school students studying physical quantities and measurements. The average validity score obtained was 0.76, indicating that the content quality, construct, and alignment with media validity criteria are met. Subsequently, the practicality assessment of interactive learning media yielded a rating of 89.57%, categorizing it as highly practical. Highly practical media implies that the content is easily understandable, appealing, and efficient, making it practical for enhancing students' critical and creative thinking skills. The implication of this research is that the interactive learning media produced can be used as one of the learning resources to promote students' critical and creative thinking skills in the subject of physical quantities and measurements.

Keyword: Creative Thinking, Critical Thinking, Learning Media, Lectora Inspire, Physics

INTRODUCTION

Currently, learning activities in both higher education and primary education carried out online (Rahim et al., 2020). Distant distance learning has emerged as a transformative mode of instruction, facilitated primarily through online platforms. This modern educational approach offers students a more dynamic alternative to traditional face-to-face learning, presenting them with many additional opportunities to engage more deeply in the learning process. In online education, the boundaries of physical classrooms dissolve, granting students the flexibility to access course materials, engage in interactive discussions, and participate in virtual space according to their preferences. This flexibility is particularly advantageous for individuals with diverse schedules, and geographical constraints, or those seeking a more personalized learning experience (Sari et al., 2022). Devices such as computers and gadgets can be used for online learning at home via a range of online learning sites and applications. Therefore, the development of this media requires the use of reliable technology to provide content that can assist student in learning (Astuti et al., 2017; Rahim et al., 2019).

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The utilization of technology in learning has transformed the traditional-based teaching method into interactive instructional media. Previously, print media evolved into interactive multimedia that can be accessed online or offline (Sheresheva et al., 2021). Interactive multimedia makes the learning process more engaging due to the presence of interaction. Additionally, interactive multimedia provides learners with concrete learning experiences and enhances learning retention for multimedia users, namely students. By using interactive multimedia, learning materials become visually tangible, stimulating various senses to interact with each other (Rahim et al., 2022). Intelligent learning media aimed at developing critical and creative thinking skills contain stimulating elements that encourage students to think critically and creatively (Fernando et al., 2021; Rahim et al., 2019; Rahim, 2018; Ridwan et al., 2021). Higher-order thinking skills (HOTS) are supposed to connect new and old knowledge, combining and developing it (Ariyana et al., 2018; Sari et al., 2022). This interactive learning medium will present figures and animations related to physics learning challenges, requiring students to evaluate the information displayed by the animated images and have the confidence to explain their analytical conclusions. When there is media that can guide students in assessing any difficulties they encounter while studying physics, understanding physics becomes much easier (Astuti & Suparno, 2017).

Students in the twenty-first century must have higher-order thinking abilities, be able to express their knowledge, and interact or cooperate in solving issues in physics study. The creation of intuitively learning media for material science utilizing the Lectora Motivate Program blends illustrations, livelinesss, and recordings (Nabila et al., 2021; Sari et al., 2023). Lectora Inspire may be used to build games that will keep students' attention and prevent them from becoming bored with the learning (Shalikhah, 2016). This interactive learning media is intended to encourage students to investigate issues or phenomena connected to physics learning, ensuring that physics learning does not become boring with current notions. This offers an opportunity to build new items relating to what has been studied (Suhardiman et al., 2022).

Based on the findings of a media analysis conducted at high schools throughout Padang City, which involved collecting learning media from each school and then analyzing it with a media analysis instrument, it was determined that the utilization of learning media was still low across high, medium, and low category schools. The majority of the media used by each school consisted of conventional PowerPoint presentations created directly by teachers. The examination of the utilization of interactive learning media yielded findings ranging from 20% to 50%, which is classified as mild to moderate. To accommodate these problems in physics subjects, interactive learning media is required. According to the criteria of the Curriculum in Indonesia, students must be actively involved in their learning, such as solving questions based on provided physical facts. This involvement is linked to the use of media in learning. The use of rules media is closely related to the stages of thinking, as rules media can make abstract concepts concrete and modify complex ideas (Usmeldi, 2017). The use of media during the introduction stage of learning significantly improves the effectiveness of message delivery and subject comprehension (Wahid, 2018). Besides arousing motivation and interest, instructional media can also assist students in improving their understanding, presenting data in an engaging and reliable manner, facilitating data interpretation, and condensing information (Usmeldi, 2017).

Based on classroom observations, it was found that the learning media in use did not meet the standards of the curriculum. In a study involving 30 students, 90.83% reported that

the material utilized in physics class was paper-based, while only 25.37% claimed that the content used stimulated their interest in learning. The printed material used was a physics textbook published under the previous curriculum. As a result, the learning resources do not correspond to the curriculum standards (Zulherman et al., 2015).

Preliminary research shows that few teachers use learning media to help students learn physics concepts, especially abstract concepts. In fact, these abstract concepts should be communicated using learning media to ensure that the teacher's explanation is conveyed and understood effectively by students. In response to these conditions, interactive learning media for the concept of physical quantities and measurements were developed to improve the critical and creative thinking skills of high school students. The importance of this research lies in the role of learning media in the learning facilities provided by teachers. Effective media can influence students' thinking processes, learning motivation, and ultimately, learning outcomes. By improving the quality of learning media, especially for abstract concepts such as physical quantities measurement, teachers can improve students' critical and creative thinking skills, resulting in better engagement and understanding of subject matter.

METHOD

Research Design

This research is research and development research or also known as R&D. The ADDIE model is used in this R&D research. The stages of this model consist of analysis, design, development, implementation and evaluation. The aim of this research is to develop interactive high school physics learning media that is valid and practical and can be used in the learning process to enhance students' critical and creative thinking skills in learning material about physical quantities and measurements (Sari, 2017). In the first step, an analysis of media development needs and an analysis of critical and creative thinking skills components in the learning media in schools. At the design stage, the initial format and design are developed using the Lectora Inspire application. In the third stage, a validity analysis is conducted, with validators being experts in the field of physics education and learning media. The next stage is implementation, which involves deploying the product in the classroom. The aim of this implementation series is to provide competency results in the form of information, mindset, and abilities. This stage involves teachers and students at several high schools in Padang. The final stage is evaluation, which aims to assess the results of the classroom implementation.

Participants

This research involved three validators who are experts in the field of physics education and physics learning media, as well as six physics teachers from State Senior High Schools in Padang City. Additionally, 30 students from three State Senior High Schools in Padang City were involved in this research, selected using a purposive sampling technique.

Instruments

The instruments used in the preliminary research consist of two main components, namely the Needs Analysis Instrument and the Validation Instrument. The contents of the instrument sheet were taken from previous research which was then modified based on research needs. The instrument that had been designed was then validated by three physics lecturers at Universitas Negeri Padang. The researcher utilized research questionnaires and

interviews with physics teachers and high school students in Padang city as methods to gather data. The questionnaire was designed as the primary tool to measure indicators related to the content of learning resources, appearance, and media quality. The distribution of the questionnaire aimed to obtain comprehensive information about respondents' issues. Meanwhile, interviews were conducted to gather responses, comments, and suggestions from teachers and students. Observation sheets were used to observe their responses in using interactive display tools during the learning process. Validation instruments were subsequently employed to assess the feasibility of the product, considering aspects such as software engineering, design, visual communication, content, and usability. The validity was evaluated by experts through the validation process, encompassing content, language, and construct validation using questionnaires. Both data collection and validation instruments play an integral role in this research methodology to ensure the accuracy and validity of the results.

Data Analyis

Analysis of the data used is by dividing the score obtained by the highest score and multiplying by 100%. These results are categorized into five categories, namely 0-20 very low category, 21-40 low category, 41-60 moderate category, 61-80 high category, and 81-100 very high category (Riduwan, 2010). The validity analysis is based on the validator's responses through a Likert scale with five levels of a scale of 1-5 with categories from strongly disagree to strongly agree (Retnawati, 2018). The results of the Likert scale were analyzed using V Aikens and the results of the Aikens V Index results can be grouped into three categories, namely less valid, valid, and very valid (Retnawati, 2018).

RESULTS AND DISCUSSION

Results

a. Analysis Stage

At the analysis stage, it was found that the learning media used in schools was not practical. PowerPoint is a medium that is always used by teachers. Learning material is summarized in PowerPoint. The presentation is only in the form of short material, example questions, and practice questions. The results of the media quality analysis are shown in Table 1. The indicators contained in the instruments used consist of material substance, presentation (communication and visuals), learning design, and software. These results indicate that the media used in learning preparation is still completely intuitive, but the interaction between media and students, media and teachers, has not been clearly defined. At this stage, an analysis of the components of critical and creative thinking skills in learning media at school is also carried out. The results can be shown in Table 2.

Table 1. Media Quality Analysis Results

School	Media Quality Analysis
State Senior High Schools A	54.6%
State Senior High Schools B	55.5%
State Senior High Schools B	47.5%

Table 2. Critical and Creative Thinking Skills Component in Learning Media Analysis

School Category	Critical Thinking Skills	Creative Thinking Skills
State Senior High Schools A	47.7%	37.7%
State Senior High Schools B	46.9%	35.6%
State Senior High Schools B	46.6%	26.4%

These results indicate that the critical thinking skills components contained in the media are in the sufficient category with a percentage range of 46.6% to 47.7%. Critical thinking indicators which include analysis, assessment, conclusions, deductive reasoning and inductive reasoning have not been fully covered in learning media. Apart from critical thinking, there is an urgent need to improve students' creative thinking skills. Analysis of creative thinking skills (fluency, flexibility, elaboration and originality) in learning media shows that the component of creative thinking skills in media is relatively low with a percentage range of 26.4% to 37.7%. This shows that there is a significant gap.

b. Design Stage

At the design stage, a complete media design is carried out. This process begins with designing interactive learning media and will become the basis for the subsequent development process. This design process is the process of creating a design according to the results of the analysis that has been carried out so that problems found in the analysis process can be resolved. The design of interactive learning media is shown in Figure 1.

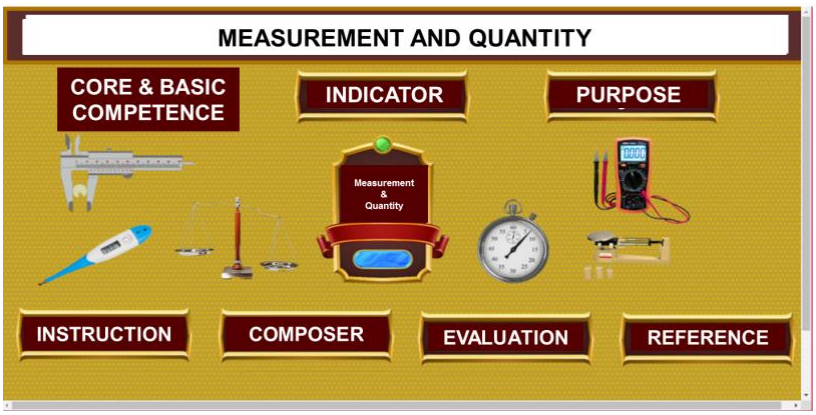

Figure 1. Cover Design

This interactive learning media consists of a cover, instructions for use, competencies, indicators, learning objectives, material summary, example questions, and evaluation. Apart from containing the components shown in Figure 1, this media also contains many examples of questions in the form of puzzles, as well as questions and quizzes which aim to inspire students to understand the material as a whole.

c. Development Stage

At this stage, a validity test is carried out on the interactive learning media that has been designed. The results can be seen in Figure 2. Based on Figure 2, the value of the learning content indicator varies between 0.58 and 0.83. These results indicate that the content validity of this media is categorized as valid. The second validity indicator focuses on the auditory and

visual components of communication displays. The results of this validity assessment are depicted in Figure 3. The value of the substance indicator for auditory and visual communication displays ranges from 0.67 to 0.92. These results indicate that the audio visual validity of this media is categorized as valid.

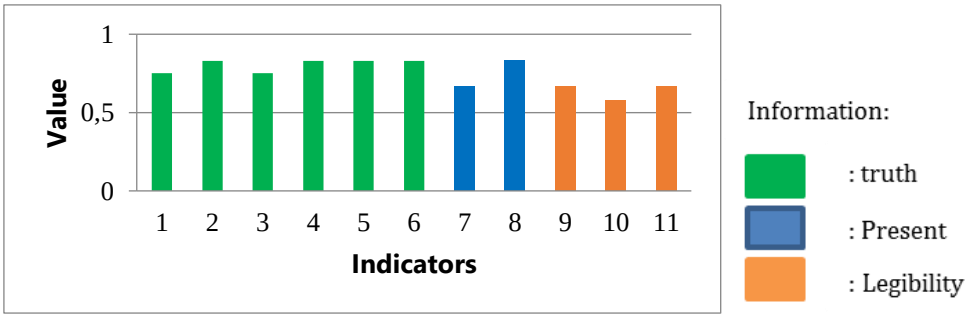

Figure 2. Results of Learning Content Validity

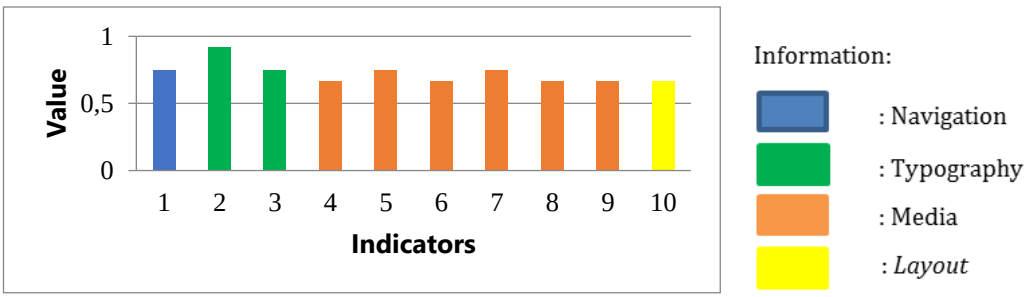

Figure 3. Results of Audio Visual Display Validity

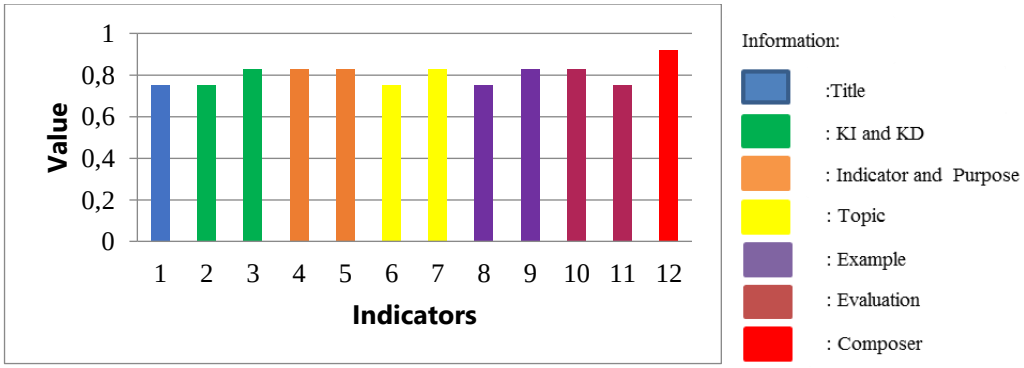

Figure 4. Result of Learning Design Validity Results

The results of the validity analysis of the learning design can be seen in Figure 4. This graphic representation presents a comprehensive display of the assessment results which shows the effectiveness and suitability of the learning design elements. These results show that the indicator values for learning design range from 0.75 to 0.92. Thus, the validation value of the learning design is considered valid.

The fourth validity analysis is the validity of software utilization, which consists of three different components and includes a total of six indicators. These indicators play an important role in evaluating the effectiveness and suitability of software utilization. Detailed findings from this validity assessment, highlighting the performance of software utilization indicators, are presented in Figure 5. Figure 5 shows that the software utilization indicator value ranges from 0.67 to 0.92. These results show that the validation value of software utilization is classified as

valid. The fifth validity analysis is the component of critical thinking skills. Figure 6 shows that the indicator values for assessing critical thinking skills range from 0.67 to 0.83. The average validation score for critical thinking skills assessment indicators is 0.76, which indicates that the critical thinking skills assessment is considered valid. The sixth validity analysis is the component of creative thinking skills. Figure 7 shows that the indicator value for assessing creative thinking skills ranges from 0.67 to 0.83. The average validation value for the creative thinking skills assessment indicator is 0.76. Thus, the validation value for assessing creative thinking skills is classified as valid.

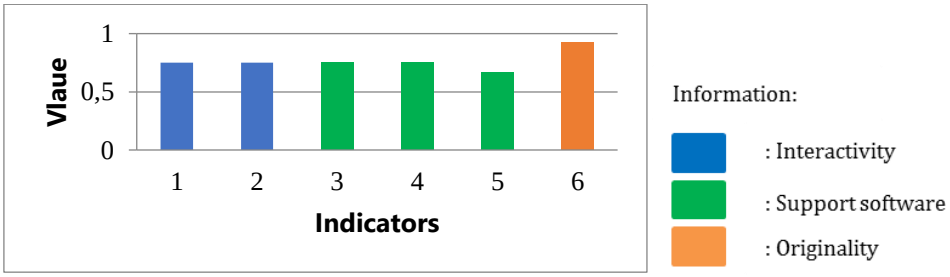

Figure 5. Results of Software Utilization Indicator Validity

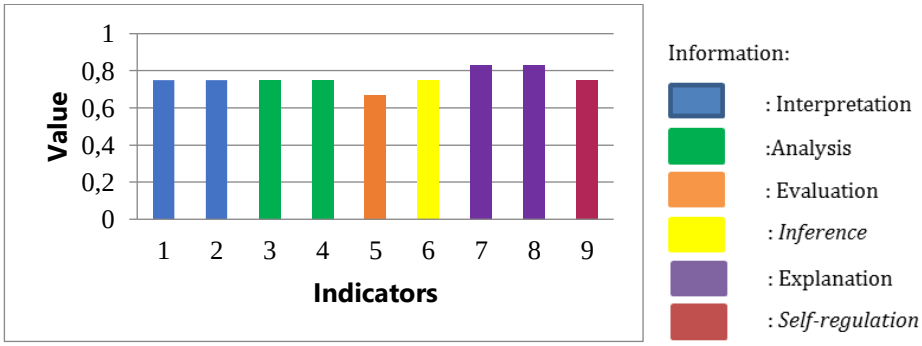

Figure 6. Results of the Validation of Critical Thinking Skills Assessment Indicators

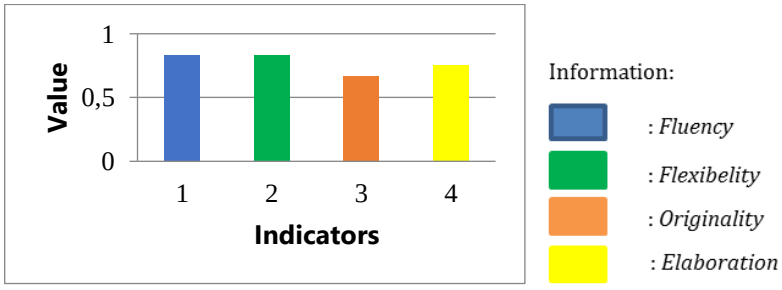

Figure 7. Results of the Validation of Indicators for Assessment of Creative Thinking Skills

After the product is declared valid with a satisfactory overall validity level, the validator continues to provide valuable input aimed at improving the interactive learning media being developed. Some validator suggestions and insights focus on resolving specific issues, such as images failing to display properly on a PC or laptop. In addition, there are recommendations to diversify the Higher Order Thinking Skills (HOTS) questions in the evaluation section.

d. Implementation Stage

The end result of product practicality is an assessment given by 2 physics teachers from

each of the three school categories namely the high category represented by School A, the medium category represented by School B, and the low category represented by School C. This practicality instrument was composed of several indicators that are easy to understand, interesting, and efficient. The teacher's assessment is valuable for understanding their response to interactive learning media. This instrument is completed by a physics teacher who utilizes such media. The results of the practicality evaluation for each school are presented in Table 3.

Table 3. Practicality Test Results of Interactive Learning Media by Teachers

School	Respondents (Teacher)	Mean	Category
State Senior High Schools A	Teacher 1	93.3%	Very Practical
	Teacher 2	94.7%	Very Practical
State Senior High Schools B	Teacher 3	78.7%	Practical
	Teacher 4	86.7%	Very Practical
State Senior High Schools C	Teacher 5	93.3%	Very Practical
	Teacher 6	90.7%	Very Practical
Average		**89.6%**	Very Practical

Based on the results of media practicality tests carried out in the three schools, it shows that this media is easy to understand, flexible and efficient. Evaluations from physics teachers in the three schools show that interactive learning media is very practical, making it very suitable to be applied in the teaching and learning process.

Discussion

Research is focused on developing interactive learning media products that are valid and practical for use in the physics learning process. The results of the investigation found that the use of intelligent learning media in high schools in Padang is not yet fully relevant. The instructor uses a self-made PPT that does not contain components of critical and creative thinking skills. This highlights the importance of creating interactive learning media to improve students' critical and creative thinking skills on physical quantities and measurement material

In responding to these findings, learning media developers in this research paid attention to the integration of elements of critical and creative thinking skills in instructional design. This involves the development of more in-depth content and innovative learning strategies to encourage the development of analysis, judgment, deductive and inductive thinking, and creativity skills such as fluency, flexibility, elaboration, and originality. In addition, the application of innovative lectora technology can ensure that this learning media is truly effective in developing students' critical and creative thinking skills (Adawiyah et al., 2019; Fanny Rahmatina Rahim, Sari, et al., 2022; S. Y. Sari, Rahim, et al., 2022). Ini juga menyoroti pentingnya pelatihan yang memadai bagi para guru dan pengajar It also highlights the importance of adequate training for teachers and educators to understand and apply relevant learning strategies in the use of new learning media.

The validity analysis conducted at the design stage of interactive learning media is based on several factors that influence the validity results. First, the content validity of the learning media is measured through content indicators. This demonstrates that the media content aligns with the learning needs identified through the initial analysis (Shalikhah, 2017).

Second, the audiovisual validity of the learning media is assessed through auditory and visual evaluations of the communication display. This indicates that the media effectively conveys information clearly and engagingly, both through sound and images. High-quality audiovisual components can enhance students' interest and comprehension of the learning material (Kahu & Nelson, 2018). Third, the validity of the learning design is evaluated based on several indicators that encompass the effectiveness and appropriateness of the learning design elements. This shows that the media includes aspects such as clarity of learning objectives, organization of learning materials, and alignment of learning strategies with the learning goals and content (Susilana Rudi, 2009). A well-designed learning approach will ensure that students' learning experiences are optimal and meet their needs. Fourth, the validity of software utilization demonstrates that the media offers ease of use, availability of relevant features, and software performance that supports the learning objectives. Fifth, the validity of critical and creative thinking skills indicates that the media is capable of stimulating and developing students' critical and creative thinking abilities. This is measured through several indicators, including the complexity of questions, the clarity of creative tasks, and the support provided for problem-solving and idea generation processes. Well-designed media will pose challenging questions, provide scenarios and tasks that encourage students to think outside the box, and offer space for students to explore and develop new ideas (Okta Priantini, 2021).

The assessment components in the practicality instrument sheet were simple to understand, appealing, and effective. Several factors must be considered in the practicality test, including the time spent on learning implementation, which must be effective and efficient, and the media's ability to pique students' learning interest. Based on the test results, all of the indicator items fall into the very practical category, indicating that interactive learning media on material quantities and measurements are very useful in the learning process. Similarly, in Ridwan's research, the level of practicability of interactive learning media to improve students' creative thinking skills is classified as of effectively and efficiently used in the learning process (Ridwan et al., 2021). If the interactive learning media produced is consistent with the media indicators contained in the instrument, the product is considered to be valid. Learning content, audio and visual display, learning design, software utilization, assessment of critical thinking skills, and assessment of creative thinking skills are the indicators. According to Sugiyono, media validity tests include expert content validity and construct validity (Sugiyono, 2012). If all of the media meet these criteria, the resulting interactive learning media can be considered valid. The impact of valid interactive learning media on learning is the achievement of learning objectives that require students to comprehend the topic presented in interactive learning media (Susilana Rudi, 2009). This is due to the content's suitability and media display, which makes it easier for students to understand topic based on concepts. Even though the product is said to be valid, the product validity value is not 100%. This is due to the presence of several invalid indicators, both in terms of learning topic, audio and visual communication display, and learning design.

The product is said to be usable if all aspects of learning media usability have been met during the learning process (S. Nabila et al., 2021). The practicality of the media is measured by how easy it is for students to understand, how effective and efficient it is when used. The effect of products labelled as practical on learning is the emergence of a fun learning process for students because it employs learning media that are simple to understand, effective, and efficient to use (Barus et al., 2021). This will increase students' interest in learning, resulting in better student outcomes (Sastra, PZM, Rahim, 2023).

The significance of this study lies in the development of interactive learning media, which can serve as a valuable online learning resource accessible via smartphones or laptops. This media incorporates components that promote critical and creative thinking skills, thereby aiding in the cultivation of students' abilities in these areas. However, it's important to note that this research only progressed up to the practicality stage. Therefore, it is hoped that future researchers will extend the investigation to the effectiveness stage. This would involve assessing the impact of interactive learning media created with the Lectora Inspire application on enhancing high school students' critical and creative thinking skills, specifically in the subject of quantities and measurements, and expanding the development of interactive learning media to cover all physics topics.

CONCLUSION

In conclusion, the developed interactive learning media meets the criteria for validity and is suitable for use in schools, encompassing content validity, audiovisual validity, instructional design validity, software utilization validity, and the validity of critical and creative thinking skill components. Practicality evaluations by physics teachers from three different school categories indicate that this media is easy to understand, flexible, and efficient, making it highly practical for implementation in the teaching and learning process. These results imply a potential enhancement in the quality of education in schools, where students can be more actively and deeply engaged in the learning process and stimulated to develop critical and creative thinking skills using such media. Additionally, this media can assist teachers in delivering content in a more engaging and interactive manner, thereby increasing student motivation and teaching effectiveness. Consequently, the use of this interactive learning media can be a significant step towards improving the quality of education across various educational levels.

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REFERENCES

Adawiyah, R., Harjono, A., Gunawan, G., & Hermansyah, H. (2019). Interactive e-book of physics to increase students' creative thinking skills on rotational dynamics concept. *Journal of Physics: Conference Series*, *1153*(1). https://doi.org/10.1088/1742-6596/1153/1/012117

Ariyana, Y., Pudjiastuti, A., Bestary, R., & Zamromi, Z. (2018). Buku Pegangan Pembelajaran Berorentasi Keterampilan Berpikir Tingkat Tinggi. *Direktorat Jendral Guru Dan Tenaga Kependidikan. Kementerian Pendidikan Dan Kebudayaan*.

Astuti, I. A. D., Sumarni, R. A., & Saraswati, D. L. (2017). Pengembangan Media Pembelajaran Fisika Mobile Learning berbasis Android. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1). https://doi.org/10.21009/1.03108

Astuti, R. D., & Suparno, S. (2017). Pengembangan Physics Comprehensive Contextual Teaching Materials Berbasis Kkni Untuk Meningkatkan HOTS dan Menumbuhkan Kecerdasan Emosional. *Jurnal Pendidikan Fisika*, *5*(1). https://doi.org/10.24127/jpf.v5i1.739

Barus, I. R. G., Simanjuntak, M. B., & Resmayasari, I. (2021). Reading Literacies Through Evieta-

Based Learning Material: Students'perceptions (Study Case Taken from Vocational School–IPB University). *Journal of Advanced English Studies*, *4*(1).

Fernando, T. J., Darvina, Y., Sari, S. Y., Dwiridal, L., & Rahim, F. R. (2021). The Effect of Hots-Oriented Worksheets with Barcode Assistance in Online Learning on Critical Thinking and Creatives of Students of Class XI Sman 1 Harau. *Pillar Of Physics Education*, *14*(1). https://doi.org/10.24036/10679171074

Kahu, E. R., & Nelson, K. (2018). Student engagement in the educational interface: understanding the mechanisms of student success. *Higher Education Research and Development*, *37*(1). https://doi.org/10.1080/07294360.2017.1344197

Nabila, P., Rahim, F. R., & Sari, S. Y. (2021). *Development of Interactive Learning Media Using Lectora Inspire Oriented towards Critical and Creative Thinking Skills on Simple Harmonic Motion*.

Nabila, S., Adha, I., & Febriandi, R. (2021). Pengembangan Media Pembelajaran Pop Up Book Berbasis Kearifan Lokal pada Pembelajaran Tematik di Sekolah Dasar. *Jurnal Basicedu*, *5*(5).

Okta Priantini, D. A. M. M. (2021). The Development Of Teaching Video Media Based On Tri Kaya Parisudha In Educational Psychology Courses. *Journal of Education Technology*, *4*(4). https://doi.org/10.23887/jet.v4i4.29608

Rahim, F. R., Muttaqiin, A., & Hardinata, A. (2019). A preliminary investigation into critical and creative thinking skills of university students in integrated science class 7 course. *Journal of Physics: Conference Series*, *1185*(1), 012131. https://doi.org/10.1088/1742-6596/1185/1/012131

Rahim, Fanny Rahmatina. (2018). Research Based Learning dalam Pembelajaran IPA Terpadu untuk Meningkatkan Kemampuan Berpikir Kreatif Mahasiswa. *Semesta: Journal of Science Education and Teaching*, *1*(2), 32–38.

Rahim, Fanny Rahmatina, Nabila, P., Sari, S. Y., & Suherman, D. S. (2022). Interactive Learning Media for Critical and Creative Thinking Skills Development. *Pillar Of Physics Education*, *15*(4), 235–244.

Rahim, Fanny Rahmatina, Sari, S. Y., Sundari, P. D., Aulia, F., & Fauza, N. (2022). Interactive design of physics learning media: The role of teachers and students in a teaching innovation. *Journal of Physics: Conference Series*, *2309*(1). https://doi.org/10.1088/1742-6596/2309/1/012075

Rahim, Fanny Rahmatina, Suherman, D. S., & Murtiani, M. (2019). Analisis Kompetensi Guru dalam Mempersiapkan Media Pembelajaran Berbasis Teknologi Informasi Era Revolusi Industri 4.0. *Jurnal Eksakta Pendidikan (JEP)*, *3*(2). https://doi.org/10.24036/jep/vol3-iss2/367

Rahim, Fanny Rahmatina, Suherman, D. S., & Muttaqiin, A. (2020). Exploring the effectiveness of e-book for students on learning material: A literature review. *Journal of Physics: Conference Series*, *1481*(1). https://doi.org/10.1088/1742-6596/1481/1/012105

Retnawati. (2018). Teachers' knowledge about higher- order thinking skills and its learning strategy. Problems of Education in the 21st Century. *Jurnal Ilmiah Sekolah Dasar*, *2*.

Riduwan. (2010). Skala Pengukuran Variabel-variabel Penelitian. In *Alfabeta*.

Ridwan, Y. H., Zuhdi, M., Kosim, K., & Sahidu, H. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kreatif Fisika Peserta Didik. *Orbita: Jurnal Kajian, Inovasi Dan Aplikasi Pendidikan Fisika*, *7*(1). https://doi.org/10.31764/orbita.v7i1.3832

Sari, B. K. (2017). Desain Pembelajaran Model Addie Dan Implementasinya Dengan Teknik

Jigsaw. *Prosiding Seminar Nasional Pendidikan*.

Sari, S. Y., Darvina, Y., Rahim, F. R., Sundari, P. D., & Aulia, F. (2022). Analysis of student's higher order thinking skill in answering on the physics national exam. *Journal of Physics: Conference Series*, *2309*(1). https://doi.org/10.1088/1742-6596/2309/1/012079

Sari, S. Y., Hirahmah, A., Hidayati, H., & Rahim, F. R. (2023). Validity of Interactive Learning Media Integrated Critical and Creative Thinking Skills Aided by the Lectora Inspire Application. *Jurnal Ilmiah Pendidikan Fisika*, *7*(2), 204. https://doi.org/10.20527/jipf.v7i2.7404

Sari, S. Y., Rahim, F. R., Sundari, P. D., & Aulia, F. (2022). The importance of e-books in improving students' skills in physics learning in the 21st century: A literature review. *Journal of Physics: Conference Series*, *2309*(1). https://doi.org/10.1088/1742-6596/2309/1/012061

Sastra, PZM, Rahim, F. R. (2023). Interactive Learning Media for Critical And Creative Thinking Skills Development. *Jurnal Eksakta Pendidikan (JEP)*, *15*(4), 13–25.

Shalikhah, N. D. (2016). Pemanfaatan Aplikasi Lectora Inspire Sebagai Media Pembelajaran Interaktif. *Cakrawala: Jurnal Studi Islam*, *11*(1). https://doi.org/10.31603/cakrawala.v11i1.105

Shalikhah, N. D. (2017). Media Pembelajaran Interaktif Lectora Inspire sebagai Inovasi Pembelajaran. *Warta LPM*, *20*(1). https://doi.org/10.23917/warta.v19i3.2842

Sheresheva, M., Skakovskaya, L., Bryzgalova, E., Antonov-Ovseenko, A., & Shitikova, H. (2021). The Print Media Convergence: Overall Trends and the COVID-19 Pandemic Impact. *Journal of Risk and Financial Management*, *14*(8). https://doi.org/10.3390/jrfm14080364

Sugiyono. (2012). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D*. Bandung: Penerbit Alfabeta.

Suhardiman, S., Nur Asni, Andi Ika Prasasti Abrar, & Ummul Hasanah. (2022). Meta Analisis Pengaruh Media Simulasi E-Learning PhET terhadap Hasil Belajar dalam Pembelajaran Fisika. *JURNAL PENDIDIKAN MIPA*, *12*(3). https://doi.org/10.37630/jpm.v12i3.652

Susilana Rudi. (2009). MEDIA PEMBELAJARAN: Hakikat,Pengembangan,Pemanfaatan,dan Penilaian. In Media Pembelajaran. *Cv. Wacana Prima*.

Usmeldi, U. (2017). Efektivitas Penerapan Media Pembelajaran Interaktif dengan Software Autorun untuk Meningkatkan Kompetensi Fisika Siswa SMK Negeri 1 Padang. *Jurnal Eksakta Pendidikan (JEP)*, *1*(1). https://doi.org/10.24036/jep/vol1-iss1/38

Wahid, A. (2018). Jurnal Pentingnya Media Pembelajaran Dalam Meningkatkan Prestasi Belajar | Istiqra` : Jurnal Pendidikan dan Pemikiran Islam. *Istiqra'*, *5*(2).

Zulherman, Desnita, & Handoko, E. (2015). Pengembangan Modul Berbasis Contextual Teaching and Learning Untuk Fisika SMA Kelas XI Semeter II pada Materi Fluida Dinamis. *Prosiding Seminar Nasional Fisika (E-Journal) SNF2015*, *IV*.