

THE DEVELOPMENT OF INTERACTIVE ELECTRONIC BOOK (BUDIN)
USING *FLIP PDF PROFESSIONAL* TO TRAIN HIGHER ORDER THINKING SKILLS

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Abstract

The main purpose of the research is to produce Interactive Electronic Book (BUDIN) using *Flip PDF Professional* which is valid, practically, and effectiveness. Validity is based on validity of learning, material, and media; practically is based on the implementation and constraints of learning; and effectiveness is based on higher order thinking skills and responses. Type of research is development using ADDIE model (Analysis, Design, Develop, Implement, Evaluate) and the subject of research is 19 student of Dharma Wanita Surabaya high school (XI grade of Science). The technique of data collection are questionnaire, observation, and test. Interactive Electronic Book (BUDIN) declared feasible if the percentage of validity (learning, material, media); practically (learning's implementation and constraints), and effectiveness (higher order thinking skills and students response) $\geq 61\%$ with good and excellent category. The result of the research showed that the validity of interactive electronic book (BUDIN) are excellent (learning 97,92%; material 95,00%; media 93,75%); the practically is excellent (learning's implementation 94,07%) and effectiveness are good based on higher order thinking skills (analysis 78,94%, evaluate 73,68%, creation (structure 77,47%, fluency and flexibility 75,95%, link 75,21%, and novelty 73,68%)) and students responses is excellent with percentage between 84,21% to 94,74%. The conclusion of the research is that interactive electronic book (BUDIN) using *Flip PDF Professional* is feasible of being used to train higher order thinking skills.

Keywords: Interactive Electronic Book (BUDIN), Higher order thinking skills, *Flip PDF Professional*

INTRODUCTION

Physics is a part of science or science that studies about natural phenomena or phenomena in terms of matter and energy. Through the field of study, Physics plays an important role in underlying the development of technological progress and the concept of living in harmony and balanced with nature. Therefore, the provision of Physics materials in the learning process must be integrated in accordance with the meaning of the nature of Physics, (Physics as product, Physics as process, and Physics as attitude) and can accommodate students' thinking skills to a higher level

Higher order thinking skills are fundamental changes in evaluation reforms aimed at introducing students' thinking skills and removing rote learning or more from repeating information or facts (Gunawan A. W., 2003). Bloom's Taxonomy is the basis of reference from the hierarchical level of thinking that identifies thinking skills from low to high levels. Higher order thinking skills leads to Analysis (C4), Evaluation (C5), and Creation (C6). The aspect of Analysis (C4) involves a deep understanding of information (Sulistiyorini, et al, 2013), where students are required to analyze incoming information and divide it into smaller structures to recognize their relationships. In the aspect of Evaluation (C5) it can be translated that this level requires the student to provide an assessment of the

solutions, ideas, and methodologies using appropriate criteria to assure the benefits (Anderson & Krathwohl, 2001), while in the aspect of Evaluation (C6) refers to creativity. In the aspect of Evaluation (C6) requires students to be able to generalize an idea or perspective on something and can design a way to solve problems (Anderson & Krathwohl, 2001) that meet novelty, fluency and flexibility criteria, the linkage between the concept (link), and structure preparation of the settlement (structure) (Silver, 1997 with modification).

The level of higher order thinking skills students in Indonesia can be showed through the results of the PISA study. The results of the PISA (Program for International Students Assessment) study in 2012 ranked Indonesia in 71 of 72 countries that follow (Tentang PISA), although in 2015 the ratings and achievements of PISA Indonesia increased by six ratings to 64, but the achievement has not said to be significant. The rating obtained by Indonesia in its participation in PISA shows the weakness of Physics learning process that has been done so far. Physics learning process is only emphasized on the delivery of material only, so the teacher can't see the other side that Physics is a complex learning that involves the thinking process (Putra & Sudarti, 2013). Therefore required a media based learning technology as a tool in supporting the achievement of learning process.

The rapid development of digital technology in Indonesia has a high potential to initiate the transformation towards the digital world. This can be showed through the widespread use of electronic devices, one of which is a smartphone. Currently, nearly 90% of students more often use smartphones than using computers or laptops, whether to communicate, learn, read, or access the internet. Generally, the use of learning media based on smartphones technology used in schools is a electronic book. Electronic book or ebook can be defined as a book form that can be opened electronically via a computer or mobile device (Wikipedia). Moving a printed book into ebook can provide several benefits, such as easy distribution and retrieval, easy to store and backup, has the ability to set the size of text, can add text to multimedia, read in different devices, and does not need a lot of space in its storage (Fojtk, 2014). Moreover, the use of ebook as a learning tool in the classroom not only provides economic benefits to parents, but also can provide physical, academic and psychological benefits to students (Embong, et al, 2012). Economically, the use of BUDIN can reduce the cost of purchasing textbooks that have low storage power compared to ebook; physically, the use of BUDIN can reduce the student's burden in carrying the package book while in school; academically, the use of features in BUDIN (such as text, audio, video, images, and animation) can encourage student creativity and psychology, the learning process using BUDIN will be more fun and meaningful for students, so students will not feel depressed at the moment learn.

The development of ebook which had exist was develop ebook which used by 3D Page Flip Operasional, Kvisoft Flip Book Maker, Macromedia Flash, etc which operated by computer or laptop, that more focus on the students responses and cognitive aspect, but not to accomodate their thinking levels (Sri Hayati et al, 2015; Kustijono & Ghofur 2015; Perdana, 2013). Although in many schools have switched to using ebook that are already accessible on smartphones, however, the ebook used has not been able to integrate between teaching materials with multimedia content that is used as a supporting tools. This is supported by the results of observations of class XI students in SMA Dharma Wanita Surabaya which shows that the use of ebook more using PDF and doc format so that less teaching materials can be delivered optimally.

In this regard, one of the efforts that can be taken is to optimize the use of technological development in the preparation of ebook, using interactive concepts or better known as Interactive Digital Book (BUDIN) with embedded multimedia containing audio-visual elements in it. The multimedia can integrate the processing of students' knowledge through the dual channel of pictorial

channel (static and written image) as well as auditory processing (Mayer 2002), besides with the audio visual element can facilitate the students in comprehending a lesson effectively and efficiently (Dale E., 1969). Therefore, the use of BUDIN is considered to be able to create interactive, meaningful, and enjoyable learning situations, while also accommodating students' thinking skills to a higher level through the features contained therein. This can be demonstrated through the results of Electronic versus traditional print textbooks research shows that students who used electronic textbooks in the study had higher levels of affective and psychomotor learning – they learned actively and they liked it (Rockinson, a.J., 2013)

Based on the description above, the research discuss about “Development Interactive Electronic Book Using Flip PDF Professional to Train Higher Order Thinking Skills”.

METHOD

The type of research is development using the ADDIE model (Analysis, Design, Developot, Implement, Evaluate) developed by Dick and Carrey (2001). The development research procedure can be illustrated by figure 1.

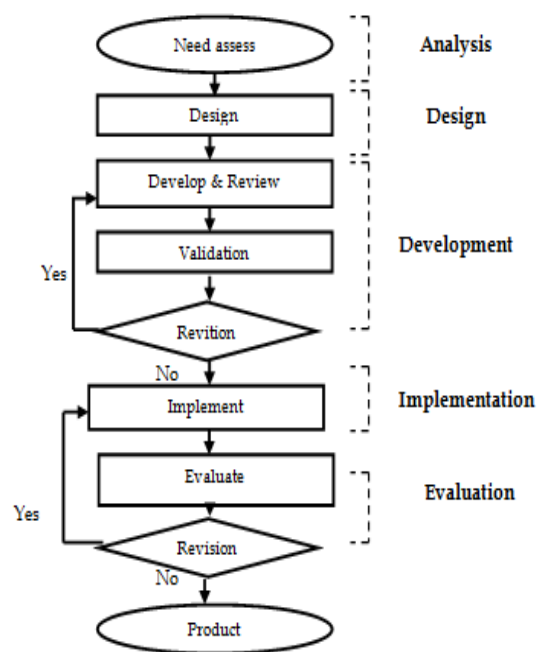


Figure 1. Interactive Electronic Book (BUDIN) Chart Design
 Source : (Dick & Carey, 2001) with modification

The first stage is assess needs which includes the analysis of curriculum 2013, analysis of higher order thinking skills competence to be trained on the media, analysis of material and learning content to be integrated in the media, and analysis of spesification media used as

a maker of BUDIN namely Flip PDF Professional and its output The result of the analysis stage is used to design the learning media at the next stage. At the Design stage, a BUDIN prototype is created that can train higher order thinking skills. The design of BUDIN is then visualized through Flip PDF Professional software at the development stage. At the development stage, BUDIN is packed with an interactive concept that provides learning resources and activities that can train higher order thinking skills for students. Learning's resource facilities are presented by combining stimuli in the form of phenomena that occur in everyday life with multimedia content such as text, images, video, audio, and animated to accommodate higher order thinking skills, while at the learning's facility will be presented in a form of direction to students to be able to analyze, evaluate, or create based on the given problem. The appearance of BUDIN developed can be seen in Figure 2.



Figure 2. The Cover of BUDIN
Source: Personal Documentation

BUDIN has been made is then reviewed and validated by experts in terms of learning, materials, and media. If BUDIN has met the criteria of validity, then the BUDIN can be implemented in the learning process in the classroom. BUDIN will then be implemented on 19 students of class XI MIA SMA Dharma Wanita Surabaya. The final stage of development research is the evaluation stage. At this stage, the practicality and effectiveness of BUDIN is measured through evaluation activities in the form of formative evaluation which includes observation (the implementation of media usage and constraints and higher order thinking skills in terms of "Creative" aspect), questionnaire (student's responses) and summative evaluation based on higher order thinking skills in terms of "Analyze" and "Evaluate" aspects (measured using tests). The technique of data collection used includes of questionnaire, observation, and test. Questionnaires are used to assess the validity of BUDIN in terms of learning, material, and media aspects, and the effectiveness of BUDIN in terms of student responses.

Observations are used to assess the practicality of BUDIN in terms of the implementation and constraints of the media and to assess effectiveness based on higher order thinking skills in terms of "Creation" aspect on making a poster, while evaluation tests are used to assess the effectiveness of BUDIN based on higher order thinking skills in terms of "analyze" and "evaluate" aspects. Scale of assessment used in questionnaire and observation using Likert scale (1=very poor, 2=poor, 3=good, and 4=excellent) (Fraenkel & Wallen, 2009).

The instrument of validity is a review and validation sheet of learning, materials, and media. The learning validation sheet assesses the suitability of the material and the media with the learning aspects on curriculum 2013, the material validation sheet assesses the material suitability with the competencies to be achieved, while the media validation sheet assesses media compliance with aspects of software engineering and audio-visual communications.

The instrument of practicality is a learning's implementation and constraints sheet. Assessment on the learning's implementation and constraints sheet refers to the interpretation of the use of BUDIN; ease of operation of BUDIN on mobile device; use of BUDIN in motivating students; student involvement in learning process; use of BUDIN as a tools of discussion and exploration of students; use of BUDIN in accommodating students' thinking ability; and use of BUDIN to make efficient use of time.

The instrument of effectiveness are higher order thinking skills observation sheet, test sheet, and questionnaire. Higher or order thinking skills observation sheet is used to assess higher order thinking skills in the "Creating" aspect that refers to the substance of poster made by students. There are four assessment's criteria on this sheet, ie novelty, fluency, and flexibility, link, and structure. The test sheets are used to assess higher order thinking skills in the "Analyze" and "Evaluate" aspect, whereas questionnaires are used to determine the responses or opinions of students on the use of BUDIN during the learning process. Questionnaire used in this research is a combination between open and closed.

The results of the validity, practicality, and effectiveness assessment (observation of higher order thinking skills) were analyzed using Table 1.

Table 1. Scale for Assessment of Feasibility's e-Book

Value Range	Category
1,00 – 1,99	Very Poor
2,00 – 2,99	Poor
3,00 – 3,49	Good
3,50 – 4,00	Excellent

Riduwan, 2015

BUDIN declared feasible (valid, practice, effective) if the percentage of validity (learning, material, and media

aspects); practicality (learning's implementation and constraints); and effectiveness (higher order thinking skills and students responses) $\geq 61\%$ with good and excellent category (Riduwan, 2015).

RESULTS AND DISCUSSION

Validity

The recapitulation of the two experts' assessment for validity aspect of the learning kit is shown on Table 1 below. The recapitulations of the validity instrument's by two experts on the aspects of learning, materials, and media can be shown in table 2 below.

Table 2. Recapitulation of validity

Indicator	Score	Category
Learning		
The Suitability of material with curriculum 2013	4	Excellent
The suitability of material to train higher order thinking skills	4	Excellent
The relevance of material to the nature of Physics	3,5	Excellent
The Suitability of media with curriculum 2013	4	Excellent
The suitability of media to train higher order thinking skills	4	Excellent
Validity of Learning		97,92%
Material		
The Clarity of concepts	4	Excellent
The Suitability of multimedia contents with Physics concept	3,5	Excellent
The Clarity of multimedia in conveying the concept	4	Excellent
The Suitability of the assignment with Physics concept	4	Excellent
The Suitability of material with the development of science	3,5	Excellent
Validity of Material		95 %
Media		
The Compatibility of BUDIN	4	Excellent
The Reliability of BUDIN	3	Excellent
The Usability of BUDIN	3	Excellent
The Display quality of BUDIN	4	Excellent
The use of multimedia content with the students 'thinking characteristic	4	Excellent
Interactivity of BUDIN	4	Excellent
Emphasis the concept on the use of contents multimedia	4	Excellent
The use of navigation buttons	4	Excellent
Validity of Media		93,75 %

Based on data validation results in table 1 by two experts can be seen that BUDIN declared feasible on learning, materials, and media aspects with excellent category.

At BUDIN, students are trained on how to think using high-level thinking as reflected in the competency standards and basic competencies contained in the curriculum 2013, where there is a linkage that refers to the development of students' mindset that refers to Bloom's taxonomy, both in the cognitive, affective, and psychomotor (Kemendikbud, 2016). There are three

higher order thinking skills aspect that are trained on students through this BUDIN ie analyzing (C4), evaluating (C5), and creating (C6).

The activities of Analyzing (C4) on BUDIN are presented using a stimulus, either in the form of images, animation or video, then the students are indirectly asked to parse information and formulate existing problems, formulate problems, and be able to recognize and distinguish the cause and effect of a problems. The activities of Evaluation (C5) on BUDIN are presented by giving actual problems about global warming phenomenon, then students will assess what problems are going on, and able to provide the right settlement step, while in the aspect of Creation (C6), in BUDIN will be given an assignment that will trace how to design an idea of completion and produce a product fluently, flexibility, novelty, linked, and structured. In the activities of Creation (C6), students are required to use their creativity in designing an idea that will be visualized in the form of a product (poster). The student's creativity will illustrate the relationship of knowledge and experiences experienced by students after the learning process using the media (Türkmen, 2015).

Through the existence of structured activities, the use of BUDIN in the learning process can be a facilitator to provide a constructivist learning environment, where students can solve problems through exploration, collaboration and active participation (Malik & Agarwal, 2012) with involves the level of thinking. Based on the description of activities in the learning process in BUDIN, indicating that each indicator assessed for the assessment of the validity of learning, materials, and media can meet the objectives of BUDIN development, that is to train higher order thinking skills.

Practicality

The recapitulations of the practicality instrument's by three observer can be shown in table 3 below.

Table 3. Recapitulation of practicality

Indicator	Score	Category
Interpretation of the use of the BUDIN in the classroom	3,67	Excellent
The ease of operation BUDIN on mobile devices	4	Excellent
Student involvement in learning process using BUDIN	3,67	Excellent
The use of BUDIN media in motivating students during the learning process.	3	Excellent
The use of BUDIN media as a tools of discussion and exploration of students	4	Excellent
The use of BUDIN in accommodating students' thinking ability	4	Excellent
The use of BUDIN in the efficient use of time in the learning process	4	Excellent
Percentage of learning implementation		94,07%

Based on the learning implementation's, BUDIN obtained the category of "Excellent" with a percentage of

94.07%. These results indicate that the developed BUDIN media meets the criteria of practicality. The acquisition of BUDIN media is practical, due to several influencing factors. First, BUDIN media developed has been in accordance with aspects and practical considerations proposed by Akker (1999) and Sukardi (2008). Second, BUDIN is designed in accordance with the basic competence and learning objectives that exist in the curriculum 2013. Third, BUDIN is equipped with interactive assignments and quizzes. Fourth, BUDIN combines interactive concepts by utilizing audio-visual elements based on mobile technology. This is because the audio visual element has enormous appeal as a medium, both for learning and dissemination of information so much in demand both among children, adolescents and adults (Firmansyah & Wrastari, 2014). Fifth, BUDIN is prepared to accommodate of student thinking, which refers to the higher order thinking skills in Bloom's Taxonomy.

There are some constraints experienced during the use of BUDIN in the learning process, that is there are some student mobile devices that can not open BUDIN because their browser has not been compromised, besides that the capacity of RAM (Random Access Memory) on mobile device also have an effect on BUDIN operation. Full RAM storage capacity due to heavy application load on mobile devices will make it difficult to open every page of BUDIN or play video, as it takes a long time.

Effectiveness

The recapitulations of the effectiveness instrument's obtained through observations and tests of higher order thinking skills can be shown in table 4 below

Table 4. Recapitulation of Higher Order Thinking Skills

Indicators	Percentage (%)	Category
	Cognitive (Test)	
Analyze	78,94	Good
Evaluate	73,68	Good
	Skills (Observations)	
Structure	77,47	Good
Fluency & Flexibility	75,95	Good
Link	75,21	Good
Novelty	73,68	Good

Based on the table it can be seen that the percentage of the greatest higher order thinking skills indicator with the category of "Good" in a row is "Analyze" and "Evaluate" (test), while the indicator of "Creation" (observation's result) with good category in a row is structure, fluency and flexibility, link, and novelty. It shows that students' ability gradation from low to high (Anderson & Krathwohl, 2001).

The percentage of indicators evaluates smaller than the indicators analyzed because not all students are able to assess, deny, or support an idea by providing a reason that

can reinforce the idea, because to evaluate a problem, students must first analyze the problem in question. Students are required to parse the information correctly and can formulate the problem, so that it can answer the problem in question, while on the aspect of creating, a novelty indicator has the smallest percentage because students have not been trained for how to make a product based on their own ideas (originality of ideas), so they are only limited to copy the ideas of others.

The effectiveness of BUDIN is also influenced by student responses. Response is used to determine students' responses to media developed during the learning process. Here is presented about the results of student responses to BUDIN.

Table 5. Recapitulation of Students's Responses Questionnaire

Indicators	Percentage (%)	Category
BUDIN's operation	84,21	Excellent
The display quality of BUDIN	94,74	Excellent
The clarity of the material in BUDIN	89,47	Excellent
The interactivity of BUDIN	92,45	Excellent
Motivation of learning	90,00	Excellent
Training of higher order thinking skills	86,51	Excellent

Based on the data of students's responses questionnaire, students's responses are excellent with the percentage between 84,21 % to 94,74%.

There are several factors that influence the student's response to BUDIN, one of which is the difference of character of each student in determining the benchmark of satisfaction and belief in BUDIN, so that BUDIN use during learning process in increasing the satisfaction and confidence of students is different (Keller, 1987). Overall, the use of BUDIN in the learning process of global warming material is getting an excellent response from students with 98.28% percentage. This shows that learning using ebook by combining interactive concepts can help students to achieve meaningful learning (Mayer, 2003). This is supported by previous research which suggests that learning using BUDIN get positive responses from students so that influence on learning achievement (Perdana, 2013).

Based on the explanation above, it can be concluded that BUDIN is declared effective in trained higher order thinking skill in terms of higher order thinking skill (obtained through test and observation) and student response.

CLOSING

Conclusion

Research conclude that interactive electronic book (BUDIN) using *Flip PDF Professional* is feasible to train higher order thinking skills because it valid (learning 97,92%, material 95%, media 93,75%), practical (learning's implementation 94,07 %), and effective (higher order thinking skills are good with analysis is 78,94%, evaluate is 73,68%, creation includes of structure 77,47%, fluency and flexibility 75,95%, link 75,21%, and novelty 73,68% then the students responses is excellent with percentage between 84,21% to 94,74%

Suggestion

The material presented on the interactive electronic book (BUDIN) is limited to the "Global Warming" material. For other researchers who will conduct research related development interactive electronic book (BUDIN) is suggested to conduct research on other Physics materials, and can add a PHET simulation in it.

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