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Feasibility of Biophysics Experiments Guide Flipbook on Respiration System Content for Junior High School Student

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Abstract: The essence of science learning is learning that should be taught more dominantly on exploration of discovery or search for concepts directly by students such as experiments. The lack of experiments guides in school is one of the reasons why practicums are rarely used. This study aims to develop a flipbook-based respiratory system experiment guide. This study uses a 4D development model consisting of define, design, develop, and disseminate stages. The data result of validation was analyzed by quantitative descriptive. Based on the results of the research development on the flipbook product of the respiratory system content practicum guide, the results obtained were feasible in 3 aspects with high categories in didactic aspects and very high categories in construction, technical, and language aspects. This product can be tested to see its effectiveness and practicality in learning at school.

Keywords: Biophysics; Experiment Guide; Flipbook; Respiration System; 4D

Introduction

The current curriculum provides opportunities for science learning to emphasize the implementation process by providing direct learning experiences for students to be able to develop, discover, and explore various concepts of the material being taught (Sundari et al., 2013). One of the learning methods that can be very helpful and facilitate students to find their own concepts of the material is practicum or experiment. Through practicum students can make various new breakthroughs in each of their inventions. This method also provides a space for more active participation of students and cooperation between them. The learning process that provides such direct experience will make learning more meaningful for students, because meaningful learning can not only be obtained by students through ordinary learning in the classroom (Rosmalinda et al., 2014; Sundari et al., 2013).

Currently, practicum in the science learning process is still not effective and optimally implemented. This can be caused by the lack of practical guidelines in schools, so that students are more dominant in getting monotonous learning in class. Such learning certainly makes students less active and bored (Sundari et al., 2013). Students need practicum as a learning method that can facilitate them to get a deeper meaning than just theoretical material obtained in class. In practicum, students can explore further, develop communication and cooperation skills, and they can even prove the truth of a theory. This makes students more interested and motivated with great curiosity in learning, so that there is a balance of abilities obtained by students between cognitive and psychomotor (Asmaningrum et al., 2018; Syamsu, 2017).

To be able to carry out practicum in science learning, a practicum guide is needed that can guide the implementation of the learning, so that the practicum can run safely and smoothly (Chan & Budiono, 2019). Practical guide is an important tool to be able to achieve learning objectives. This practicum guide includes practicum objectives, theoretical basis, tools and materials, experimental procedures, result sheets and experimental analysis, as well as evaluation questions

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based on the practicum carried out (Asmaningrum et al., 2018). A good practicum guide, of course, must be able to attract the attention of students, so that they can focus on each stage of the practicum. To be able to attract the attention of these students, the practical guide must also be packaged in an attractive manner. The presentation of this practical guide form certainly has many and various references. One alternative solution is to develop a practicum guide based on digital technology.

One of the most significant advances of the 21st century is the very rapid development of aspects of digital technology. Even the existence of digital technology can already be felt in the world of education. The technology must of course be used properly and optimally, so that the quality of learning in this era increasingly exists and improves, can adapt to circumstances, and be able to transform in a better direction (Diani & Sri Hartati, 2018; Fadrianto, 2019; Febrian, et al., 2021; Febrian, et al., 2021). This is of course in line with the 21st century learning paradigm that integrates cognitive, affective, psychomotor, and technological abilities (Meilani et al., 2020).

Currently, many digital technologies have even started to be used as tools in the learning process such as learning media, teaching materials, and other learning components to improve the quality of learning and the abilities of students (Moto, 2019; Rahayu et al., 2022). The role of technology in education is pursued as solutions to learning problems that are considered less effective so far. This role is considered important to be able to help the learning process become more effective, interesting, and interactive with various learning technology products developed such as teaching materials and media (Hamid, 2021).

The presence of technology as a means to assist in the development of media and teaching materials is nothing new today. This phenomenon is expected to make it easier for students to achieve their learning goals, make the scope of learning unlimited, and make learning innovations more interesting in science learning in particular (Halimah et al., 2021; Hamid, 2021; Pinar, 2019). In learning, teachers and students certainly really want the selection of appropriate media and teaching materials, because these two main things can affect motivation, interest, and learning outcomes achieved later. Media and teaching materials are essential elements in learning because they are a means of conveying information on teaching materials from teachers to students (Amanullah, 2019; Diani & Sri Hartati, 2018; Nurwidiyanti & Sari, 2022). So, media can guarantee and increase the interest, motivation, and learning outcomes of students (Abadiyah et al., 2018; Dewi et al., 2020; Istigfar et al., 2018; Nuraeni, 2021).

In this study, one of the media and teaching materials developed was based on Kvisoft Flipbook Maker. This selection is based on the aim of presenting integrated media teaching materials that are more varied, practical, and efficient, so that they are attractive and increase students' learning motivation (Hardiansyah & Sumbawati, 2016; Pratiwi et al., 2020; Setiyo et al., 2021; Simangunsong et al., 2020). Through the Kvisoft Flipbook Maker application, a file that was originally in the form of a PDF can be converted into a flipbook, which is a learning media in the form of virtual book teaching materials whose pages can be opened like reading a book on a monitor layer (Fahmi et al., 2019; Hendriyani et al., 2020; Mulyaningsih et al., 2021; Prisila et al., 2021; Syah et al., 2020).

The advantage of this flipbook is that it can present material equipped with multimedia such as images, animation, video, music, audio, and hyperlinks, and is more easily accessible anywhere and anytime (Fahmi et al., 2019; Luthfiani et al., 2021; Nuraeni, 2021). The use of this flipbook is certainly very helpful for the learning process that requires visualization, improve the meaningfulness, effectiveness, and quality of science learning as is the case with the respiratory system material in this biophysics study. With complex and concrete materials, teaching materials such as this flipbook are needed to explain well (Andini & Nur Qomariyah, 2022; Zakia et al., 2019). Based on the description of the problem above, the researchers in this development research developed a flipbook of biophysics practicum guide on respiratory system material for junior high school students

Method

This development research aims to develop a flipbook product for biophysics practicum manuals on respiratory system materials. This product is intended for junior high school students, especially class VIII. This development research uses a 4D model with the stages of define, design, development, and disseminate. The define stage consists of several stages of analysis such as front-end analysis, students, curriculum, and concept-materials (Thiagarajan, 1974). At the design stage, the researcher designs a product including a draft cover design and the entire contents of the flipbook, layout, and several other design features such as animation, images, videos, and music. A detailed discussion of the define and design stages will be discussed in a separate article.

At the development stage, researchers create and develop the entire product to completion in consultation with the supporting lecturers and revisions from the validators. In the disseminate stage, researchers will publish scientific articles about the feasibility of this product and disseminate the product. Data collection in this study involved a validation process by 5

experts/practitioners who assessed the feasibility of the product from 3 aspects including didactic, construction, and technical and language. The results of the validation data are obtained through filling out a feasibility test questionnaire by the validator in the form of a dichotomy, provided that the answer Yes is worth 1 and No is worth 0. The data were then analyzed by descriptive quantitative.The data is then calculated with the following Formula 1.

$$\bar{x} = \frac{\sum x}{n} \quad (1)$$

$\bar{x}$ = Average score
$\sum x$ = The total score of each rater for a particular component
n = Number of validators

Based on the calculation of the average score above, the results are then converted into categorical data to show the level of the score interval obtained with the provisions of the Table 1.

Table 1. Determination of Product Eligibility Criteria Interval (Widoyoko, 2014)

Interval Score	Category
$X > (\bar{X}_i + 1{,}8Sb_i)$	Very High
$(\bar{X}_i + 0{,}6Sb_i) < X \leq (\bar{X}_i + 1{,}8Sb_i)$	High
$(\bar{X}_i - 0{,}6Sb_i) < X \leq (\bar{X}_i + 0{,}6Sb_i)$	Enough
$(\bar{X}_i - 1{,}8Sb_i) < X \leq (\bar{X}_i - 0{,}6Sb_i)$	Low
$X \leq (\bar{X}_i - 1{,}8Sb_i)$	Very Low

X = Empiric Score
Xi = Ideal mean (1/2 (maximum score + minimum score))
Sbi = Ideal standard deviation (1/6 (maximum score – minimum score))

Result and Discussion

The results and discussion in this article will focus on discussing product feasibility, while for other 4D model development stages such as the define, design, and product effectiveness/practical testing stages, will be written in a separate article. This biophysics practicum manual flipbook product development was developed with the help of the Kvisoft Flipbook maker application. The manufacturing stage begins with a general design of the shape and presentation of the product. Here are some snippets of the flipbook presentation of biophysics practicum guides on respiratory system content:

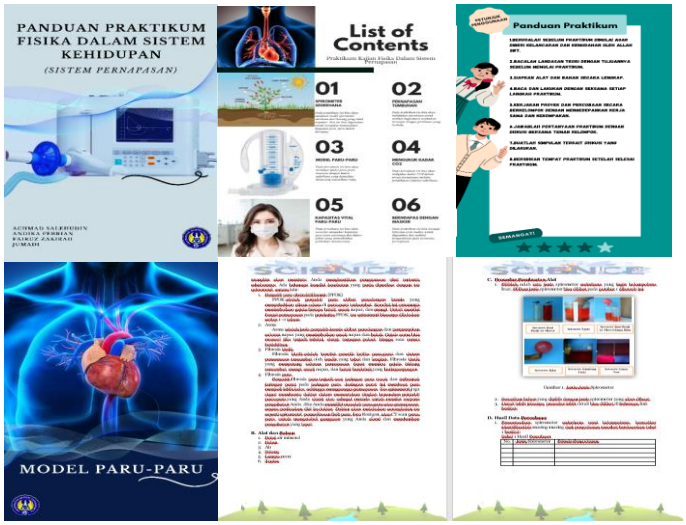

Figure 1. Snippets of Product

After the product design and manufacture process is complete, the researcher will test the feasibility of the product on 5 experts/practitioners as validators. The purpose of this feasibility assessment is to determine the extent of the feasibility of the product being developed. This feasibility test process is measured using a questionnaire validation sheet by assessing 3 main aspects, namely didactic, construction, and technical and language. The indicators of each validation are adjusted to the product draft design grid and the synthesis of several relevant articles. The following are the results of the feasibility test on the didactic aspect.

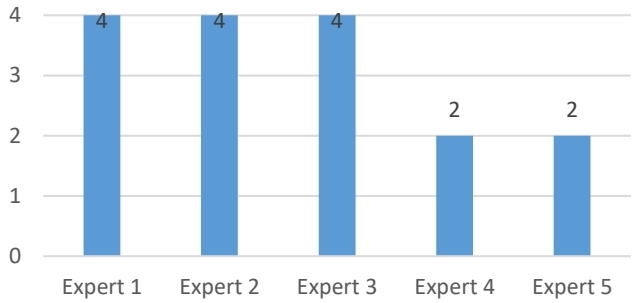

Figure 2. Product Feasibility Test Results on Didactics Aspects

Based on the results of the feasibility test above by the validators on the didactic aspect, the flipbook product of the biophysics practicum guide on the respiratory system material got an average score of 3.2. This score is 3.21, so that in the didactic aspect the product is declared feasible in the high category. As for this aspect, assessing feasibility in terms of the compatibility of practicum activities with competency standards, basic competencies, indicators, and learning objectives to be achieved. In this aspect, the value of the suitability of practicum activities can be easily understood by students. Meanwhile, the results of the

feasibility test from the construction aspect can be seen in the Figure 3.

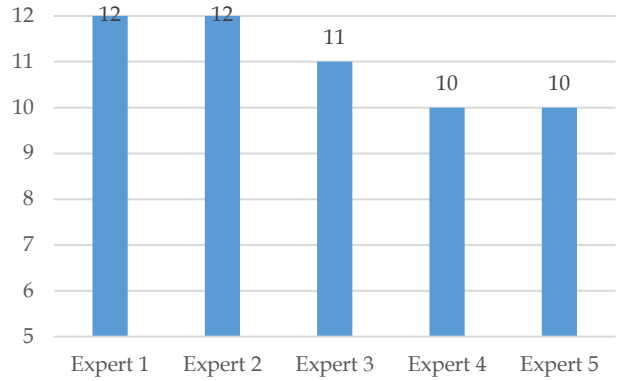

Figure 3. Product Feasibility Test Results on Constructions Aspects

Based on the results of the feasibility test above by the validators on the construction aspect, the flipbook product of the biophysics practicum guide on the respiratory system material gets an average score of 11. This score is > 9.6 so that the product construction aspect is declared feasible with a very high category. As for this aspect, assessing the feasibility in terms of completeness and suitability of the developed flipbook format. While the feasibility test on the technical and language aspects can be seen in the Figure 4.

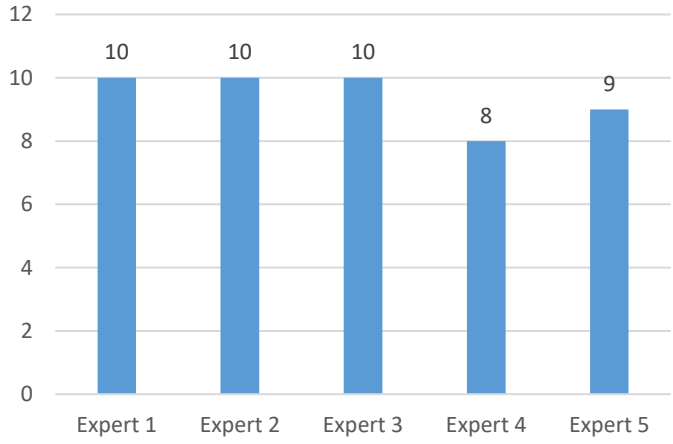

Figure 4. Product Feasibility Test Results on Technics and Linguistics Aspects

Based on the results of the feasibility test above by the validators on technical and linguistic aspects, the flipbook product of biophysics practicum guide on respiratory system material got an average score of 9.4. This score is > 8,01 so that in the technical and language aspects the product is declared eligible with a very high category. As for this aspect, assessing the feasibility in terms of the completeness and suitability of the design and the developed flipbook language, such as images, animation, video, audio, music, layout, and communicative language according to EYD.

Based on the results of the feasibility test from the 3 aspects above, it can be seen that the flipbook product of the biophysics practicum guide which was developed through several stages of research on the development of a 4D model is declared feasible. The feasibility of this product can be continued with the testing phase of the effectiveness and practicality of the product, so that it can provide an overview of how effective and practical this flipbook product is used in the learning practicum process, especially junior high school science to be able to increase creativity, meaningfulness, effectiveness, and quality learning process.

Conclusion

Based on the results of the research development on the flipbook product of the respiratory system material practicum guide, the results obtained were feasible in 3 aspects, namely, eligible with high categories in didactic aspects and very high categories in construction, technical, and language aspects. This product can be tested to see its effectiveness and practicality in learning at school. The implementation of the experiments guide will help facilitate student practicum activities, so as to increase the meaning, effectiveness, and quality of science learning through integration with digital technology.

Author Contributions

Andika Febrian contributed as conceptualized of ideas, designed research methods, collected-analyzed data, and as the main author of the article.
Fairuz Zakirah and Achmad Salehudin contributed to develop the product and collected the data.
Jumadi contributed as lecturers who provided guidance in research and writing this article.

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Concflict of Interest

The authors declare no conflict of interest.

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