JPPIPA 9(10) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Lesson Study Books Specially in Biology Based on Scientific Approaches

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Received: April 27, 2023
Revised: August 5, 2023
Accepted: October 25, 2023
Published: October 31, 2023

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DOI: 10.29303/jppipa.v9i10.3734

Abstract: Prospective biology teachers need to be well prepared, not only in terms of biology content but also their teaching skills, including lesson study. This study aims to developing a biology lesson study book based on scientific approach. The research method used is research and development by adopting the ADDIE model. The research instrument used was a questionnaire to measure the responses of experts, teachers and students to the quality of the book. This research also pays attention to qualitative (suggestions and comments) and quantitative data. The results showed that the book was considered feasible by experts. Teacher and student responses also showed a positive impact on the use of the book. The test results also showed an increase in learning outcomes. So, the book can be used in classroom learning.

Keywords: Biology; Book; Development; Lesson study; Scientific approach

Introduction

Educating prospective biology teachers so they can collaborate by implementing planning, implementing, observing and reflecting is not an easy job. Identification of appropriate pedagogic approaches needed to obtain an ideal and effective learning is a topic that continues to be discussed (Cochran-Smith et al., 2015; Nye et al., 2004). Technological advances in the era of the industrial revolution 4.0 require a learning method that is practical, active and involves student participation (Sadikin et al., 2019). Among the challenges for universities in producing prospective biology teachers is improving teaching skills (Knight et al., 2014).

Efforts that can be used to improve teaching skills or pedagogic competence is lesson study (Supeno et al., 2022). Lesson study is a method of implementing learning that starts from plan, do and see (Saribas et al., 2015). Lesson study functions to improve the quality of teaching and learning and the ability of teachers, with learning research in sustainable collaboration (Lestari et al., 2018). Meanwhile, there are modes in lesson study and each has its own rules (Saito et al., 2020).

Lesson study is an in-service teacher and pre-service teacher strategy, in research a teaching and learning activity based on the principles of complementarity and collaboration to create a quality learning community (Jamaluddin et al., 2020). Currently the lesson study course is taught at FKIP Jambi University, including in the Biology Education Study Program. However, students of the Biology Education Study Program still have low learning motivation because there are no lesson study textbooks specifically for prospective biology teachers. This is important, because prospective biology teachers must develop biology learning with content characteristics that require the support of scientific methods, experiments, facts and theories (abstract and concrete). So, it is necessary to develop lesson study textbooks specifically for biology based on a scientific approach as a support pedagogic abilities of prospective biology teachers.

In its application, lesson study is considered as an approach, a learning model as well as inquiry learning,

How to Cite:
Siburian, J., Sadikin, A., Yusuf, M., & Sembiring, D. A. E. P. (2023). Development of Lesson Study Books Specially in Biology Based on Scientific Approaches. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8569–8574. https://doi.org/10.29303/jppipa.v9i10.3734

contextual teaching learning, cooperative learning, problem based learning and others. Lesson study is actually a systematic step in planning, implementing and evaluating learning to improve the quality of learning (Setiawan et al., 2015). Lesson study also includes an orderly and measurable procedure in learning carried out by teaching staff in Japan in conducting effective teaching experiments to improve learning outcomes (Garfield, 2006).

The activities of teachers in lesson study are carried out together, starting from designing lessons, developing media, learning instruments, implementing, observing, evaluating and making continuous improvements to get better quality. According to Walker (2005) Lesson study is a method of teacher professional development. Then, Lewis (2002) explained that the idea in lesson study is actually short and simple, that is, if a teacher wants to improve learning, then he must collaborate with other teachers to design, observe and reflect on the learning being done.

This lesson study learning also allows it to be collaborated with the scientific approach. This approach helps students to identify problems to find solutions (Nurhayati et al., 2023), and it is also possible in lesson study. Other findings also show the integration of lesson study and the scientific approach, for example in the form of lesson plans (Pakaya et al., 2023), efforts to improve teacher competence (Ariani, 2018), and stimulate student motivation and activeness (Irmayanti et al., 2019).

In terms of implementation, the scientific approach does show something positive. For example, to improve critical thinking skills (Handayani et al., 2022), affect student science literacy (Fatmawati et al., 2023), and entrepreneurial skills (Camuffo et al., 2020). So the assumption that this approach is also able to have a good impact when collaborated with lesson study. Based on these conditions, the researchers developed a lesson study textbook based on a scientific approach aimed at biology education students. It is hoped that this book can be one of the learning resources, in order to prepare themselves as prospective biology teachers.

Method

This research is research and development (R&D). This research was conducted to produce certain products or outputs and to test these products (feasible or not) involving users of these products (Sugiyono, 2018). The development model used is ADDIE (analysis, design, development, implementation and evaluation). Revisions at each stage are expected to get input and assessments from experts so as to get a quality product (Figure 1).

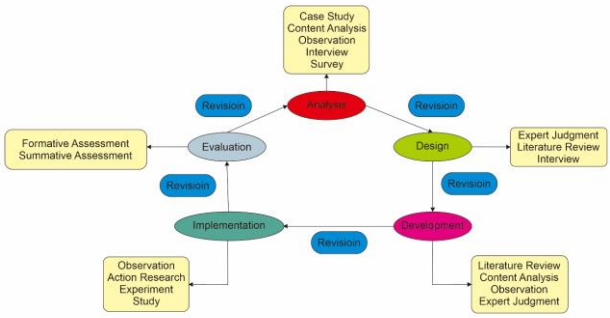

Figure 1. ADDIE Model's (Rusdi, 2018)

This study collected data through interviews on textbook needs, validation questionnaires, and student response questionnaires. Data were analyzed through validity testing and product trial analysis. Product validation is carried out by experts and calculated using a formula and converted according to validity criteria (Table 1).

Table 1. Product Validity Criteria

Range Score	Criteria	Information
90% ≤ SV ≤ 100%	Very Valid	No Revision
80% ≤ SV < 90%	Valid	Minor Revision
60% ≤ SV < 80%	Less Valid	Major Revision
0% ≤ SV < 60%	Not valid	Not usable

$$SV = \frac{scor\ obtained}{maximum\ score} x100\% \quad (1)$$

Where, SV is percentage validation score.

An analysis of data on the results of product trials by teaching students was also carried out. After using the book, students will be given a response questionnaire, then the data will be calculated and adjusted to the product trial criteria (Table 2).

Table 2. Product Trial Criteria

Range Score	Criteria
90% ≤ SV ≤ 100%	Very Good
80% ≤ SV < 90%	Good
60% ≤ SV < 80%	Less Good
0% ≤ SV < 60%	Nor Good

$$Percentage = \frac{count\ score}{maximum\ score} x100\% \quad (2)$$

Result and Discussion

Analysis

This book was developed based on a needs survey of 270 respondents. Based on the survey, 86.5% of respondents said they "really needed" lesson study textbooks, the rest said they "needed" it. This means that this textbook is needed by students as prospective biology teachers. Literally, textbooks can help students

prepare themselves for the future (Yusuf et al., 2020) and can also help lecturers in carrying out learning in class (Baburkin et al., 2016).

Design

The design of a special biology lesson study book based on a scientific approach is made by taking into account the rules of textbooks. Book content is arranged based on the curriculum and also relevant literature reviews. The addition of related research results also contributes to enriching the material in the book. This is because research results are known to be able to examine content in detail and add insight to users (Primiani, 2014).

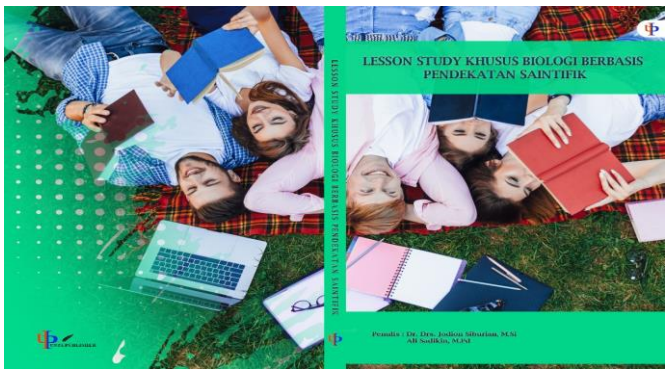

Figure 2. Book cover lesson study for scientific-based biology

Book design uses computer devices and software that are commonly used. This lesson study book is structured to suit the needs of students in lectures. Accurate language selection is carried out to facilitate user understanding. Because language is a means of verbal communication between writers and readers (Suryaman, 2012). In addition, the layout is also considered proportional in order to provide comfort to book users.

Development

Development is carried out systematically in order to get the best results. After the draft book is complete, it is followed by validation by experts. This assessment was carried out 2 times according to the results in Table 3.

Table 3. Expert Validation Results

Validation	Score	Criteria
First Validation	70	Less Valid
Second Validation	85	Valid

Assessment is not only quantitative, but also qualitative in the form of expert advice. The suggestions for improvement from the validator for each aspect of textbook development are in Table 4.

Table 4. Suggestions from Validators in Stages 1 and 2

Aspects	First Validation		First Validation	
	Suggestions	Revision	Suggestions	Revision
The components of the book are complete according to the textbook rules	Add author biography	Added	Clear	-.
The font type used are consistent and clear to read	Consistent use of fonts	Font fixed	Clear	-
The font size used are consistent and clear to read	Clear	No Revisions	Clear	-
The image displayed corresponds to the text.	Clear	No Revisions	Clear	-
The image size used are consistent and clear to read	Image size consistency	Image size fix	Clear	-
The displayed image supports the contents explanation	Clear	No Revisions	Clear	-
The color composition used is interesting	Use a more varied color	Use a variety of colors	Clear	-
Proportionate and attractive design layout	Clear	No Revisions	Clear	-
The material presented is in accordance with the competencies to be achieved.	add research results	Added research results	Clear	-
The material presented is in accordance with the curriculum used.	Clear	No Revisions	Clear	-
The contents of the book presented are complete	Clear	No Revisions	Clear	-
Content is presented systematically	Break down the content from simple to complex	Build better content	Clear	-
Textbooks are predicted to be able to increase student motivation.	Yes,	No Revisions	Clear	-

Experts positively respond to the developed lesson study textbooks. This is certainly a good benchmark for us in improving the book. Because a good book must also go through good validation (Trianto, 2010). As a result of the assessment, it was found that the book had been declared valid when validating it for the second time. We are trying to perfect the book, especially on the language aspect. Because the quality of good teaching materials is also shown by the use of good language (Pribadi et al., 2017). In other fields, textbook

development is also carried out based on scientific pedagogy as a form of curriculum prototype in schools (Imanda et al., 2022).

Implementation

After being validated by experts, the next step is implementation. This stage is carried out by testing the product in small groups and large groups. The trial was carried out starting from a small group trial, then continued with a large group trial.

a) Data of small group trial

After being revised, a small group trial (6 students) was carried out to obtain suggestions and input in order to improve product quality. Data from the results of this trial were collected using a student response questionnaire with questions whose answer choices were "Yes" or "No" and the reasons for each answer. The student's answer is used as input to improve the textbook. Student comments and suggestions are presented in Table 5.

Table 5. Result of Small Group Trial

Name	%	Response
RS	90 (Very Good)	This book is very good, because it makes it easy to understand lesson study
AS	80 (Good)	I think more pictures need to be added
ES	70 (Less Good)	It's been pretty good
AH	80 (Good)	I think this book is good enough
RKD	70 (Less Good)	Needs a little more improvisation
HM	90%(Very Good)	This book is very good, students become motivated

The student response questionnaire consists of 10 questions whose answer choices are "Yes" or "No" and also the reasons. The results of testing on small groups showed that two respondents gave "less good" responses. So, the book was perfected according to the input given by the students. Meanwhile, the rest gave a positive response with a "good" and "very good" level of the book.

b) Data of large group trial

After the small group trial and making improvements, the test continued to the large group. This trial was carried out with more respondents than before and of course with different students. The trial results can be seen in Table 6.

Table 6. Result of Large Group Trial

Name	%	Response
BP	90 (very good)	This book is very good
TN	80 (good)	Help me in understanding the lesson
AY	80 (good)	There are some minor mistakes in the writing
SK	90 (very good)	I am motivated to learn
UL	100 (very good)	Very helpful to deepen lesson study
FT	80 (good)	Thanks for the book
HF	80 (good)	Interesting enough to be used as a source of reading
MT	90 (very good)	Interesting, because it is scientifically based
MD	80 (good)	Examples need to be completed
GT	90 (very good)	That's enough for me

The results of the large group trial showed a more positive direction than before. Five respondents gave "very good" responses to textbooks and five gave "good" responses. This means, the book has sufficiently accommodated the needs of students. Students also feel motivated to learn when using books. This is also in line with the findings of Nuryasana et al. (2020) that the use of textbooks affects student motivation in lectures.

Evaluation

At this stage an evaluation of the book that has been developed into a lesson is carried out. The aim is to test the effectiveness of the book in micro-learning in the classroom. The test results show that there is an increase in student learning outcomes of 15.38%. There are indications that lesson study is able to influence student learning outcomes. Other findings also say that lesson study has an impact on student learning outcomes (Indrawan, 2017; Mahrus et al., 2019), concept understanding (Jufri et al., 2019; Lisanti et al., 2022), and creative thingking (Fatmawati et al., 2021). Then, this increase also indicates that the scientific approach has contributed to student learning outcomes (Setiyadi, 2017).

Then, it is believed that lesson study books can also help enrich the insights and abilities of prospective

teachers. So that later they will be able to carry out lesson study in the field. Because according to Coenders et al. (2019), lesson study contributes to providing experience for teachers in the field.

Conclusion

Based on this research, it was concluded that the developed scientific-based special biology lesson study book is feasible to use. The developed textbooks can also be tested for their effectiveness on several variables, such as active learning, learning motivation, or student learning outcomes. Textbooks can also be developed in forms other than print, for example ebooks or in the form of digital books for practical use.

Acknowledgments
The author thanks to those who have contributed to this research, especially Jambi University. So, research is expected to provide benefits in the development of knowledge.

Author Contributions
Conceptualization, J.S, A.S, M.Y, D.A.E.P.S.; Metodology, J.S, A.S.; Developing Product, J.S, A.S; Analyzing Data, M.Y, D.A.E.P.S.; Drafting Article, A.S, M.Y; Editing and Draft Finalization, D.A.E.P.S.

Funding
This research was funded by Universitas Jambi.

Conflict of Interest
The authors declare no conflict of interest.

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