Development of character-filled junior high school teachers books based on integrated learning threaded models with visual sense themes and optical instruments

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Abstract. The general objective of this study was to develop integrated science-based teacher books with character based threaded model integrated learning. At the Preliminary Research stage, a need analysis is conducted. The method used to do need assessment is a descriptive research method. Respondents selected in this study were science teachers at SMPN 2 Nan Sabaris in the academic year 2017/2018. The type of data in this study is primary data. The type of data in this study is primary data. Where the teacher's book is a guideline for teachers in carrying out learning including preparation, implementation, and assessment as well as guidelines for the use of student books. The purpose of this study was to develop the results of a character-based science-based teacher book on integrated threaded learning with the senses of vision and optical devices. This book was prepared to get a clear and detailed picture of carrying out learning activities. The development phase is now from the design of the teacher's book, then the teacher's book is validated by experts and practitioners. This type of research is research and development using a Plomp model consisting of preliminary research (preliminary analysis) prototyping and assessment, in this study are data analysis, validation data, and practicality, and effectiveness data. The research instruments consisted of sheets of interview sheets, and teacher response questionnaires. This data analysis technique is descriptive percentage. The results of the research at the preliminary research stage are the results of a needs analysis and context analysis of the opportunities for SMP-based science teacher books with integrated threaded model-based learning with the senses of vision and optical devices. The result of prototype I is the teacher's book is valid with a value of 0.86. The result of prototype II is the teacher's book is practical, and the result of prototype III is the teacher's book is very practical. Furthermore, the results of the assessment phase are that the teacher's book is in a very effective category. Based on the results of the research that has been carried out, the SMP Science teacher book with the character of integrated learning based on threaded models with visual sensory themes and optical devices is declared valid, practical, and effective.

1. Introduction

Education is a very important thing in life. Education as a human effort to foster his personality in accordance with values in society and culture. In the preamble of the 1945 Constitution, paragraph four includes the noble ideals of the Indonesian people. The noble ideals are to protect the entire nation and all of Indonesia's bloodshed, promote public welfare, educate the life of the nation and participate in carrying out world order based on freedom, eternal peace and social justice. Efforts that can be made to
accelerate the realization of the country's ideals are to prepare future generations who are strong, intelligent, independent, and adhere to spiritual values.

Through education, someone acquires teaching and science. Education as the spearhead in building human resources (HR) must clearly play a role in helping participants become assets of the nation that has professional, productive and independent expertise in the face of global competition. The quality of education is closely related in the process of implementing learning which is influenced by several factors. These factors include: curriculum, teaching staff and education, learning processes, facilities and infrastructure, school management and the environment. Various efforts have been made by the government to continue to improve the quality of national education. Among them is the provision of benefits to the achievements of educators through certification, so that educators become motivated to improve the quality of educating them. Supporting facilities such as the procurement of teaching materials, improvement of facilities and infrastructure and optimizing the use of laboratories and libraries can optimize classroom learning.

The government's new policy is to change the curriculum into the 2013 curriculum. The 2013 curriculum aims to develop student competencies in a balanced manner so that they can improve learning outcomes. These competencies are knowledge competencies, attitude competencies and skills competencies. Knowledge competence expects the birth of students who are able to formulate creative problem solving. Attitude competencies aim to form character students while skill competencies require students to be productive. These three competencies should be applied by students in school and in the community. Character education can be integrated in learning in each subject, one of them is Science. Natural Sciences (IPA) is a science whose discussion of nature and its contents and has been scientifically tested. Science includes four main elements, namely attitudes, products, processes, and applications in everyday life. Science education is a vehicle for students to learn about themselves and their surroundings, and apply them in their daily lives. Learning material related to values and norms needs to be developed and linked to the context of everyday life.

Republic of Indonesia Presidential Regulation Number 87 Year 2017 concerning strengthening character education (PPK) in order to realize a cultured nation through strengthening religious values, honesty, tolerance, discipline, hard work, creative, independent, democratic, curiosity, national spirit, love for the land, respect for achievement, communicative, love for peace, love to read, care for the environment, care for the social, and be responsible, need to strengthen character education. Strengthening Character Education, hereinafter abbreviated as PPK, is an educational movement under the responsibility of education units to strengthen the character of students through harmonization of heart, feeling, though thinking, and sports with involvement and cooperation between educational units, families, and communities as part of National Mental Revolution Movement (GNRM).

Integrated threaded lessons or tertiary models are learning models that combine several forms of skills. An integrated threaded learning model can be applied in science learning because science learning in SMP is an integrated science that includes physics, biology and chemistry that can be done at one time. Learning material is done by thinking skills, organizing skills, and social skills. It means integrating social aspects, knowledge, and skills. This threaded learning model will make students active in learning because they can develop learning skills that include thinking skills, social skills and organizing skills and learning skills, graphic organizer, technology and multiple intelligence skill [1].

Based on the Regulation of the Minister of Education and Culture No. 8 of 2016 concerning textbooks states that there are two types of books used as reference textbooks in learning, namely student books and teacher books. Viewed in terms of utilization in the learning process, student books and teacher books are a unity in the learning process. Teacher's book was developed to support the implementation of student books. In other words, teacher books are used as a guide in the use of student books. In addition to students using guidebooks, the teacher also has guidelines for the implementation of learning. In this regard, textbooks for students have been developed from previous research by Ulfa Rahmi (2017), namely integrated science learning textbooks containing threaded-based characters with the senses of vision and optical devices. The developed student book can be said to have fulfilled the suitability of the student learning textbook, but there is no teacher's book that matches the theme.
Therefore, to make it easier for the teacher to use the student book, it is necessary to develop a teacher's book in accordance with the theme as a guide to the implementation of classroom learning activities.

Analysis of the teacher's book is done through a study of the section or structure of the book to design an expected teacher's book. Teacher's books are analyzed from government-issued books that have been circulating in schools that use the 2013 Curriculum. A good book is certainly not just a set of ideas, but lies in a programmed and systematic design so that it becomes useful and meaningful for the achievement of learning goals.

Based on observations made by the researcher on the teacher's book, namely the science teacher of SMPN 2 Nan Sabaris in the school year 2017/2018. The analysis is carried out by observation and questionnaire distribution to the teacher at the school. Based on the analysis of the data obtained through the questionnaire analyzed, that is, the teacher is still experiencing difficulties because the material in the teacher's book is less than the student's book in other words the teacher's book is used as a guide in the use of student books, the material must be broad. Assessment in student books consists of three aspects, namely attitudes, knowledge, and skills. In the assessment section for specific instructions the teacher's book does not contain clear assessment instruments such as instruments for assessing attitudes, knowledge and skills. For this reason, in the teacher's book an assessment rubric is needed. This still creates difficulties for the teacher to apply the assessment in learning. In addition, an assessment rubric is also needed as an assessment guide.

2. Method

2.1. Type of Research
This type of research is research developing or known as research and development (R & D). The development research is a study used to produce certain products and test the effectiveness of these products. The product developed is an integrated junior high school science teacher book containing characters based on the threaded sense of vision themes and optical devices that are valid, practical, and effective. Research and development as a research activity that starts with research and continues with development. Research activities are carried out to obtain information about user needs and in the implementation of product trials, while development is carried out to produce learning devices.

2.2. Development Model
The development model is steps that are carried out systematically to carry out the design and development of teacher books which are realized in the form of diagrams or narratives. The model of developing a junior high school science teacher book filled with integrated learning based on threaded models with the senses of vision and optical devices namely Plomp. The research process adopts the steps proposed by Plomp [2], which consists of preliminary research, prototyping phase (prototype or development stage), and assessment phase (assessment phase).

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2.3. Development Procedure
The model used in this study is the Plomp model. In this model there are 3 phases, namely the preliminary research phase, the prototyping phase, and the assessment phase.
Table 1. Evaluation Criteria in Design Research [2]

| Phase                      | Criteria                          | Activity description                                                                 |
|----------------------------|-----------------------------------|---------------------------------------------------------------------------------------|
| Preliminary Research Phase | The emphasis is mainly on content validation, not much on consistency, and practicality. | Problem analysis and literature review in the form of preliminary analysis, material analysis, media analysis, analysis of learning activities, assessment analysis, analysis of perceptions of educators. |
| Design                     | Emphasis on validation and practicality | Designing products, Prototypes developed, evaluated, and revised repeatedly to obtain valid and practical prototypes. Evaluations carried out consisted of top Self Evaluation, Expert Review, One to one Evaluation and small Group Evaluation. |
| Assessment Phase           | Effectiveness                      | Assess whether this product has been effective through the field test.                 |

2.4. Product Testing
The product testing phase is carried out to collect data that can be used as a basis for determining the practicality and effectiveness of the products produced.

2.5. Trial Subject
The research subject for the teacher book trial with the threaded model-based character is the teacher.

2.6. Data Types
The data obtained in this development research is in the form of qualitative data and quantitative data.

3. Results and Discussion
The things discussed in this study are the results that have been achieved in the research and limitations encountered and some alternative solutions. The results of the study were strengthened through the study of theory and the results of previous research relevant to this study. Based on the stages of the research method that has been carried out, the teacher book is developed through the Plomp’s research procedure. The discussion includes a description of preliminary research, prototyping phase, and phase assessment.

3.1. Preliminary Research (Phase of initial investigation)
Preliminary research is an initial investigation in research. The initial analysis is specifically consisting of performance analysis, needs analysis, job analysis, analysis of practical experience about the difficulties of learners and some new concepts needed in learning.

Initial investigations were obtained from needs analysis, which consisted of needs analysis (initial and final analysis, material analysis, learning analysis, media learning analysis and assessment analysis).

3.2. Design Phase
The teacher book design phase is based on the results of the needs analysis. Each analysis result has contributed to the development of the teacher's book. Preparation of science teacher books is the result of student book analysis and performance analysis. The results of the student book analysis show that the teacher is still having difficulty in implementing learning. This is because the student book has not explained the steps of the learning model used. In addition, based on teacher performance analysis, the
initial skills that are not maximal with regard to students are not critical in solving complex problems and are unable to be independent in experiments.

The design of the teacher's book consists of general instructions and specific instructions. Development of teacher books based on Ministry of Education and Culture [3,4] and description of items for assessment instruments for junior high school science teachers according to BSNP. In addition to designing teacher books, at this stage the preparation of instruments needed in the research was also carried out. The instruments include validity instrument assessment sheets, practical instrument assessment sheets, effectiveness instrument assessment sheets, validity instruments, pre-technical instruments and effectiveness instruments.

3.3. Development Phase
The development phase begins with the design of the teacher's book, then the teacher's book is validated by experts and practitioners. During the formative development and evaluation phase, the prototype was developed, evaluated, and revised repeatedly. This phase has a microscope that helps in developing and improving teacher books developed so as to produce valid and practical final results.

3.3.1. Self evaluation or self evaluation. The results of this self evaluation phase are in the form of teacher book designs, colors and writing selected according to the senses of vision and optical devices

3.3.2. Validation of the Science Teacher's Book. Validation of teacher books was carried out by 5 validators, namely 3 experts and 2 practitioners. Validation of teacher books seen from four aspects including aspects of content feasibility, language, constructs and graphics. The results of the study at the prototyping stage I, were obtained that the teacher's books developed were in the valid category of the assessment of experts and practitioners. The results of the teacher book validation test for each statement are presented in Table 2.

| No. | Validation Component | The experts Aiken’s Value | Criteria | Practitioner Aiken’s Value | Criteria |
|-----|-----------------------|---------------------------|----------|---------------------------|----------|
| 1   | Content               | 0.85                      | Valid    | 0.83                      | Valid    |
| 2   | Construct             | 0.87                      | Valid    | 0.84                      | Valid    |
| 3   | language              | 0.86                      | Valid    | 0.83                      | Valid    |
| 4   | Integrity             | 0.87                      | Valid    | 0.85                      | Valid    |

Based on Table 2 from the results of expert and practitioner validation, it can be concluded that the SMP Science teacher book with character-based integrated learning is a threaded model with a visual sense theme and an optical instrument in a valid category. This is evidenced by the value of each aspect judged to be at a value of 0.6 in the valid category. The teacher's book developed has met the indicators developed in the teacher's book validation. During the validation process there are several revisions suggested by the validator.

3.3.3. Practicality of Natural Science Teacher Books. The practicality of the teacher book is carried out by the teacher. The acquisition of practical data is obtained from the results of the practical questionnaire filled in by the teacher. Practical testing is carried out through three stages, one-on-one evaluation stages, small group evaluations, and field tests. One-on-one evaluation is done by asking for teacher comments about the teacher's book that was developed. The teacher's book is given to 3 teacher teachers (2 teachers from SMPN 2 Nan Sabaris 1 teacher at SMP 2 Pariaman). Data obtained from questionnaire results in the form of questions that are filled in by the teacher. The results of the one-on-one evaluation of the overall science teacher books are easy to understand, interesting and efficient. Small group evaluations are conducted after evaluating one to one. This evaluation was carried out by 5 teachers, namely 3
teachers from Nan Sabari's 2 Middle School and 2 teachers from Pariaman Middle School 2. Through a small group test, practicality was obtained. Field tests were conducted at the West Sumatra Provinsi MGMP. The practicality of the teacher's book is seen as easy to understand, interesting, and efficient in the teacher's book. Through field testing, the practicality of teacher books from easy-to-understand aspects with categories is very practical. Can be seen in Table 3.

| No | Statement                | Value  | Category     |
|----|--------------------------|--------|--------------|
| 1  | Easy to understand       | 84.62  | Very practical |
| 2  | Interesting              | 83.33  | Very practical |
| 3  | Efficient                | 86.54  | Very practical |

Based on Table 3, it can be seen that the practicality of the teacher's book is easy to understand, interesting, and efficient in the very practical category above 80. The value of each statement is in the range of 82.69 to 88.46. The material statement on the composition of colors in the teacher's book is interesting to read and the completeness of the material in the teacher's book adds insight to the teacher having a value of 82.69. Furthermore, the teacher's book statement can be developed with a relatively small cost, obtained value 88.46. Furthermore, the effectiveness of teacher books developed based on the results of field tests is very practical.

3.4. Assessment Phase
Teacher book assessment through effectiveness tests. Obtaining data from the effectiveness test using the observation sheet in the form of a questionnaire. Where the effectiveness of teacher books is carried out using a questionnaire. The effectiveness questionnaire was given to several teachers who saw the usefulness of the developed teacher books. Technical effectiveness is carried out in the Provincial MGMP. The criteria for an effective teacher book is that after using the teacher's book there is a positive impact on the teacher in the learning process. The results of the teacher book effectiveness test for each statement are presented in Table 4.

| No                  | Statement                           | Value  | Category     |
|---------------------|-------------------------------------|--------|--------------|
| 1                   | Evaluation of teacher perceptions   | 84.34  | Very effective |
|                     | Evaluate changes in knowledge, skills and attitudes | 86.30  | Very effective |

Based on Table 4, it can be seen that the effectiveness of teacher books is based on evaluations of teacher perceptions of the usefulness of teacher books very effectively. Then the junior high school science books containing integrated learning-based characters threaded models with visual sensory themes and optical devices are easy to understand and can be used as guidelines for using student books, namely junior high school textbooks with character based integrated learning threaded models with visual sensory themes and optical instruments and teacher books. This is a valid, practical and efficient use by teachers in schools.

4. Conclusion
The results of the needs analysis carried out are as follows: 1) the teacher has not used varied learning every meeting, 2) Learning resources used by the teacher have not helped the teacher in monitoring the progress and progress of student competencies, 3) in the closing activities the teacher has not followed up with 4) the suitability of the teacher's book with SKL has not fulfilled the criteria regarding ability qualifications which include attitudes, knowledge and skills, and not yet in accordance with the scope of KD with KI-1 and KI-2, 5).
The results of the book phase prototyping teacher get a valid category. The respective values of content validation, constructs, languages and graphics have validation indicators is 60.6. This means that the junior high school science teacher book containing integrated learning based on threaded models with a sense of vision theme and valid optical criteria, can be tested for practicality.

The results of prototyping phase of the teacher get the practical category. Through practicality testing in the small group test, the teacher books developed are in the practical category. Furthermore, the results of the practicality of the teacher's book in the large group test (field test) are in the very practical category of easily understood, efficient and interesting aspects. This means that the junior high school science teacher book containing character based learning is integrated threaded model with a sense of vision theme and a valid and practical optical instrument used in the science learning process.

The results of the assessment phase of the junior high school science teacher charged with integrated learning based on threaded models with the senses of vision and optical devices received an effective category, based on teacher perceptions and changes in teacher knowledge and skills.

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