Validity of flood themed science textbook for junior high school with sequenced model using problem-based learning

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Abstract. Validity is important in determining the quality of an intervention development. This study aims to prove the content validity of Flood Themed Science Textbook for Junior High School with Sequenced Model Using Problem Based Learning. Validation data were collected by questionnaire which then interpreted result in descriptive. The content validity assessed by experts and practitioners. In this study, Flood Themed Science Textbook for Junior High School with Sequenced Model Using Problem Based Learning was assessed using a Likert scale. There were five experts and four practitioners who assess the content, presentation, linguistic, and graphical aspect indicators. Assessment results were used to calculate the validity coefficients with the Aiken’V formula. The results showed that the validity of the content was 0.87 based on expert’s assessment and 0.88 based on the practitioner’s assessment. The experts and practitioner’s assessment are in a valid criterion, so that the Flood Themed Science Textbook for Junior High School with Sequenced Model Using Problem Based Learning can be used in learning as well as for further research.

1. Introduction
The book is a written piece of paper that presents the science or ideas of its author systematically arranged [1]. The book also means a binding paper, written or empty [2]. Books are categorized into reading and learning book based on the designation of educational interests [3]. Learning books are called textbooks. The book as a teaching material is a book that contains a knowledge as the results of the analysis of the curriculum in written form. Textbooks containing science derived from KD (basic competency) are contained in the curriculum [1]. Textbooks are textbooks used as standard references on specific subjects [4]. Furthermore, textbooks are the main learning resources for achieving KD and KI (main competency) and are declared worthy by Kemendikbud (The ministry of education and culture) for use in educational units [5]. Thus, textbooks are the main learning resources that contain science to achieve the curriculum goals.

Textbooks provide opportunities for students to learn new learning materials or repeat lessons and provide knowledge for students and teachers [1]. In addition, the textbook serves as a manual for students in learning and guidelines for teachers in teaching students for certain subjects. The textbook of the lesson is also useful as the main operational instrument for the implementation of the curriculum.

The content of textbooks is a translation or a description of the subject matter of learning materials set out in the curriculum [3]. Learning materials in textbooks should contain content and learning
processes on local potential and uniqueness to shape students' understanding of potential in their area of residence [6]. The learning process that is relevant and meaningful for students is created through integrated learning [1]. Integrated learning based on themes to connect the various subjects to give learners meaningful experience [7] and learners' understanding becomes more intact [8]. Materials in junior high school for science subject are based on themes that link physics, biology and chemistry concepts with intact [9].

In fact, many learning materials did not provide local content in their learning materials [10]. The book was published by Kemendikbud (revision 2017) also still has not integrated science into a theme. Therefore, science textbooks can be compiled using a theme in linking the subject matter.

West Sumatra, Indonesia, is an area that has potential for disaster especially big flood potency. Medium flood potential is found in 7 sub-districts while medium-high is located in 37 sub-districts spread over 19 districts [11]. Lessons focused on flood disasters in schools have not been implemented. Student knowledge and awareness is still lacking on Disaster Risk Reduction (DRR) [12]. Based on this, the use of the flood theme as a potential area in the learning materials aims to make students participate in disaster mitigation. Integrated thematic learning that links learning to environmental situations using this theme can provide a meaningful experience for students so that students have better competencies [1,13].

Science subject at junior high school level can be integrated into one unity of discussion through models of alignment. Science textbooks can be presented using a sequenced model. This model combines science materials consisting of physics, biology, and chemistry as a whole. The model is sequenced, arranging related sequences from separate and synchronized subjects [14].

Science textbooks contribute to instruction and tasks by teachers. Science textbooks also guide inquiry, describe abstractions, and present practical questions so as to develop student problem-solving skills [15]. Preparation of textbooks using Problem Based Learning (PBL) to assist students in solving problems scientifically. The use of PBL can increase student involvement [16], functional knowledge [17], problem-solving skills and scientific attitude [18]. The real problem given can be about the phenomenon of flooding.

Preparation of textbooks has the mission of optimizing the development of declarative and procedural knowledge by always referring to what is programmed by Kemendikbud. The structure of instructional materials developed includes the presence of KI and KD, subject matter, teaching materials, and stages of learning-based learning model implementation [19]. The textbook structure consists of 5 elements, namely the title, KD or subject matter, supporting information, exercises, and assessment [1]. Student books contain chapter titles and KD information that correspond to the topics in each chapter. Each chapter is equipped with concept maps, introductory, student activity sections, both experimental and non-experimental or discussion, exercise questions, summaries, evaluations, and assignments for students [20]. Each discussion in the textbook covers three competency domains: knowledge of skills and attitudes, as well as each chapter / theme containing one or more projects to be performed and presented to students [21]. The activity load provided to the students is an integral part of the textbooks listed at the end of each chapter. The final section of the textbook consists of information on publishers, glossaries, bibliography, indexes, and attachments [5].

The observed textbook format of Kemendikbud is still incomplete based on the principles of textbook preparation. The junior high school science textbook by Kemendikbud (revision 2017) has not included KI, KD, IPK (competency achievement indicator), learning objectives, and concept maps. This book is also not followed by the steps of the learning model. The scientific measures presented do not yet fulfill the observing, questioning, collecting information, associating, and communicating (5M) activities intact. Some activities are guided by a scientific step, but do not cover these five activities.

The ideal textbook or high quality textbook is a worthy book in terms of content, linguistic, presentation, and graphics. In addition, textbooks also contain components relevant to education or curriculum objectives. The pattern of textbook packaging is also carried out according to the characteristics of good teaching materials, both in terms of material content, presentation, and linguistic [19].
Validity indicates the extent to which a measuring instrument is able to measure what it wants to measure. Valid means the instrument used can measure what should be measured [23]. Validation tests can be performed by experts and users (teachers) [4]. Validation of products can be done by experienced experts to assess the weakness and the strength of the product generated.

Validity commonly used tripartite classification that is content, criterion, and construct, while Kennenth Bailey classify three main types of validity: face validity (considered equal to content validity), criterion validity, and construct validity [22]. Components of the content validity of the textbook include the components of content feasibility, presentation, linguistic, and graphical [24], [19]. Face validity as part of the content validity is the starting point of evaluation of test quality, in this case the items. The degree to which an expert is involved in assessing the feasibility of a grain will be estimated and quantified, then the statistics are made an indicator of the validity of the content of the item and the validity of the content. [25]

The component feasibility test is a test of the validity of a content or material from a textbook. The content feasibility component consists of dimensions of spiritual attitudes, social attitudes, knowledge, and skills [24]. Aspects of content take into account the suitability of the material with the curriculum, the purpose of education, and the development of student cognitive; completeness of competence; folklore, depth, breadth, accuracy, and material maturity; as well as containing spiritual, social, psychomotor, and productivity values [19], [21]. The teaching materials should reflect the various best values that the student should know. These values can be either values of local wisdom or universal values [19].

Components of instructional materials should arouse students' interest and attention, easily understood by students, encourage students to think and learn, and based on assessment formative authentic [19]. Components of presentation feasibility consist of presentation techniques, supporting material presentation, presentation of learning, and completeness of the presentation. Then, the criterion of the textbook's validity component is also seen from the linguistic aspect. Components of linguistics that is in accordance with the level of student development, communicative, interactive, coherence and the demands of the flow of thought, conformity with the rules of the Indonesian language, as well as the consistency of the use of terms and symbols / symbols [24]. When making textbooks pay attention to the components of these linguistic criteria well then the information conveyed channeled well. In addition, the validity of textbooks is also reviewed in terms of graphics. The criterion of ergonomics is the appearance and design of a textbook. Components of eligibility include the size of the book (the suitability of the book size with ISO (International Organization for Standardization) standards and the content of the book), the design of the book's skin (layout, typography, and illustration), as well as the design of the book (layout and typography) [24]. Based on the description of the components of textbook eligibility many factors must be met so that the textbook is valid and can be used for students in learning.

2. **Method**

This research is descriptive research. Descriptive research aims to describe a phenomenon or event [26]. Data collected in the form of numbers interpreted in the form of description. The design of self-evaluated textbooks is given to experts (expert) to be validated. Validation is a process to assess whether the design of a product is feasible or not. Expert evaluators are considered in terms of expertise in content, presentation, linguistic, and graffiti aspects. This study also involves practitioner evaluators. The steps undertaken to validate textbooks are: a. Arranging lattice sheet validation; b. Compiling validation sheet; c. Validating the validation sheet to the experts; d. Fix the validation sheet according to expert evaluator's suggestion; e. Validating science textbooks to experts and practitioners to identify their strengths and weaknesses; f. Analyze the result of validation sheet filled by evaluators; and g. Make revisions in accordance with suggestions / feedback from the evaluators until the product is considered valid and meet the advice of the evaluators.

Validation instrument of science textbooks used in the form of questionnaires. Instrument of validation was compiled using Likert scale 1-4 with terms 1 = disagree (0% -25%), 2 = less agree
(26% -50%), 3 = agree (51% -75%), and 4 = very agreed (76% -100%). Content validity can be analyzed using Aiken’s V formula [27]. The content validity coefficient is calculated by this formula based on the assessment results of the expert panel of n people against a grain in terms of the extent to which the grains represent the measured constants. Aiken’s V statistic is formulated as follows:

\[
V = \frac{\sum s}{n(c-1)}
\]

where:
- \( s = r - lo \)
- \( lo = \) The lowest validity score value
- \( c = \) Rate of validity of the validity
- \( r = \) Number given by an appraiser

\( V \) value the item can be said to be valid if \( V \geq 0.67 \) [25].

Questionnaires are assessed first by the experts according to predetermined criterion whose results are shown in Table 1. Validation instrument has met the valid criterion as shown in Table 1. The instrument is used as a reference in assessing textbooks.

| Aspect                                      | V     | Criterion |
|---------------------------------------------|-------|-----------|
| Clear language                              | 0.87  | Valid     |
| Based on indicators                        | 0.87  | Valid     |
| Based on the aim                           | 0.80  | Valid     |
| Does not contain a double meaning          | 0.93  | Valid     |
| Easy to understand                         | 0.87  | Valid     |
| Based on good EBI (Ejaan Bahasa Indonesia) | 1.00  | Valid     |
| Average                                    | 0.89  | Valid     |

3. Result and Discussion

Validation has been done based on theoretical textbook eligibility. Moreover, the validation also refers to the components of textbook worthiness according to BSNP (The National Agency for Educational Standards) that includes the feasibility of content, presentation, linguistic, and graphical. The developed textbook of the flood theme was validated by involving five experts and four practitioners. Expert evaluators consist of lecturers who have an educational background in the field of science, science education, and Indonesian language. Two of them are experienced in teaching the subject of instructional media. Scientists assess aspects of content, instructional media experts assess aspects of presentation and graphics, while Indonesian language experts evaluate linguistic aspects. In addition, the practitioner evaluators consist of four junior high school science teachers from two schools.

The design of the flood theme science textbook at the beginning begins with the cover. The cover contains the title and specifications of the book. The textbook cover is designed to attract and describe the material contained in the textbook. The front cover contains subject titles, themes, education level that namely junior high school, integrated models and learning models, author names, publishers, and curriculum 2013 symbol. The 2013 curriculum symbol shows that textbooks are developed in accordance with the applicable curriculum. Then, pictures of flood phenomena are used to show themes and so textbooks become interesting. The cover is designed with a blend of blue to attract students. Next, there is the title page, introduction, table of contents, list of illustrations, and list of symbols. Then, the contents of the book consist of introductions and sub-themes. The introduction section presents a mind map so that students easily understand the interrelationships between sub-themes. The final section contains a glossary, literature, author's biodata, and ends with a back cover.

A Snapshot of the cover design section and a mind map of validated books can be seen in figure 1.
Figure 1. (a) Cover of textbook of science; (b) map of thought of flood theme
This book assessed using a Likert scale with category 1 = Disagree; 2 = less agree; 3 = agree; and 4 = strongly agree. Then, the results of this assessment were processed using aiken's V formula. Figure 2 below shows the results of experts and practitioner’s assessment of all four aspects of the assessment:

![Graph showing assessment results](image)

**Figure 2.** Assessment of experts and practitioners on the flood science textbook theme

Based on the graph shows that the difference of experts assessment and practitioner's results is not so conspicuous, the four aspects (content, presentation, linguistic, graphical) almost look the same. The value of aiken's V by the practitioners at the graph is higher than experts on the content and presentation aspect, whereas the value of aiken's V by the expert is higher than that of the practitioner on the linguistic and graphical aspects. This difference is because experts better understand aspects of content and practitioners better understand the conditions of needs in the field. Expert’s assessment considers textbooks that are in accordance with scientific rules while practitioner’s assessment are more based on teachers' knowledge and experience on the need of textbooks in the field.

The evaluator gave some suggestions for the researcher to slightly revise the textbook in the form of improvements to the learning objectives to further detail the condition part, clarify the description of the image provided, and clarify the excerpt of the book usage instructions. Furthermore, the carbohydrate digestion description is more adjusted to the image. In terms of linguistic, it is corrected with the use of capital letters at the beginning of the greeting. Then, the laying of the instruction manual of the book more well laid out. After the correction, a textbook is produced in terms of content, presentation, linguistic, and graphical aspects. Experts and practitioner’s assessment results after revision can be seen in Table 1.

**Table 2.** Experts and practitioners' assessment of sub-indicators of science textbook scoring

| No | Sub Assessment Indicator                               | Assessment of Experts | Assessment of Practitioners |
|----|---------------------------------------------------------|-----------------------|----------------------------|
|    | V            | Criterion | V            | Criterion |
| (a) | Content Aspect                                      |                       |              |
| 1   | The Dimension of Spiritual Attitude                  | 0.67                  | Valid 1.00   | Valid     |
| 2   | The Dimension of Social Attitude (Caring Attitude)    | 0.83                  | Valid 0.92   | Valid     |
| 3   | Dimensions of Knowledge                               |                       |              |
| 3.1 | Material Coverage                                    | 0.72                  | Valid 0.89   | Valid     |
| 3.2 | Material Accuracy                                     | 1.00                  | Valid 0.92   | Valid     |
| 3.3 | Up to Date                                            | 0.67                  | Valid 0.88   | Valid     |
| 3.4 | Contextual                                            | 0.83                  | Valid 1.00   | Valid     |
| 4   | Skill Dimension                                       |                       |              |
| 4.1 | Scope of activities                                   | 0.67                  | Valid 1.00   | Valid     |
| 4.2 | Experiment accuracy                                   | 0.83                  | Valid 0.92   | Valid     |
The assessment of the textbook is in accordance with the scientific stage. Then, the flood science textbook is in a valid criterion according to experts (0.88) and practitioners (0.91). In terms of assessment indicators, overall also meet valid requirements. The results which are at valid criterion indicate that the textbook has shown the suitability of the content based on the dimensions of attitude, knowledge, and skills. The dimension of knowledge shows the scope of the material, the accuracy of the material, the up-to-date, and the contextual content has been valid criterion [19], [24]. Skill dimensions have provided coverage of activities, accuracy of experiments, characteristics of activities, and application of skills at valid criterion. The activities presented reflect the substance of the skills contained in KD and KI 4 [1] [3]. Activities are also in accordance with the scientific stage. Then, the learning step use the PBL model in order students has a scientific attitude [18]. The results of the textbook validation on the presentation aspect are at valid criterion that show the textbook is in accordance with the systematic and coherence of presentation [24]. The results of the textbook validation on the graphical aspects are at valid criterion. This shows that the size of the book is proportional, and the cover design has reflected the contents of the book. The letters used are clear, proportional book layout. Color mix has been interesting. Linguistic aspect validation results are also obtained at valid criterion. This shows the language used according to the level of learner development, communicative, and in accordance with the correct Indonesian language [19], [24].

| No | Sub Assessment Indicator | Assessment of Experts | Assessment of Practitioners |
|----|--------------------------|------------------------|-----------------------------|
| 4.3 Characteristics of activities | 0.83 | Valid | 1.00 | Valid |
| 4.4 Application skills | 0.83 | Valid | 1.00 | Valid |
| Average aspect of content | 0.81 | Valid | 0.93 | Valid |
| (b) Presentation Aspect | | | | |
| 1 Presentation techniques | 0.79 | Valid | 0.96 | Valid |
| 2 Supporting material presentation | 1.00 | Valid | 1.00 | Valid |
| 3 Presentation of learning | 0.88 | Valid | 0.90 | Valid |
| 4 Completeness of presentation | 0.83 | Valid | 0.92 | Valid |
| Average aspect of presentation | 0.91 | Valid | 0.96 | Valid |
| (c) Linguistic Aspect | | | | |
| 1 Appropriate thinking of the student level development | 1.00 | Valid | 0.83 | Valid |
| 2 Student's understanding of the message | 0.92 | Valid | 0.88 | Valid |
| 3 Grow a student’s sense of pleasure when reading it | 0.67 | Valid | 0.83 | Valid |
| 4 Conformity of terms | 0.83 | Valid | 0.83 | Valid |
| 5 Coherence | 1.00 | Valid | 0.92 | Valid |
| 6 Conformity with Indonesian rules | 0.92 | Valid | 0.83 | Valid |
| 7 Consistency in the use of terms, symbols / symbols | 0.92 | Valid | 0.92 | Valid |
| Average linguistic aspect | 0.89 | Valid | 0.86 | Valid |
| (d) Graphical Aspect | | | | |
| 1 Book size | 0.83 | Valid | 0.92 | Valid |
| 2 Cover book design | 0.83 | Valid | 0.83 | Valid |
| 3 Book design | 0.97 | Valid | 0.90 | Valid |
| Average aspects of graphical | 0.93 | Valid | 0.90 | Valid |
| Average | 0.88 | Valid | 0.91 | Valid |
4. Conclusion
Based on the explanation, the development is done has fulfilled the pattern of arranging of teaching materials in accordance with the characteristics of good teaching materials. It also means the textbook has already fulfilled the validity component which includes the content feasibility, presentation, linguistic, and graphical components. Consequently, the textbook can be tested in learning.

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