



Development of Chemistry Textbooks Based Scientific Approach in Efforts to Implement Prototype Curriculum at Schools

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Abstract: The purpose of research is to develop the chemistry textbook based on the scientific approach in implementing the prototype curriculum in schools. The development of textbooks uses the type of R & D. The R & D model used is ADDIE model which has five Phases, namely (1) analysis, (2) design, (3) development, (4) implementation, and (5) (evaluation). At the analysis is carried out with initial analysis, participant analysis students, task analysis, concept analysis, and formulating learning objectives. At Phase design is carried out preparation of core competency (KI) and basic competencies (KD), preparation of the grid/framework module, and the initial draft of the module. The development includes the assessment Phase of the expert team on the developed textbooks. Implementation and evaluation phase includes development trials to see the effectiveness of the developed textbooks. The research subjects consisted of 9 teachers' chemical. Data collection is carried out to determine the feasibility of products that have been developed through a validation questionnaire filled out by experts and response questionnaire teachers are also students. The results showed that the -based chemistry textbooks *scientific approach* developed has received a very feasible assessment by experts to be tested for its use in learning. Next, the teacher's response and students towards *scientific approach* the developed at the trial Phase is classified as a very feasible category to be implemented in learning. In addition, chemistry textbooks based on a *scientific approach* are effectively used as a textbook.

Keywords: Textbooks; Scientific approach; Prototype curriculum

Introduction

Education is an effort to produce human resources who are knowledgeable and have noble character and quality so that they can compete in the global era. However, with the Covid-19 pandemic, the government implemented a flexibility policy for schools to choose a curriculum that suits the learning needs of students, known as the prototype. prototype curriculum was prepared several years ago to be implemented in the Driving School program and is also a continuation of the learning policy as a response to the Covid-19 pandemic. The COVID-19 pandemic has caused learning losses significant literacy and numeracy Learning loss is

defined as the absence of the learning process in schools (Vitasari & Supahar, 2018). Curriculum prototype is expected to provide a wider space for character development and basic competencies.

One of the main characteristics of the prototype that supports learning recovery is the flexibility for teachers to carry out learning according to the abilities of students and make adjustments to the local context and content. In implementing this, it is necessary to have a learning process where a teacher must have the right strategy in carrying out learning activities, ideally textbooks such as modules that are made should be able to help improve the thinking processes of students and other activities that are in line and in accordance with the learning

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objectives to be achieved. Learning using modules can improve student learning achievement (Mercedes, 2009; Rahmi, 2013; Budimah, et al., 2014; Imanda, et al. (2017); Fitriani (2017); and Dhamija & Khancha, 2014).

The limited number of textbooks used by teachers in a lesson will cause the knowledge gained by students to be very limited and even teachers often pass a certain subject due to not having textbooks so that the learning process does not run effectively, including in chemistry lessons. The use of developed textbooks in chemistry learning can provide students with complex knowledge. This is in accordance with what was stated by Chen et al. (2011); Setiawati et al. (2020); Ozdilek and Ozkan (2009) that the learning achievement of students at a school in Taiwan increases when taught using a textbook developed according to the needs of students.

To train the development of attitudes, knowledge and skills of students can be done through a scientific approach. Sumiati, et al. (2018) said approach is very closely related to the skills and character of students, namely characters based on scientific attitudes such as hard work, discipline, honesty, openness, democratic, creative, careful, thorough, communicative and responsible. The scientific approach has five Phases, namely observing, asking, collecting data, associating and communicating. The learning process is guided by the rules of scientific approach, which is able to invite students to investigate problems in the form of problem formulations and hypotheses of caring for the environment, curiosity and love of reading, so that students will have the opportunity to do research and develop and present the work. Based on this, the researcher conducted research entitled Textbook of Chemistry Based Scientific Approach in Efforts to Implement Prototype in Schools.

The developed module is used in learning with acid-base materials in State Senior High Schools throughout Bireuen Regency. The development of this chemistry textbook is expected to help students understand the concepts in acid-base material. In this module, the concept of acid base is explained in simple language so that it is easy to understand. The questions as practice material are presented in a coherent manner so as to train students' abilities to acid-base material.

Method

The type of development used in this research is Research and Development (R & D) or development research, namely research conducted to develop chemistry textbook based on scientific approach. The R & D model used is the ADDIE model which has five Phases, namely (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation (evaluation). At the Phase analysis carried out with preliminary analysis, student analysis, task analysis, concept analysis, and

formulating learning objectives. At the design, the core competency (KI) and basic competencies (KD) are prepared, the lattice/framework for the textbook is in the form of a chemistry module, and the initial draft of the module is designed. The development Phase includes the assessment Phase of the expert team on the developed textbooks. The implementation and evaluation Phases include development trials to see the effectiveness of the developed textbooks.

This research was carried out in high schools throughout Bireuen Regency, from March to November 2022. The research population included high school chemistry teachers in Bireuen Regency. Subjects to determine teacher responses were 30% of the total population of teachers in the field of chemistry at SMAN Bireuen Regency, and subjects to obtain student responses were taken from SMA Negeri 2 Peusangan. The selection of the SMA as the research subject was based on a case study review conducted at the problem identification Phase.

In this development research, data were collected using product validation sheet instruments and questionnaires. The product validation sheet is in the form of a validation questionnaire filled out by experts to determine the feasibility of the product that has been developed. Questionnaire sheets for teacher and student responses, in the form of questionnaires for chemistry teachers and students, where each questionnaire contains questions arranged according to the criteria for use to obtain information related to teacher and student responses to products that have been developed in the learning process as an effort to implement prototype curriculum in schools. The data obtained were processed using quantitative descriptive analysis.

Result and Discussion

The research data obtained are qualitative data obtained from product validation sheets and questionnaire responses from students and teachers. Before conducting the research, the research instrument used was first tested for validation, so that the data obtained were valid. Valid means that the instrument can be used to measure what should be measured (Sudijono, 2011). The input from the validator is used as material for improvement for the instrument before it is used. The process of developing this interactive media-assisted module uses the ADDIE model. The Phases that have been carried out starting from analysis, design development, implementation, and evaluation.

Analysis Phase

At this Phase the researcher collects information related to learning in schools. This aims to determine the problems that exist in the field as a source of initial research for researchers in developing chemistry

textbooks. Data collection was carried out by conducting preliminary tests on students and conducting interviews with teachers in the field of chemistry studies as well as conducting a literature study on teaching materials (state of teaching materials) that existed, especially at SMAN 2 Peusangan. From the preliminary analysis, it was found that the teaching materials used were in the form of textbooks in the library, not using developmental teaching materials that described many exercises and sample questions that could support the development of the cognitive potential of students.

The results of the analysis on the learning process found that learning tends to only use the teacher-centered and monotonous lecture method. Students tend to listen and are not actively involved during the learning process. In addition, in teaching and learning activities do not use any media other than textbooks available at school. The learning material about the acid-base concept that is taught only introduces strong and weak acids and bases, while the material on reactions in acid-base solutions is simply passed so that students do not understand about reactions in acid-base solutions.

The results of the needs analysis in terms of these three aspects become a problem for students. There should be several media and other additional teaching materials used in chemistry learning, so it was decided to develop a chemistry textbook based scientific approach to the concepts and types of reactions in acid-base solutions. The chemistry textbook developed is in the form of a module. The reason for choosing the module is that this type of teaching material can be used as independent learning material for students because it is equipped with examples of questions and exercises that can train students to understand the material quickly and easily.

Design Phase

In the design phase, the researcher determines the media that is in accordance with the learning objectives, chooses the module development format and conducts the initial design. Media selection is adjusted to the analysis Phase. Furthermore, the researchers made an initial design along with learning tools that must be prepared before the product trial was carried out. In this Phase, the product produced is a scientific approach about concepts and reactions in acid-base solutions. The first thing to do is make an initial design (module framework, module initial design and material scope map). After the initial module design is carried out, consultations with experts are carried out so that the products developed are of good quality.

Development Phase

At the development Phase, the chemical approach based on scientific approach is packaged in such a manner according to the points at the design Phase which will become draft 1. The Phases in this section include: (a) review of scientific approach-based chemistry teaching materials, and (b) validation. The results of the interactive media-assisted module review are in the form of suggestions and input from experts which are then used to revise the interactive media-assisted module to make it more perfect. The results of this study are referred to as draft 2. Furthermore, draft 2 was validated by 2 USK lecturers and 4 chemistry teachers which was carried out by filling out a product quality assessment questionnaire sheet. The validation results were analyzed descriptively quantitatively and interpreted into a Likert scale. Assessment of chemistry teaching materials based on a scientific approach uses an assessment score on a scale of 1-5. A product that is suitable for use if the expert based on his experience states that the product is suitable for use (Epinur, et al., 2013).

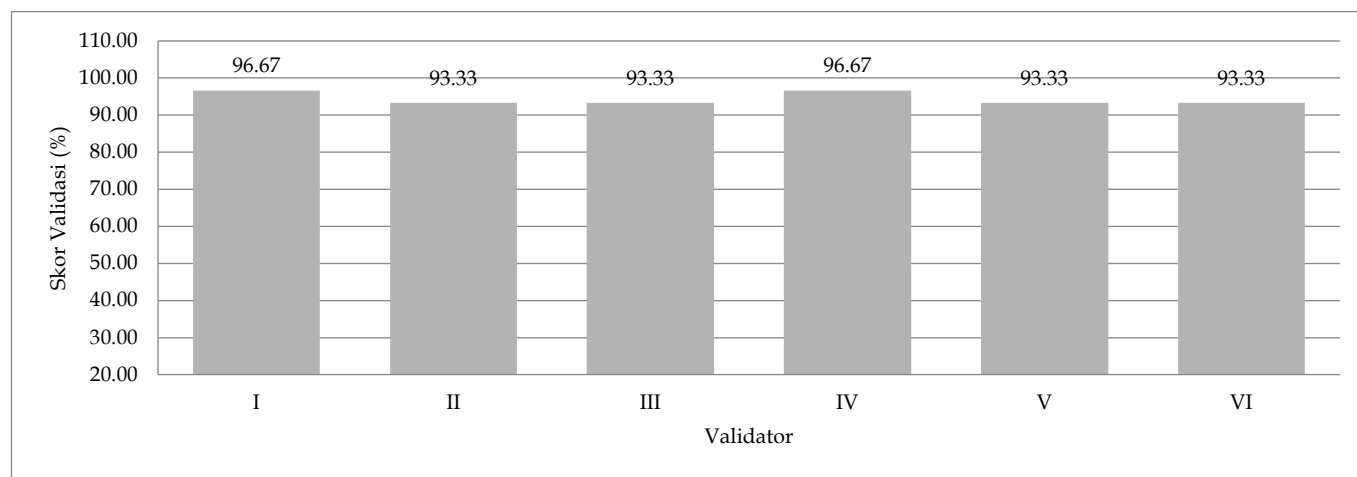


Figure 1. Percentage of Validation Results on Chemistry Textbooks Based on Scientific Approach

The average validation results from 6 validators for scientific approach are 93.00% with very decent qualifications, so it can be concluded that scientific approach suitable for use or continued to the next Phase. This is in accordance with what Parmin and Peniati (2012) stated, the validation results are in the good or very good category, so the module is declared suitable for use.

Quality assessment is also carried out on chemistry teaching materials based on a scientific approach. The product assessment results were analyzed descriptively quantitatively and interpreted into a Likert scale. The average validation results of 6 validators for scientific approach are 95.00% with very decent qualifications so

that it can be concluded that scientific approach suitable to be used as auxiliary media in the learning process.

In addition to assessing product quality, this Phase also carried out initial trials of chemical teaching materials based on the scientific approach that had been developed. The initial trial was carried out with the aim of getting input and suggestions on several aspects described in the questionnaire. The results of the questionnaire on the initial trial will be used as improvements before continuing with the implementation phase. The percentage of the results of the initial trials on chemistry teachers and students can be seen in the following figure 2.

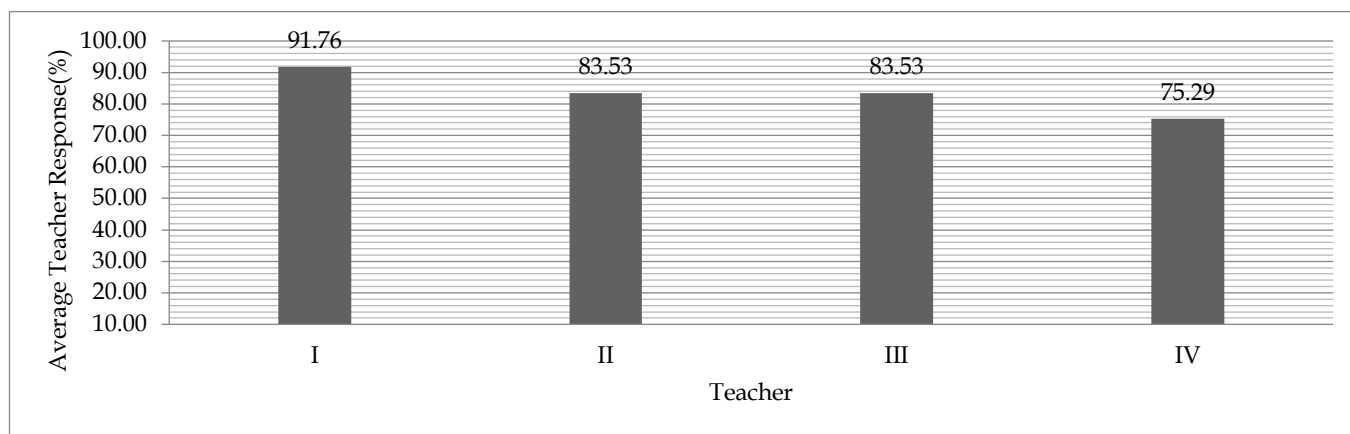


Figure 2. The Average Percentage of Teacher Responses to the Trial of Chemistry Textbooks Based on Scientific Approach

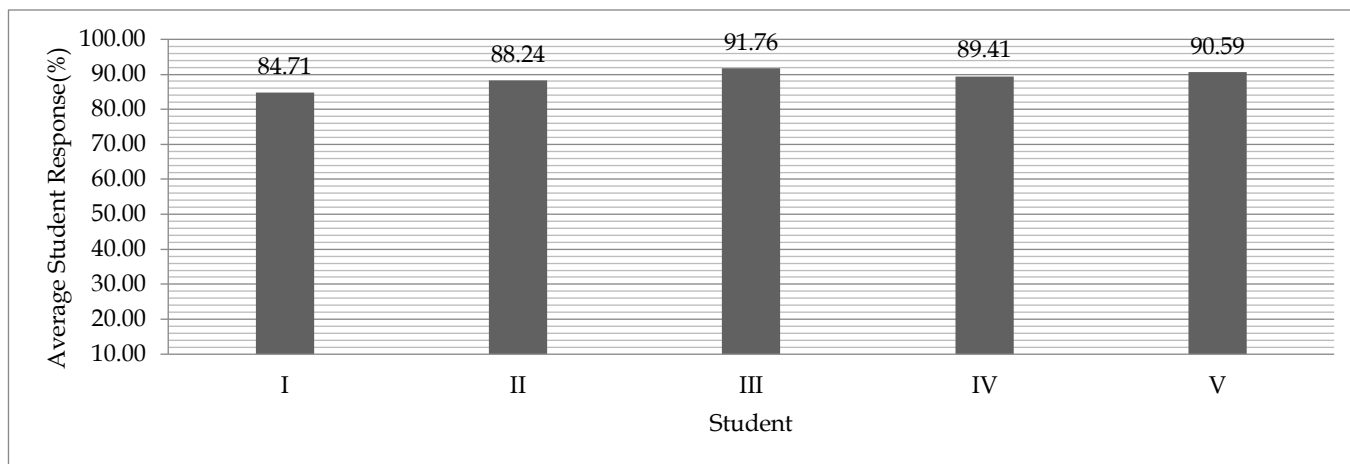


Figure 3. The Average Percentage of Students Responses to the Trial of Chemistry Textbooks Based on Scientific Approach

Based on Figures 2 and 3, it can be seen that the teacher's response is 83.53% and the student's response is 88.94%. This achievement is classified as a very decent qualification although there are several things that need to be improved. Based on this percentage, it can be stated that chemistry teaching materials based on a scientific approach feasible to be continued in the implementation Phase.

Implementation Phase

Implementation is a step to implement chemistry teaching materials based on scientific approach that has been prepared. The implementation in this study was carried out in 5 to 15 schools for chemistry teachers and 1 school for class XI students. Initial scale trials can be carried out in 1 to 3 schools, while broad trials are carried out in 5 to 15 schools. Teacher response questionnaires were given to 10 teachers from several public and private schools in Bireuen. The teacher's response

questionnaire covers several aspects including; benefits, material, language, motivation and module display. The average score of each teacher's response at the

implementation Phase can be seen in the following figure 4.

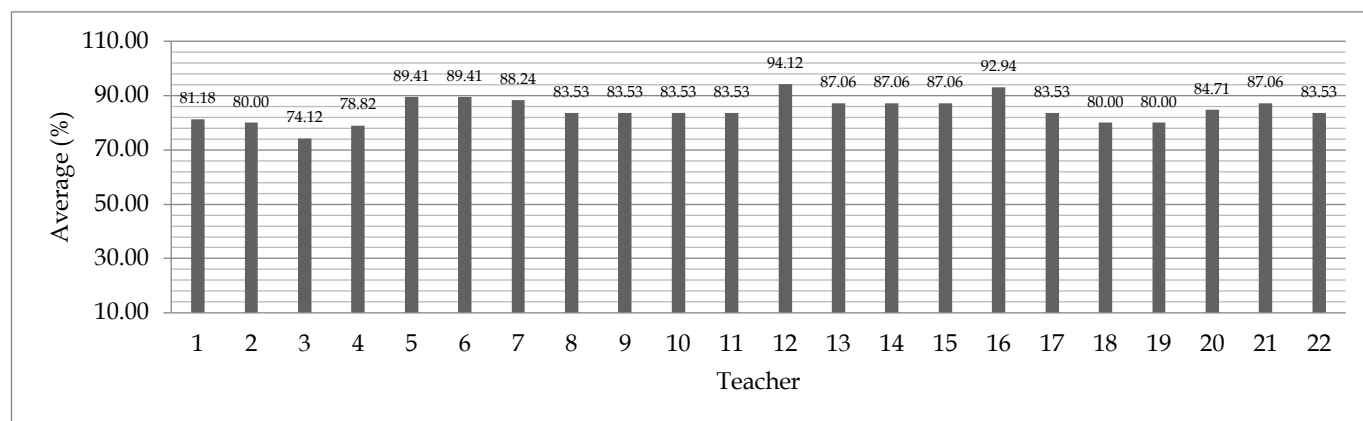


Figure 4. Average Percentage of Teacher Responses to Chemistry Textbooks Based on Scientific Approach

The average percentage of responses from all teachers was 84.65%. This achievement is classified as very good qualification. This shows that the teacher gives a positive response to the scientific approach that have been developed. This positive response provides an indication that the scientific approach are effective and very well used in the chemistry learning process, especially on concepts and acid-base reactions.

The implementation for students was carried out at SMA Negeri 2 Peusangan. Students were given modules and the researchers gave instructions on the use of chemical modules based on the scientific

approach. Students are also given instructions to do the exercises in the module, especially on the types of chemical reactions in acid-base solutions. At the Phase of checking the correctness of the exercises that have been done by students, researchers use chemical teaching materials based on scientific approach that has been developed. After learning is complete, students are given a questionnaire to find out their response to learning concepts and types of acid-base reactions using scientific approach. Filling out the questionnaire is done at the end of the learning process in class, the percentage of student responses can be seen in the Figure 5.

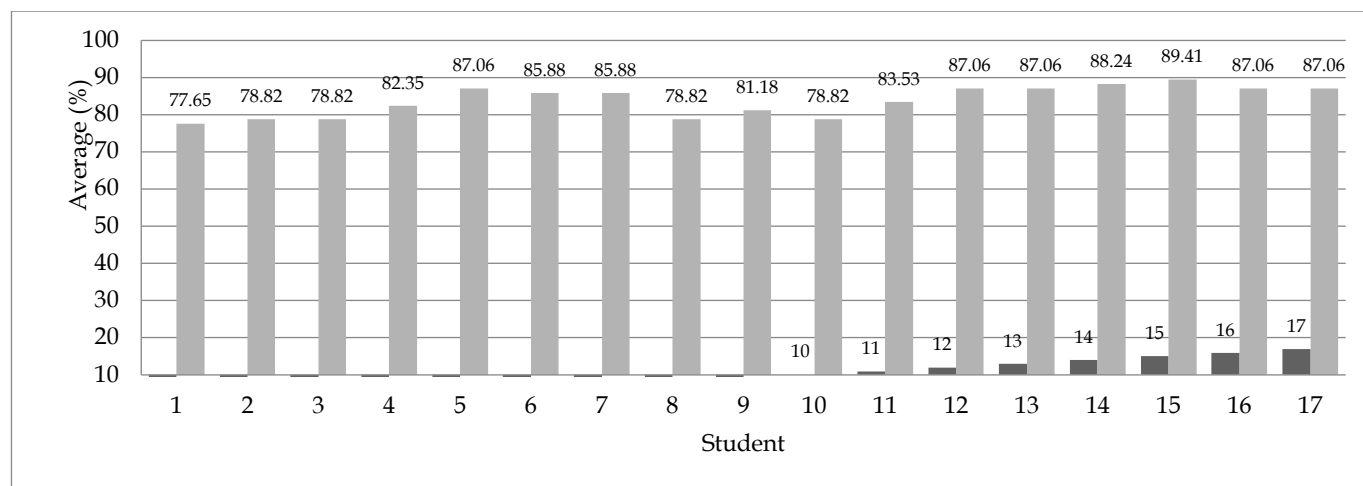


Figure 5. Average Percentage of Student Responses to Chemistry Textbooks Based on Scientific Approach

The average percentage of student responses obtained is 83.81%. This achievement is classified as very good qualification. Student responses on all aspects indicate that the developed module makes it easier to understand the concepts and types of reactions in acid-base solutions. The responses of these students indicate that this module is appropriate to be used as a source of

student self-study, because it can help students understand the material easily.

EvaluationPhase

Phase in the evaluation, what is done is product improvement based on the implementation of the developed product. The results of improvements at this

Phase resulted in a more perfect module so that researchers carried out field distribution of the developed module. Based on the results of the implementation that has been carried out, it is stated that chemistry teaching materials based on the scientific approach are feasible to use. This is concluded based on the results of the average percentage of the module validation questionnaire, teacher and student responses and the results of cognitive identification.

Conclusion

Based on the results of the research that has been carried out, it can be concluded that the chemistry textbook based on scientific approach that was developed received a very decent assessment by experts in an effort to implement a prototype curriculum in schools based chemistry textbooks scientific approach that were developed were categorized as very feasible in an effort to implement a prototype curriculum in schools.

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