STES – Chemistry book: The need for learning and teaching on acid and base 11th grade students

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Abstract. The aims of this study explain the need of chemistry book on acid and base developed by 4S TMD models with STES approach. Problems of education in the last 100 years are often related to students understanding of the concepts taught, one of which is acid-base [1]. In acid-base, there are many applications in daily life. So to overcome these problems, we need a teaching material with the STES approach [2]. The STES approach is used to improve positive attitude towards science and conceptual knowledge as well as improving teacher quality and student learning outcomes [3,4]. This study uses qualitative descriptive research. The instruments of data collection used in this study were structured questions and interview. The study involves 3 senior high schools and 3 vocational high schools with 12 chemistry teachers. The teachers structure question responses was analyzed descriptively for each item. The teacher needs teaching materials that explain the material simply and involve examples in daily life. The teaching material available lack a concept that contains knowledge is associated with technological developments, especially in acid-base material. The research findings indicate the need to develop chemistry book on acid-base to meet the shortcomings of interesting teaching materials. The results of this study are the basis for us in developing a chemistry book on acid and base by 4S TMD models with STES approach that can be used chemistry learning and teaching in upper high schools.

1. Introduction

The progress of the era is accelerating, now we have entered the 21st century. Where the world demands humans to have the ability to compete in the 21st century. Ability that must be possessed is (i) learning and innovation skills, (ii) information, media and technology skills, (iii) life and career skills [5]. One of these abilities can be possessed through education. Through education students are required to go beyond knowledge and develop high thinking skills and problem solving [6,7]. In learning there are also often problems that can result in students not understanding the material being taught. Problems in the teaching and learning process are caused by several factors including the lack of understanding of the teacher’s concepts related to the material being taught, the methods used by the teacher are less varied and the lack of availability of teaching materials that can be used in learning [8,9]. Teaching materials are expected to be used to help students learn independently and improve student understanding in learning especially acid-based learning [10].
Students must have the basic ability to understand a learning called prerequisite material [11]. In acid-base learning the prerequisite material is electrolyte and non-electrolyte solutions, reaction equations, compound names. In acid-base learning teachers can also start with acid-base found in everyday life. So that it can motivate students to learn the concept of acid base. Many young people now live in advances in environmental technology [12]. So it is very easy for students to find acid-base problems in life through the internet. That way students can easily associate the knowledge they already have with new knowledge given by the teacher. Knowledge must be held between microscopic, macroscopic, and existing phenomena and critical thinking skills [13]. Then the teacher becomes a determining factor in determining the success of students in developing the concepts learned [14]. The task of a teacher must be to help students learn the basic concepts of a science so that students can master learning. Meaningful learning when acquired knowledge can be applied [15]. In order to make it easier for teachers to carry out their duties as learning facilitators, a tool called teaching materials is needed.

Chemistry is a very dependent science on theory that states the properties of matter that can be observed from phenomena then submicroscopic levels [16,17]. Acid-base material is a chemical subject that is always considered abstract and difficult to understand. The material has an important role to help understand some facts in life and environmental problems [18]. Concern for the environment is needed in this modern era [19,20]. Therefore teaching materials are needed that can help students in studying chemistry [21].

Teaching materials are a very important source of learning in the learning process. Good teaching materials are teaching materials that have material that is easily understood and mastered so students have competence [22] and by reading text books students can more easily understand [23]. An effective textbook is a book that can deliver material in an interesting, accurate, and easily understood way and an attractive text book display. The appearance of an interesting text book is to use text that is very easy to read [24]. Students can use explanations in the form of concept questions then give students to understand and explain in their own language [25,26]. Interesting and effective teaching materials can be associated with learning approaches, one of which is the STES approach.

The STES approach has developed for academic interests [27,28]. The STES approach recognizes the need for education for young people in facing the challenges of a world that is constantly changing [29]. Students must have knowledge of science, technology, and society [30]. Science educators say that students must have abilities in the STES context in learning science concepts [2,31. Learning science must be meaningful and enable students to apply scientific knowledge [32] to better understand the surrounding environment so that students can participate in improving lives [33-35].

2. Methods
This study used a descriptive qualitative method. The purpose of this descriptive study is to make a description, systematic description and describes the condition as it is. Subjects of The Study involves 3 senior high schools and 3 vocational high schools with 12 chemistry teachers. This study uses structured question instruments and interviews. Questions consist of 13 questions given to the teacher. The results of answers to questions are analyzed descriptively for each question. To collect data, we also conducted interviews with teachers regarding the teaching materials used and the learning methods commonly used in schools in acid-based learning and what the STES approach was known to the teacher. The results of this study are the basis for us in developing a chemistry book on acid and base by 4S TMD models with STES approach that can be used chemistry learning and teaching in upper high schools.

3. Results and Discussion
We analyze the teacher's answers to descriptively to find out the problems that are occurring in the learning process, especially regarding teaching materials and learning approaches used. The following are answers to questions from several teachers. Teaching materials used by teachers can now be shown in figure 1, 2 and 3.
Teaching materials used by teachers are in the form of books, power points, and the internet. The teacher only has existing learning media such as books that can be found in the library, teaching materials made by the teacher and students using the internet access that they own. Teaching materials used are still lacking, namely less interesting material and incomplete material. For other teaching materials, schools still experience limitations. Next, answering questions about teaching materials needed by students is shown in figures 4 and 5.

In questions 4 and 5 it is found that the teaching materials needed by teachers for students to learn are easy to understand teaching materials. Then the teacher gives answers to the teaching materials needed for acid-base material, namely teaching materials that can help understand acid-base material and there are practicums that can make students explore acid-base material. Then, the answers to the teacher's questions about the development of instructional materials are shown in figures 6 and 7.
In questions 6 and 7 it was found that the teacher had never developed teaching materials and had never and did not know the teaching materials developed with the 4S TMD method. Then the teacher is given questions about the STES approach, the following answers are shown in figures 8 and 9

Figure 8. The teacher did not know about the SETS approach

Figure 9. The teacher the SETS approach to learning never applied

The questions 8 and 9 show that the teacher knows about the STES approach. And also the teacher has never applied for a race with the STES approach. Then the questions about teaching materials needed for acid-base material so that students can easily understand the material are shown in questions 12 and 13 in figure 10

Figure 10. Teaching materials for acid-base material

In answers to questions 12 and 13 regarding teaching materials such as what is needed for acid-base material, the teacher wants acid-base material that is easily understood by giving examples that are associated with everyday life. With easy-to-understand language and teaching materials that are easily available. Based on the 13 questions that have been given to the teacher that the teacher wants teaching materials that have material that is easy to understand and there are examples that are associated with daily life so that students are easier to explore knowledge especially in acid-base material. Judging from the teacher's wishes, the STES approach is an approach that can be used in developing teaching materials. Where the STES approach has the values of Science, Technology, Environment and Society that can help students understand acid-base material. Development of teaching materials can be developed with one of the development methods, namely 4S TMD. This method not only pays attention to structuring but also the characteristics of teaching materials. Based on conclusions that can be drawn from the questionnaire questions, the researchers wanted to develop teaching materials on acid-base material with the STES approach using the 4S TMD method to overcome the shortcomings of teaching materials used now.

4. Conclusion

Based on the analysis of the teacher questionnaire, it was found that the teacher desperately needed teaching materials that could explain the material by connecting daily life. Desired teaching materials in the form of textbooks because of limited school facilities to support video-based learning, computer and internet. Teachers also need teaching materials that can be used independently by students and
contain values that can be associated with everyday life. It can be concluded that teachers need teaching materials that contain material that is interesting, easy to understand and contains phenomena associated with life. Teaching materials that can be used are teaching materials using the STES approach developed with the 4S TMD method. The method of developing teaching materials with 4S TMD not only paid attention to its structure but also the structure of its characterization which was associated with the STES approach which contained the values of science, technology, environment, and society. The results of this study are the basis for us in developing a chemistry book on acid and base by 4S TMD models with STES approach that can be used chemistry learning and teaching in upper high schools.

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