THE DEVELOPMENT OF CONTEXTUAL SCIENCE TEXTBOOK MODEL TO IMPROVE GENERIC SKILLS IN FACING DISRUPTION ERA

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ABSTRACT

The era of disruptive innovation does not only provide hope for progress, but also shakes up people's live who have been established so far. In this era, humans must be able to adapt well by having skills that can be used in various fields of life, namely generic skills. Generic skills can be developed for students in junior high school through the use of contextual science book in learning that facilitates the development of generic skills.

The aims of this research are to; (1) analyzing the validity of the contextual science textbook model, (2) analyzing the effectiveness of the contextual science textbook model, and (3) analyzing the practicality of the contextual science textbook model developed to improve students' generic skills. This research is a development research. The product of the contextual science book model developed was tested for validity, readability, effectiveness, and practicality. This research was conducted in class VII of a public junior high school in Demak, Central Java, Indonesia.

The research results; (1) the contextual science textbook model used in learning is declared to be very valid from the components of content feasibility, presentation, linguistic, and presentation completeness, (2) contextual science textbook model is effective for improving students' generic skills, the increase include; cooperation skills 3.47%, communication skills 7.74%, creativity skills 16.67%, critical thinking skills 3.34%, numeracy skills 19.99%, technology and information skills 6.66%, problem solving skills 33.33%, management skills 1.55%, and research skills 6.67%, and (3) the contextual science textbook model is very practical to use in learning, which is based on teacher and student responses on aspects of language use, aspects of material presentation, aspects of material accuracy, and aspects of ease of use get practicality values in the very practical category. The researcher suggest; Science textbook should be contextually composed and provide features that can facilitate students to develop generic skills. For science teachers, they should choose textbooks that facilitate students to develop generic skills that are indispensable in facing the era of disruption in the present and in the future.

Keywords: Development of contextual science textbook models, Generic Skills, Disruption Era

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1. INTRODUCTION

The developments of science, technology, and innovation that occur today color various aspects of life. Various innovations are disruptive, it means that the innovations do not only provide hope for progress, but also shake up people's live who have been established so far. This era of disruptive innovation marked by various changes humans must be able to adapt well. In order to adapt well, humans is need to have skills that can be used in various areas of life. These skills are called generic skills, namely skills that include; collaboration, communication, creativity, critical thinking, technology and information, numeracy, problem solving, management, and research.

The results of research in universities show that generic skills can be developed through workplace context-based learning. This learning is certainly not suitable to be applied in Junior High Schools, because the students are not of working age. Instead, it uses the context of everyday life or what is often called contextual learning. The components of contextual learning are; constructivism, inquiry, questioning, learning societies, modeling, reflection, and authentic assessment.

The application of contextual learning in junior high schools requires textbooks that support contextual learning to facilitate the development of generic skills. Therefore, it is necessary to develop a contextual science textbook model to improve generic skills.

The 21st century learning aims to develop skills related to collaboration, communication, creative, and critical thinking. In learning, teachers must always innovate, so that the 21st century learning objectives can be achieved.

Today, the development and application of science and technology in life has an impact on life in society. Technology differenciates between the past and the future. Technology does not only serve as a differentiator, but can also cause chaos (disruption). Disruption can also lead to the creation of innovations that change everything in the past seen as good, quickly turning into obsolete, outdated, and useless (Kasali, 2018).

The characteristics of disruption according to Kasali (2017) follow the 3S, namely; (1) speed, meaning that changes in this era move quickly, no longer linearly, but exponentially, because they are supported by technology, (2) surprises, meaning that changes in this era cause many surprises, because many unexpected new things have an impact which is extraordinary, and (3) sudden shift, meaning that many things shift suddenly, but not disappear, the market and its customers remain in place, but in this era they move quietly.

Global changes that take place very quickly require human resources who are able to compete at a global level. These human resources can be prepared through school, so that after the students graduate and enter the community, they are able to face the era of disruption. The main strategy to become an active student can be done in two ways, namely through good education and personal skill development.

Reliable human resources that posses generic skills can be formed or created through education in schools, including at the junior high school level. Through the contextual science textbook model that has been studied, students are expected to be able to understand concepts easily, and have generic skills as a whole so that they are able to solve problems in everyday life.

Based on the description above, the formulation of the problem in this study is; 1) how is the validity of the contextual science textbook model to improve students' generic skills?, 2) how effective is the application of contextual science textbook model to improve students' generic skills?, and 3) how practical is the application of contextual science textbook model to improve students' generic skills?

2. RESEARCH METHOD

This is a research and development (R & D) study, using the Sugiyono design, which consists of 10 (ten) main steps, namely; (1) potential and problems, (2) data collection, (3) product design, (4) design validation, (5) design revision, (6) product try or product try I, (7) product revision or product revision I, (8) product try II (trial use), (9) product revision II, and (10) mass production (Sugiyono, 2010). The main objective of the research is to obtain a valid, effective, and practical contextual science book model, namely a book model that meets content validity, effectiveness for improving generic skills, and acceptability to be applied in learning in junior high school.

The research begins with a literature review to obtain a hypothetical framework and model from a contextual science book, followed by the preparation of a three-chapter sample, readability test, validity test, effectiveness test, and practicality or acceptability test. The book sample test for readability, effectiveness, and practicality was carried out in class VII of a public junior high school in Demak, Central Java, Indonesia. The readability test used data obtained with the gap technique (Source, th) on fourteen students. The effectiveness test used generic skills test data from 30 students. The practicality test uses data on teacher and student preferences that are revealed by questionnaires. The validity test is based on the judgment of three experts (validators). Tests of validity, effectiveness, and practicality are carried out if the average readability of the book is at least 41% with a moderate level of readability (Mulyati, 1995). The book model is declared valid if the average expert judgment score is at least 69%, effective if the average value of generic skills increases from Chapter 1 learning to Chapter 2 learning, and practical if the average practicality value is at least 61. The stages of this research are presented in Figure 1.

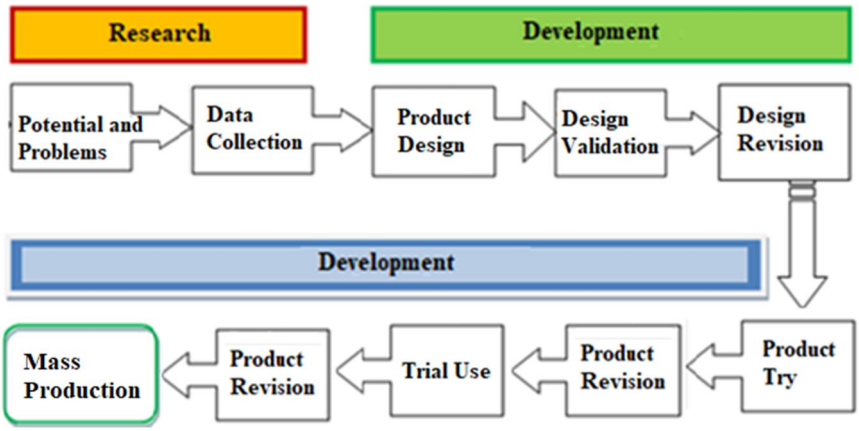

Figure 1. The stages of research according to Sugiyono (2010).

3. RESULTS AND DISCUSSIONS

The research on the development of this contextual science book model was carried out through the development of a book model, and real learning. At the development stage, the book model was revised to evaluate and improve the model design based on input from expert validators. Revision of the book model was also carried out based on the results of the first trial, and the results of the second trial in learning.

Validity

Based on the results of the assessment of all components of the contextual science textbook model for class VII SMP by Validators I, II, and III, a comparison diagram of the results of the

product validity assessment of the contextual science textbook model can be made. The validity of the contextual science book model is shown in Figure 2.

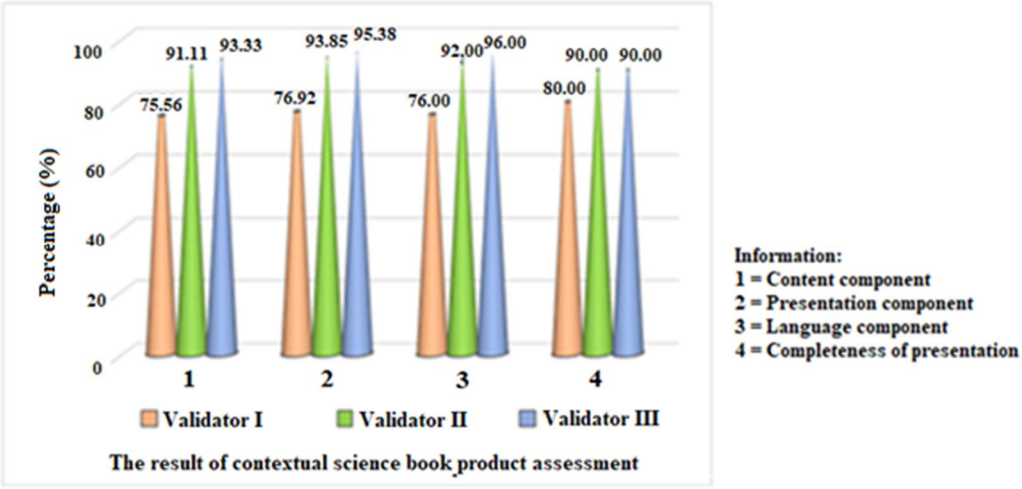

Figure 2. Comparison of the results of the product assessment of the contextual science textbook model

Readibility

The arithmetic mean (X) and percentage (%) of respondents' answers to the texts of Chapter 1, Chapter 2, and Chapter 3 in texts I, II, and III are presented in Table 1.

Table 1. Average count (X) and percentage (%) of respondents' answers in the texts of Chapter 1, Chapter 2, and Chapter 3 in texts I, II, and III

No.	Texts	Chapter 1		Chapter 2		Chapter 3	
		X	X (%)	X	X (%)	X	X (%)
1.	I	36,40	79,19	42,36	86,44	45,93	88,32
2.	II	43,60	82,21	38,57	80,36	43,00	78,18
3.	III	41,90	82,07	37,93	88,21	43,93	87,86
	Average	40,63	81,16	39,62	85,00	44,27	84,79

Note:

Chapter 1: Classification of Matter and Its Changes
Text I : Material Change
Text II : Elements, Compounds, and mixtures
Text III: Density

Chapter 2: Energy, Energy Transformation, and Metabolism
Text I: Forms of Energy
Text II: Changes in the Form of Energy
Text III: Saving Energy

Chapter 3: Global Warming
Text I : Greenhouse Effect
Text II : Global Warming
Text III: Impact of Global Warming

Effectiveness

The effectiveness of the contextual science textbook model was obtained based on the results of trial 1 in the learning activities of Chapter 1, and trial 2 in the learning activities of

Chapter 2. The results of trials 1 and 2 were also used to determine the improvement of students' generic skills which included; cooperation, communication, creativity, critical thinking, technology and information, numeracy, problem solving, management, and research.

The assessment of cooperation in this study was carried out on experimental activities and presentations. The improvement of students' cooperation skills from learning Chapter 1 and learning Chapter 2 is shown in Figure 3.

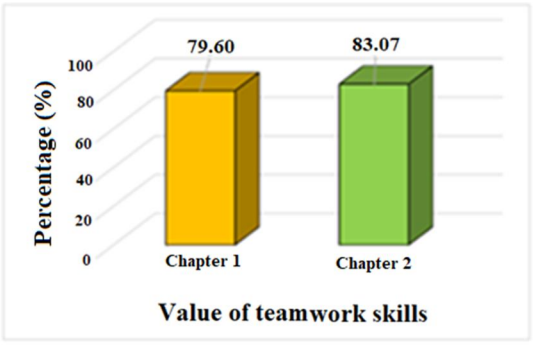

Figure. 3 Improved cooperation skills

Assessment of communication skills is done through observation when students make presentations. The results of the assessment of communication skills are presented in Figure 4.

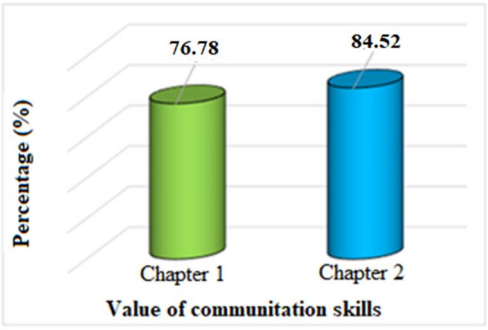

Figure 4. Improved communication skills

Students' creativity skills are developed through product assignments for water filters and waterwheels. The percentage of mastery learning creativity skills from Chapter 1 and Chapter 2 is shown in Figure 5.

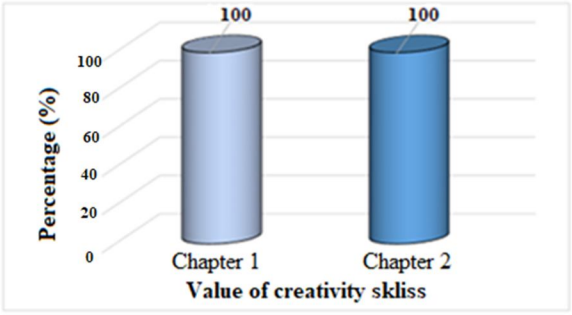

Figure 5. Mastery of learning creativity skills

Critical thinking skills in this study were developed through questions presented in the HOT (Higher Order Thinking) category, namely questions related to analysis (C4) and evaluation (C5). The percentage increase in mastery learning critical thinking skills is shown in Figure 6.

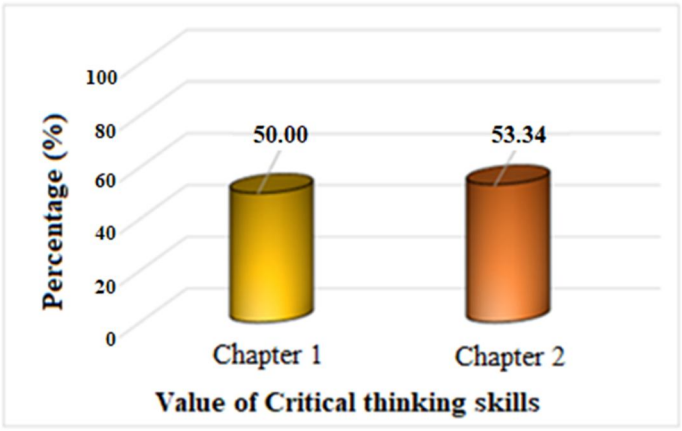

Figure 6. Improved critical thinking skills

The information and technology skills in this study were developed through project assignments. The project task developed in the contextual science textbook in this study was to make an experimental report using a computer using a Microsoft word sheet. The percentage increase in mastery learning classically in technology and information skills is shown in Figure 7.

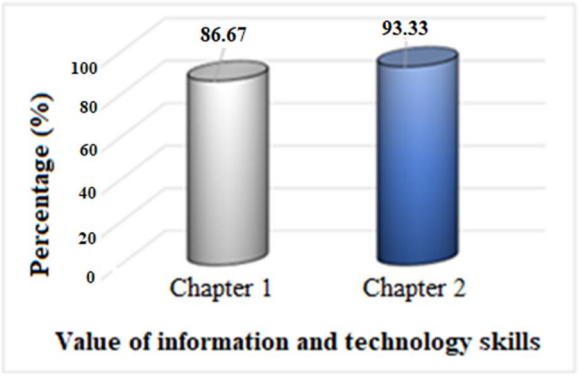

Figure 7. Improved information and technology skills

Numerical skills in this study were developed through Competency Test questions presented in each sub-chapter, and Daily Assessment Exercises presented at the end of each chapter in each basic competency. The questions presented to assess numeracy skills are knowledge questions that are in the application domain (C3), analysis (C4), and evaluation questions (C5). The percentage increase in mastery learning classically for numeracy skills is shown in Figure 8.

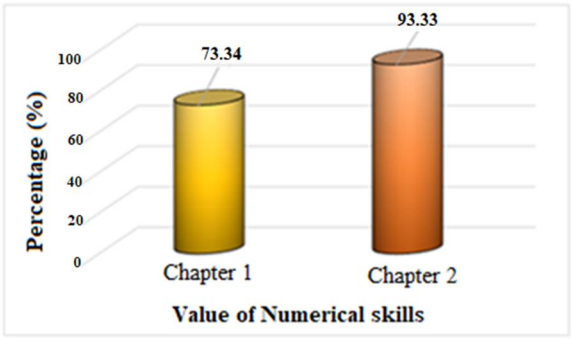

Figure 8. Improved numerical skills

Problem solving skills in this study were developed through laboratory practicum activities, and observation activities related to concepts learned in everyday life. The percentage increase in mastery learning classically in problem solving skills is shown in Figure 9.

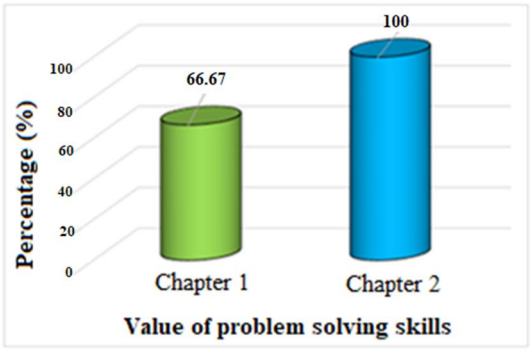

Figure 9. Improved problem solving skills

The improvement of students' self-management skills from learning Chapter 1 and learning Chapter 2 is shown in Figure 10.

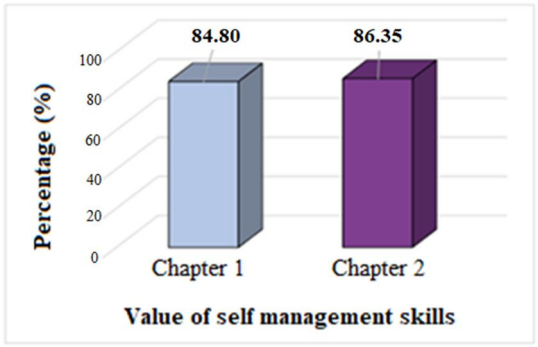

Figure 10. Improved self management skills

Research skills in this study were developed through experimental activities related to the concepts being studied. The percentage increase in mastery learning in classical research skills is shown in Figure 11.

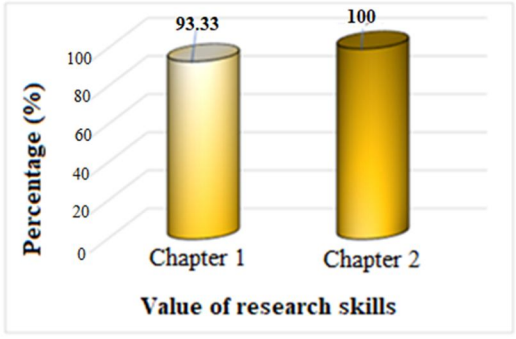

Figure 11. Improved research skills

Practicality

The practicality of the contextual science book model is measured based on the response preferences of teachers and students. The preference responses of teachers and students respectively are presented in Figures 12 and 13.

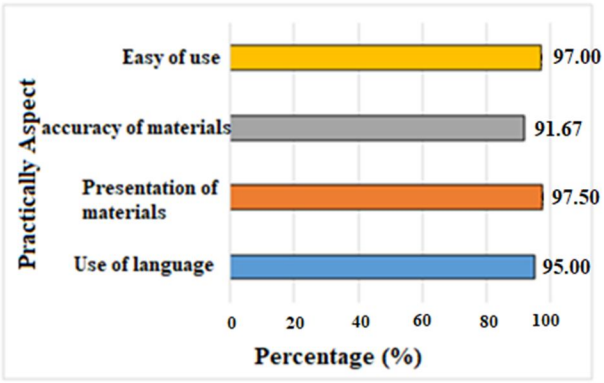

Figure 12. Textbook Practicality Test Results by Science Teachers

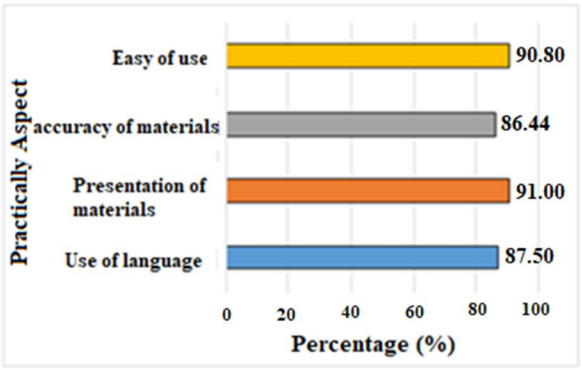

Figure 13. Textbook Practicality Test Results by students

3.1 The Validity of the Contextual Science Textbook Model

Based on Figure 2, the validity of the contextual science textbook model, on the content feasibility component, the results of the analysis of the three validators provide an average percentage of 86.67% with a very valid category, on the presentation component, giving an average percentage of 88.72% with a Very Valid category, on the component linguistics gives an average percentage of 88.00% in the Very Valid category, and on the component of completeness of presentation, the Validator gives an average percentage of 86.67% in the Very Valid category. Thus, it can be concluded that the contextual science textbook model is very valid for use in learning.

3.2 Readibility

Based on the data analysis of the readability level of texts I, II, and III in Chapter 1, it can be seen that the average readability level of Chapter 1 texts is 81.16% with independent/free or easy categories. This shows that the text of Chapter 1 on the Concept of Classification of Materials and Its Changes in the contextual science book model is easy to understand.

Based on the data analysis of the readability level of texts I, II, and III in Chapter 2, it can be seen that the average readability level of Chapter 2 texts is 85.00% with independent/free or easy categories. This shows that the text of Chapter 2 on the Concept of Energy, Energy Transformation, and Metabolism in the contextual science book model is easy to understand.

Based on the data analysis of the readability level of texts I, II, and III in Chapters, it can be seen that the average readability level of Chapter 3 texts is 84.79% with independent/free or easy categories. This shows that the text of Chapter 3 on the Concept of Global Warming in the contextual science book model is easy to understand.

Based on the analysis of the readability level of Chapter 1, Chapter 2, and Chapter 3 texts, it can be seen that the average readability level of Chapter 1 texts is 81.16% in the easy category, the average readability level of Chapter 2 texts is 85% in the easy category, and the average readability level of Chapter 3 text is 84.79%, in the easy category. Thus, the average readability of the text in the contextual science textbook model for class VII junior high school is 83.65% in the easy category (easy to understand). Based on these data, it can be concluded that the contextual science textbook model for class VII junior high school can be used in the learning process.

3.3 Effectiveness

Based on Figure 3, the average value of cooperation skills from the experimental aspect of learning Chapter 1 is 80.00% in the Good category, while from Chapter 2 it is 83.47% in the Very Good category, or an increase of 3.47%. The average value of cooperation skills from the presentation aspect of Chapter 1 learning is 79.20% in the Good category, while from Chapter 2 it is 82.67% in the Very Good category, or an increase of 3.47%. Based on these data, it is obtained information that the average total value of cooperation skills from the experimental aspect and presentation aspect of Chapter 1 learning is 79.60% in the Good category, while in Chapter 2 learning is 83.07% in the Very Good category, or an increase of 3.47%.

Based on the description above, the average value of students' cooperation skills through experimental activities and presentations has increased from 79.20 in the Good category in Chapter 1 learning, to 82.67 in the Very Good category in Chapter 2. Thus, the overall results the observation of students' cooperation skills in learning Chapter 1 and learning Chapter 2 has increased from 79.60 in the Good category, to 83.07 in the Very Good category.

Cooperation skills are usually used in activities to work on tasks together in order to solve a problem or achieve a common goal. These skills are needed by students, because in time they will be needed in people's lives as real experiences. Cooperation skills can also be developed through interaction between individuals by means of sharing personal information, or designing goals, or end products. In learning, collaboration skills can be done by forming small groups (Friend & Cook, 2007; Helle & Olikinuora, 2006; Bennet, 2004; Panitz, and Lou et al, 2001).

Based on the discussion above, it can be seen that contextual science textbooks have facilitated students well in improving cooperative skills in learning, thus providing provisions for students in developing the character of collaboration/collaboration with others. Cooperation/collaborative skills are one of the 21st century skills that are needed by students in facing the era of disruption.

Based on Figure 4, the overall average value of students' communication skills in Chapter 1 and Chapter 2 learning has increased from 76.78 in the Good category, to 84.52 in the Very Good category, or an increase of 7.74.

Communication can occur when someone shares information, and other people do it the same way. This skill can be taught through real practice, so that it can cultivate listening skills so that students can distinguish what is appropriate and not in accordance with the information heard (Barker, 2006; Kelly, 2007; and Torbert, 2005).

Based on the discussion above, it can be concluded that contextual science textbooks have facilitated students well in improving communication skills in learning, thus providing provisions for students in everyday life.

Based on the products of water filters, and waterwheels made by all groups, there was not a single product similar. This proves that students have varied creativity skills. Students from each group want to display a product that is different from the work of other groups. Based on Figure 5, students' learning completeness in Chapter 1 and Chapter 2 did not increase, because student learning outcomes in both chapters had been completed 100%. There is not a single student who is incomplete in learning related to creativity skills. However, there was an increase in the quantity or the number of students who scored in the good and very good categories. In Chapter 1 learning, the number of students who scored creativity skills in good and very good categories was 25 people or 83.33%, while in Chapter 2 learning the number of students who scored in good and very good categories was 30 people or as many as 100%.

Creativity is needed by everyone in order to adapt and survive with the development of a rapidly changing and increasingly competitive world. This skill can be developed by someone by contributing to creative thinking. Creativity is difficult to teach in learning, but can be developed outside of learning or outside the classroom (Langrehr, 2007; Yu and Lau, 2004; Sternberg, 2006; Csikszentmihalyi & Wolfe, 2000; Sak & Marker, 2006; and Ireland, 2006).

Based on the discussion above, it can be concluded that contextual science textbooks can facilitate students well in improving creativity skills, and provide provisions for students in everyday life. Creativity skills are one of the 21st century skills that are needed by students.

Based on Figure 6, information is obtained that the number of students who have completed learning from Chapter 1 learning is 15 people or as much as 50.00%, while students who have completed learning in Chapter 2 are 16 people or as much as 53.33%. The increase in student learning mastery related to the assessment of critical thinking skills from learning Chapter 1 and Chapter 2 is 3.33%.

Nicholson (2006) states that critical thinking skills are a very important need in the future. Someone who has critical thinking skills can solve a problem effectively. Active participation of students to think critically in problem solving can increase motivation and cooperation skills. Critical thinking skills can be improved by giving assignments to students in learning activities (Alan & Mohamed, 1997; Sam & Frederick, 2006; and Eraut, 2000).

Based on the discussion above, it can be concluded that contextual science textbooks can facilitate students well in improving critical thinking skills, although the increase is very small. To improve critical thinking skills significantly, that the subject matter teachers more related to the concepts studied by students, and examples of questions presented in books.

Based on Figure 7, information is obtained that the mastery of learning technology and information skills has increased from 26 students or as many as 86.67% students, to 28 students or as much as 93.33%, or an increase of 6.67%.

The ability to use technology is a very important part in the world of work. Employing agencies and companies are satisfied when school graduates have information and technology skills (IOD, 2007; Dacre Pool & Sewell, 2007; and CBI, 2008b). In order to face the era of disruption, students must have 21st century skills. 21st century skills include; (1) digital era literacy skills, (2) innovative thinking, (3) productive interpersonal skills, and productive social skills. A wide variety of technological tools can be used to design learning experiences so that learning is engaging for students.

Learning by incorporating technology-enabled practices can be a source of inspiration and professional renewal. Experiences like this can improve constructivism-based learning, so that it can produce meaningful changes in learning outcomes.

Based on the discussion that has been described above, it can be concluded that the contextual science textbook model can facilitate students in improving technology and information skills.

Based on Figure 8, it can be seen that the classical mastery of Chapter 1 related to numeracy skills is 73.34%, while in Chapter 2 learning is 93.33%, so that the students' classical mastery has increased by 19.99%. Numerical skills are one of the most important graduate selection criteria, which includes numeracy skills. This numeracy skill is a skill that must be possessed by students who have graduated from a school (Googfellow, 2008; CIHE, 2008; and IOD, 2007). In the learning process, the ability to process numbers develops interactively on aspects of conceptual and procedural knowledge, to understand the principles of calculation, and to develop problem-solving strategies (Garcia et al, 2014; Fazio et al, 2014; and Rousselle et al, 2007). Based on the discussion above, it can be concluded that contextual science textbooks can facilitate students well in improving numeracy skills.

Based on Figure 9, it can be seen that the classical mastery of Chapter 1 related to problem solving skills is 66.67%, while in Chapter 2 learning is 100%, so that the classical mastery of students has increased by 33.33%. Problem solving skills are ranked the most important that graduates must master which are indispensable in the world of work. These problem-solving skills are needed by entrepreneurs in innovating. Problem solving skills are needed in the future. The most appropriate approach to solving problems is a systems approach (Curry et al, 2003; VIC Careers, 2006; AIG, 2006a; Nicholson, 2006; and Field, 2002). Problem solving skills are activities to summarize ideas that use thinking skills to solve a challenge. Based on the discussion above, it can be concluded that contextual science textbooks can facilitate students well in improving problem solving skills.

Based on Figure 10, it can be seen that the average value of self-management skills in Chapter 1 learning is 84.80% in the Very Good category, while the average value of self-management skills in Chapter 2 learning is 86.35% in the Very Good category. Thus, the increase in the value of self-management skills obtained by students from learning Chapter 1 and Chapter 2 is 1.55%. Based on the discussion above, it can be seen that the average self-management skills of students in learning are very good, although they still need to be improved. Students in learning Chapter 1 and Chapter 2 have been able to complete the previously designed objectives, can complete assignments in an orderly manner, have notes on essential materials related to complete learning materials, and have adequate reference books in order to achieve learning objectives.

Self-management greatly affects motivation, and student achievement. The higher the student's self-efficacy, the higher the self-regulated learning (Amir, 2016; Adicondro et al, 2011). Self-management skills that can improve student learning independence can be developed through an internet-based Self-Regulated Learning approach (Ana, 2015). In this digital era, learning can be done face-to-face directly, and it can also be done online. Online student self-study is concerned with process and time management, and goal setting to complete certain academic work. The main factor of time management is closely related to spiritual factors and the innate factors of each individual that determine the pattern of stable attitudes in him (Zimmerman, 2008), and Boroujerdi, 2013).

Self-management skills in learning Chapter 1 and learning Chapter 2 have increased. This proves that the contextual science textbooks used in learning can facilitate students' self-management skills.

Based on Figure 11, it can be seen that the classical mastery of Chapter 1 related to research skills is 93.33%, while in Chapter 2 learning is 100.00%, so that students' classical mastery has increased by 6.67%. Explicit and coherent research skills can be developed through education and practice. These research skills can be developed through activities asking research questions, evaluating data or reading critically, and communicating research results that have been obtained by students. Improving research skills in students allows directing students to be more effective in forming

human resources that can be used to improve their knowledge (Willison, 2010; Ssegawa et al, 2009), and Feldon et al, 2014). Based on the discussion above, it can be concluded that contextual science textbooks can facilitate students well in improving research skills.

3.4 Practicality

Based on Figure 12 and Figure 13, information is obtained that the contextual science textbook model for class VII junior high school is very practical to use in learning. Based on the teacher's response to the language use aspect, the practicality value was 95.00% in the Very Practical category, while based on the student's response, the practicality was 87.50% in the Very Practical category. Based on the teacher's response to the aspect of presenting the material, the practicality value is 97.50% in the Very Practical category, while based on the student's response, the practicality is 91.00% in the Very Practical category. Based on the teacher's response to the aspect of material accuracy, the practicality value was 91.67% in the Very Practical category, while based on the student's response, the practicality was 86.44% in the Very Practical category. Based on the teacher's response to the ease of use aspect, the practicality value was 97.00% in the Very Practical category, while based on the student's response, the practicality was 90.80% in the Very Practical category.

4. CONCLUSIONS

The contextual science textbook model is very valid to be used in learning. The validity of the content feasibility component got an average of 86.67% with a very valid category, the presentation component, got an average of 88.72% with a very valid category, the linguistic component got average of 88.00% with a very valid category, and the presentation completeness component, got an average of 86.67 % with very valid category.

The contextual science textbook model is effective for improving students' generic skills. The contextual science book model for Class VII junior high school can improve collaboration skills, communication, creativity, critical thinking, numeracy, technology and information, problem solving, self-management, and researching by 3.47, 7.74, 16, respectively. 67, 3.34, 19.99, 6.66, 33.33, 1.55, and 6.67%.

The contextual science textbook model is very practical to use in learning. Based on the teacher's perception, aspects of language use, got a practicality value of 95.00% in the very practical category, while the student response was 87.50% in the very practical category. Based on the teacher's response to the aspect of presenting the material, the practicality value was 97.50% in the very practical category, while the student response was 91.00% in the very practical category. Based on the teacher's response to the aspect of material accuracy, the practicality value is 91.67% in the very practical category, while the student response has 86.44% practicality in the very practical category. Based on the teacher's response to the ease of use aspect, the practicality value was 97.00% in the very practical category, while the student response was 90.80% in the very practical category.

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