

E-book development of  
integrated science theme  
temperature and measurement to  
growing independence for  
student learning.

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## E-BOOK DEVELOPMENT OF INTEGRATED SCIENCE THEME TEMPERATURE AND MEASUREMENT TO GROWING INDEPENDENCE FOR STUDENT LEARNING

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### ABSTRACT

Based on the research, it is known that students only depends on teaching materials in the form of worksheets (LKS) in which the material is very superficial. Students are less interested to learn, because the lack of pictures/illustrations about the material being studied. Another obstacles are experienced, most of the students are passive in learning, they just did what was ordered by the teacher. This e-Book development in order to meet curriculum in 2013 and development of Science and Technology which is very fast. The purpose of the research is to develop an e-Book of Integrated Sciences that appropriate with criteria assessment of BSNP and determine its effectiveness. This research and development are carried out in SMP N 1 Subah Batang using study subjects in 10 students of class VII E for small-scale trials, and all students of class VII E for large-scale trials. Recapitulation of the research results were analyzed by descriptive's percentage. The test results of the proper e-Book Integrated Science by material experts 95.37%, linguists 100%, and media experts 95%. Classical scores of student learning independence 82.13% (independent). <sup>2</sup> Student learning results are significantly increased that showed by criteria of the classical high gain and significant t test. Based on the results of this study can be concluded the e-Book Integrated Science with theme of Temperature and Measuring that developed, declared proper by experts and fulfilling the criteria of BSNP and can foster learning independent and improve the student learning results.

Keywords: e-Book, Integrated Science, Independent

### INTRODUCTION

According to Permendikbud No. 65 in 2013 about Standard Process that science subjects at the level of SMP/MTs must be adapted to the characteristics of competence begin to introduce subjects to maintain an integrated thematic. The scope of learning science is packed into a single unified of study. Therefore, science subjects should be presented through a learning science in an integrated (Nisak and Susantini, 2013). Students can gain hands-on experience through an integrated science learning, so it can add strength to accept, store, and apply the concepts they have learned (Listyawati, 2012). Integrated science learning demands professional science teachers, master the material in an integrated science (Physics, Chemistry, and Biology), able to

package and develop the material in the form of a theme or topic by using adequate infrastructure (Soewarno & Asmarol, 2008).

Harsono (2007) in his research stated that the learning material really fit the needs of student are not always available. This situation is caused by many things, including guide teaching material of integrated science provided by the government has not really link between physics, chemistry, biology, and earth science and space.

Based on the research in SMP N 1 Subah Batang, it is known that teaching materials are used in the form of worksheets which contain a summary of the material that very superficial. Students always depend on material contained in the worksheets alone, in addition students less interested to learn because of the lack of

pictures/illustrations of the material being studied. Another problem in the process of learning include a lack of student interest in reading textbooks. In addition, most students just are like "nails", do not move if it does not hit with a hammer, meaning that students are passive. For example, in reading textbook, if not commanded by the teacher, so the books will not be touched and still complete as unreadable. When the teachers give some work, not all of the student did them directly because of less confident fear of wrong answers so that most students copy his work's friend. When the task is given of the group, not all of work group members did it, it is visible when the student can not answer questions about the group assignment.

Some problems in learning showed that the responsibility of students and students' self-confidence in science teaching and learning activities less than optimal, so that students learning independence is still very low. Basically independence is the behavior of individuals who are able to take initiative, able to overcome problems, have confidence and be able to do something himself without help of others (Nuraeni, 2012). Moreover, in the teaching and learning activities (KBM) is not supported by textbooks that are interesting, so that students become lazy to learning. For this reason, necessary to new development in the preparation of teaching materials that interesting, so that students feels helped in learning the material at the same time feel more passion in learning the material presented and confident with the capabilities that will develop learning independent.

Along with the times and Science and Technology (IPTEK) many students who choose to bring a laptop or gadget rather than bring textbooks. Textbooks are heavy, seemed inconvenient of students to bring it at school. Because the students want it all very practical, only with a soft file that can be accessed with gadgets, so do not need to bring books at school with large size. The use of computer-based technologies are ways to produce or deliver materials by using the resources based on microprocessor, in which the information or material presented is saved in digital form, rather than in printed form (Ulfa, 2013). Also described in the research Pummawan (2007) that e-learning modules can improve cognitive development and ICT skills.

Harsono (2007) in his research stated that the learning material really fit the needs of student are not always available. This situation is caused by many things, including guide teaching material of integrated science provided by the government has not really link between physics, chemistry, biology, and earth science

and space. To supporting the significance of an integrated science teaching in junior high school, of course, requires a learning device has been referring to the integrated learning that support teachers and students, one of them is to develop teaching materials integrated science of e-Book. Through teaching materials teachers will be easier to implement learning and students will also be easier to learn independently.

Therefore, need for teaching materials in the form of Integrated Science e-Book that is interesting, so the students' understanding becomes more organized and depth, as well as facilitate students in understanding the relationship of material science from one context to another. By e-Book, interest in reading students are expected to learn the material science will increase, so that the independence and the result of student learning increased.

Based on the background and the basic theory has been stated above, the problems can be revealed: (1) how the feasibility of e-Book integrated science as teaching material; (2) how the effectiveness of e-Book integrated science can foster independent learning and student learning outcomes; (3) how the teacher and student responses to the e-Book Integrated Sciences. The purpose of this study is (1) to determine the feasibility of e-Book integrated science as teaching material; (2) to determine the effectiveness of e-Book integrated science can foster independent learning and improve student learning outcomes; (3) to determine the responses of teacher and student toward e-Book Integrated Sciences.

## METHODS

Design that applied in this study is the research and development (Research and Development). According to Sukmadinata (2011), research and development is a process or steps to develop a new product or to enhance existing products and can be accounted for. This study was held in SMP Negeri 1 Subah Batang using the sample of 10 students of class VII E for small-scale trials and the whole class VII E for large-scale test. Sampling was done using simple random sampling technique. Research data that will be taken is the result of an e-Book assessment, independence assessment of student learning outcomes, student learning outcomes, the results of student responses to the e-Book, and the results of teachers' responses to the e-Book.

## RESULTS AND DISCUSSION

The results of the research on the development of e-Book of integrated science theme Temperature and Measurements include assessments of teaching materials, the results of student readability, readability results of the teacher, assessment result of student independence learning, student learning outcomes, the results of students' responses to the e-Book, and the results of teachers' responses to e-Book. Feasibility test of e-Book of integrated science theme Temperature and Measurements use assessment instruments of learning material from the National Education Standards. Instrument I consists of feasibility of material, instruments II consists of language feasibility, and instrument III consists of media feasibility. Feasibility test results of e-Book of integrated science theme Temperature and Measurement are presented in Table 1 by the experts.

**Table 1.** Summary of the feasibility test results of e-Book of integrated Science theme Temperature and Measurement by the experts.

No.	Instrument	Score	Criteria
1	Matter Feasibility	95,37%	Very Worthy
2	Language Feasibility	100%	Very Worthy
3	Media Feasibility	95,00%	Very Worthy
	Average	96,79%	Very Worthy

Assessment results show that e-Book of integrated science theme themes Temperature and Measurement have been fulfilled the criteria of the assessment instruments from National Education Standard Agency. Validation results of e-Book then is used for small-scale trials and large-scale trials. Small-scale trials used for taking students' readability data of e-Book and teachers' readability of e-Book. Students and teachers readability data obtained from "Yes" and "No" questionnaires. Whereas the large-scale trials used for taking the students' independence learning data, students' learning outcomes, and students and teachers' responses toward e-Book of integrated science. Students and teachers readability results toward e-Book in small-scale trials are presented in Table 2 and Table 3.

**Table 2.** Teachers' legibility results toward e-Book of Integrated Science theme Temperature and Measurement.

No	Respondents	Agencies	Score (Criteria)
1	A	SMP N1 Subah	100% (Very Worthy)
2	B	SMP N1 Subah	100% (Very Worthy)
3	C	SMP N 1 Subah	100% (Very Worthy)

**Table 3.** Students' legibility results toward e-Book of Integrated Science theme Temperature and Measurement.

No	Aspect in questions	Score	Criteria
1	Are the sentences in the e-Book appropriate with EYD rules?	100%	Very Worthy
2	Are the symbols used in e-Book readable?	100%	Very Worthy
3	Are the posts in e-book clear?	100%	Very Worthy
4	Does the e-Book use communicative language?	100%	Very Worthy
5	Is there any ambiguity language in e-book?	100%	Very Worthy
6	Are the pictures in e-Book clear?	100%	Very Worthy
7	Are the font of the e-book clear and readable?	100%	Very Worthy

Based on Table 2 and Table 3, it shows that legibility of e-Book of Integrated Science theme Temperature and Measurement are very well received by the students and teachers. Students' and teachers' response results of the legibility of e-book shows that sentences, symbols, pictures and font in the e-book are readable. Language used in e-book is communicative and it doesn't have ambiguity meaning. So that it helps the students in understanding the materials in e-book.

Students' and teachers' response data is taken from "Yes" and "No" questionnaires. Students' and teachers' response results toward e-book of Integrated Science are presented in Table 4 and Table 5.

**Table 4.** Teachers' response results toward e-book of Integrated Science theme Temperature and Measurement.

No	Respondents	Agencies	Percentage (Criteria)
1	A	SMP N 1 Subah	100% (Very Worthy)
2	B	SMP N 1 Subah	100% (Very Worthy)
3	C	SMP N 1 Subah	95% (Very Worthy)

Based on teachers responses, learning structures in e-Book have been formulated clearly based on Curriculum 13. Learning objectives is also formulated clearly in the indicators. The materials in the learning material are easy to understand. It is constructed logically and systematically from the simplest sub-material to the most complex sum-material. According to Putri (2010), organizing the placement of map/chart display; systematic order and structure of the material, placement of the texts, pictures, and interesting illustrations; understandable order and plot inter chapter, unit, and paragraph; title, sub-title (learning activity) and explanation that is easy to follow.

**Table 5.** Students' response result toward e-Book of Integrated Science theme Temperature and Measurement.

No	Aspect in question	Score	Criteria
1	Are the material in the e-book easy to understand?	100%	Very Worthy
2	Do illustration pictures in e-book help in understanding the material?	91,67 %	Very Worthy
3	Are learning activities in e-book enjoyable?	100%	Very Worthy
4	Are the used of the symbols in e-book appropriate with the exits rules?	100%	Very Worthy
5	Whether <i>e-Book</i> : Interesting	100%	Very Worthy
6	Easy to use	77,78 %	Worthy
7	Different from the other learning material	100%	Very Worthy
8	Ease to study science independently without teachers help.	97,22 %	Very Worthy

9	Ease to understand temperature and measurement material.	100%	Very Worthy
10	Presented in interesting way.	100%	Very Worthy
11	Presented an up to date information	100%	Very Worthy
12	Increase the curiosity to learn more	97,22 %	Very Worthy
13	Ease in observing science	100%	Very Worthy
14	Ease in measuring science object	100%	Very Worthy
15	Ease the students in conveying oral and written opinions	97,22 %	Very Worthy
	Rata-rata	97,41 %	Very Worthy

Technical terms in e-Book are easy to understand because it uses technical terms that have been approved in science field and it is used consistently so that the learning material can be learned by the students independently. Besides the e-book contains the material it also contains various concepts exploration that can be applied. Concept exploration is also safe to do by the students because it doesn't use dangerous materials. The existence of concept exploration in e-book can ease the students in learning activities. In the end of sub-material there are exercises that can help the teacher to evaluate the students' ability. However, according to one of the teachers, if there is no rubric of assessment in the exercises it causes an obstacle to the teachers in assessing. Whereas in teacher-version e-book there are answer keys and rubric of assessment for post-test only. Thus, over all of e-book of integrated science theme Temperature and Measurement is excellent.

The results of the students' responses of e-book show that the students of SMP Negeri 1 Subah Batang find it helpful in understanding the material. *E-Book* different from the previous learning material, there are pictures, videos and animation in it that help students observing science object. Students anxiety and positive response influenced by the content and activity in e-book. Concept exploration activity and breaking news can trigger the students' spirit because the students can be creatively convey his ideas freely and students become aware of existing scientific developments. The learning process isn't monotonous when compared with students who just sit and listen to the teachers' explanation. The concept exploration in e-book is able to

give fun and interesting learning experiences. Exercise activity in e-book encourages students to take a responsibility and discipline by answering the available link. *E-Book* also has extra information like breaking news that can enrich the knowledge and broaden students' concepts. Some students think that e-book of integrated science uneasy to use. After further investigation, indicated their difficulty to access the e-Book for not having a computer at home. Because it needs to be further developed for mobile e-Book, e-Book that can be accessed by using mobile phones. Students' learning independence data is taken from the questionnaire that has been filled by the students after learning activity use e-book. Students' learning independence result is presented in Table 6.

**Table 6.** Students' learning independence

No.	Criteria	Numbers of students
1	Very independent	15
2	Independent	21
3	Quite independent	0
4	Dependent	0
Sum		36

The criteria that emerged after students using teaching materials of e-book is independent and very independent. It shows that e-book of integrated science theme temperature and measurement can develop students' independence by fulfilling independence indicators based on Syam in Widodo (2012) that is students have learning independence if they have confident, motivation, initiative, discipline, and responsibility.

Students' outcomes data is got from pre-test and post-test scores. The results of pre and post test are presented in Table 7. Pre-test and post-test data then analyzed by significance test and determine the value of the gain (Table 8 and 9). Based on the obtained data, it shows that in the classical gain obtained was 0.71 with high category. The result of N-gain of each indicator is also fulfilling moderate and high criteria (Table 10). Toward those increase, significance test is done toward pre and post test data using t test in SPSS version 16.0. The t test result shows that  $t (-23.699) < t \text{ table } (1.69)$ . This means that the improvement of student learning outcomes before and after using the e-Book of Integrated Science theme Temperature and Measurement show significant improvement. When viewed individually, student learning outcomes also increased. This is proven

by the acquisition of the individual gain that are medium and high, there is no gain to the low category (Table 9).

**Table 8.** The result of calculated N-gain

No	N-gain	Sum	Criteria
1	Average Gain	0,71	High
2	Highest Gain	1,00	High
3	Lowest Gain	0,40	Moderate

**Table 9.** Recapitulation of calculated N-gain result

No	Gain criteria	Numbers of the students
1	High	18
2	Moderate	18
3	Low	0
Sum		36

**Table 10.** The result of calculated N-gain for each indicator

No	Indicator	N-gain	Criteria
1	Describe the function of Touch Sense as Thermostat	1,00	High
2	Perform the conversion of temperature scale	0,82	High
3	Know lower fixed point and upper fixed point of thermometer	1,00	High
4	Explain types of thermometer	0,90	High
5	Compare between self-scale thermometer with standardized thermometer	0,39	Moderate
6	Explain the definition of fixed point in the determination of temperature scale	0,67	Moderate
7	Investigate the influence of object types against the growth of expansion length	0,55	Moderate
8	Recognize the liquid expansion	0,90	High
9	Recognize the gas expansion	0,75	High
10	Find out the technology principle caused by the temperature changes	0,86	High
11	Find out the influence of temperature changes against living thing life	0,77	High

It is along with Moody's opinion (2010) that the use of e-book can increase students' literacy skill. The same result is also got from a research done by Pummawan (2007) that e-Learning module can improve students' cognitive skill. Judging from the value of the gain and t test results, it can be concluded that e-book of

integrated science theme Temperature and Measurement can improve students' learning outcome significantly. It is caused because the developed e-book different from the common e-book. Beside the material is coherent, in the e-book of Integrated Science theme Temperature and Measurement it also present videos, animations, pictures that help the students to understand the concepts of science. In the *e-Book* there is concept exploration which trains the students to do lab work, exercises that train the students to study independently. In addition, interesting layout is also the factor why students enjoy this e-book.

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## CONCLUSION

Based on the research, it can be concluded that :

1) e-book of integrated science theme Temperature and Measurement can be said valid by the experts so that it is proper to be used as students' learning material, 2) e-Book of Integrated Science theme Temperature and Measurement can grow the learning independence and improve the students' learning outcome, it is effective and can be applied for seventh grade of SMP/MTs, 3) e-Book of Integrated Science theme Temperature and Measurement got positive responses from students and teachers.

Suggestions for this study is e-book of integrated science which is developed to be used in the integrated science learning in SMP/MTs especially in further Temperature and Measurement matter it is expected to be done in the stage of dissemination and implementation using a broader sample . It is needed to develop an e-Book that can be accessed using a phone to students who do not have computers so that they can still access the e-Book

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