



ELECTRONIC THEMATIC TEACHING MULTIMEDIA WITH LOCAL CULTURE BASED MATERIALS AND ITS EFFECT ON CONCEPTUAL MASTERY OF PRIMARY SCHOOL STUDENTS

Ferdinandus Samri¹ⁱ,

Josep Marsianus Rewo,

Dek Ngurah Laba Laksana³

¹Department of Physical Education,
STKIP Citra Bakti,
Indonesia

²Department of Science Education,
STKIP Citra Bakti,
Indonesia

³Department of Elementary School of Teacher Education,
STKIP Citra Bakti,
Indonesia

Abstract:

It has been identified that the learning resources used in primary education are major concerns that need to be prepared. In accordance with its characteristics, critical thinking skills become the major focus in instructional process in 21st century. The ability to think critically is considered as one of conceptual mastery learning. Therefore, learning resources need to be prepared comprehensively in order to make it applicable for learners. Indonesian 2013 curriculum states that learning in schools must emphasize on the learning experience that are in accordance with the interests and aptitudes of the learners. Considering that the characteristics of students in each region in Indonesia are different from one another, it is necessary to identify elements of local culture (local wisdom) for students' learning resources. In addition, it is necessary to analyze these local cultural elements and integrate them into the teaching materials used in learning activities. In this study, the learning materials developed are electronic teaching materials. This is due to electronic teaching materials enables the researchers to insert sound elements and dynamic images into the materials. The objectives of this study are 1) to produce electronic teaching materials with multimedia content by integrating local culture for thematic instructions in elementary schools, and 2) to describe the quality of the product from field test results and development of electronic teaching materials with multimedia content for thematic instructions in elementary schools. Electronic teaching materials with multimedia content are developed using the ADDIE model. This model

ⁱ Correspondence: email laba.laksana@citrabakti.ac.id, ferdysamri15@gmail.com

consists of five steps, namely: (1) analyze, (2) design, (3) develop, (4) implement, and (5) evaluate. The data collected in this study are analyzed descriptively qualitatively. Meanwhile, the data on the effectiveness of the use of the textbook utilizes nonparametric statistical analysis of the Wilcoxon Signed Rank Test Related-Samples. The textbook developed is on the theme 1 about The Beauty of Togetherness and Theme 3 about Caring for Living Things for Grade IV of primary school students. The content feasibility test is carried out by the judgement from content expert, multimedia expert, and instructional design expert. All three assessments result in the very good category. After the local culture based electronic textbook is applicable to be used, this textbook is experimented to determine the effectiveness of its use. Descriptively, it can be obtained that the mean score of students' conceptual mastery from initial test, week 1, and week 2 are 61.48, 69.63, and 77.78. The results of the nonparametric statistical Related-Samples Wilcoxon Signed Rank Test on the test results before treatment (pretest) with the results of the conceptual mastery test a week after using the electronic textbooks, it can be seen that there are significant differences in conceptual mastery of the fourth graders before and after a week of learning using local culture based electronic textbook media.

Keywords: electronic teaching materials, multimedia instructions, thematic instructions, conceptual mastery

1. Introduction

Thematic is an integrated process of learning with the use of themes to link various fields of study and concepts. This thematic model is mostly carried out in low grades starting from first to third grade in primary schools due to the learning patterns and mindset of elementary school students are generally still based on concrete objects and consider everything as a whole (holistic). Additionally, thematic instruction is also a learning approach that integrates various competencies from various subjects. The integration is carried out for attitudes aspect, abilities / skills and knowledge in the learning process as well as the integration of various related basic concepts.

On the other hand, many problems are still encountered in implementing thematic instructions. One of the problems is the quality of learning achievement which is influenced by the quality of learning resources. Generally, curriculum explanation is presented abstractly. Some parts of the material are semi-concrete, and only a small portion of it is concrete materials (Ediger & Rao, 2003; Dick et al., 2009). The curriculum in schools also mostly presents material that is abstract in nature, with elementary school as no exception. Basically, it is very difficult for primary school students to recognize material or concepts from verbal presentations and presentation is needed to concretize abstract material (Ediger & Rao, 2003).

Improving the quality of education can be done by improving the quality of instructions primarily on strategies for using and managing learning resources (Degeng, 2013). Students in addition to interacting with educators as a source of learning, they also

interact with all possible learning resources to achieve the desired results (Fry, Ketteridge, & Marshall, 2014). In addition, implementing pedagogic competence means educators are required to have methodological abilities in terms of designing and implementing instructions, including mastery of the use of learning resources (Reigeluth & Carr-Cheliman, 2009).

Further, improving the quality of learning is conducted by involving all learners' senses. This involvement certainly must be supported by a delivery strategy that maximizes the function of learners' five senses (Mayer, 2007). multimedia which covers text, video, and animation is considered important to maximize this function. It is also necessary to state that learning with the help of multimedia can motivate students and create active learning (Muller, Lee, & Sharma, 2008).

For this reason, learning resources need to be prepared comprehensively to produce a product that is in line with 21st century competence. Learning resources developed are electronic teaching materials with multimedia content. Electronic teaching materials is suitable to be included with sound elements and dynamic images such as video (Dwiyogo, 2013). Besides, there are a number of advantages of the use of electronic books primarily on improving students' learning motivation (Ciampa, 2012; Jones & Brown, 2011).

The significance of this study is to produce a teaching materials to be used in thematic instructions for four graders. This product uses the Indonesia 2013 curriculum with local culture basis. The developed product is also expected to be valuably used by teachers and students in the Eastern Nusa Tenggara Province, Indonesia.

Based on the aforementioned background, this study aims to (1) produce an electronic multimedia teaching materials that is suitable to thematic instructions as well as students' characteristics, (2) describe the quality of the field test product of electronic multimedia teaching materials for thematic instructions in schools, and (3) find out the effectiveness of the use of the electronic teaching materials to primary school students' conceptual mastery.

2. Literature Review

2.1 Electronic Teaching Materials

Teaching materials are a set of materials that are systematically arranged, whether written or not to create an atmosphere that allows students to learn (Kemdikbud, 2013). In addition, the Director General of Higher Education (2014) also adds that teaching materials are information, tools and texts needed by teachers or instructors for planning and reviewing the implementation of learning.

Meanwhile, according to Kitao & Kitao (2018), teaching materials are a set of tools that contain learning materials, methods, limitations, and ways of evaluation which are designed systematically and attractively in order to achieve the expected goals, competence and sub-competence with all its complexity. The National Center for Vocational Education Research Ltd / National Center for Competency Based Training

supports that teaching materials are all forms of materials used to assist teachers or instructors in carrying out teaching and learning activities in class. It can be written or unwritten material (Hamza, 2012). The parts in the e-book contribute to the development of children's early reading competence, attitudes, and motivation to read digital texts. Studies show that electronic books and constructivist teaching methods can increase reading motivation among early readers (Ciampa, 2012).

Electronic books are available through two main sources: online websites and personal electronic devices. The importance of these devices cannot be underrated. There are several factors affecting the transition from printed version to electronic format, one of which is online resources provide quick access to reading material as needed (Jones & Brown, 2011).

2.2 Multimedia and Instructions

Multimedia is defined as a delivery of information in an interactive and integrated manner which includes text, images, sound, video or animation (Hackbarth, 1996; Philips, 1997; Chapman & Chapman, 2004). Multimedia instructions can be interpreted as a computer-based interactive communication system in an integrated presentation. The term computer-based means that multimedia programs use computers to present instructions. While the term integrated means that multimedia instructions can display text, images, audio, and video or animation in one presentation.

Multimedia instruction takes advantage of the flexibility of computers to solve learning problems. As with most teaching systems, computers can be used as the primary teaching tool to reinforce early stage learning, stimulate and motivate students to learn, or for various other possibilities. There are many benefits that can be obtained from the flexibility of using this multimedia since it can insert video, audio, graphic elements, forms, processes, roles and other responsibilities (Lee & Owens, 2004).

Empirically, Mayer argues several principles of multimedia (Clark & Mayer, 2003), namely: (1) multimedia principle, (2) contiguity principle, (3) modality principle, (4) signaling principle, and (5) interactivity principle. The principles stated by Mayer are in harmony with the three factors that influence the extraneous cognitive load, but attention needs to be given to the redundancy effect which can be contrary to other principles, such as the principle of multiple presentation. The use of multimedia principles has shown a significant contribution to learning (Mayer, 2007).

Generally, multimedia instruction can motivate students and create active learning (Muller, Lee, & Sharma, 2008). However, its effectiveness viewed from the achievement of learning is lack of consistency (Leacock, & Nesbit, 2007; Park & Lim, 2007). Several studies have reported the advantages of using multimedia in learning (Choi, Lee, & Jung, 2008; So & Kong, 2007). Deiman & Keller (2006) suspect that the inconsistency of learning achievement using multimedia is caused by the design that only emphasizes on the cognitive aspect, neglecting the motivation aspect, even it is proven to play a very important role in learning. The lack of ability to utilize navigation and assistive devices is the cause of the ineffective open learning environment.

2.3 Thematic Instruction in Primary Schools

Thematic instruction is heavily influenced by the exploration of topics in the curriculum to enable students learn to connect the learning process and content across disciplines simultaneously. Thematic instruction as a concept can be interpreted as a learning approach that involves several subjects to provide meaningful experiences to students. It is said to be meaningful because in this thematic learning, students will understand the concepts they learn through direct experience and relate them to other concepts they have already understood.

Practically, this thematic instruction begins with a topic or theme chosen and developed by the teacher together with students. The purpose of this theme is not only to master the concepts of a subject, but also concepts from related subjects. Compared to conventional approaches, thematic instruction emphasizes on students' involvement in the learning process or directs students to be actively involved in the learning process and decision making. Also, this thematic instruction emphasizes the application of the concept of experiential learning.

2.4 Local Culture- based Instruction

According to Sardjiyo and Pannen (2005), culture-based instruction is a strategy for creating a learning environment and integrate culture to learning experiences. In culture-based learning, culture becomes a medium for students to transform their observations into creative principles about nature.

Accordingly, culture-based learning enables students to not just imitate and / or accept the information conveyed, but also create meaning and understanding from the information they get. Likewise, culture-based learning is not just transferring or conveying cultural manifestations, instead using culture to make students able to create meaning, build creativity to achieve a deep understanding of the material of the subjects they are studying.

Culture-based instruction can be divided into three types namely, learning about culture, learning with culture, and learning through culture (Sardjiyo and Pannen, 2005). Learning about culture places culture as a field of science. Furthermore, learning with culture occurs when culture is introduced to students as a way or method of learning a particular subject. Learning with culture covers the use of various cultural manifestations. In learning with culture, culture and its manifestations become learning media in the learning process.

3. Material and Methods

Electronic teaching materials with multimedia content are developed using the ADDIE model. This model consists of five steps, namely: (1) analyze, (2) design, (3) development, (4) implementation, and (5) evaluation (McGriff, 2000). The choice to use this model is based on the consideration that this model is developed systematically and is based on the theoretical foundation of instructional design.

This model is arranged programmatically with a systematic sequence of activities in an effort to solve learning problems related to delivery strategies, students' needs and characteristics. Visually, the five stages of the ADDIE model can be seen in Figure 1.

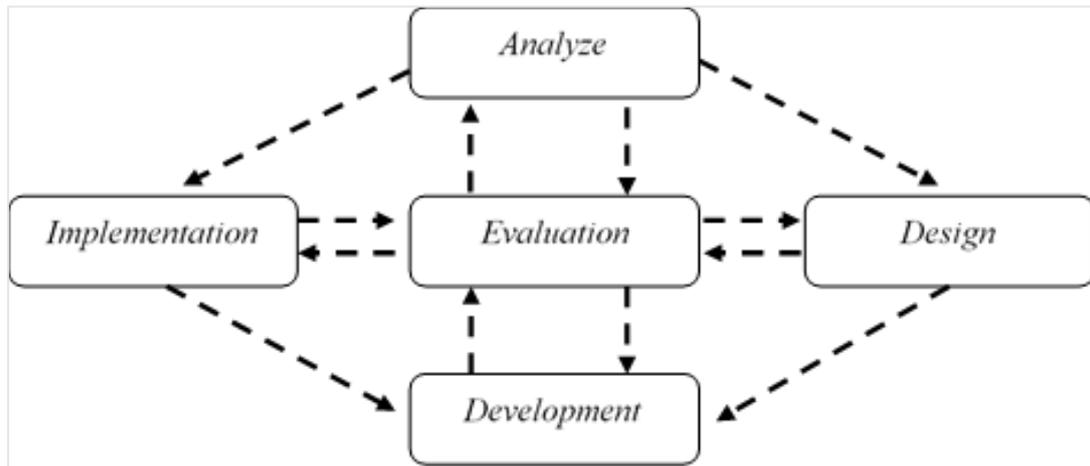


Figure 1: ADDIE Model (McGriff, 2000)

The analysis stage includes the activities of analyzing learning needs, Core Competencies and Basic Competencies for four graders on science subject. At the design stage, the results of the needs analysis are integrated into multimedia electronic teaching materials for four grade of primary school students. Development stage is done by making electronic teaching materials with multimedia content using flipbook software. In the implementation stage, a limited field test of multimedia electronic teaching materials for teachers and students is carried out. Furthermore, in the evaluation stage, a revision of electronic teaching materials containing multimedia products is done referring to the results from the field test.

The steps of this study are provided in a form of flow chart as follows.

Data regarding the quality of electronic teaching materials with multimedia content are viewed from the content, presentation and expert reviews and field test. Expert reviews are carried out using questionnaires and are carried out by media experts and learning design experts. The tests are carried out to individuals, small group, and field test. Field test is conducted using a questionnaire that has been constructed. The data is taken after the teacher and students use electronic teaching materials with multimedia in their learning activities

The collected data in this study are analyzed descriptive qualitatively as follows: (1) data regarding the quality of multimedia electronic teaching materials as a result from expert judge. The judgement focuses on the material content, instructional design, instructional media and students try out. This data analysis technique is carried out by grouping information from qualitative data in the form of input, response, criticism, and suggestions for improvement contained in the questionnaire.

The result of the analysis is then used to revise the developed product. (2) The data regarding the quality of multimedia electronic teaching materials as a result from product

try out is analyzed using score conversion gathered from questionnaire. (3) Data on the effectiveness of using electronic thematic teaching materials with multimedia content is analyzed using the nonparametric Wilcoxon Signed Rank Test.

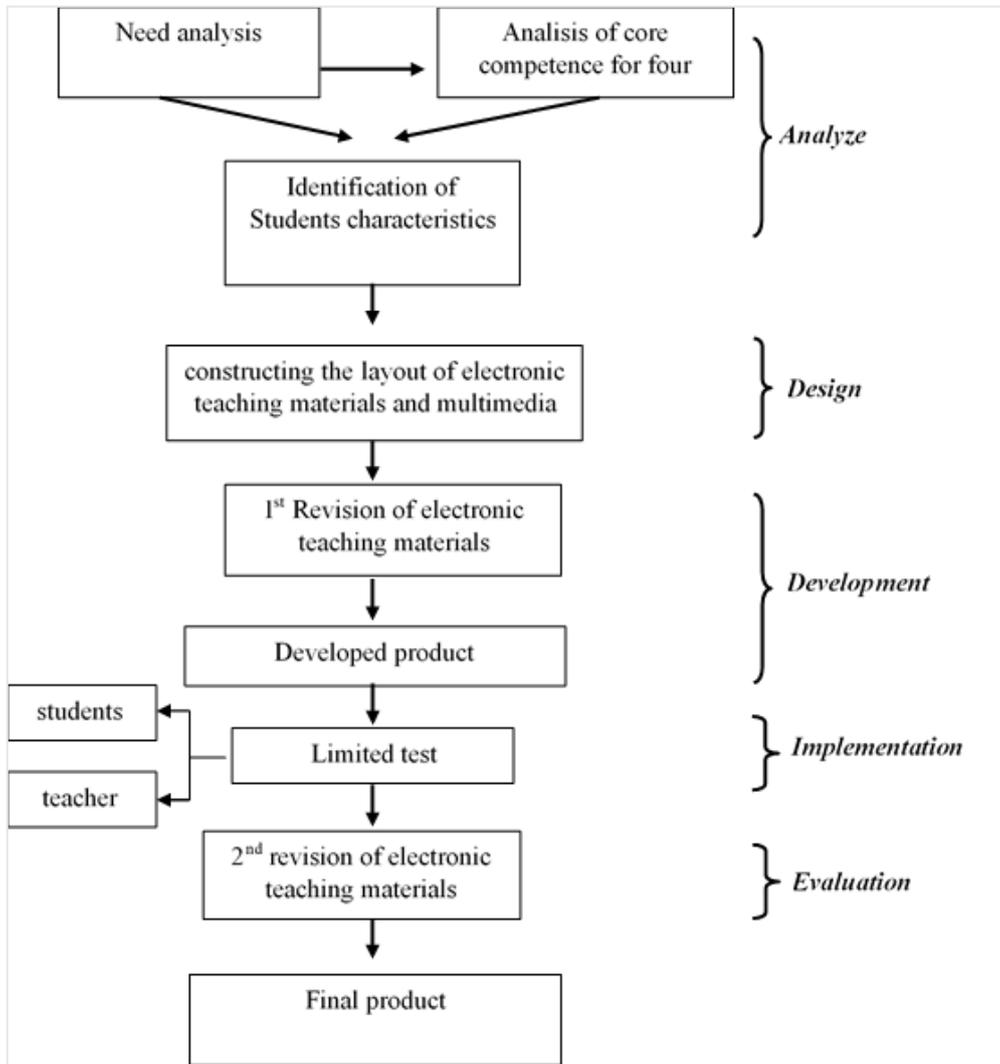


Figure 2: Steps of the Development of Electronic Teaching Materials

4. Result and Discussion

The textbook developed is on the theme 1 The Beauty of Togetherness and Theme 3 Caring for Living Things for four grade students at Elementary School. The front page of teaching materials displays pictures related to local Ngada culture. The view of the developed front page is presented in Figure 3.

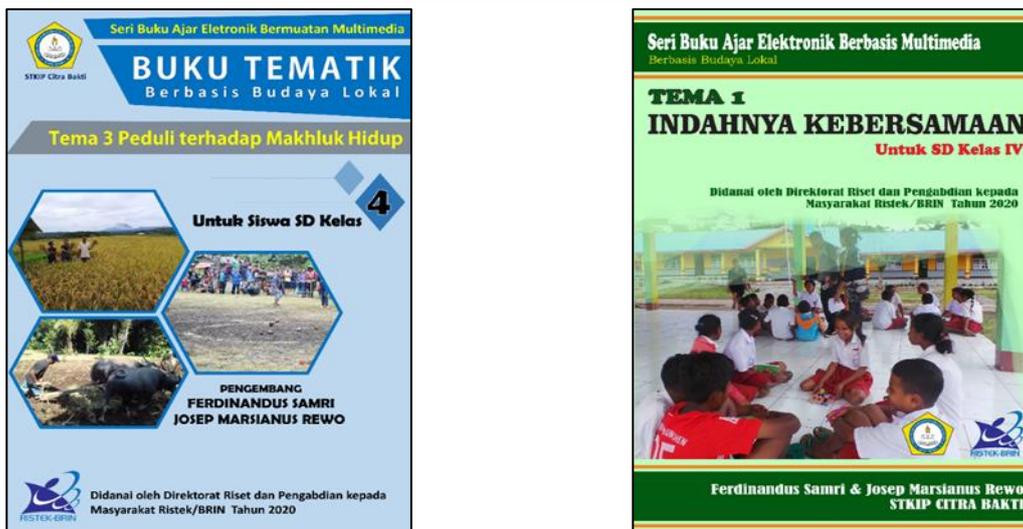


Figure 3: The View of Thematic Book Cover

In the content section of the electronic book, it consists of learning materials, discussions, and exercises. The learning material displays a lot of pictures based on local Ngada culture as well as videos that support learning activities. The display of learning activities is presented in Figure 4.



Figure 4: The Display of One of the Instructional Activities

5. Results of the Electronic Textbook Feasibility Expert Test

The content feasibility test is carried out by content expert, multimedia expert, and the instructional design expert. Assessment of the content is done by content experts, multimedia experts, and instructional design experts, all three assessments are in the very good category.

The results of the content expert judgement are presented in Table 1. The content experts involved came from three elementary schools in Ngada regency. The content expert is a four grade teacher who has been experienced in implementing thematic instruction for at least 5 years.

Table 1: Assessment of Feasibility Aspect from Content Expert

No	Aspects	Expert			Average score
		I	II	III	
1	Appropriateness of content with learning objectives	4	4	5	4,3
2	Suitability of content and 2013 curriculum in primary schools	4	4	5	4,3
3	Compatibility of material depths with 2013 curriculum in primary schools	4	5	5	4,7
4	Organization of teaching materials viewed from the orderliness of the presentation of the material	5	5	5	5,0
5	The organization of teaching materials viewed from the systematic presentation of the material	4	5	5	4,7
6	Suitability of language choice with the level of development of elementary school students	4	4	4	4,0
7	The effectiveness of word choice (diction)	4	5	5	4,7
8	The accuracy of the use of sentence structure (composition of subject, verb, object, and complement)	4	4	4	4,0
9	The accuracy of the use of mechanics	4	4	5	4,3
10	The suitability of pictures, video media to clarify and deepen messages or concepts	4	4	4	4,0
11	The compatibility of examples to explain concepts	4	4	4	4,0
12	The compatibility of exercises to support concept explanation	4	5	4	4,3
13	The suitability of materials with the development of information technology	4	4	4	4,0
14	The practicality to explore electronic teaching materials content	4	4	5	4,3
15	The organization of learning activities designed to support culture-based instruction	5	5	5	5,0
Mean score		4,4			
Category		Very good			

From Table 1, it can be categorized that the quality of electronic teaching materials particularly on the feasibility of content based on content expert judgement is in the very good category. The highest score is in the aspect of organizing teaching material in terms of the conciseness of the presentation of the material and the aspect of organizing learning activities designed to support culture-based learning.

The results from multimedia expert judgement are presented in Table 2. The multimedia expert involved are those with the expertise in instructional technology.

Table 2: Expert Judgement on the Feasibility of the Multimedia

No	The assessed Aspects	Score
	Front Page	
1	Center of view	4
2	The composition and layout elements	4
3	Color display	4
	Typography	
4	Font	4
5	Font size	4
6	Space	4

Ferdinandus Samri, Josep Marsianus Rewo, Dek Ngurah Laba Laksana
ELECTRONIC THEMATIC TEACHING MULTIMEDIA WITH LOCAL CULTURE BASED
MATERIALS AND ITS EFFECT ON CONCEPTUAL MASTERY OF PRIMARY SCHOOL STUDENTS

No	The assessed Aspects	Score
	Display	
7	Layout consistency	5
8	Background set	5
9	Illustration placement	4
10	Text, picture, and video composition	4
11	Orderliness of the electronic teaching materials	5
12	Attractiveness of the design	5
	Video usability	
13	Compatibility with the materials	5
14	Video quality	3
15	Volume	4
	Picture and Illustration	
16	Supporting to the materials	5
17	Attractiveness of the figure and illustration	5
	E-book operation	
18	Usability of the electronic teaching materials	4
19	Navigation button function	5
	Mean	4,3
	Category	Very good

From Table 2, it can be categorized that the quality of electronic teaching materials on the feasibility of content based on multimedia expert judgement is in the very good category. The highest score is in the aspect of display, video used, pictures / illustrations, and operation of the electronic books.

The result of instructional design expert judgement is presented in Table 3. This involves lecturers whose expertise are in instructional technology.

Table 3: Assessment on the Feasibility of the Content from Instructional Design Expert

No	Aspects	Score
1	The attractiveness of the cover page design	5
2	Precision of the layout	4
3	Consistency of the use of space, title, sub-title, and materials typed	4
4	Completeness of components in every chapter	4
5	Clarity of the fonts	4
6	Accuracy of material presentation	4
7	Precision of the table placement, pictures and illustration, and video	4
8	Clarity of the material arrangement	4
9	Organization of the teaching materials viewed from arrangement of the material presentation	4
10	Organization of the teaching materials viewed from the systematic presentation of the materials	5
11	Organization of the learning activities set to support culture-based instruction	5
	Mean score	4,3
	Criteria	Very good

From Table 3, it can be categorized that the quality of electronic teaching materials on the feasibility of content based on the learning design expert judgement is in the very good category. The highest score is in the aspect of the attractiveness of the cover design, organizing the teaching material in terms of the systematic presentation of the material, and organizing learning activities designed to support culture-based instruction.

5.1 Conceptual Mastery of Students Using Culture-based Electronic Teaching Book

After the culture-based electronic textbook is suitable based the results of the assessment by experts, this textbook is used in learning to determine the effectiveness of its use. The test is administered to 27 students in three schools in Ngada regency, Indonesia. Test data are presented in Table 4. The assessment was carried out three times, at the beginning before the use of electronic teaching standards, at the end of the first week after using the electronic textbook, and at the end of the second week.

Table 4: The Scoring of Conceptual Mastery of Students Using Culture-based Electronic Teaching Book

No	Student Code	Class	N ₀	N ₁	N ₂
1	SDR-1	IV	75	75	80
2	SDR-2	IV	75	80	80
3	SDR-3	IV	60	65	85
4	SDR-4	IV	75	70	85
5	SDR-5	IV	50	75	80
6	SDR-6	IV	60	75	80
7	SDR-7	IV	55	75	85
8	SDR-8	IV	70	70	90
9	SDR-9	IV	55	60	65
10	SDR-10	IV	60	60	75
11	SDR-11	IV	60	60	75
12	SDN-1	IV	65	70	70
13	SDN-2	IV	60	65	60
14	SDN-3	IV	60	70	70
15	SDN-4	IV	65	75	80
16	SDN-5	IV	65	75	75
17	SDN-6	IV	70	75	75
18	SDN-7	IV	65	65	70
19	SDW-1	IV	70	65	80
20	SDW-2	IV	50	75	90
21	SDW-3	IV	50	75	80
22	SDW-4	IV	60	75	85
23	SDW-5	IV	60	75	80
24	SDW-6	IV	50	65	80
25	SDW-7	IV	70	70	80
26	SDW-8	IV	50	60	85
27	SDW-9	IV	55	60	60

Note: N₀ is initial mastery, N₁ is conceptual mastery after 1 week of treatment, N₂ is conceptual mastery after 2 weeks

Descriptively, it can be obtained that the mean score students' conceptual mastery for the initial score, week 1, and week 2 are 61.48, 69.63, and 77.78. The complete descriptive data is presented in Table 5.

Table 5: Descriptive Data on Students' Conceptual Mastery

No	Statistic	N ₀	N ₁	N ₂
1	Samples	27	27	27
2	Mean	61,48	69,63	77,78
3	Median	60,00	70,00	80,00
4	Mode	60,00	75,00	80,00
5	Standard Deviation	8,06	6,19	7,89
6	Range	25,00	20,00	30,00
7	Lowest Score	50,00	60,00	60,00
8	Highest score	75,00	80,00	90,00

Note: N₀ is initial mastery, N₁ is conceptual mastery after 1 week of treatment, N₂ is conceptual mastery after 2 weeks.

To test the hypothesis, data distribution normality test is firstly conducted. The test results show that the data is normally distributed. Test results data are presented in Table 6.

Table 6: Normality Test on Data Distribution

Variable	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
Initial Mastery	0,165	27	0,056
Conceptual Mastery week 1	0,252	27	0,000
Conceptual Mastery week 2	0,241	27	0,000

Table 3 shows the significance value of the distribution of the first week data on students' conceptual mastery with the second week is less than 0.05. This means that the data distribution is not normal. Therefore, the inferential statistic nonparametric test was conducted with the Related-Samples Wilcoxon Signed Rank Test.

The results of the nonparametric statistical test with Related-Samples Wilcoxon Signed Rank Test on the test results before treatment (initial mastery) with the results of the test a week after the use of electronic textbooks is presented in Table 7. From Table 7, it can be seen that there are significant differences in four grade students' conceptual mastery before and after a week of learning using local culture-based electronic textbooks.

Table 7: SPSS Results on Significance Test toward Students' Initial Conceptual Mastery and the Achievement after One Week of Treatment

No	Variable	Value
1	Sample	27
2	Test Statistic	221,000
3	Standard Error	28,456
4	Standardized Test Statistic	3,707
5	Asymptotic Sig. (2-sided test)	0,000

The results of nonparametric statistical tests on the result before treatment (initial mastery) the second week of conceptual mastery are presented in Table 8. From Table 8, it can be seen that there are significant differences in the conceptual mastery of fourth grade students before and after two weeks of learning using local culture-based electronic textbooks.

Table 8: SPSS Results on Significance Test toward Students' Initial Conceptual Mastery and the Achievement after Two Week of Treatment

No	Variable	Value
1	Sample	27
2	Test Statistic	351,000
3	Standard Error	39,232
4	Standardized Test Statistic	4,473
5	Asymptotic Sig. (2-sided test)	0,000

From the results of this study, it can be seen that the use of electronic textbook media on Ngada's local culture can improve students' conceptual mastery in thematic instructions in elementary schools

5. Recommendations

Recommendations from the findings of this study are (1) for teachers, they can develop teaching materials that have an audiovisual impact on students, learning resources that are rich in images and videos which further facilitate learning and the effectiveness of the learning occurs. (2) students can use this electronic teaching material since it is easily used on a computer or smartphone.

6. Conclusion

The conclusion of this study can be described as follows (1) multimedia-based electronic teaching materials have been produced for thematic instruction in elementary schools on two learning themes, first theme is the Beauty of Togetherness and Theme 3 which is Caring for Living Things for four graders. (2) The content feasibility test is carried out on the content expert, multimedia expert, and the learning design expert judgement. Thus, it results in all three assessments are in the very good category. (3) Teaching materials developed are effective to improve students' learning achievement on the conceptual mastery.

Acknowledgements

The researchers would like to extend the highest gratitude to (1) Mini The Ministry of Education and Culture of the Republic of Indonesia through the Directorate of Research and Technology for Higher Education in the Research and Service Research Grants Fund for the 2020 fiscal year.

About the Authors

Ferdinandus Samri is lecturer in STKIP Citra Bakti, Indonesia. His scientific field is Environment Education.

Josep Marsianus Rewo dan is lecturer in STKIP Citra Bakti. His scientific field is Educational Evaluation.

Dek Ngurah Laba Laksana is lecturer in STKIP Citra Bakti. His scientific field is Elementary School Instructional Technology.

All the writers are actively involved in scientific writing and have published several works indexed in Google Scholar and Sinta (Indonesian Index).

References

- Burkes, E. K. M. (2007). Applying cognitive load theory to design of online learning. Doctor of Philosophy *Dissertation*. Denton: University of North Texas.
- Chapman, N. & Chapman, J. (2004). *Digital multimedia (2nd Ed.)*. London: John Wiley & Sons, Ltd.
- Ciampa, K. (2012). Reading in the digital age: Using electronic books as a teaching tool for beginning reader. *Canadian Journal of Learning and Technology*, 38(2), 1-26
- Clark, R. C., & Mayer, R. E. (2003). *E-learning and the Science of Instruction*. San Francisco: Jossey-Bass.
- Degeng, I. N. S. (2013). *Ilmu pembelajaran: Klasifikasi variabel untuk pengembangan teori dan penelitian*. Bandung: Kalam Hidup dan Aras Media.
- Deima, M. & Keller, J. M. (2006). Volitional aspect of multimedia learning. *Journal of Educational Multimedia and Hypermedia*, 15 (2), 137-158
- Dick, W., Carey, L., & Carey, J. O. (2009). *The systematic design of instruction 7th Ed*. United State of America: Pearson Education.
- Dwiyogo, W. D. (2013). *Media pembelajaran*. Malang: UM Malang.
- Ediger, M. & Rao, D. B. (2003). *School curriculum and administration*. New Delhi: Discovery Publishing House
- Fraser-Abder, P. (2011). Teaching budding scientists-fostering scientific inquiry with diverse learner in grades 3-5. United State of America: Pearson Education, Inc Fry, H., Ketteridge, S., & Marshall, S. (2014). *A handbook for teaching and learning in higher education: Enhancing academic practice, 4th edition*. London: Routledge
- Hackbarth, S. (1996). *The educational technology handbook: A comprehensive Guide*. Englewood Cliffs. Educational Technology Publication, Inc.
- Hamza, M. (2012). *Developing training material guide*. Swedish: Civil Contingencies Agency
- Hardy, T. & Fler, M. (2008). *Science for Children: Developing a Personal Approach to Teaching*. Sidney: Prentice Hall.

- Harp, S. F. & Mayer, R. E. (1997). The role of interest in learning from scientific text and illustration: On the distinction between emotional interest and cognitive interest. *Journal of Educational Psychology*, 89 (1), 92-102.
- Huk, T., Steinke, M., & Floto, C. (2003). Computer animations as learning objects: what is an efficient instructional design, and for whom? *Proceedings of IADIS international Conference*.
- Jones, T. & Brown, C. (2011). Reading engagement: A comparison between eBooks and traditional print books in an elementary classroom. *International Journal of Instruction*, 4(2), 5-23.
- Kinshuk & Patel, A. (2003). Optimising domain knowledge representation with multimedia objects. In S. Naidu (Ed.). *Learning & teaching with technology – principles and practices* (pp. 55-68). London: Kogan.
- Kitao, K. & Kitao S. K. (2018). *Selecting and developing teaching/learning material*. The Internet TESL Journal. Retrieved by <http://iteslj.org/Articles/Kitao-material.html>.
- Laksana, D. N. L. (2014). Profil Pemahaman Konsep IPA Guru-Guru Kelas Sekolah Dasar di Kabupaten Ngada. *Jurnal Ilmiah Pendidikan Citra Bakti*, 1 (1), 15-26.
- Leacock, T. L., & Nesbit, J. C. (2007). A Framework for Evaluating the Quality of Multimedia Learning Resources. *Educational Technology & Society*, 10 (2), 44-59.
- Lee, W. W. & Owens, D. L. (2004). *Multimedia-based instructional design: Computer-based training, web-based training, distance broadcast training, performance based solution (2nd ed)*. San Francisco: Pfeiffer A Wiley Imprint.
- Mayer, R. E. (2007). *Multimedia learning*. New York: Cambridge University Press.
- McGriff, S. J. (2000). Instructional Systems. New York: College of Education, Penn State University. [Online] Retrieved by http://www.cdc.qc.ca/actes_aqpc/2005/ellis_joanne_608.pdf.
- Muller, D. A., Lee, K. J. & Sharma, S. D. (2008). Coherence or interest: which is most important in online multimedia learning? *Australian Journal of Educational Technology*, 24 (2), 211-221.
- Park, S. & Lim, J. (2007). Promoting positive emotion in multimedia and hypermedia learning using visual illustrations. *Journal of Educational and Hypermedia*, 16 (2), 141-162.
- Phillips, R. (1997). *The developer's handbook to interactive multimedia: a practical guide for educational applications*. London: Kogan Page Ltd.
- Reigeluth, C. M. & Carr-Cheliman, A. A. (2009). Theories for Different Outcomes of Instruction. In C. M. Reigeluth, & A. A. Carr-Cheliman (Eds.), *Instructional-Design Theories and Models: Building a Common Knowledge Base, Vol. 3* (pp. 195-197), New York: Routledge.
- So, W. M. & Kong, S. C. (2007). Approaches of inquiry learning with multimedia resources in primary classroom. *Journal of Computer in Mathematics and Science Teaching*, 26 (4), 329-354.

- Spector, J. M. (2009). Adventures and advances in instructional design theory and practice. In L. Moller, J. B. Huett, D. M. Harvey (Eds). *Learning and instructional technologies for the 21st century* (pp. 1-14). New York: Springer.
- Turkmen, H. (2006). What technology plays supporting role in learning cycle approach for science educational. *TOJET*, 5 (2), 1303-1321.

Creative Commons licensing terms

Author(s) will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Education Studies shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflicts of interest, copyright violations and inappropriate or inaccurate use of any kind content related or integrated into the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).