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Submission date: 10-Jul-2023 07:33AM (UTC+0700)

Submission ID: 2128721282

File name: 6_Implementation_of_E-Comics_to_Grow.pdf (1.27M)

Word count: 5435

Character count: 31092

IMPLEMENTATION OF E-COMICS TO GROW ENVIRONMENTAL LITERACY USING OUTDOOR LEARNING METHODS IN THE NEW NORMAL TIME

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ABSTRACT

The implementation of e-comic development is based on the low level of environmental literacy due to the lack of training and incomplete material in the textbook, so that students are not accustomed to being skilled in carrying out environmental literacy in the surrounding environment, especially during the COVID-19 pandemic and in inclusive education. The research method in this article is a systematic literature review. The purpose of developing e-comic is to produce learning media used independently by students to foster environmental literacy in grade 4 Elementary School. This environmental literacy hopes that students can achieve goals such as: (1) Awareness (increasing individual awareness, and sensitivity to the environment), (2) Knowledge (gaining experience in gaining a basic understanding of the environment), (3) Attitude (increasing feelings and values of caring for the environment, as well as motivation to actively participate in environmental protection), (4) Skills (increasing skills to solve environmental problems), (5) Participation (actively involved in the community in efforts to solve environmental problems). The achievement of problem-solving skill competencies can also help students to support other skills such as reading and writing. In addition, it also applies a project-based learning model. This is because there is a problem that problem solving abilities are still low, so a Project Based Learning model is needed.

KEYWORDS

E-comic, Inclusive Education, Environmental Literacy, Problem Solving Ability, Project Based Learning

How to cite:

E-ISSN:

Published by:

Brian Priyangga, Sarwi, Arif Widiyatmoko. (2022). Implementation of E-Comics to Grow Environmental Literacy using Outdoor Learning Methods in the New Normal Time. Journal of Eduvest. Vol (Number): Page 1917-1930

2775-3727

<https://greenpublisher.id/>



6 INTRODUCTION

Inclusive education has become the highest priority in education policies of various countries since the UNESCO Salamanca Declaration in 1994. Inclusive education is implemented to provide opportunities for every student, especially Children with Special Needs (ABK), who have the potential to be involved in education in public schools. Children with Special Needs according to Permendiknas No. 70 of 2009 Article 3 paragraph 2, namely: mentally retarded, deaf, blind, speech impaired, physical disabilities, slow learners, learning difficulties, autism, and have motor disorders.

There are many studies that show that children with special needs taught in inclusive schools show better development of interaction and social skills in order to integrate into society when they are adults (Wiener & Tardif, 2004). Other researchers suggest that children with special needs in inclusive schools get academic benefits in public schools (Ruijs, Peetsma, & van der Veen, 2010).

Education is very crucial to face the development of technology and science (Yao & Guo, 2018). Education is an important investment in human resource development (Graham, 2020). Good education is a way to create quality human resources (Adi, SS, Kusumawardani, IN, 2018).

Efforts to increase quality human resources can be through learning (Kang, Ho, & Marquardt, 2021). Learning means a stage carried out by teachers to teach students in the learning process to process and acquire skills, knowledge and behavior (Cofré et al., 2019). Conceptually, compulsory learning activities are close to the environment (Liu, Cheng, & Chen, 2019). Learning activities should take advantage of the potential of the environment and local wisdom so that the teaching and learning process is more meaningful, but in reality this has not been implemented by the teacher. Learning can be achieved through experience, learning media, environment, and cognitive strategies (Hu, Gong, Lai, & Leung, 2018).

One of the fundamental disciplines is learning science, because science continues to follow the times (Arneson & Offerdahl, 2018). Science learning has a goal based on the Ministry of Education and Culture (2020) which is to increase intellectual abilities, solve problems, train in expressing ideas, achieve optimal learning outcomes, and develop the characteristics of students.

Science lessons are not only needed to acquire concepts or knowledge, but students are also expected to be able to connect and apply them in life. This implementation mainly responds to environmental conditions that are increasingly damaged and polluted by human activities. Therefore, it is very appropriate to integrate environmental literacy skills into science learning, where the reference criteria for the environmental knowledge component is to measure the degree of environmental understanding by students and can then be used as a reference for assessment.

E-comic learning media can be used in learning (Lee, Joh, Yoo, & Oh, 2021). From research in increasing students' learning motivation using comics learning media in mathematics, e-comic media is expected to make it easier for students to understand the material on problem solving abilities (Fadella & Prabowo, 2018). Variations of learning media by involving the senses make it

easier for students to absorb and process lesson content; the more senses involved, the better it can be understood and remembered (Jauhari, 2018) .

E-comic learning media are usually of interest to students aged 6-12 years because comics are interesting picture books (Rina, Suminar, Damayani, & Hafiar, 2020) . Comics are picture story books that contain cartoon features to attract the reader's attention (Stephens Griffin, 2019) . So it can be concluded that comics can help students in improving practical environmental literacy (Riwanto & Budiarti, 2020) . This can be shown from the iconic visual illustrations in comic media (Schreiber & Struminski, 2018) . So that students do not directly learn to use concrete learning media but use interesting cartoon images as learning topics (Hartel & Dunst, 2019) .

One of the interesting themes in learning in elementary school is on theme 9 which is My Country's Rich. This is in line with the problem that there is a lack of learning that relates to the environment around students in Jepara Regency, namely the Karimunjawa Islands in the form of utilizing alternative energy sources, namely Solar Power Plants (PLTS). Students who live in the area should really understand the material about alternative energy sources. Many types of energy sources are close to their environment but in fact they think that environmental material is material that is difficult to understand in learning.

Based on students' interest in comics (Ruch, Heintz, Platt, Wagner, & Proyer, 2018) . So that e-comic learning media can be used as media to facilitate students during the teaching and learning process and will have an impact on the success of students in learning (Mustikasari, Priscylio, Hartati, & Sopandi, 2020) .

Based on this statement, researchers have carried out research aimed at developing e-comics to foster environmental literacy in alternative energy sources. Media is designed with the help of the Autodesk application . In the e-comic media there is an attractive pictorial display and explains the local wisdom that exists in the Karimunjawa Islands so that students can be motivated and can improve environmental literacy with this e-comic learning media.

RESEARCH METHOD

This research with the concept of systemic literature review has a technique that is carried out in five stages, namely: formulating research questions, mapping and finding articles that are in accordance with the research questions posed, classification and evaluation of collected articles, summarizing articles, interpreting article findings. The articles included in this study are all articles on the topic of comics for children with special needs in inclusive schools, the environmental literacy movement and e-comics. The search process involves searching computerized data, selecting complete articles, in English and scientifically peer-reviewed. Articles are searched through the Scopus database and Google Scholar using Publish or Perish. The search was carried out on articles published in 2018 to 2022 according to the rate of recency in the last 5 years. A total of 1300 articles were obtained after reading each article title. The articles were then selected and analyzed based on: (1) identification of the title, name of the researcher, and abstract; (2) completeness of information on research objectives, methods and results; (3) assessment of selected studies; (4) form a decision about which study to choose. After going through the selection process, there were 16 articles that were considered for further research.

RESULTS AND DISCUSSION

The e-comic book based on local wisdom " Let's Get to Know Alternative Energy Sources of PLTS in the Karimunjawa Islands and PLTU Jepara" is a learning media for grade IV elementary school students which is arranged according to the 2013 curriculum. This e-comic book is designed to increase learning independence, critical thinking and student problem solving as a learning guide. Local wisdom-based e-comic books can be accessed *online* via *Google Drive* provided by the teacher. This local wisdom-based e-comic book is used to facilitate the implementation of the learning process. Local wisdom- based e-comic books are in the form of local wisdom-based learning media inventions and can be accessed via *Google Drive* so that they are more practical to use in learning.

Several research findings indicate the effectiveness of *project-based learning* , among others , Sucilestari's research states that project-based models can improve students' life skills. Improvement of all aspects of life skills, namely individual skills, academic skills, and professional skills (Sucilestari et al., 2018) .

The project-based model can be applied to improve the life skills of students in schools, especially in the learning process both at home and in the school environment (Vina Serevina et al., 2018) . In line with the results of Uswatun Chasanah's research which shows that project-based learning is very effective compared to conventional models, namely increasing learning outcomes in process skills, creative thinking skills and students' speaking skills (Uswatun Chasanah, Khoiri, & Nuroso, 2016) .

The sixteen articles that have met the criteria are further described in Table 1.

Table 1 Results of Systematic Literature Review

No	Author & Year	Title	Method	Results
1	Uyun Siti Syarifah (Sharifah, 2021)	Development of Comic Media in Distance Learning to Improve Understanding and Learning Outcomes of Children with Intellectual Requirements	Research and Development (RnD) method ADDIE	The results showed that the development of comic media in PJJ could increase students' understanding of the material that had been delivered. Especially for mentally retarded students, this can be an alternative key to improve learning outcomes.
2	Chi Chi Karlina, Rosida Rakhmawati, Mujib (Karlina & Rakhmawati, 2020)	Development of Mathematics Comic Model Teaching Materials for Children with Special Needs (ABK) Students	Research and Development (RnD) method ADDIE	The results showed that the question of teaching mathematics learning in the form of mathematical comics about children with special needs was valid .

3	Ntobuo, Amali and Arbie (Ntobuo, Arbie, & Amali, 2018)	<i>The Development of Gravity Comic Learning Media Based on Gorontalo Culture</i>	<i>Research and Development (RnD)</i>	The results of the study show that the comic media developed is very valid from the experts, so it is very suitable for use in the learning process.
4	Diana Kusumaningrum (Kusumaningrum, 2018)	Environmental Literacy in the 2013 Curriculum and Science Learning in Elementary School	<i>Systematic Literature Review</i>	Environmental literacy skills are very important to be instilled from an early age into character, because character education in students will be embedded in the long term.
5	Tsalitsatul Maulidah, Ika Farida Yuliana, Nur Faizah Rohmatul Lailia and Sukiyanto (Maulidah & Farida, 2021)	Literacy Movement in an Effort to Increase Reading Interest in Children aged 6-8 Years during the Covid-19 Pandemic	My method is descriptive litative	The results of the research are that there has been a change, namely that students are enthusiastic about participating in the activities held which indicate that the community has begun to be interested in literacy.
6	Istiqomah, Rintayati and Subiyantoro. (Istiqomah, Subiyantoro, & Rintayati, 2020)	<i>The Urgency of Science Comic Based on Local Culture in Forming Elementary School Character of Environmental Care and Awareness</i>	Qualitative research	In this study, it was concluded that science comics can strengthen the concept of environmental care and awareness according to the developmental stage of elementary school students.
7	Dewi, Lintangari and Kusumawardani. (Dewi,	<i>Local Wisdom Based Stories in Conserving Water</i>	Qualitative research	The results of his research revealed that the Singosari people still maintain local culture by

	Kusumawardani, & Lintang Sari, 2020)	<i>Resource</i>		believing in mystical stories to preserve nature such as springs, these stories can be used as a medium for learning English with narratives that are turned into interesting stories.
8	Nurjannah, IF, Wahyudi, W., & Setiawan, Y. (Nurjannah, Wahyudi, & Setiawan, 2019)	<i>Development of Comics with Discovery Learning Model as a Media to Increase Student's Literacy in Primary School</i>	<i>Research and Development (RnD)</i>	The results of the study that comic-based learning media with the sub-theme of learning energy and change developed have been declared valid by experts and are practically used in learning
9	Kurnia, Utomo and Sumarti (Kurnia, Sumarti, & Utomo, 2020)	<i>Implementation of Problem Based Learning Assisted with Science Comic Books to Improve Critical Thinking Skill of Elementary Students</i>	Classroom action research	The results showed that there was an increase after applying the PBL model with the help of science comics as a media book.
10	Maryani and Amalia (Maryani et al., 2018)	<i>The Development of Science Comic Book to Improve Student's Understanding in Elementary School</i>	<i>Research and Development (RnD)</i>	The results of this study indicate that the comics used in natural science learning are very effective in increasing the understanding of elementary school students and these comics are suitable for use in science learning.

11	Surya, Sriyanto and Poerwanti (Surya, Poerwanti, & Sriyanto, 2020)	<i>The Effectiveness of the Use of Digital Based Educational Comic Media in Improving Reading Interest in Elementary School Students</i>	Quantitative Research	The results show that there is an effectiveness in using comics media and increasing students' reading interest in the high category.
12	Nofa Rina (Rina et al., 2020)	<i>Character Education Based on Digital Comic Media</i>	<i>Research and Development (RnD)</i>	This study aims to producing character-based comic media for the development of character education .
13	Yunjung Lee, Suhyeon Yoo Uran Oh and Hwayeon Joh (Lee et al., 2021)	<i>Access Comics: An Accessible Digital Comic Book Reader for People with Visual Impairments</i>	<i>Research and Development (RnD)</i>	A number of studies have been carried out to improve the accessibility of various types of images on the web (for example, photos and images) artwork) for visually impaired people.
14	Riwanto, Mawan Akhir, Budiarti, Wahyu Nuning (Riwanto & Budiarti, 2020)	<i>Development of Digital Science Comics for Elementary School as a Support for Digital Literacy in Online Learning</i>	<i>Research and Development (RnD)</i>	The results of the study that digital comic media with high feasibility, supports digital literacy, and can help learning in online learning .
15	L Mustikasari, T Hartati, W Sopandi and G Priscylio (Mustikasari et al., 2020)	<i>The Development of Digital Comic on Ecosystem for Thematic Learning in</i>	<i>Research and Development (RnD)</i>	This study obtained the results of the thematic learning digital comics that were suitable for use on the basis of the material expert's

		<i>Elementary Schools</i>		assessment of 3.51 in good category, media expert 4.01 in good category, teacher assessment 3.9 in good category and student assessment of 3.93 in good category. The developed comic media has an impact on increasing motivation, interest in learning, student activity and facilitating the student learning process.
16	Megawati, Sri Latifah, Ridwan Fitri, Ady Anugrah, Antomi Saregar and Nur Endah Susilowati (Fitri, Latifah, Saregar, Anugrah, & Susilowati, 2021)	<i>Character Education Based Digital Physics Comic on Newton's Law: Students and Teacher Perception</i>	Qualitative descriptive research.	Character education is important in learning. For this reason, character education is very important in the learning process

In this writing, the researcher develops e-comic learning media based on local wisdom which is a modification of e-comic which is applied to science learning material alternative energy sources and the relationship between the media is inserted with local wisdom in the Karimunjawa Islands, Jepara, Central Java. The e-comic media based on local wisdom in the Karimunjawa Islands contains material in the form of narrative texts, pictures of tourism potential where Karimunjawa has been designated as a biosphere reserve by UNESCO, and comic characters wear traditional clothes according to local environmental conditions which are multi-ethnic. The material in e-comic media based on local wisdom in the Karimunjawa Islands contains an explanation of activities in coastal areas and alternative energy sources of PLTS. In addition to the material there is a *link Google Drive* whose comic content can be accessed by students wherever they are and introduces local potential in Jepara to the wider community.

In the e-comic media based on local wisdom in the Karimunjawa Islands, there is character recognition in which the characters have elements of local wisdom in the Karimunjawa Islands where the community is multiethnic. This e-comic media based on local wisdom in the Karimunjawa Islands can be accessed via *cellphone/computer* by accessing the *google drive link*. Can maximize the

existing technology in schools. E-comic media based on local wisdom in the Karimunjawa Islands in the form of a pdf via a *whatsapp group* or a *goggle drive link* , this media can be *downloaded* so that it can be accessed anywhere at any time as long as it has internet quota when downloading and can also be printed for offline learning.

The mechanism for compiling e-comics includes: (1) the stage of analyzing the needs of electronic comics, (2) the stage of designing electronic comics, (3) the stage of validation and refinement. The details of the mechanism for compiling e-comics will be explained as follows: steps to analyze the needs of electronic comics, e-comic designs are determined according to the learning implementation plan. At the design stage of electronic comics, the writing of e-comics is carried out based on a learning implementation plan based on independent learning activities that integrate environmental literacy.

The e-comic book based on local wisdom "Let's Get to Know Alternative Energy Sources of PLTS in the Karimunjawa Islands and PLTU Jepara" is used as a means of assisting the learning process that presents material for alternative energy sources, changes in energy forms, due to excessive use of fossil fuels and the process of electrical energy from sunlight. the sun as a supporter of students' understanding to local wisdom-based problem solving. The development of e-comic media is used to foster environmental literacy. With this innovation, students can know and implement environmental literacy. The design of this e-comic was assisted by the *Autodesk application program* . Display of e-comic books based on local wisdom, students can access *the google drive link*



Figure 1 Cover of E-comic , Picture 2 Introduction of E-comic Characters , Picture 3 Opening of E-comic





Figure 4 Contents of E-comic

This study aims to develop and implement e-comic learning media based on local wisdom to foster environmental literacy in fourth grade elementary school. The type of research used is *Research and Development* with the ADDIE development model, namely *Analyze* , *Design* , *Development* , *Implementation* , and *Evaluation*. This study used a test subject by conducting validity tests on media experts, material experts, learning experts and the responses of ten fourth grade elementary school students. Collecting data using a questionnaire instrument. The research data were analyzed by quantitative descriptive and qualitative descriptive. The results of the media expert validator get a score of 29, the percentage of 90.6% is categorized as very valid. The results of the material expert validator get a score of 37, the percentage of 92.5% is categorized as very valid. The results of the learning expert validator get a score of 53 percentages of 94.64% categorized as very valid. And the results of the responses of ten fourth grade elementary school students got a score of 429 with a percentage of 89.375% categorized as very valid. The overall results of the validator test are categorized as very valid so that e-comic media based on local wisdom can be used with alternative energy sources learning in science lessons for grade IV elementary school.

There is a difference in the increase in environmental literacy in students who use e-comic based on local wisdom which is higher and significantly higher than

the class that uses science textbooks, namely in the medium category with the N-gain value obtained is 0.40 in the environmental knowledge aspect and 0,37 on the aspect of environmental competence. The experimental class N-gain value which is higher and significant than the control class is found in aspects of knowledge, competence and environmental attitudes and the experimental class N-gain value which is not higher and significant than the control class is found in indicators of content knowledge, procedural knowledge, explaining phenomena scientific research, interpreting scientific data and evidence and reflecting on the importance of environmental science from a personal perspective.

The application of e-comic based on local wisdom in the distance learning process will be very useful, because in *online learning* students are encouraged to stay happy at home, one of which is a virtual model using the *zoom meeting application*. Thus, students will easily understand the material of alternative energy sources.

Project Based Learning is quite effective in achieving social, spiritual, product, project behaviors and learning mastery of students (Noor, Hardyanto, & Wibawanto, 2017). Based on the various research findings described above, *project-based learning-based e-learning* can be a solution to optimize the learning process, especially during the current pandemic. *Online learning based on project-based learning*, students can undergo more meaningful learning so that the insights and knowledge gained have meaning that can be used to solve the problems they face.

To grow environmental literacy requires media that can stimulate students to develop ideas, ideas and feelings so that students can express their ideas well and can be understood by others. A very effective and efficient media used is the Development of E-Comic Media Based on Local Wisdom to Grow Environmental Literacy for class IV with a *project based learning model*, where students are asked to do projects, namely making videos telling the activities of students in environmental literacy in their lives. students are then sent online to the teacher. If done offline, this e-comic can be printed and ask students to do problem solving skills after they read the comic, students can grow environmental literacy by implementing ways to maintain alternative energy sources around the students' environment that were previously taught by the teacher. teacher.

CONCLUSION

The conclusion from the writing of this article manuscript is the Implementation of Local Wisdom-Based E-Comics in Inclusive Education to Grow Environmental Literacy using the Outdoor Learning Method in the New Normal Period on 4th grade science material at SD KD 3.5 and KD 4.5. Implementation of E-comic Development with a project-based model that is intended where students are asked to do projects, namely making videos telling the activities of students in environmental literacy in their lives with the help of the role of parents or families that are made by students and then sent online to the teacher. If done offline, this e-comic can be printed and ask students to do problem solving skills after they read the comic, students can grow environmental literacy by implementing ways to maintain alternative energy sources around the students' environment that were previously taught by the teacher. teacher.

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