Journal of Innovation in Educational and Cultural Research

Volume 3 Issue 4 Year 2022 Pages 731-736
ISSN 2722-9688 | e-ISSN 2722-9696
http://jiecr.org | DOI: 10.46843/jiecr.v3i4.242

The Multimedia Innovation in 21st Century: The Development of e-LKPD Based on Scientific Inquiry in Science Class

Encep Andriana[1*], Putri Syafiila Daffa Fauzany[1], Trian Pamungkas Alamsyah[1]

[1]*Department of Elementary School Teacher Education, Faculty of Teacher and Education, Universitas Sultan Ageng Tirtayasa, Indonesia*

***Correspondence to**: *andriana1188@untirta.ac.id*

Abstract: This research that has been explored learned in the 21st century is oriented toward technological sophistication in the form of digital-based multimedia innovation in Elementary schools. This research aimed to find out the development of e-LKPD, its feasibility, and student response toward e-LKPD based on scientific inquiry in Elementary School level science subjects. Research and Development (R&D) methods are used in this research. This research uses unstructured interviews, questionnaires, and documentation as the data collection. Data analysis used descriptive scale analysis. This development used a 4D model developed by Thiagarajan consisting of 4 stages Define, Design, Development, and Disseminate. Thirty students of fifth-grade elementary school students were subjected to testing. The result namely validation of e-LKPD products based on scientific inquiry in the form of applications that can be accessed via Android smartphones and Window desktop screens, the results of material expert validators obtained an overall average of 95.38%, validation of linguists obtained an overall average of 93.63%, and media expert validation has obtained an overall average of 81.64%. The feasibility of e-LKPD products based on scientific inquiry science showed a positive response from a student questionnaire result with an average percentage of 91.58%.

Keywords: culturally responsive teaching; multiculturalism; multicultural education; higher education

Recommended citation: Andriana, E., Fauzany, P. S. D., & Alamsyah, T. P. (2022). The Multimedia Innovation in 21st Century: The Development of e-LKPD Based on Scientific Inquiry in Science Class. *Journal of Innovation in Educational and Cultural Research*, *3*(4), 731-736.

INTRODUCTION

Human activity today is oriented towards technological sophistication. Technology also affects the means to send messages, printing, cinema, and radio, so digital technology creates new interactions. Technological developments affect the exciting sectors, one of which is the education sector. Education is an important part of life, educational development must be oriented to the use of information, communication, and technology (Inayah, 2020; Sumardi, 2020). Education that is carried out today is carried out online by utilizing technological sophistication, if you look at the 21st-century education that is oriented towards technological sophistication and is network-based as the answer to navigating the 21st century. The fact is technology and knowledge are used as the only tools for interaction and communication between teachers and students, learning tools as a means of good knowledge compared to traditional teaching (Consculluela, 2020). There are 4 skills in the 21st-century skills: communication, collaboration, critical thinking, and creativity which were developed in 21st-century education into 6 skills proposed by Fullan and Langworthy character education, citizenship, communication, critical thinking, collaboration, and imaginative creativity (Gonzales, 2020; Orus, 2020).

In the 21st century, there are communication skills needed to produce graduates who can articulate thoughts and ideas effectively. Multimedia is an important thing in education that makes the classroom environment better by providing information by observing students (Jalinus, 2021; Vijayalakshmi, 2020). Communication skills in learning need to be supported by multimedia-based learning. Multimedia learning can improve the learning experience and have a positive impact on students, encouraging students to visualize learning content in different ways which consist of computer-based interactive multimedia that contains various kinds of content, such as images, video, text, graphics, animation, and sound effect accompanied by menu or instruction as a means of getting information (Habib, 2020; Krishnasamy, 2020).

The development of electronic student worksheets is used as a solution to achieve 21st-century skills, one of the multimedia innovations in the 21st century is paperless technology that has been implemented in Indonesia, such as e-LKPD or electronic-based student worksheets for better student learning (Rachmasari, 2019; Zahra, 2020). Based on multimedia in the 21st century, skills in the 21st century are linked to interactive multimedia. That can be applied in elementary school science learning. Following the objectives of learning science in elementary schools in terms of character education, one of which is that students can develop curiosity, positive attitudes, and awareness about the relationship between science, technology, and society,

and students can develop process skills to observe the surrounding environment (Arman et al., 2020).

Learning science in elementary schools must foster curiosity in students, elaborate social attitudes, appreciate, and respect the environment, as well as enrich knowledge based on the principles of science obtained. The basic science of process skills includes observing, classifying, predicting, measuring, inferring, and communicating (Andriana, 2015; Darmaji, 2020; Raj & Devi 2014). Therefore science learning in elementary schools is oriented to scientific skills, namely scientific inquiry, as scientific inquiry is learning that puts forward scientific investigation, in the process, students learn how to solve problems and how to investigate scientifically which allows students to learn about real life in science and scientific knowledge in life (Permana, 2020).

In connection with the sophistication of technology and online science learning at the elementary school level in the 21st century, multimedia innovations developed by digital-based teaching materials are e-LKPD which are oriented to scientific inquiry in the form of applications that make it easier for students to understand the material in electronic form, e-LKPD is a type of interactive LKPD that contains exercise sheets for students that can be completed digitally (Supriatna, et al., 2022). The use of e-LKPD has benefits, including the ability to simplify and reduce time so that the teaching and learning process becomes more effective, as well as being a learning tool that can attract student learning interest (Fikri, et al, 2022; Syafitri, et al, 2020).

The developed e-LKPD can be operated by students using Android-based smartphones and *windows*-based *desktop screens*. Very efficient and designed to make it easier for students to carry out online science learning. e-LKPD is based on scientific inquiry in presenting problems, stimulating problem formulation, identifying problems with the investigation, and looking for ways to find difficulties (Dewi & Puspita, 2021). The findings previously made by (Amthari, 2021) that e-LKPD products contain learning materials equipped with pictures and videos can attract students' attention in learning and support students' understanding of the material. The purpose of this research is to describe the development, feasibility, and response of students to e-LKPD based on scientific inquiry on compound elements, single substances, and mixed substances in science subjects in fifth-grade elementary school.

METHODS

This research is classified as research and development. Research and development is a process or method used to validate and develop products. This research method can be developed science based on the application of certain products in increasing work productivity (Purnama, 2013). The development model used to develop e-LKPD based on scientific inquiry on the science material is to use the 4-D development model developed by Thiagarajan consists of 4 stages (Dewi & Akhlis, 2016), namely:

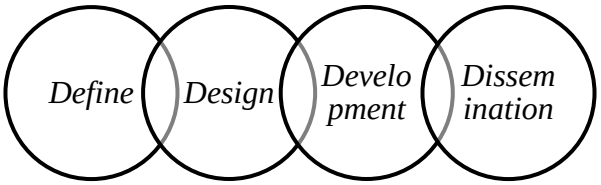

Figure 1. Research and Development Steps

1. Define

At this stage the researcher determines and defines the requirements that need to be in the development of e-LKPD, namely there is a needs analysis, curriculum analysis, and material analysis.

2. Design

The researcher now creates an e-LKPD design that satisfies the standards for a quality e-LKPD. Design refers to the initial design of the e-LKPD based on scientific research and the choice of application formats for the developed e-LKPD based on scientific research.

3. Development

At this stage, the researcher produces a revised e-LKPD product based on comments and suggestions from the supervisor which is referred to as draft 1. The next stage requires comments and suggestions from experts to determine the feasibility of e-LKPD, namely there is the validation of instrument experts, media experts, materials expert, and linguists. The product trial was carried out in the fifth-grade of Elementary school which was carried out online during learning. This trial is intended to determine student responses to the e-LKPD that has been developed by researchers.

4. Disseminate

This stage is the final stage contained in the 4-D development model, this stage tests the product to a wider range of things such as testing all students, testing in other classes, and testing in other schools. At this stage only limited dissemination to all students in class VB Elementary school.

The data used in this study are quantitative and qualitative. The data sources in this study were divided into two, namely primary data sources, namely the v class teacher at Elementary school, and secondary data

sources, questionnaires, and documentation. The population used by researchers in this study were students of class V Elementary school, totaling 30 students. Data collection techniques used questionnaires, unstructured interviews, and documentation. The inspection technique and the validity of the data in the expert test questionnaire using the Likert scale and the data validity technique based on the formula (Orozco, 2019) namely $= \frac{R}{SM} \times$ 100%, and the student response questionnaire using the Guttman scale, the data validity technique refers to (Arman et al., 2020) namely $= \frac{n}{N} \times$ 100%.

RESULT AND DISCUSSION

Learning science, one of the main subjects found in elementary school education units, examines the treasures of knowledge about objects in the universe by observing and exploring. This is in line with the expert's view of (Tias, 2017) that learning science as a subject in elementary school aims at providing knowledge, wading through observation activities, regarding various types and temperaments of the natural environment and the artificial environment. Science learning is supported by digital teaching materials, namely e-LKPD which is designed on an application basis as interactive teaching materials. e-LKPD is a student worksheet that contains a summary of the material, questions, and instructions for carrying out tasks that students must do in the learning process packaged in interactive multimedia (Awe, 2019).

The final product of this research is a scientific inquiry-based e-LKPD in this application containing activities that refer to scientific inquiry such as reading activities, observing pictures, cognitive questions that train critical thinking skills, as well as practical activities that lead students to trials, also making conclusions. in the form of photos or *videos* to the e-LKPD application. The scientific inquiry process contains questions that lead to discovery, and critical thinking concludes the results of activities based on the data obtained and is explained by documentation as evidence of the implementation of scientific activities (Baykara, 2018). To determine the feasibility of e-LKPD based on scientific inquiry, researchers conducted a feasibility test on the product developed with 2 validators from each instrument, namely material, language, and media expert instruments. E-LKPD feasibility tests were obtained from material experts, linguists, and media experts. The results of the feasibility test can be reviewed at the points below:

a. Material Validation

The validation process by material experts was carried out twice. The following is a table for evaluating e-LKPD by material experts.

Table 1. Material Expert Validation Results

No.	Aspect	Rating Score		Np (%) Total
		V1	V2	
1.	Content Eligibility	100%	100%	100%
2.	Serving Eligibility	85,71%	80%	82,85%
3.	e-LKPD based on scientific inquiry	100%	100%	100%
	Total	96,15%	94,61%	95,38%
	Average	95,38%		
	Criteria Advisability	Very Feasible		

Based on the table above, the results of the material expert feasibility test are 95.38% because the material contained in the e-LKPD includes assignments, materials, and practicum activities that are in sync with Core Competence and Basic Competencies, presenting coherent material and based on scientific inquiry. The e-LKPD material needs to be oriented towards the basic competencies to be achieved, the material can be in the form of a general description or scope (Prastowo, 2014).

b. Language Validation

The validation process by linguists was carried out twice. The following is the assessment table of e-LKPD by linguists.

Table 2. Linguistic Expert Validation Results

No.	Aspect	Rating Score		Np (%) Total
		V1	V2	
1.	Readability of language in e-LKPD	92%	88%	90%
2.	Clarity of information in e-LKPD	90%	100%	95 %
3.	Conformity using language in e-LKPD with Indonesian language rules	100%	95%	97,50%
	Total	96,15%	94,61%	95,38%
	Average	93,63%		
	Criteria Advisability	Very Feasible		

Based on the table above, the results of the linguistics expert test are 93.63% because the language in effective e-LKPD, the Enhanced Spelling synchronous sentence structure, the use of PUEBI synchronous terms, and the language used are in sync with the student's developmental level. E-LKPD uses language that is in synchrony with the level of development, using a clear and uncomplicated sentence structure.

c. Media Validation

The validation process by media experts was carried out twice. The following is the evaluations table of e-LKPD by media experts.

Table 3. Media Expert Validation Results

No.	Aspect	Rating Score		Np (%) Total
		V1	V2	
1.	Didactic	80%	72%	76%
2.	Construction	90%	95%	92,50%
3.	Technical	83,63%	72,72%	78,18%
Total		84,54%	79,90%	80,50%
Average		81,64%		
Criteria Advisability		Very Worthy		

Based on the table above, the results of the media expert feasibility test are 81.64% because e-LKPD is good at implying student activity, stimulating students to find concepts, having instructions for use, identity, order of material, sourced from clear and appropriate sources, e-LKPD design interesting. Whereas in e-LKPD there are conditions that are met, namely didactic conditions, namely e-LKPD needs to follow the principles of effective learning such as actively involving students, construction requirements namely e-LKPD have a systematic order, have learning objectives, have an identity, and so on, technical requirements include clear writing, appropriate images, and an attractive appearance (Trianto, 2013).

E-LKPD is a student worksheet, which was created electronically and can be utilized to support students' learning in the 21st century. According to findings from earlier research e-LKPD is a worksheet for students that contains a summary of the subject matter, question, and instructions for completing tasks containing text, audio, and visual components that are related to the fundamental competencies that must be attained, with the goal of assisting students in learning in a focused manner, actually e-LKPD are fundamentally the same as LKPD, expect that they only exist as electronic files that can be accessed on smartphone, laptop, and computers rather than as printed documents (Awe, 2019; Setiana, et al, 2019). This e-LKPD product is very useful for students in understanding the material because it has real images, animations, audio, and video links on the display that can pique students' interest in learning. Previous research has shown that e-LKPD products contain learning materials with pictures and videos that can attract students' attention in learning and support students' understanding of the material (Amthari, 2021).

Through this e-LKPD makes it easier for students to understand a material; additionally, the developed e-LKPD must use a model or skill that supports the e-LKPD. Scientific inquiry skills are used in this e-LKPD, so there are reading activities, observing pictures, questions that encourage students to be skilled in critical thinking, and practical activities that train students' scientific skills. The scientific inquiry includes questions that lead to discovery, critical thinking skills to carry scientific knowledge, conclusions based on results of the data obtained, and documentation as evidence of the implementation of scientific activities (Baykara, 2018).

The results of this scientific inquiry-based e-LKPD in the form of an application make it much easier for students to access it during the learning process because they do not have to open the browser-page first, it also has entertaining features and content to keep students' attention. Previous findings indicate that the developed e-LKPD in the form of .exe or applications has advantages over the printed LKPD. Equipped with a variety of activities and supported by interesting features or content that contribute to the product's quality and feasibility (Hidayah, 2020).

CONCLUSION

E-LKPD science based on scientific inquiry obtained material validation results of 95.38% in the "very feasible" category, language validation results of 93.63% in the "very feasible" category, and media validation results of 81.64% in the "very worthy" reasonable category. Student responses after undergoing a trial that linked 30 respondents scored 91.58% in the "very good" category. It was stated that the scientific inquiry-based e-LKPD got a positive response after the trial so it was good at being applied in learning activities.

REFERENCES

Amthari, W., Muhammad, D., & Anggereini, E. (2021). Pengembangan E-LKPD Berbasis Saintifik Materi Sistem Pernapasan Pada Manusia Kelas XI SMA. *BIODIK: Jurnal Ilmiah Pendidikan Biologi*, 7(3), 28-35.

Andriana, E. (2015). Analisis Kemampuan Kerja Ilmiah Mahasiswa Pendidikan Guru Sekolah Dasar Melalui Model Pembelajaran Berbasis Proyek Pada Mata Kuliah Pendidikan IPA di SD. *Jurnal Pendidikan Sekolah Dasar,* 1(2), 82-88.

Arman, A., Annisa, M., & Kartini, K. (2020). Pengembangan Perangkat Pembelajaran IPA Berkarakter Berbasis Integrasi Model Pembelajaran Problem Based Learning dan Keterampilan Proses Sains. *LENSA: Jurnal Pendidikan IPA*, 10(1), 1-10. https:// doi :10.24929/lensa.v10i1.90 .

Awe, Y. E., & Ende, I. M. (2019). Pengembangan Lembar Kerja Siswa Elektronik Bermuatan Multimedia Untuk Meningkatkan Kemampuan Kognitif Siswa Pada Tema Daerah Tempat Tinggalku Pada Siswa Kelas IV SDI RUTOSORO Di Kabupaten Ngada. *Jurnal DIDIKA,* V(2), 48-61.

Baykara, H., Yakar, Z., & Liu, S. (2018). Preservice Science Teachers Views About Scientific Inquiry. *European Journal Of Education Studies*, 4 (10), 128-143.

Cosculluela, L. C., Suarez, C., Quiroga, S., Sierra, S. N., Blasco, L. R., & Martinez, R. A. (2020). Flipped Classroom Model Before and During Covid-19: Using Technology to Develop 21st Century Skills. *Interactive Technology and Smart Education*, 18(2), pp.189-204.

Darmaji, K., Agus, D. K., Astalini., Perdana, R., Kuswanto., & Ikhlas, M. (2020). Do a Science Process Skills Affect On Critical Thinking in Science? Differences in Urban and Rural. *International Journal of Evaluation and Research in Education (IJERE)*, 9(4), 874-880. http://doi.org/10.11591/ijere.v9i4.20687

Dewi, P. I., & Puspita, V. (2021). Efektifitas E-LKPD Berbasis Pendekatan Investigasi Terhadap Kemampuan Berpikir Kritis Siswa Sekolah Dasar. *Scholar's Journal,* 5(1), 86-96.

Dewi, R. N., & Akhlis, I. (2016). Pengembangan Perangkat Pembelajaran IPA Berbasis Pendidikan Multikultural Menggunakan *Game* Untuk Mengembangkan Karakter Siswa. *Unnes Science Education Journal*, 5(1), 1098-1108.

Dwi, F. D., & Friska, N. (2019). Interaksi Model Pembelajaran Scientific Inquiry dan Penalaran Formal Terhadap Pengetahuan Ilmiah Fisika. *Proceedings of the National Seminar on Expo II Research Results and Community Service,* Medan. Thing. 1736-1742.

Gonzales, C. J., Agudelo, L. O., & Salinas, J. (2020). Key Competences, Education for Sustainable Development and Strategies for The Development of 21st Century Skills. A Systematic Literature Review. *Sustainability*. 12(24), 10366. https://doi.org/10.3390/su122410366 .

Habib, A., Astra, M. I., & Utomo, E. (2020). Media Pembelajaran Abad 21: Kebutuhan Multimedia Interaktif Bagi Guru dan Siswa Sekolah Dasar. *Journal Riset Teknologi & Inovasi Pendidikan*, 3(1), 25-35.

Hidayah, N. A., Winingsih, H. P., & Amalia, F. A. (2020). Pengembangan E-Lkpd (Elektronik Lembar Kerja Peserta Didik) Fisika Dengan 3d Pageflip Berbasis Problem Based Learning Pada Pokok Bahasan Kesetimbangan Dan Dinamika Rotasi. *Jurnal Ilmiah Pendidikan Fisika*, 7(2), 36-43.

Inayah, A. A., & Zubaidah, E. (2020). Implementation of Dakon -Themed Game Media: Encourage Curiosity 21st Century In Primary School. *Journal of Education and Learning (EduLearn)*, 14(4), 609-616. https://doi.org/10.11591/edulearn.v14i4.15091 .

Jalinus, N., Verawardina, U., Krismadinata., Nabawi, A. R., & Darma, Y. (2021). Development Blended Learning Model in Vocation Based on 21st Century Integrated Learning and Industrial Revolution 4.0. *Turkish Journal of Computer and Mathematics Education*, 12(8), 1239-1254.

Krishnasamy, S., Ling, S. L., & Kim, C. T. (2020). Improving Learning Experience of Probability and Statistics Using Multimedia System. *iJET*: 15(1). https://doi.org/10.3991/ijet.v15i01.11349 .

Orozco, B., Castillo, B. I., R., & Ramos, H. S. (2019). Neoaltar: An Interactive Multimedia Day Of The Dead Experience. *Elsevier Heliyon,* 6(2), 03339 https://doi.org/10.1016/j.heliyon.2020.e03339 .

Orus, L. M., Coscolluela, L. C., Toledo, V. S., & Sanchez, S. V. (2020). The Technological Challenge Facing Higher Education Professrs: Perceptions of ICT Tools for Developing 21st Century Skills, 12(13), 5339. https://doi.org/10.3390/su12135339 .

Permana, I. T., & Rofi'ah, L. N. (2020). Pengaruh Scientific Inquiry Terhadap Hasil Belajar Biologi. *Journal of Biology and Learning Biology,* 5(1), 33-41.

Prastowo, A. (2014). *Development Thematic Teaching Materials*. Kencana Prenadamedia.

Purnama, S. (2013). Method Research and Development. *LITERATURE*, 4(1), 19-32.

Rachmasari, M., Serevina, V., & Budi, S., A. (2019). Lembar Kerja Elektronik Peserta Didik Dengan Model Pembelajaran Berbasis Masalah Untuk Meningkatkan Kemampuan Berpikir Tingkat Tinggi. In *Proceedings of the National Physics Seminar (E-Journal)*: 8. https://doi.org/10.21009/03.SNF2019 .

Raj, R. G., & Devi, N. (2014). Science process skills and achievement in science among the high school students. *Sch. res. J. interdisciplinary.stud.* 2(15), 2435–2443.

Setiana, S. D., & Nuryadi, N. (2021). Analisis Efektivitas E-LKPD (Lembar Kerja Peserta Didik Elektronik) Berbasis Etnomatematika Batu Akik Ditinjau dari Kemampuan Awal Siswa. *Journal Gantang*, VI(2), 113-123. http://ojs.umrah.ac.id/index.php/gantang/index.

Sumardi, L., Rohman, A., & Wahyudiati, D. (2020). Does Teaching and Learning Process in Primary Schools Correspond to The Characteristics of The 21st Century Learning. *International Journal Of Instruction*, (13)3, p357-370.

Supriatna, A. R., Siregar, R., & Nurrahma, D. H. (2022). Pengembangan E-LKPD Berbasis Problem Based Learning Pada Muatan Pelajaran Matematika Pada Website Liveworksheets di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 4(3), 4025-4035. https://edukatif.org/index.php/edukatif/index .

Taluke, D., Ricky, S., M., & Lakat, A., S. (2019). Analisis Preferensi Masyarakat Dalam Pengelolaan Ekosistem Mangrove di Pesisir Pantai Kecamatan Loloda Kabupaten Halmahera Barat. *Journal City Territory Planning*, 6(2), 531-540.

Tias, U. I. (2017). Penerapan Model Penemuan Terbimbing Untuk Meningkatkan Hasil Belajar IPA Siswa Sekolah Dasar. *Dwijacendikia*, 1(1), 50-60.

Trianto. (2013). *Mendesain Model Pembelajaran Inovatif, Progresif, Konsep, Landasan, dan Implementasinya Pada Kurikulum Tingkat Satuan Pendidikan.* Kencana Prenada Media Group.

Vijayalakshmi, R., & Kumar, J. (2020). Role of Multimedia on Motivation and Knowledge Retention. *The International Journal of Analytical and Experimental Modal*, (12)4, pp.1500-1509.

Zahra, M., Abdurrahman, A., Herlina, K., Widyanti, R., & Agustiana, L. (2020). Teachers' Preceptions Of 3D Technology-Integrated Student Worksheet On Magnetic Field Material: A Preliminary Research On Augmented Reality in STEM Learning. *Young Scholar Symposium On Science Education and Environment (YSSSEE)*, 1796. doi:10.1088/1742-6596/1796/1/012083.