

# Interactive Learning Multimedia: A Shortcut for Boosting Gen-Z's Digital Literacy in Science Classroom

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## ARTICLE INFORMATION

### Article History:

Received: 17-07-2022

Accepted: 10-04-2023

### Keywords:

*interactive learning multimedia;*

*digital literacy;*

*Gen-Z*

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## ABSTRACT

This study aims to develop interactive multimedia to train generation Z's (Gen – Z) digital literacy. This research involved 46 generation Z in 8<sup>th</sup> Grade in two junior high schools in Makassar. Multimedia development uses the ADDIE model which consists of needs analysis, design, development and evaluation. The results shows multimedia learning declared feasible with a validity content of 1, and Gen-Z's digital literacy index of 3.30 or was in the medium category. Thus, it can be concluded that interactive multimedia learning can enhance Gen-Z's digital literacy. This research shows that science learning can contribute in improving digital literacy.

The 21<sup>st</sup> century is characterized by scientific innovations in various fields. This major innovation certainly requires competent human resources in order to adapt while contributing to the development of this science and technology. Referring to these conditions, all learning, including science learning, is expected to be able to improve 21st century skills. One of these skills is digital literacy (Abaniel, 2021; Buitrago-Flórez et al., 2021; Dishon & Gilead, 2021; Emara et al., 2021; Novitra et al., 2021; Semilarski et al., 2021). Digital skills or known as digital literacy are one of the abilities that must be possessed to be able to compete in this digital world. Digital literacy is skills in using technology, as well as accessing, understanding, assessing and communicating information obtained in the digital space in a safe way (UNESCO, 2018). Another definition of digital literacy is individual skills in the use of digital devices to search, sorting information, think critically and creatively, and communicate effectively through the digital landscape (Julien, 2019).

A study confirms that digital literacy can be trained through science learning. This is due to the utilization of scientific approach in the science classroom (Komang et al., 2020), where students are trained to look for relevant theories from various sources to verify the findings and concepts of science they are studying. In response to these opportunities, science learning should take a role in developing digital literacy to produce the 21st century generation. It can be done by digital-based science learning. Digital-based science learning can be applied by harnessing digital learning multimedia. This is supported by research that shows that science learning can enhance digital literacy by using learning multimedia (Aqmal Nurcahyo et al., 2020). Furthermore, the use of digital learning media can sharpen students' technological skills (Winasti et al., 2018).

Based on preliminary studies in two junior high schools that have used digital learning media in Makassar, it was found that 83.3% of science teachers design digital learning media using Microsoft Powerpoint which contains learning objectives, teaching materials, drawings and learning videos. However, the results showed that the use of learning media created with Microsoft Powerpoint can reduce teacher-student interaction, causing students to be less active in learning (Ding & Liu, 2012). In addition, although this school has used digital learning media, the results of the digital literacy index survey at the time of the preliminary study revealed that the digital literacy index of students in the two schools was 3.78 with the highest score of 5. This indicates that the digital literacy index in the two schools has not reached the good category. Therefore, efforts are needed to train students' digital literacy by optimizing the use of digital-based learning multimedia. Given the preliminary study result and the potential of enhancing digital literacy through science learning, this study aims to develop interactive learning multimedia that contains digital literacy competencies.

## METHOD

This study was research and development using ADDIE model. The research took place in two Junior High School in Makassar and involved 46 Gen-Z at 8<sup>th</sup> Grade on on 30<sup>th</sup> January – 31<sup>st</sup> May 2022. The research begun with the need analysis phase was conducted to acquire the students' and teachers' need as well as analysing the science curriculum as a baseline to design interactive multimedia. The following phase was designing multimedia and research instruments such as multimedia validation sheet, digital literacy questionnaire, and a set of questionnaire of teachers and students' response towards multimedia. Draft I of Multimedia and research instruments subsequently validated by experts in development phase. Draft I of Multimedia was declared valid by two experts in multimedia and science education with the content validity was 1. Similarly, the digital literacy questionnaire and questionnaire of teachers and students' response towards multimedia were valid with content validity value of 1. According to Gregory, multimedia and research instruments can be declared valid if the content validity value is more than 0,60 (Gregory, 2015). Furthermore, the digital literacy was acknowledged reliable with alpha Cronbach value of 0,930. The valid multimedia then implemented in science classroom in the implementation phase. Afterwards, Gen-Z's digital literacy was measured along with teachers' and students' response towards multimedia at the evaluation phase. The capacity of Gen-Z's digital literacy creating digital content, and digital safety.

## RESULT

### Interactive Learning Multimedia Validity

Validity test towards interactive learning multimedia measured two aspects namely usability (technical and structure) and science and digital literacy content.

**Table 1. Multimedia Validity Result**

Aspect	Content Validity Value	Validity Level
Usability	1	Very High
Science and Digital Literacy Content	1	Very High

Table 1 shows that interactive learning multimedia was valid on the aspects of usability and the content of Science and digital literacy.

**Table 2. Experts' Suggestions**

Expertise	Validator	General Evaluation	Suggestions
Multimedia	1	Multimedia can be used in limited field test without revision	-
	2	Multimedia can be used in limited field test with small revisions	Adding backsound to increase students' concentration and create a relax learning environment.
Science Education	1	Multimedia can be used in limited field test without revision	-
	2	Multimedia can be used in limited field test with small revisions	The concept's mind map shall be revised. Beside, insert one slide regarding the pressure on solid matter

Table 2 shows the experts suggestions on interactive learning multimedia. The suggestions were further used in revising interactive learning multimedia. The revised multimedia became draft II that was brought to limited field test. The limited field test was carried out in 1 science classroom that consists of 15 students. Table 3 and 4 shows Draft II interactive multimedia was meets the teachers' need as well as obtains great impressions of students.

**Table 3. Science Teachers' Response towards Interactive Multimedia during Limited Field Test**

No.	Questions	Suggestions
1	How is your impression towards the given interactive multimedia?	This learning media is very helpful for students' literacy in creating, and analyzing a problem.
2	How is the compatibility between the indicators of competence achievement and the substance pressure material presented on multimedia?	Thank God it is appropriate. The constraint is only on the estimation of time
3	Do you experience difficulties when using multimedia in learning? (Please accompany with explanation/reason)	Yes, for the current condition, the estimated time is very difficult, the science teacher is only given 1 hour in the meeting.
4	Is there a difference in substance pressure learning situations between classes that use multimedia and classes that do not use interactive multimedia?	Yes, there is a difference

5	How is student involvement in learning when using interactive multimedia learning?	Students are active in using learning media, actively ask questions and their learning motivation increases.
6	Suggestions and feedback for interactive learning multimedia improvements	This computer-based learning media really helps students understand physics concepts from the virtual experiments they conduct. Since time is limited, it is recommended that individual tasks on multimedia be made into group tasks

**Table 4. Students' Impression towards Interactive Multimedia during Limited Field Test**

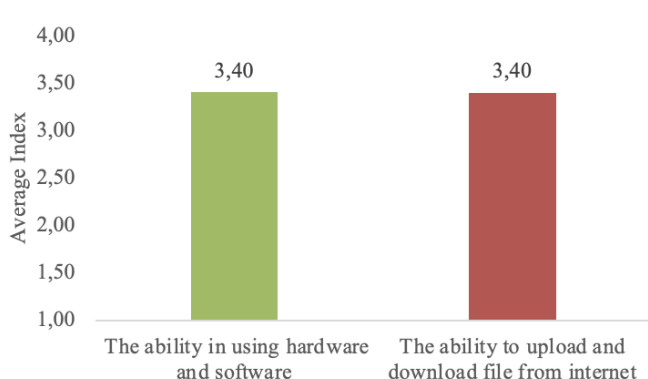
Student	Impression on Interactive Multimedia
1	Unique, cool, creative and makes learning easier
2	I love the virtual lab
3	Very good
4	I think interactive learning multimedia is easy to understand and Clear so that I can understand
5	Fun
6	Pretty Exciting
7	Make it easier to understand the material
8	Very exciting
9	Good
10	Fun
11	I like
12	Make experimenting easier
13	I like the material
14	Good
15	The material is good

**Digital Literacy Index**

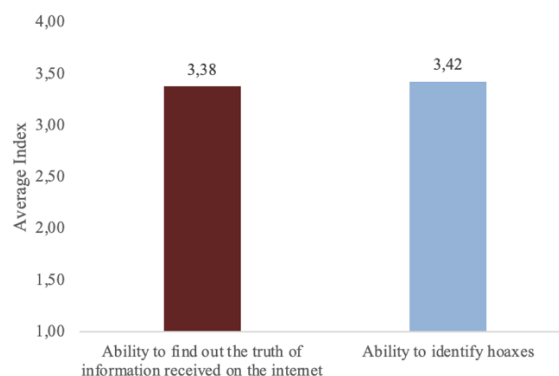
**Table 5. Students' Impression towards Interactive Multimedia during Limited Field Test**

Digital Literacy Competencies	Average	Criteria
The use of Technology	3,40	Medium
Information and Data Literation	3,40	Medium
Communication and Collaboration	3,40	Medium
Digital Content Creation	3,36	Medium
Digital Safety	2,94	Low
The average of Digital Literacy Index	3,30	Medium

Table 5 indicates that technical ability in utilizing technology, information and data literacy as well as communication and collaboration obtains similar index value of 3,40. On the other hand, digital content creation index is 3,36 and the lowest index shown by digital safety which obtains 2,94. The further analysis was carried out in each digital literacy competency.

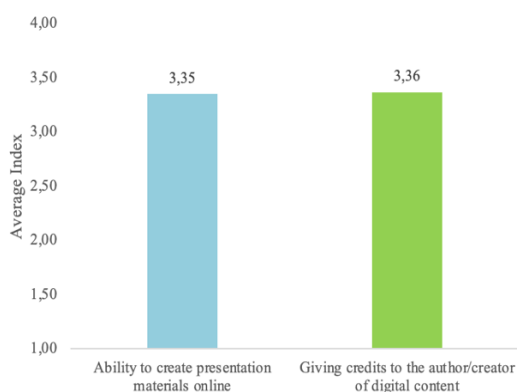


**Figure 7. The ability in using technology index**

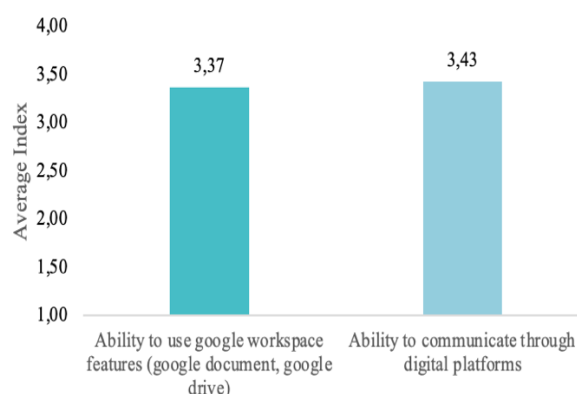


**Figure 8. Information and data literacy index**

Figure 7 shows the value of the digital literacy index in the sub-indicator of the ability to use hardware and software as well as the ability to download and upload data to the internet is 3.40 or is in the moderate category. Meanwhile, figure 8 shows the value of the digital literacy index for the sub-indicator of the ability to find out the truth of information received on the internet was 3.38 and the ability to identify hoaxes was 3.42. So it can be concluded that both sub-indicators are in the medium category.

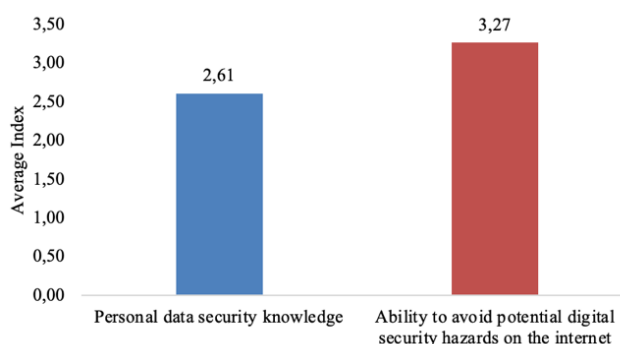


**Figure 9. Communication and Collaboration Index**



**Figure 10. Digital content creation index**

Figure 9 shows the digital literacy index value for the google workspace feature proficiency sub-indicator is 3.37. Meanwhile, the ability to communicate through digital platforms has an index of 3.43 or is in the medium category. Furthermore, figure 10 shows the index of digital content creation on each domains. The digital literacy index for the sub-indicator of the ability to make presentation materials online is 3.35 and the habit of including the name of the author/creator of the digital work is 3.36 or is in the moderate category.



**Figure 11. Digital Safety Index**

Figure 11 shows the index value for the security sub-indicator is 1) personal data security knowledge of 2.61 or is in the low category and 2) the ability to avoid potential digital security hazards on the internet by 3.27 or is in the medium category.

## DISCUSSION

### The Feasibility of Interactive Learning Multimedia

The feasibility of multimedia is assessed based on two aspects, namely the validation results of multimedia experts and material experts as well as the responses of teachers and students to interactive learning multimedia. The following outlines the feasibility of interactive learning multimedia in each aspect.

Experts' judgement. Reviewing the results of expert validation of structural, technical and material aspects of multimedia, it was obtained that interactive learning multimedia was declared valid and feasible for use. This is because interactive multimedia learning is equipped with a usage guidebook, making it easy for users to use. In addition, interactive learning multimedia features operate well and the multimedia installation process was running without any problems. In addition, video, simulation and audio content on multimedia can be played well. This is in line with the multimedia feasibility criteria developed by Thorn that interactive learning multimedia is declared feasible if it meets the requirements of ease of navigation, usability, multimedia learning design and compatibility (Pratama et al., 2019).

Furthermore, the feasibility of interactive learning multimedia on aspects of science and digital content is declared feasible by science education experts. This is because interactive learning multimedia is developed based on the science basic competency on pressure of matter and also digital literacy competencies. In regard with digital literacy content, multimedia is equipped with features to enhance Gen-Z's digital capacity in technology use, information and data literacy, communication and collaboration, digital content creation, dan digital safety. The following is a description of interactive learning multimedia design in terms of digital literacy content.

Competency in using technology is an important part of constructing an individual's digital literacy skills. Furthermore, competence in using technology consists of a basic understanding of software and hardware as well as basic knowledge of the internet (Kementerian Komunikasi dan Informatika RI, 2022). Based on these indicators, interactive learning multimedia is developed in the form of software to increase students' knowledge in operating software, as well as facilitating students in training the ability to use hardware by operating multimedia. In addition, interactive multimedia learning is also equipped with online student worksheets (LKPD). Worksheets created with Google documents allow students to learn how to connect hardware with the internet network via WiFi and Hotspot. In addition, this LKPD also facilitates students in getting to know search engines. Competency in information and data literacy. Interactive learning multimedia is equipped with material to recognize fake news or hoaxes. This is intended so that students can distinguish trusted and untrusted information sites and avoid fake news



Figure 12. Display of material – tips in recognizing fake news

Competency in communicate and collaborating. Communication and collaboration content is a digital literacy competency that focuses on the ability of individuals to communicate and collaborate through the digital landscape. To enhance these competencies, interactive multimedia learning is equipped with a virtual laboratory and an online students' work sheets (LKPD) using Google Document. Both features facilitate learners to work together in conducting virtual experiment activities and writing reports collectively. In addition, the existence of online LKPD can lessen learning time given that the worksheet can be done simultaneously through google document.

Digital content creation. Digital content creation focuses on developing individuals' abilities in creating digital content. In this case, students are directed to be able to create digital content in the form of presentation materials using online applications. Therefore, students are asked to create a pascal law experiment report into the form of presentation materials using Canva or Google Slides.

Digital safety. Digital safety is the ability of students to maintain the security of personal data when doing activities in the digital space. Therefore, interactive multimedia learning is equipped with material about the types of personal data that should not be shared with others. In addition, interactive multimedia learning contains material on the characteristics of websites that contain viruses or malware. It aims to prevents students' in being exposed to malware or virus.



Figure 13. Display of material on the type of personal data privacy



Figure 14. Display of Website Feature Material that contains viruses or malware

### Teachers' and Gen-Z's Response Towards Interactive Multimedia

The research findings reveals the average teacher's response to interactive learning multimedia is in the very good category. In line with this, the average percentage of responses for each aspect is in the range of 80% - 100%, so that teacher responses can be expressed in very strong categories (Riduwan, 2015). Another finding is that the benefit aspect obtains the

highest percentage of responses is 100%. Based on these data, it can be stated that interactive learning multimedia is very beneficial for Schools A and B, especially in overcoming the limitations of substance pressure practicum tools available in both schools. In addition, the existence of interactive multimedia makes learning time more efficient. The allocation of science learning time, which is limited to 40 minutes during the new normal, causes science teachers in Schools A and B to have to arrange learning time so that materials and practicums can be carried out. The existence of multimedia is very helpful in maximizing the allocation of very limited learning time. This is because interactive multimedia learning provides materials, virtual experiments and practice questions in one application, making it easier for teachers and students to access and utilize the multimedia. This is supported by research that reveals that the use of interactive learning multimedia can make it easier for teachers to deliver material creatively and improve the quality of learning (Guan et al., 2018; Kapi et al., 2017; Khoiriah et al., 2016; Stark et al., 2018).

Similarly, the Gen – Z's response towards interactive learning multimedia is in very good category. This is because multimedia is developed according to the needs of students. In addition, multimedia is accompanied by a user guide, so students can easily understand the procedure for using multimedia. On the technical aspect, multimedia can be easily installed on the hardware used by students, and the process of loading multimedia applications goes well. Likewise with the content on multimedia, both material, simulation videos, animations and virtual experiments went well. In addition, based on the results of observations during the multimedia implementation stage, students showed interest and enthusiasm in participating in learning. Several studies have confirmed that multimedia can stimulate students' interest in learning (Guan et al., 2018; Khoiriah et al., 2016). Furthermore, at this stage of multimedia implementation, students show their activeness by giving questions about the material being taught. In addition, students become very active, especially when working on virtual experiments with group friends. This is supported by the results of other studies that reveal that the use of multimedia can transform the learning environment from teacher-centered to student-centered (Coleman et al., 2016).

### Gen-Z's Digital Literacy

Digital literacy is an individual's skill in finding, processing, evaluating the information obtained through the digital space as well as individual skills in creating digital content and doing activities in the digital space in accordance with applicable regulations. Based on the results of the study, it was obtained that the average student literacy index was in the moderate category. This is in line with the results of a survey on the digital literacy status of the Indonesian people which shows that the digital literacy index of the Indonesian people is still in the moderate category (Kementerian Komunikasi dan Informatika RI, 2022). Similarly, another research also reveals that Gen-Z's digital literacy is in good category (Naci Çoklar & Tatli, 2021; Stjepić et al., 2019). The results is further analyze on digital literacy index on each competency and the role of interactive learning multimedia.

Three digital literacy competencies, namely the ability to use technology, information and data literacy, communication and collaboration, obtained the same average index in moderate category. This is because the interactive learning multimedia developed can facilitate students in honing their digital literacy competencies. For example, competency content using technology as well as communication and collaboration competencies are presented in various forms such as virtual laboratories and Google Document-based LKPD to train students' ability to use technology to support learning, as well as train students to collaborate through real-time LKPD work through Google Docs. In addition, students are instructed to make presentation materials from the LKPD created. The creation of this presentation material utilizes an online graphic design application, namely Canva. The creation of percentage materials using Canva also allows students to work collectively in real-time which is part of the digital literacy competencies of "communication and collaboration" as well as "digital content creation". Here's an example of a presentation slide created by a student.



Figure 15. Cover

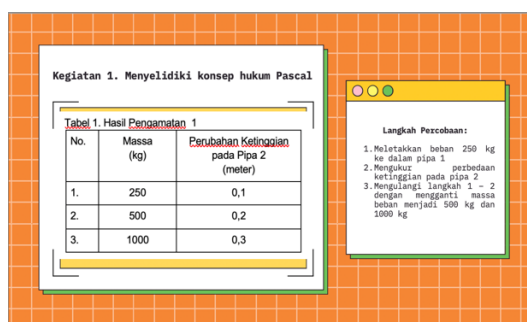


Figure 16. Slide of experiments procedure

Kegiatan 2. Menyelidiki tekanan kedua pipa dengan kedalaman tertentu

Tabel 2. Hasil Percobaan 2

No.	Massa (kg)	Kedalaman (meter)	Tekanan pada Pipa 1 (Pa)	Tekanan pada Pipa 2 (Pa)
1.	500	2	114,929	114,929
		3	124,500	124,500
		3	115,400	115,400
2.	1000	2	115,400	115,400
		3	125,319	125,319

Langkah Percobaan:

1. Meletakkan beban 250 kg ke dalam pipa 1
2. Mengukur tekanan pada pipa 1 dan pipa 2 di kedalaman 2 meter
3. Mengulangi langkah 1 dan 2 dengan mengganti kedalaman menjadi 3 meter
4. Mengulangi langkah 1 dan 2 dengan beban 1.000 untuk kedalaman 2 dan 3 meter

Figure 17. Experiment Result Slide

Kesimpulan

Tekanan yang diberikan pada zat cair dalam ruang tertutup melalui beban yang diberikan, akan diteruskan ke segala arah dengan besar yang sama.

Figure 18. Conclusion Slide

Furthermore, information and data literacy also obtained an index with a moderate category. This achievement is supported by the existence of material on interactive learning multimedia that discusses the characteristics of fake news and how to identify it. Another finding is that the digital literacy index on digital security competencies is in the low category. This is because there are still many students who admit that they upload personal data such as cellphone numbers, home addresses and dates of birth on social media that they have.

Based on the achievements of each competency, it can be stated that the interactive learning multimedia developed can facilitate students in training their digital literacy competencies. This finding is supported by a study that confirms that the use of interactive multimedia can improve students' digital literacy (Aqmal Nurcahyo et al., 2020). Other research revealed that technology-based learning can improve students' digital literacy (Atmanegara, 2019; Brata et al., 2022).

## CONCLUSION

Interactive learning multimedia that is feasible to use contains core competencies, basic competencies, learning objectives, materials, simulations, videos, practice questions and virtual laboratories. Multimedia feasibility is indicated by the validation results of multimedia experts and material experts who each show a content validity of 1 or 100% or meet the criteria for the feasibility. In addition, the feasibility of multimedia is evidenced by the response of teachers and the response of students who are in the very good category. Furthermore, interactive learning multimedia can improve Gen – Z's digital literacy. This is because multimedia learning contains material that includes five digital literacy competencies, namely competencies in using technology, information and data literacy, communication and collaboration, digital content creation, and digital security. The value of the student's digital literacy index after learning science using interactive learning multimedia is 3.30 or is in the medium category.

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