

UTILIZATION OF DIGITAL WORKSHEETS FOR CREATIVE THINKING: SYSTEMATIC LITERATURE REVIEW

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Abstract. 21st-century education requires creative thinking skills and should always follow technological developments. This research aims to ensure that digital worksheets influence creative thinking skills. This research uses a systematic literature review method. A total of 10 articles are included in the data analysis stage. The article was obtained using Harzing's Publish or Perish tool. The findings of this research, digital worksheets can train creative thinking skills and can be used as a learning guide. Used by teachers and students in the learning process as a medium for creative and innovative teaching materials, it can improve understanding and attention. It can attract students' interest in learning. Digital worksheets are easy to use and easy to access via various devices such as telephones and computers. Teachers can develop digital worksheets further by focusing on integrating digital worksheets with other digital learning platforms and using these digital worksheets to practice other thinking skills.

Keywords: digital worksheets; creative thinking; learning.

INTRODUCTION

The development of science and technology has entered an increasingly sophisticated era, including in the field of education (Hubers et al., 2022; Mulyani & Haliza, 2021). This phenomenon needs to be responded to by emphasizing 21st century learning to face the industrial revolution 4.0 (Panie et al., 2023). Learning activities need to focus on skills that are relevant to the modern world, including skills for creative thinking and adaptive attitudes in using technology (Solfitri et al., 2023; Trilling & Fadel, 2009). Creative thinking refers to the ability to produce ideas or solutions in the problem-solving process, which is characterized by the creation of something new from ideas, descriptions, concepts, experiences, and knowledge that is useful and appropriate to the given task (Hadar & Tirosh, 2019; Perry & Karpova, 2017; Suherman & Vidákovich, 2022). To measure creative thinking abilities, used three indicators, namely: (1) fluency is an individual's ability to generate various responses and solution paths to a problem; (2) flexibility refers to an individual's ability to change the path of thinking when facing a dead end or thought barrier; and (3) originality as an individual's ability to find unique, uncommon (rare) and new solutions (Amabile, 1983; Kaufman & Sternberg, 2010; Siswono, 2006; Torrance, 2018).

In order to train students' creative thinking skills when learning, teachers need to prepare learning tools, one of which is media. Learning media is a tool that can help the teaching and learning process so that the meaning of the message conveyed becomes clearer and learning objectives can be achieved effectively and efficiently (Nurrita, 2018). Learning media that is suitable for application in 21st-century learning is media with the help of technology, or what is called digital media. The application of digital worksheets can be an alternative learning media that can be used (Andini et al., 2022; Subakti et al., 2021). Digital worksheets are media in the form of teaching materials that can be used as guides, guidelines, and learning resources, containing sheets of practice questions that students must work on and use with the help of digital devices such as gadgets, laptops, and computers so that digital worksheets do not need to be printed (Andini et al., 2022; Komalasari et al., 2022; Purnama & Suparman, 2020; Yudha & Yuliani, 2023). In general, digital worksheets contain components including titles, learning instructions, competencies to be achieved, activity guidelines, evaluation, and assessment.

The current situation in schools is that the use of digital worksheets needs to be considered optimal. This condition occurs in elementary schools, middle schools, high schools, and universities.

The teaching material media used by teachers is still conventional; teachers have difficulty developing student worksheets independently so teachers only buy student worksheets from publishers (Adawiyah et al., 2021; Noprinda & Soleh, 2019; Nurhaliza & Titikusumawati, 2023; Putri & Astawan, 2022; Solfitri et al., 2023; Utami & Dafit, 2021; Yudha & Yuliani, 2023). In fact, the student worksheets given to students really help train their creative thinking skills (Asshidiq M. N et al., 2023; Setiatun et al., 2022; Subakti et al., 2021). The more practice questions students do, the more they will enrich their knowledge in solving specific problems. Students will become accustomed to providing new and adaptive solutions. The use of digital worksheets also helps teachers make it easier to deliver learning material to students. The ease of access to digital worksheets allows students to study anywhere and at any time as long as the device is connected to an internet connection. Digital worksheets can also train students' independence and increase motivation in learning (Sariani & Suarjana, 2022). So, in the learning process at school, learning tools such as media in the form of teaching materials should be presented in digital form.

Previous research suggests that the use of digital worksheets can facilitate learning at school and help improve students' creative thinking skills (Asshidiq M. N et al., 2023; Lestari et al., 2022; Mariyana et al., 2023; Noprinda & Soleh, 2019; Setiatun et al., 2022). Research by Asshidiq M. N et al. (2023) and Subakti et al. (2021) shows that the level of effectiveness of digital worksheets on creative thinking abilities received an n-gain score in the medium category. Developing digital worksheets also requires particular strategies that teachers must pay attention to (Warodiah et al., 2021). So with the diversity of effects that the use of digital worksheets has on creative thinking skills, this research aims to map the use of digital worksheets for teachers on students' creative thinking skills. This research is essential to carry out because it can be used as consideration and reference material for teachers in order to develop learning media that is relevant to learning objectives.

RESEARCH METHOD

This type of writing uses a systematic literature review research method. The position of a systematic literature review is secondary studies. Systematic literature reviews are beneficial for synthesizing various relevant research results that have been carried out, so that they will present the facts comprehensively (Siswanto, 2010). The steps taken are 1) formulating research questions; 2) conducting a literature search; 3) data collection and data quality selection; 4) carrying out analysis, synthesis, and interpretation of data; and 5) presenting research results (Thomé et al., 2016). Based on the phenomenon of using digital worksheets, this research will answer research questions. First, analyze the effectiveness and validity of using digital worksheets. Second, identify the benefits of digital worksheets for teachers and students. Third, describe the advantages of digital worksheets. Fourth, determine a strategy for developing digital worksheets for teachers and learning media developers.

The literature search was carried out using Harzing's Publish or Perish 8 tool, with data sources coming from Google Scholar and Crossref. The Publish or Perish (PoP) application is beneficial in searching for scientific references in the form of previous research articles or online books (Iramadhanian & Yahfizham, 2023). Both Google Scholar and Crossref are software services that researchers use to carry out scientific publications of research results, and more than 1000 universities in the world already store their research in this software (Hendricks et al., 2020; Rafika et al., 2017). Both software are easy to use, so they have become one of the primary references for researchers when searching for scientific literature.

The research questions that have been formulated will take this research to the literature search stage. The keywords included are "student worksheet," "digital student worksheet," "creative thinking," and "thinking skills." Thirty-two documents of literature were obtained, and then data quality selection was carried out according to the data criteria set out in Table 1. So, ten documents of relevant literature were obtained and entered the data analysis, synthesis, and interpretation stage.

Table 1. Data Criteria

Types of Publications	Yes/No
Journal Articles	Yes
Proceeding	Yes

Research Methods	Yes/No
Quantitative	Yes
Research and Development	Yes
Access	Yes/No
Online	Yes
Year of Publication	Yes/No
2020 – 2023 (3 years)	Yes
Research Variabel	Yes/No
E-Worksheet	Yes
Creative Thinking	Yes

Data analysis, synthesis, and interpretation were carried out to answer research questions by summarizing various research results (Siswanto, 2010). The research results are presented so that they can answer the research questions.

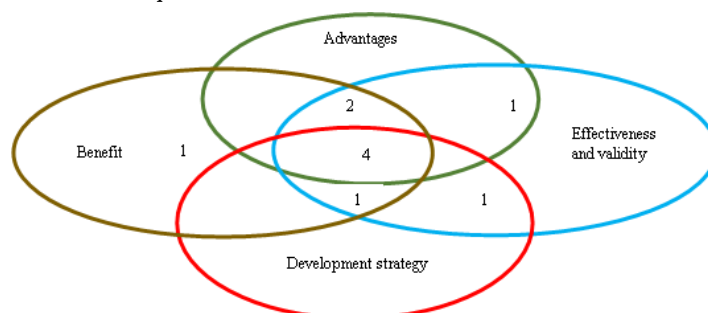


Figure 1. Article Relevant to The Research Problem

Of the ten relevant literature obtained, all came from Indonesia. The fourth article discusses effectiveness and validity analysis, benefits, advantages, and strategies for developing digital worksheets. Two articles discuss the effectiveness and validity, benefits, and advantages of digital worksheets. One article discusses the effectiveness and validity of digital worksheets and their advantages. One article discusses the effectiveness and validity of digital worksheets and development strategies. One article discusses the effectiveness and validity, benefits, and strategies for developing digital worksheets. One article discusses the benefits of digital worksheets for creative thinking.

RESULT AND ANALYSIS

Based on a systematic literature review of the literature that has been obtained according to the criteria, ten articles analyze the effectiveness and validity of digital worksheets, their benefits, advantages, and development strategies.

1.1 Review Article Findings

The year of publication of the articles obtained was in the range of 2020 – 2023, with a total of one article published in 2020, one article published in 2021, four articles published in 2022, and 4 articles published in 2023. Articles published in proceedings and journals have a good reputation, as shown in Table 2. The proceedings articles indexed by Scopus consist of one document in the Proceedings of the 7th International Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS 2020). The articles published indexed by Sinta consist of nine documents with two documents coming from the same journal. The journal consists of the Scholar's Journal: Journal of Mathematics Education indexed by Sinta 4 with one document; The Journal of Chemical Education (JPKim) is indexed by Sinta 2 as two documents; Axiom: Mathematics Education Study Program Journal indexed by Sinta 2 as one document; Pendipa: Journal of Science Education indexed by Sinta 4 as one document; The MIPA Education Journal is indexed by Sinta 4 as one document; The Journal of Educational Research and Evaluation is indexed by Sinta 2 as one document; The Iqra' Journal of Educational Studies is indexed by Sinta 2 as one document; and the Undhiksa Physics Education Journal is indexed by Sinta 4 as one document.

Table 3 presents the distribution of documents and index descriptions. There is one Scopus-indexed document with paper ID A01. Five Sinta 2 indexed documents with paper IDs A03, A04, A07, A08, A09. And four Sinta 4 indexed documents with paper IDs A02, A05, A06, and A10. Furthermore, for the research design of the selected documents, there are two research methods chosen, namely Quantitative and Research and Development (RnD). Table 4 describes the Quantitative design; there is one document with paper ID A03. Meanwhile, for RnD design, there are nine documents with paper IDs A01, A02, A04, A05, A06, A07, A08, A09, and A10.

Table 2. Articles Relevant to Research Topics

Paper ID	Author	Year	Type of Publication		Publisher	Indexing
			Journal	Proceeding		
A01	Dwi Septiana Sari et al.	2020		Proceedings of the 7th International Conference on Research, Implementation, and Education of Mathematics and Sciences (ICRIEMS 2020)	Atlantis Press	Scopus
A02	Dwiki Prasetya Subakti et al.	2021	Jurnal Cendekia: Jurnal Pendidikan Matematika		Universitas Pahlawan	Sinta 4
A03	Suci Desmarani et al.	2022	Jurnal Pendidikan Kimia (JPKIM)		Universitas Negeri Medan	Sinta 2
A04	Annisa Oktavia Lestari et al.	2022	Aksioma: Jurnal Program Studi Pendidikan Matematika		Universitas Muhammadiyah Metro	Sinta 2
A05	Shafira Putri Andini et al.	2022	Pendipa: Journal of Science Education		Universitas Bengkulu	Sinta 4
A06	Shofiyah Qonitah et al.	2022	Jurnal Pendidikan MIPA		STKIP Taman Siswa Bima	Sinta 4
A07	Titi Solfitri et al.	2023	Journal of Educational Research and Evaluation		Universitas Pendidikan Ganesha	Sinta 2
A08	Mariyana et al.	2023	Jurnal Pendidikan Kimia (JPKIM)		Universitas Negeri Medan	Sinta 2
A09	Rr Tasya Noor Nabila & Agus Kamaludin	2023	Jurnal Iqra' Kajian Ilmu Pendidikan		Institut Agama Islam Maarif NU Metro	Sinta 2
A10	Asshidiq M. N. et al.	2023	Jurnal Pendidikan Fisika Undiksha		Universitas Pendidikan Ganesha	Sinta 4

Table 3. Distribution of quartile and documents

Index	Number of documents	Paper ID
Scopus	1	A01
Sinta 1	0	-
Sinta 2	5	A03, A04, A07, A08, A09
Sinta 3	0	-
Sinta 4	4	A02, A05, A06, A10
Sinta 5	0	-

Table 4. Summary of main study design

Main study design	Number of documents	Paper ID
Quantitative	1	A03
Research and Development	9	A01, A02, A04, A05, A06, A07, A08, A09, A10

Table 5. References to Articles Relevant to the Research Topic

Research Topic	Articles
Effectiveness and validity of digital worksheets	Andini et al., (2022); Asshidiq M. N et al., (2023); Desmarani et al., (2022); Lestari et al., (2022); Mariyana et al., (2023); Nabila & Kamaludin, (2023); Qonitah et al., (2022); Sariyani & Suarjana, (2022); Solfitri et al., (2023); Subakti et al., (2021)
Benefits of digital worksheets	Andini et al., (2022); Desmarani et al., (2022); Mariyana et al., (2023); Qonitah et al., (2022); Solfitri et al., (2023); Subakti et al., (2021)
The advantages of digital worksheets	Andini et al., (2022); Desmarani et al., (2022); Lestari et al., (2022); Mariyana et al., (2023); Nabila & Kamaludin, (2023); Qonitah et al., (2022); Solfitri et al., (2023); Subakti et al., (2021)
Digital development strategy worksheets	Andini et al., (2022); Mariyana et al., (2023); Nabila & Kamaludin, (2023); Qonitah et al., (2022); Sariyani & Suarjana, (2022); Solfitri et al., (2023)

1.2 Effectiveness and validity of digital worksheets

Findings from the literature obtained show that digital worksheets that have been developed are practical in students' creative thinking (Asshidiq M. N et al., 2023; Desmarani et al., 2022; Lestari et al., 2022; Mariyana et al., 2023; Solfitri et al., 2023; Subakti et al., 2021). Developed are practical in students' creative thinking happened because there was an increase in pretest scores to posttest scores after using digital worksheets in learning. This increase in creative thinking abilities occurs because students are facilitated to carry out activities that can achieve each of the creative thinking indicators, namely fluency, flexibility, and originality through the digital worksheets developed (Solfitri et al., 2023). These activities include students being able to ask open questions and students being allowed to find solutions to the problems they face. Apart from the digital worksheet media itself, effectiveness can be achieved because the role of the teacher is successful in conditioning learning in the classroom; the teacher teaches very well so that students can give full attention during the learning process (Mariyana et al., 2023).

Before digital worksheets are implemented for students, the media is validated by validators consisting of material expert validators, media experts, and practitioner experts. The validation results from the three validators are valid even though there are revisions that must be corrected first (Andini et al., 2022; Nabila & Kamaludin, 2023; Qonitah et al., 2022; Sariyani & Suarjana, 2022). Instruments validated by material experts are related to aspects of the appropriateness of content and language, including the suitability of the material presented with the competencies to be achieved

and the use of language that is easy to understand and following PUEBI (General Guidelines for Indonesian Spelling). In the aspect of content suitability, validators assess that the material in digital worksheets can foster creative thinking abilities, namely fluency, flexibility, and originality (Qonitah et al., 2022).

Instruments validated by media experts are related to graphic aspects and presentation aspects, including appearance, color, design, and layout. Instruments validated by expert practitioners include aspects of appropriateness of content, linguistic aspects, and presentation aspects consisting of presentation techniques, presentation of learning material, and presentation of learning. Validity is an important thing that must be fulfilled before implementing learning media for students because if the digital worksheet instrument is valid, then it can be interpreted that this digital worksheet can be used to measure indicators of students' creative thinking.

1.3 **Benefits of digital worksheets**

Digital worksheets act as a learning medium that is used during the learning process at school, having benefits that teachers and students can feel at the same time. Digital worksheets are included in the type of online media, so they can be used as a means of discussion between teachers and students even though they are not in the same classroom, but they are in the same virtual space (Solfitri et al., 2023). Digital worksheets can motivate students to learn because the display of digital worksheets is designed attractively with a combination of colors, typefaces, and layouts that are appropriate for students' ages. This suitability is essential to design because the visual appearance of learning media can speed up and clarify students' understanding (Andini et al., 2022; Qonitah et al., 2022; Silfianah, 2020). Apart from that, digital worksheets also make it easier for students in the learning process; because of this type of online media, teachers can provide digital worksheets before class learning begins (Subakti et al., 2021). Digital worksheets can be given when students are at home so that students can study the material first and try to answer the questions given. Students have material for discussion during class. Techniques like this help teachers in conveying lesson material in class and are very helpful in conditioning students when studying in class (Desmarani et al., 2022).

Through digital worksheets, students can enrich themselves with practice questions contained in the digital worksheets (Mariyana et al., 2023). Because the main content of digital worksheets predominantly contains exercises - practice questions according to the material being studied. This dominant proportion of practice questions can help trigger students to practice creative thinking, namely finding various kinds of solutions to the problems in the questions they are facing. The more students practice in this matter, the more their problem-analysis skills will be honed. These digital worksheets can be interpreted as a helpful medium as a source of independent learning for students (Desmarani et al., 2022). Just by accessing digital worksheets via an electronic device connected to the internet, students can study independently at home. Students can access a summary of important material included in digital worksheets and can access material connected to YouTube videos and other learning games. So, with only one medium in the form of digital worksheets that can be accessed independently, students can successfully gain diverse learning experiences (Nabila & Kamaludin, 2023; Qonitah et al., 2022).

1.4 **The advantages of digital worksheets**

The various types of learning media that exist provide many choices for teachers to determine the correct type of learning media for their students. Digital worksheets are a learning medium that can be used with various advantages. Teachers and students can easily access digital worksheets via laptops or devices (Nabila & Kamaludin, 2023; Solfitri et al., 2023). According to data from the Central Statistics Agency (BPS), 67.88% of the Indonesian population aged 5 years and over will already have a device by 2022 (Central Statistics Agency, 2022). The existence of this data supports the implementation of the use of digital worksheets for students at both elementary school, middle school and university levels. The use of digital worksheets in learning can increase students' cognitive achievements, in this case, creative thinking (Mariyana et al., 2023; Qonitah et al., 2022; Solfitri et al., 2023; Subakti et al., 2021). Digital worksheets are a form of stimulus to trigger learning activities oriented toward students' creative thinking activities. Stimulus is needed as a trigger for learning and stimulation so that the positive reciprocal response that the teacher wants toward students emerges. In line with Indriyani's (2019) research on learning media, media is critical as a stimulus to help teachers achieve cognitive learning goals, so teachers are really needed to develop learning media that suit student characteristics.

Apart from that, digital worksheets can also facilitate students giving open-ended answers (Andini et al., 2022; Solfitri et al., 2023). The questions asked ask students to provide various solutions to problems, perhaps even more than one answer. It is possible for students to provide different answer descriptions but still have the same type of solution. Therefore, the development of this digital worksheet is designed so that students can provide answers in the form of detailed and long explanatory text so that it is not only designed as multiple choice or matching. These various forms of questions can provide particular interest for students (Andini et al., 2022; Subakti et al., 2021). The impression obtained is that it is varied; teachers become more creative and can make more innovations in developing practice questions. Digital worksheets can be used to insert other multimedia elements, not only text but also visual elements such as images and animations, as well as audio-visual elements such as learning videos (Desmarani et al., 2022; Subakti et al., 2021). The variety of types of media that can be combined in digital worksheets can add to students' learning experiences so that the learning they do feels meaningful.

Digital worksheets are included in the type of online learning media, so this media can shorten reading time in class so that it can be used for discussions or other meaningful activities (Desmarani et al., 2022). These digital worksheets can be given to students before learning takes place. Students can also study it in advance, anytime and anywhere. That way, students will also feel confident in class because they have previously studied the material that will be taught in class at that time. Apart from that, because it is online, the practice questions that students work on can be directly monitored by the teacher and will automatically be assessed. In this way, students can immediately know the results of their efforts so that students can repeat themselves if they feel the results are not satisfactory because the questions are designed as student practice. Learning will also feel more efficient because students can work on practice questions not only in class (Lestari et al., 2022).

With the various advantages that digital worksheets have, of course, some obstacles accompany them. Reporting from the results of a survey conducted by KPAI (2021) regarding the implementation of distance learning, it is known that 53.6% of students who use gadgets, laptops, and computers do not have wifi facilities at home, and 46.4% have wifi facilities, so students use internet network through an internet quota provider which is considered more expensive. This condition needs to be taken into consideration for teachers who will use learning media in their classes. A possible solution is to choose learning media according to student characteristics, such as student learning styles and the student's family economic background. Teachers need to consider using online media that does not require an extensive internet network.

Moreover, teachers collaborate with school principals to facilitate learning at school by installing wifi, if wifi is not yet installed at school. So what is needed to overcome the obstacles above is the importance of teachers choosing appropriate learning media and collaborating with schools in procuring new facilities such as wifi. However, in the learning process in the classroom amidst increasingly sophisticated technological conditions, teachers and schools need to follow and respond to the challenges of current developments.

1.5 **Digital development strategy worksheets**

To produce digital worksheets that are useful and influential for students, teachers, and learning media, developers need to pay attention to the development strategies that need to be implemented. First, digital worksheets must contain a cover, foreword, table of contents, instructions for use, title, student identity, core competencies, essential competencies, learning indicators, learning objectives that are in line with the curriculum, a summary of critical material, project activities in the form of practice questions. in accordance with creative thinking indicators, discussion columns, appendixes and bibliography (Andini et al., 2022; Nabila & Kamaludin, 2023; Qonitah et al., 2022; Sariyani & Suarjana, 2022; Solfitri et al., 2023). Second, digital worksheets that are developed need to pay attention to the appearance of the media, including the variety of letters used, the menu layout on the media, and the colors chosen (Qonitah et al., 2022). Third, the variety of media inserted must be diverse, such as inserting clear and high-resolution images, inserting videos or video links connected to other learning platforms, and inserting relevant animations or cartoon images (Mariyana et al., 2023; Nabila & Kamaludin, 2023; Qonitah et al., 2022; Sariyani & Suarjana, 2022). In line with research by Atasoy and Ergin (2017), it is revealed that inserting relevant animations or cartoon images according to the material can help students express their thoughts and make decisions without guidance from the teacher. They have the potential to complete

discussions in their groups. This digital worksheet development strategy can help teachers and learning media developers produce suitable media and have an impact on learning in class.

CONCLUSION

Based on the description of the findings above, digital worksheets are effective in improving students' creative thinking skills. Digital worksheets provide opportunities for students to ask open questions, and students are allowed to find solutions to the problems they face, thus triggering creative thinking activities for students. The benefits and advantages of digital worksheets can be considered by teachers to be implemented in the classroom while still paying attention to student characteristics. Digital worksheets are one of the online learning media that is creative innovative, and can improve students' better understanding. Digital worksheets are easy to use and easy to access via various devices such as gadgets, laptops, and computers. Apart from that, to develop digital worksheets, there are development strategies that must be considered, such as the content that must be available, the display design, and the variety of media inserted. Teachers can develop digital worksheets further by focusing more on increasing the level of creative thinking achieved, integrating digital worksheets with other digital learning platforms such as Canva and Quizziz, including quality visualization, and using these digital worksheets to practice other thinking skills.

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