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An Integrative Review: The Power of Digital Learning Media in Influencing Learning Styles That Teachers Should Be Considered

Yunisca Nurmalisa, Sunyono, Dwi Yulianti, Risma Margaretha Sinaga

Abstract—**The future of online learning or cybergogy known by several terms, such as blended learning, flipped classroom, or hybrid is something that cannot be avoided. This compelling situation is not due to the COVID-19 pandemic alone but has become a necessity for every student from school to higher education. This article aims to analyze and explain understanding in education related to the concept of "digital media", and all student responses including "learning styles", and related concepts, by reviewing, and synthesizing the literature using in an integrative review. A total of 154 qualitative and quantitative articles published between 2000 and 2020 were reviewed. Based on the inclusion analysis, 25 articles reveal things related to "digital media" and the behavior of students' "learning style" responses and what digital learning media should be. Concerning what is embedded in digital media that can result in different reactions from one another, digital learning media should be made by considering the behavioral reactions of students' "learning style" responses.**

Keywords: Digital Media, Learning Style, Learning Approach, Cybergogy.

I. INTRODUCTION

Digital media for learning (cybergogy) currently faces many challenges not only in terms of content, but also the distinctive challenges faced by educators in terms of how young people perceive, gather, and communicate to improve and build new technologies [1], [2]. Digital media facilitate distance education, blended learning, or virtual learning where students more easily access information by adjusting their own time [3], [4]. In this regard, teachers must choose the right learning media and learning methods in delivering teaching materials by adjusting the learning characteristics of the students they teach. Of course now what has changed is the nature of media, not about education it means education will always be empirical, theoretical, and practical, but learning media is always evolving according to learning needs and therefore it is justified that schools use media tools to students understand learning better [5]

Learning media development is also followed by determining the appropriate learning style. so that in carrying out learning, what must be considered is learning styles related to typical learning such as determining learning styles, combinations of learning styles, learning style profiles, and involvement of learning styles. [3], [6]–[8]. As a learning experience, it would be better if the learning method chosen by the teacher was following the learning style and learning media used. So that it can support the development of student skills, and the efficiency of the media used (Blaschke, 2012; Kurucova et al., 2018; Lee et al., 2012)

A. Aims

This integrative review was conducted to identify the influence of digital media in determining learning styles by analyzing definitions and examples in the existing literature

B. Research Question

What should teachers consider in capitalizing on digital learning media so that the use of digital learning media can be of maximum benefit to student learning?

II. METHOD

A. Search Strategy

Online electronic databases such as Google Scholar, SAGE Publications, ERIC, ScienceDirect, Social Sciences Citation Index®, Taylor & Francis Online, and systematically searched using a combination of the following keywords: media, digital, learning. Keywords are illustrated in table 1.

TABLE 1 KEYWORD SEARCH

Keywords Used in Search
Technology, Digital Technology, Digital Cultures, Digital Learning, Digital Media, Children's Media, Media Literacy, Cybergogy, Teaching, Learning, Learning Style, Learning Approach, Learning Combination, Multitasking, Interactive Earning, Learning Environments, Learning Experiences.

This review article uses inclusion and exclusion criteria to focus on the problem. The inclusion and exclusion criteria are determined in Table 2, which were defined in English from 2000 to 2020.

TABLE 2 INCLUSION AND EXCLUSION CRITERIA

No.	Inclusion Criteria
1.	Empirical and research-based publications
2.	The method used is a qualitative, quantitative, and mixed research study
3.	Peer-reviewed journal articles and specialty textbooks
4.	Only full-textual content articles
5.	Reports commissioned by international organizations
6.	literature review (including unpublished/gray literature: government reports, policy statements, conference proceedings, theses, dissertations, and research reports)
7.	English speaking only
8.	Published between January 2000 to December 2020

Based on the search described above, there were approximately 45,800 articles identified from the search described above, and 4730 articles were identified (see figure 1 for the data search process). The screening process for reducing duplicates and unrelated articles resulted in 3650 articles. The software chosen is Mendeley which is a free reference manager and academic social network that helps researchers organize research, collaborate with others online, and find the latest research. 926 publications were identified as potentially relevant sources of evidence based on the search strategy carried out. As a result, we followed a phased review - an initial review of the abstract, followed by an in-depth review.
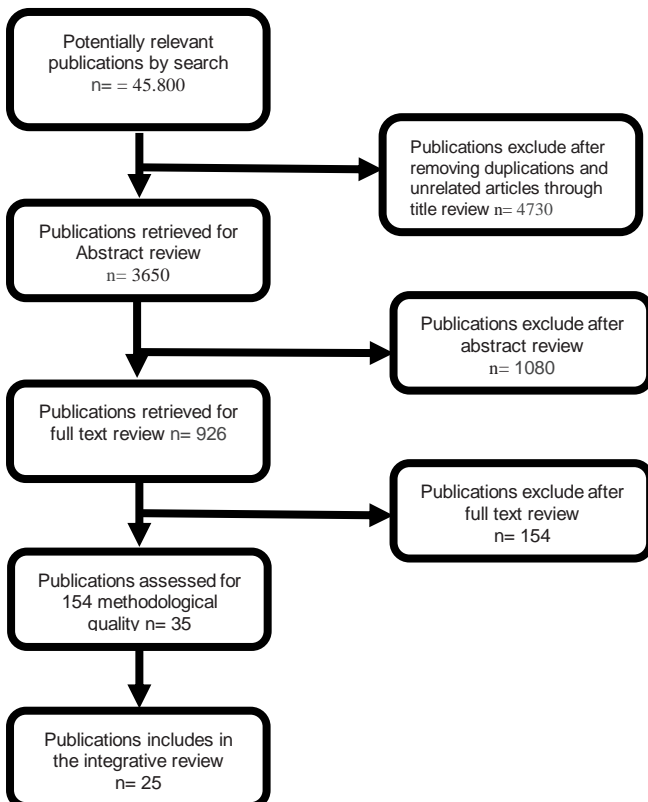

Figure 1 Integrative Review Flowchart

In Figure 1 the PRISMA guidelines are applied to select the selected literature. The search identified 45,800 citations from the search. After removing the duplicates 4730 articles remained. Then sources were filtered by title and abstract, and 1,080 non-conforming articles were excluded. Reasons for exclusion include but are not limited to types of digital media, learning styles, and learning approaches. Furthermore, for eligibility 154 full-text articles were assessed independently. Of the remaining articles, 35 were excluded for reasons including, but not limited to: the effectiveness of the instructional model of learning strategies, the nature of the resources, and the involvement of students in learning. This resulted in 25 articles which were eventually implemented into the final review.

B. Quality Rating

The studies that met the inclusion criteria were then assessed for quality using an assessment tool, which was developed intentionally based on the quality assessment criteria. This allows the reviewer to examine the main study in-depth and ascertain its relevance and usefulness

C. Coverage of Integrative Critical Review

This integrative review of the literature shows similarities, and two recurring friends appear in Table 3.

TABLE 3 KEY THEMES IN THE REVIEW

No	Theme
1.	Approach to Learning through Digital Media
2.	Learning Style with Digital Approach

D. Approach to Learning through Digital Media

In this digital era, people have entered a modern technological life where they improve or change our quality of life to accommodate changes in the environment, communication, and ways of meeting our needs [12]. The use of technology is widespread, especially in learning but the use of technology in learning is more difficult because students must understand the use of technology and they must find appropriate ways to understand technology-based learning. [13]. The potential of a resource-based learning environment for teaching and learning is quite large, meaning that existing resources can be supported by an appropriate learning environment. Environmental support has a high impact on personalized learning support systems, for example, online learning environments can provide various types of displays such as animations, videos with learning materials, and structure of learning materials that can be made attractive [14], [15].

Digital learning media is increasingly popular. The indication is that more and more individuals access a large number of digital resources while fundamentally changing how, when, and for what purposes resources are created and used in learning and enabling technology to exist in the classroom, home, and community [16]. With more and more people accessing digital media, there is a need for digital literacy stages to become a culture, including in the field of education. For users to behave wisely, efforts are needed to improve

media literacy to optimize educational potential and promote global understanding through active reasoning about mass media and international culture that can support children's learning in culturally diverse societies [17]. Currently, developing digital media literacy cannot be limited to mastery but analysis, evaluation, critical reflection including the impact on society, and the ability to make proper judgments about the role of technology in society and culture must be considered. [18], [19].

Digital culture is defined as all types of changes in personal and community life, and behavior caused by the presence of digital media, and networks and changing them quickly [12]. Therefore, schools are justified in utilizing digital media to help students "understand media" and current media developments so that students are always updated [5] because the purpose of the media is to facilitate communication and learning [4]. During the process of cultural development through the development of digital learning media, students commonly assumed that accustomed to researching selected topics, planning delivery media, learning outcomes and also using technical tools, and also mastering the material sufficiently [8]. Referring to the experience of children dealing with computers in their spare time, children are more than just mastering tools for retrieval of information, at the same time they can do several activities in one thing or what is commonly called multitasking [7], [20]. Children's skills in dealing with Information Technology tools are strong support for interactive learning practices.

In interactive learning, students' ability in the field of information technology is included in the consideration of the media for delivering information and representing multimedia to accommodate various types of interactions, learning, and teaching styles [6]. For students used to multitasking out of doors about the classroom, the use of media combined with things to do which can be taken into consideration low interactive factors can assist lessen the extraneous cognitive load because fewer elements are involved in working memory [7]. This is also a challenge for multimedia design makers where the media created must have clear guidelines in the designs created. If there are no guidelines embedded in the design, cognitive overload may occur when students lack sufficient knowledge to process new multimedia material in a meaningful way [21]. and while outside of school, many of them engage with technology in much more informal, active, and sometimes creative ways [1]. The importance of informal learning and creative learning environment experiences supported by technology was also discussed by Lai et al. (2013) and Manca & Ranieri (2016). According to Thiele et al. (2014), the use of technology that is following active learning techniques makes students more involved compared to ordinary learning.

E. *Learning Style with Digital Approach*

In the industrial era 4.0, learning which is part of education is no longer limited to classes and books, but student involvement, motivation, and interaction are key factors in achieving the success of the learning process [25]. Understanding the students' overall learning implies an important interaction effect between learning styles and learning media which can be seen from the significant difference between abstract and concrete thinkers, concrete experience relates to immediate environmental situations, and pays little attention to systems analysis or scientific methods, abstract conceptualization emphasizes theory construction, which is higher-order learning not just specific experience. [14]. Student learning styles vary widely [14], [26]. Generally refers to the important behavioral characteristics of a learner that can be used as an indicator of how the learner understands, interacts, or responds according to his learning environment, which may be unavoidable in a learning environment that is limited to conventional learning with varied learning styles. [14]. Students learn in various ways such as hearing, seeing, taking notes, imagining, and visualizing among many others [27]. Students are easier to explore learning skills such as the ability to focus on learning, the ability to think a lot, coordinate attention using their learning style, and understanding learning styles can help learn according to their strongest abilities. Learning takes place when students process new information [28].

The implementation of learning combined with technology demands to always learn with changes and improvements in the technology of the educational environment [27]. Cybergogy is a form of independent learning that occurs through professional guidance using the Internet [29]. Using the Cybergogy approach which is an educational method in the era of digitalization of learning that utilizes information and communication technology empowerment facilities that are used for students' cognitive, emotional, and social progress [30].

In the classroom, students with visual learning styles performed very well because all tests were carried out in a written "visual" format [31] and when outside the classroom using a computer there were no significant differences. Because the characteristics of visual learners have a clear imagination in seeing pictures, they visualize what they learn in their minds. Based on the research Shaffiei et al. (2014) results of visual learners prefer to use pictorial characteristics in their learning. Cybergogy learning is here to overcome the problem of different learning styles. In cybergogy students are free to determine their learning style both visually and audio-visually.

The utilization of information technology has a positive impact on learning and provides a fun and interesting learning atmosphere [33]. If students are aware of their learning style preferences research has shown that they prefer to seek learning environments and tools that enhance these preferences [34]. Different learning styles support each student to work at their best, provide opportunities to process assignments, encourage increased interest in learning activities, and create positive learning motivation [35]. The other is that the use of VR gives students a virtual experience through watching videos. Students realized that in the application of VR HMD in learning, the video was able to present a concrete type of experience but not conceptual knowledge, they feel that VR HMD is easy to use when facilities and resources are adequate, based on research results the use of VR HMD increase learning efficacy and academic ability. [36]. According to Hu et al. (2007), the findings show that using technology-assisted learning can result in a meaningful increase in learning effectuality as measured

objectively and subjectively, technology-assisted learning considers the entire course to be easier, assessment of learning and generally refers to the extent to which students perceive the subject matter to be learnable. Furthermore, learning styles affect learning satisfaction in technology-assisted learning environments because the reduced risk of weak study group support offsets the benefits of increased learning effectiveness.

There are some learning design models, like Integrated Learning Design Environment (ILDE), ARCS model, The Balanced-Learning Design (BLADE) Model, and Interactive Learning Model (ILM) [6], [37]–[39]. The Learning Design Model has modules that are effective for visual learners, active learners, and reflective learners [40]. Online modules help students to improve their listening and speaking skills [10]. Cybergogy provides benefits for everyone, but the understanding of the specific benefits will vary for each person depending on the ability to receive the learning available online [29]. Thus recognizing learning preferences, learning style profiles, and involving student study groups will be an important part of the learning style component [6], [39]

Table 4 Summary of Research Studies Included in the Integrative Review

No.	Author, Year, Country	Method	Key points identified
1.	[19] Australia	Review	A proposed framework for developing digital media literacy and training students in digital media invention helps discover the training needs of students and teachers for virtual media output competently and communication in their disciplines
2.	[18] Norway, Sweden	Review	Shows how participants align their actions both on and in front of the screen and where splits and pauses are oriented as important aspects of organizing activities. In addition, shows how past and present technologies are linked together in the concept of literacy culturally and historically
3.	[7] USA	Experiment	Inform students on the state of multitasking. The findings show that the multitasking state can break down thinking in the acquisition of knowledge. This results in another cognitive load that overloads working memory. Students perform better when they focus on one task at a time especially when they are learning new material in and out of class.
4.	[6] UK	Qualitative Research	Explore learning style profiles with a more learner-oriented interactive approach system for the design of Interactive Learning Systems used to create more effective interactive learning systems.
5.	[8] USA	Mix Method Research	Seeing students' interactions with self-produced digital media, satisfaction, and learning styles.
6.	[1] UK	Review	Digital media challenges and opportunities not only does content become a digital barrier to children's use of technology as a learning experience in the classroom or in their free time but is also influenced by learning styles
7.	[4] Thailand	Review	Describes a system that can be used for teaching and learning in schools using technology as well as a system used as responsible online information.
8.	[2] USA	Review	A critical approach is needed to understand participatory media pedagogy. Part of the challenge educators face is in looking at the ways young people come together and communicate to improve/build new technologies.
9.	[41] UK	Research	Content engagement and learning styles with digital culture
10.	[9]	Review	Inspires a more independent and self-regulated learning approach, driven by students' intrinsic

No.	Ref	Type	Description
			motivation which can eventually turn into self-determination.
11.	[10] Slovakia	Research	Explaining Online modules help students to improve speaking and listening skills, as online exercises and assignments provide authentic opportunities to practice skills through real and direct communication
12.	[42] Jordan	Research	Research results show that prospective teachers have positive perceptions about the importance of technology and digital media integration in early childhood classrooms.
13.	[40] Malaysia	Research	This showed that the Isman Learning Design Model that notices learning from the interpretation of learners based on the perspective of content is appropriate in designing and developing Physics modules based on learning styles and proper technology in the secondary education circle. Effective modules for visual learners, active learners, and reflective learners.
14.	[15] Thailand	Research	Explain Environmental support has a high impact on student efficiency in personalized ubiquitous learning support systems. Whereas students at high achievement levels perceive ease of use with a positive attitude that influences their decision to use a personalized ubiquitous learning support system, as well as their subsequent actual use.
15.	[43] South Africa	Research	Development with TETS strategy. Most students' learning styles are different or
			assimilated.
16.	[44] Taiwan	Research	Using multimedia teaching styles to improve student learning attitudes. The use of multimedia teaching style has a significant effect on students' learning attitudes with different learning methods in teaching
17.	[12]	Review	All these 'gogies' will make the lives of teachers easier if they have the competence to use and understand the digital system that governs our educational life in the 21st century. The life of a person with a digital culture enters our classrooms, homes, neighborhoods, and communities
18.	[13] UK	Research Case Study	Describe the patterns, motivation, and involvement of students with technology. The focus on independent learning has helped draw attention to what students are doing while they are studying, rather than what they feel they have to do
19.	[16]	Research	Generative learning objectives require varied learning strategies rather than single learning strategies strategy
20.	[21]	Quantitative Research	Describe the challenges for software developers to reduce students' cognitive load.
21.	[36]	Research	Seeing the effect of using HMD in learning. And the influence of the concrete experience on learning style
22.	[14] Hongkong	Quantitative Research	See the comparison of face-to-face learning using technology. Online learning environments can provide listening practice, but their effectiveness may not be comparable to

23.	[27] Malaysia	Mix Method Research	Explain preferences for learning styles and technologies used
24.	[31] US	Research	Determine appropriate learning styles and strategies to improve learning. Students benefit from using knowledge of their particular learning style to better manage their learning.
25.	[35] Kazakhstan	Review	Proving the practicality of different learning to bridge the knowledge gap. Different learning strategies can be added to foster student understanding as a good learning tool.

III. DISCUSSION

This Integrative Review is based on an analysis of the included articles showing the impact of learning with digital media and the systems used in using technology [4], [6], [8], [39]. The use of technology can also have a negative impact if the student's learning process is treated as if it were a machine rather than a human, students will be more effective in learning if it is presented with the preferred method of obtaining information, and the learning design made can meet student learning needs. According to our review, achieving these benefits is the most important reason for designing and implementing digital media integrated learning styles so that the learning process carried out and the learning media used are following the preferences of students' learning styles. In this study, the uses of technology and digital boundaries are presented not only in terms of content but also in style. [4], [20]. A critical approach is needed to understand pedagogical media, especially in the form of participatory, all forms of learning approaches will make it easier for teachers if they understand the digital system that regulates educational life today [2], [12].

The current challenge is the changing nature of resources and the development of learning strategies that involve technology and the role of software developers [16], [21], [43]. So that the determination that students make has an impact on whether or not the choice of learning style, learning environment, and learning strategies used in student learning is carried out [14], [27], [31]. In reviewing learning media, educators and/or software developers need to present a system that uses technology in schools with responsible use of online information, and an active approach to supporting the needs of up-to-date learning experiences [4], [8], and such as the Interactive Learning System (ILS).

When starting to use different learning techniques, the software can be introduced first to spread knowledge [35] an ILS or educational design approach can encourage students to create their media to use. All of this is used to achieve more effective interactive learning and when digital media is created by students themselves, the learning media can lead to learning satisfaction and affect their learning style [6], [8]. Apart from that, all is that students learn in different ways. Vincent & Ross (2001) explained that teacher statements can be repeated easily by students with auditory learning styles. Visual learners will easily adapt to classroom conditions and have good self-regulation. Kinesthetic learners do not have an organized picture in conventional classes so they have difficulties in traditional classes [27].

IV. CONCLUSION

The development of technology affects student learning styles [27]. This review provides a synthesis of the determination of learning styles that are influenced by technology, namely digital media as a learning tool that is adapted to students' learning styles. Digital media affects learning styles such as determining learning styles, combinations of learning styles, learning style profiles, and learning style involvement [14], [27], [31], [45]. Schools must play a central role in developing 'digital literacy' that will enable young people to face the challenges of new world media. Teachers need to see their students learning and provide learning that is appropriate to their students' learning styles. Learning designed to fill students' learning needs becomes an important reason to design digital media as a means of learning that is appropriate to students' learning style preferences

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Participants

Ms. Haylee Lin (haylee)

Yunisca Nurmalisa (yunisca_nurmalisa02)

Messages

Note	From
Dear Yunisca Nurmalisa: This is to acknowledge the receipt of your manuscript submitted to "International Journal of Information and Education Technology" for possible publication. **Manuscript ID:** IJIET-5128 **Title:** An Integrative Review: The Power of Digital Learning Media in Influencing Learning Styles That Teachers Should Be Considered **Submission URL:** http://ojs.ejournal.net/index.php/ijiet/authorDashboard/submission/5128 The manuscript will undergo a double-blind peer-review process and we will inform you of the progress made in this regard via email **if you confirm that your submission meets the requirements as follows:** 1. Publication fee: you support open access publishing, which allows unlimited access to your published paper, and you will pay the Article Processing Charge (450 USD), please note that the APC only applies if your paper was accepted after standard peer-review.	haylee 2022-04-15 03:05 PM

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The editorial team had assessed your submission and feels that it has potential for publication, so we would like to invite you to revise the paper and resubmit it for further review.

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Important notice: Please revise the manuscript according to the reviewers' comments and upload the revised file **within one month**. Any revisions should be clearly highlighted, for example using the "Track Changes" function in Microsoft Word, so that changes are easily visible to the editors and reviewers. Please provide a cover letter to explain point-by-point the details of the revisions in the manuscript and your responses to the reviewers' comments.

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Reviewer A:

Comments to Authors

Title:
The topic in this title is general, because there have been many previous studies that have conducted research on similar topics, only that the literature review differs.
However, there is nothing new from the research results obtained in this study.

Abstract:
Based on the results of this study, what is the influence of this study's findings on the world of education, and what remedies are proposed by the authors?

INTRODUCTION:
The principle of the triangle that is arranged is quite good and quite systematic, and the State of the art that is built is quite good. However, there is no previous research in this manuscript.
The existing analysis gap is not sufficient to strengthen the research objectives in this manuscript.
There is no novelty in this study, and there is no explanation regarding the advantages of this study compared to previous research.

METHOD:

The experimental setting has not been clearly described.

There are no collection techniques, technical analysis, and drawing conclusions techniques used in this study.

Research result:

The research results presented are not sufficient to answer the research problem formulation

Because the research results are listed like a Novel Book that tells about learning approaches and learning styles. It is not appropriate to present research results in the form of scientific articles.

DISCUSSION:

This manuscript's discussion is not in-depth because it lacks rich reinforcement of the study findings:

Does it support the research findings or contradict the findings of previous studies (in published articles)?

CONCLUSION:

This conclusion appears to be only a summary of the paper; the conclusion should answer the formulation of the problem contained in the research topic.

REFERENCES:

Please update any bibliography that is older than 10 years with a bibliography from the most recent year (within the last ten years).

Add bibliography from articles published in this destination journal and in international journals (Scopus or/and WoS).

Reviewer B:

Comments to Authors

The article has novelty in the idea of framing integrative reviews to provide various learning modules and educating teachers on various existing styles which could relevant to the current scenario of the digital culture.

Please update any bibliography that is older than 10 years with a bibliography from the most recent year (within the last ten years).

Add bibliography from articles published in this destination journal and in international journals (Scopus or/and WoS).

Reviewer B:

Comments to Authors

The article has novelty in the idea of framing integrative reviews to provide various learning modules and educating teachers on various existing styles which could relevant to the current scenario of the digital culture. Things like alignment and using reference number in the tabular column in place of author and year has to be ensured properly before submitting for publication. Suggestive or categorical learning style could have been made as the outcome of methodically selected large reviews. As the author has advanced digital/media literacy to the students, he could have suggested a model.

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Reviewer A:

Comments to Authors

Overall, the Authors revised this manuscript based on feedback from reviewers in the second phase, even though the research results are still debatable; however, it can still be tolerated due to the presentation of the research results, which is quite good, and the discussion, which is also quite good and appropriate.

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Reviewer A:

Comments to Authors

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