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Impact of Correlation of Multimedia Elements with Tablets and Digital Stories in Educational Management

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ABSTRAK

Penggunaan media teknologi merupakan metode pengajaran yang efektif di kalangan pendidik karena lebih mudah dan cepat dalam pelaksanaannya. Namun penggunaan fitur interaksi dan elemen multimedia seperti teks dan gambar dalam menciptakan storytelling masih sulit dilakukan oleh siswa dan guru. Selain itu, unsur penilaian bercerita dengan teknologi masih kurang. Tujuan penelitian untuk menganalisis Keandalan Elemen Multimedia pada Tablet dan Evaluasi Cerita Digital dan untuk mengetahui Korelasi Elemen Multimedia pada Tablet dan Evaluasi Cerita Digital. Metode penelitian dengan pendekatan survei kuantitatif. Subjek berjumlah 67 siswa, mahasiswa, guru dan dosen. Teknik pengumpulan data dengan instrumen yang dikembangkan dari indikator unsur multimedia, cerita digital dan tablet. Instrumen dinilai berdasarkan skala Likert dari poin 1 sampai dengan poin 7. Teknik analisis data menggunakan SPSS Versi 25.0 dengan uji validasi, mean, standar deviasi dan nilai minimum serta korelasi. Hasil, ditemukan penggunaan multimedia, cerita digital, dan tablet memiliki reliabilitas dan korelasi yang tinggi serta hubungan yang positif dan signifikan antara seluruh variabel dalam evaluasi. Temuan ini menegaskan bahwa unsur-unsur dalam multimedia berada pada level 5 dan dapat digunakan dalam proses pembelajaran yang efektif. Implikasi memberikan gambaran kepada guru dan siswa untuk aktif menggunakan multimedia sebagai alat bantu proses pembelajaran.

ABSTRACT

Technological media is an effective teaching method among educators because it is easier and faster to implement. However, the use of interaction features and multimedia elements such as text and images in creating storytelling is still problematic for students and teachers. In addition, the assessment element of storytelling with technology still needs to be improved. The purpose of the study was to analyze the Reliability of Multimedia Elements on Tablets and Digital Story Evaluation and to determine the Correlation of Multimedia Elements on Tablets and Digital Story Evaluation. The research method is a quantitative survey approach. Subjects totaled 67 students, students, teachers, and lecturers. Data collection techniques used instruments developed from indicators of multimedia elements, digital stories, and tablets. The instrument was rated based on a Likert scale from point 1 to point 7. Data analysis techniques using SPSS Version 25.0 with validation test, mean, standard deviation, minimum value, and correlation. Results showed that multimedia, digital stories, and tablets had high reliability and correlation and a positive and significant relationship between all variables in the evaluation. This finding confirms that the elements in multimedia are at level 5 and can be used in an effective learning process. The implication provides an overview for teachers and students to use multimedia as a tool for the learning process actively.

1. INTRODUCTION

Education management is essential in determining the quality of education processes and outcomes. In an increasingly digital era, effective education management involves not only administration and operations but also the utilization of technology to support the learning process (Jääskeläinen et al., 2021; Neuman et al., 2021). Appropriate use of technology can increase student engagement, enrich subject matter, and enable more flexible teaching methods. One of the essential things in education management is how to deliver material to students (Chevalier et al., 2022; Suryaman et al., 2020). The storytelling method has long been recognized as an effective way to improve student understanding and engagement in learning. Storytelling provides lessons about the story's content and helps students develop critical thinking skills, imagination, and empathy. Therefore, education management should ensure that materials are effectively integrated into learning to support students' holistic development. Although storytelling has many advantages, its application has many obstacles, both for students and teachers (Jensen et al., 2022; Salminen et al., 2022). Often, students need help developing exciting and meaningful stories, while teachers also need help assessing the quality of the stories made (Khosrawi-Rad et al., 2023; Mascini et al., 2020). In addition, technology still needs to be optimized in the storytelling

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assessment process. The use of technology in storytelling, such as digital story assessment, has yet to be widely developed (Alghazi et al., 2020; Dubé & Wen, 2022). Concerning these issues, using multimedia elements with tablets and digital stories is a potential solution to face this challenge (Botsis et al., 2020; Lowery et al., 2020). Using technology, students can more easily express their ideas through interactive and engaging media. Tablets provide an easy-to-use and flexible platform, allowing students to integrate multimedia elements such as images, sounds, and videos into their stories. With the help of technology, digital stories make the storytelling process more exciting and more accessible for teachers to assess student work more objectively and comprehensively (Davy Tsz Kit et al., 2022; Klima Ronen, 2020) Educators are starting to shift from traditional storytelling methods to digital storytelling, known as Digital Storytelling (PD). The Digital Storytelling (PD) method is very appropriate to apply in the current era of digital technology (Rubegni et al., 2022; Shinas & Wen, 2022);. This transformation of innovative and creative methods helps effectively combine an educator's tasks (Hermann & Bossle, 2020; Jahnke & Liebscher, 2020; Miranda et al., 2021). Educators, often in the process of presenting information, can increase retention and communication with students through storytelling methods, such as presentations that involve exploring information and developing student knowledge. With this combination method, the students also agreed that combining storytelling with multimedia technology could fulfill communication satisfaction through the storytelling method (Li, 2020; Tuma, 2021); Tavares, 2022) . Apart from that, interaction with students can be improved through PD, which has connected audiences through media and technology (John & De'Villiers, 2020; Sailer et al., 2021). Providing and disseminating information becomes more transparent when humans use technology and the media to interact directly by exchanging and sharing information. Thus, introducing PD in the education sector can help convey information quickly and improve technology skills for students and educators (Haleem et al., 2022; Kim et al., 2021). Regarding mobile technology used by students and teachers to convey information through storytelling, many elements are used to evaluate story questions in storytelling with multimedia and tablets. Teachers and students widely use mobile technology as a tool for sharing information and telling stories to students.

The development of increasingly sophisticated and mobile technological equipment means that sharing stories can be carried out smoothly. Sharing information in the form of stories can be realized with the support of mobile devices such as tablets and smartphones, which enable learning to occur anywhere and at any time. In this case, many people agree that using computer equipment in the storytelling process improves traditional storytelling methods (Chevalier et al., 2022; Nair & Yunus, 2021);. The positive response to mobile devices such as laptops, smartphones, and tablets is also popular among Indonesians and internationally (Mohtar et al., 2023; Muhanna et al., 2020). A touchscreen tablet was chosen because it can make learning more interactive and engaging. Touchscreen tablets also facilitate user interaction with multimedia elements such as text and images. Studies show that interacting with on-screen information using fingers as input devices can give users confidence in controlling their interactions (Mishra et al., 2020). This is because the role of input control devices such as touchscreen-driven keyboards and mice has made it easier to input data. In addition, touchscreen functions such as zooming in, zooming out, and moving images to the desired location through finger input have made it easier to complete tasks quickly and reduce errors (Debnath et al., 2020; Sánchez-Velasco et al., 2020).

This research is supported by previous research, stating that a teacher must present the material in a way that is as interesting as possible so that students are interested in listening to the material (Jalaluddin et al., 2020; Rodríguez et al., 2021). Research has shown that multimedia is related to tablets and digital stories (Hafeman et al., 2020; Rangraz Jeddi et al., 2020; Xu, 2020). It is also supported by research related to the use of digital storytelling. The research states that digital storytelling can increase students' learning motivation and allow them to express themselves creatively (Kalantari et al., 2023; Mohammad & Pedersen, 2022);. The novelty value of this study lies in its in-depth investigation of the use of digital technology, especially tablets, and digital storytelling, in the context of education management. It emphasizes how multimedia elements, when implemented through tablets, can enhance the learning experience and manage the learning process more efficiently. With the differences in opinion from each previous study regarding the effectiveness of multimedia elements in using tablets to assist the learning process, telling stories to students, and sharing information between educators and students, this research urgently needs to be carried out (Muhanna et al., 2020; Vackova et al., 2023). This gap is visible; educators and students hope that the presence of tablets as a storytelling tool can help them convey the content of the material; while theory says that tablets are presented to help consumers share information and the reality in the field, researchers see elements in multimedia Many shortcomings are found and tend to make students and teachers confused about its use. It is urgent to research the reliability of multimedia elements in tablets and in the evaluation of digital stories and to find the correlation between multimedia elements in tablets and in the evaluation of digital stories. Therefore, this study aimed to analyze the Reliability of Multimedia Elements on Tablets and Digital Story Evaluation and find out the Correlation

between Multimedia Elements on Tablets and Digital Story Evaluation. This research is expected to provide in-depth insight into the influence of digital technology on students' learning experience, as well as how digital devices can be optimized to support educational goals.

2. METHOD

The type of research used in this research is quantitative with a survey method (Johnson et al., 2020; Sobrino-Duque et al., 2022). The subjects in this research were students, teaching staff, and teachers at schools. The total number of respondents was 67 people, consisting of 37 women and the remaining 30 men. Meanwhile, the composition of the teaching staff consists of 10 lecturers, 50 students, and 7 school teachers. The data collection technique in this research is with instruments. The instruments provided are prepared based on research indicators and validated so that they are suitable for use as measuring tools. The respondents were given an instrument on a Likert scale from point 1 to point 7. The number of respondents was distributed to 67 people and the instrument was distributed using the Google From link that had been created. Respondents were asked to assess as objectively as possible what they experienced, felt, and saw. The research indicators for each media are presented in Tables 1, 2, 3, and 4.

Table 1. Tablet Related Indicators

Number	Indicator
1	Visibility of system status
2	Matching between the system and the real world.
3	User control and freedom.
4	Consistency and standards.
5	Avoidance of errors.
6	Reduce loading on user Storage.
7	Modifications and shortcuts.
8	Efficiency of use and performance.
9	Aesthetics and minimal shaping design.
10	Help users know course, recognize, diagnose and recovery
11	Help and documentation.
12	Interaction and ergonomics.

Table 2. Multimedia Indicators

Number	Indicator
1	Multimedia element used has a clear purpose.
2	The use of multimedia elements is appropriate to the content _
3	Combination of appropriate multimedia elements.
4	Healthy managed presentation of multimedia elements.
5	The number of multimedia elements for a screen does NOT exceed two elements.
6	Use of interesting multimedia elements to support the information provided
7	High quality of multimedia elements.
8	Use of multimedia elements can improve content presentation.

Table 3. Digital Storytelling (PD) Element Indicators

Number	Indicator
1	Perspective follows looking at the first or third person in the story.
2	The story is created intentionally to achieve objective A of the assignment (information, education, entertainment, etc.).
3	The narrator appreciates the story, and tells how the story influences the audience.
4	Questions and situations are used in the story process to involve the audience and the final solution.
5	Telling stories attracts the audience's attention by the emotional path or emotional purpose of the argument.
6	The use of sound to tell stories is again effective in conveying messages.
7	Sound tracks are used to support the emotions and messages you want to send and to attract the audience.
8	The beat of the story is manipulated by music tempo, sound level, picture period, camera angle to make the narrative interesting.

Number	Indicator
9	The story consists of bending the story starting from the introduction, content and conclusion.
10	Use of media likes images and sounds without the use of text to convey messages.
11	Narrative material contributes to the plot of the story.
12	Users are interacted with by other users to build a story.
13	Users contribute to the construction of the narrative by interacting with the storytelling system.
14	Use ingredients correctly and optimally without overdoing it.

Table 4. Device Third Indicator

Number	Indicator
1	Draw
2	Using images from the library
3	Take and edit photos
4	Using videos from the library
5	Notes And edit video
6	Uses audio from the library
7	Notes And edit audio
8	Type and edit text
9	Sharing data from the server
10	slot for that scene
11	Export to digital form
12	Operation with tablet
13	Free
14	Draw

Note: Not Available; VB: Version Trial

Data analysis techniques were carried out using SPSS statistics version 25.0 by looking at the average value and standard deviation. Apart from looking at the average and standard deviation, SPSS statistics version 25.0 was also used to analyze the correlation of data obtained from respondents. Before carrying out SPSS analysis, the research first groups the data obtained, how much data comes from men, and how much data comes from women. Data grouping is also carried out based on national origin status. The Research Scale is presented in Table 5. The questionnaire instrument was tested through validity analysis and reliability analysis before the actual research analysis was carried out. The validity of the instrument containing heuristic items was carried out by experts in the fields of tablets, PD, and multimedia. Then the reliability of the research instrument items is determined by the Cronbach Alpha coefficient. For instruments that have reliability, the Cronbach Alpha coefficient/value must be at least 0.7 (Beykmirza et al., 2022; Naqvi et al., 2020). Alpha values of less than 0.60 are considered low and not acceptable, while Alpha values between 0.60 to 0.80 are acceptable (De Juan-Roldán et al., 2022; Taghizadeh et al., 2020; Zhang et al., 2020). Reliability analysis obtained on the 34 items of this research instrument has obtained a high average Alpha value of 0.883. This value is above 0.80 which indicates that the item has high reliability to continue the actual analysis of this instrument.

Table 5. Research Scale

Scale	Choice
1	Very very NOT important
2	Very unimportant
3	Not important
4	Less is important
5	Important
6	Very important
7	Very very important

3. RESULT AND DISCUSSION

Result

The following are the results of the analysis of the respondents' responses. In Table 6, there are 19.5% of male respondents provided responses and 80.30% of female respondents provided assessments. From Table 6, it can be seen that the users are still dominated by students and teachers who come from China or a mixture of Chinese and Indonesian with a frequency ratio of 26 people versus 11 people.

Table 6. Demographic Profile of Respondents

Nation	Man	Woman	Frequency	Percent (%)
Indonesia	5	6	17	26.8
China	2	24	40	63.4
Another	1	3	10	9.8
Amount	8 (19.5%)	33 (80.5%)	67	100,0

Table 7. Minute Scores and Standard Deviation for Each Measure

No	Between Facing Tablets		Multimedia		Bercerita Digital	
	Minimal	Standard deviation	Minimal	Standard deviation	Minimal	Standard deviation
1	5.71	1.123	6.15	0,792	5.95	0.973
2	**6.56**	0.673	6.22	0,881	6.15	0.792
3	5.83	1.138	**6.54**	0,596	6.02	0.908
4	5.71	0.844	5.88	0,872	6.00	0.806
5	5.32	1.491	5.24	1.280	**6.39**	0.703
6	5.39	1.222	5.85	0,963	6.22	0.852
7	5.49	1.165	6.20	0,813	6.22	0.852
8	5.63	1.220	6.51	0,779	5.83	0.972
9	5.63	1.199			6.24	0.888
10	6.17	1.022			5.90	0.800
11	5.83	0.946			6.17	0.892
12	6.15	0.882			6.12	1.053
13					6.02	0.724
14					6.32	0.907
Average	5.78	0.923	6.07	0.498	6.11	0.866

From Table 7, it can be seen that using multimedia is still better than just using tablets or digital media that specifically tells stories. From Table 7 it can be seen that the standard deviation for multimedia is 0.498, this means that respondents who rated multimedia were still better on tablets or digital stories.

Table 8. The Strength of Relationship Following the Correlation Coefficient Value

Correlation Coefficient Size (r)	The Power of Correlation
±.81 to 100	Very strong
±.51 to .80	Strong
±.31 to .50	Simple
±.21 to .30	Weak
±.01 to .20	Very weak

From Table 8, it can be seen that the correlation between tablets, multimedia and digital stories has a fairly strong relationship. The analysis results show that students or teachers who can use multimedia can already use tablets and digital stories.

Table 9. Pearson Intercorrelation Analysis

Size		Tell a story Digital	Multimedia	Between faces tablet
Digital Storytelling	Pearson Correlation	1	0.703**	0.424**
	Signature (1- tail)		0.000	0.003
	N	67	67	67
Multimedia	Pearson Correlation	0.703**	1	0.495**
	Signature (1- tail)	0.000		0.001
	N	67	67	67
Between the tablet faces	Pearson Correlation	0.424**	0.495**	1
	Signature (1- tail)	0.003	0.001	
	N	67	67	67

**Correlation is significant at the 0.01 level (2- tailed).

Discussion

This research found that the demographic profile of respondents was still dominated by students and teachers with mixed backgrounds between Indonesia and China. As can be seen in Table 6, there were 67 respondents involved, but 26 people who used tablets, multimedia, and digital stories were still dominated by students and teachers from indigenous Indonesian backgrounds. Overall there were 80.5% female respondents and the remaining 19.5% male respondents. Meanwhile, for racial composition, the majority consisted of Chinese respondents (63.4%), Indonesian (26.8%), and the remainder from other races (9.8%). This research also found mean values, scores, and standard deviations which were used to see the distribution of goods according to dimensions as shown in Table 7. In total, there are three dimensions involved, namely tablet interface, multimedia, and PD. The first dimension is the tablet interface with full minutes = 5.78, and the highest score is 6.56, that is, the second item is the match between the system and the real world. This is important regarding the clarity of the language or instructions used in this storytelling tool. This is because there are respondents from non-technical backgrounds who have difficulty understanding instructions and terminology correctly. The second dimension is multimedia with an overall mean = 6.07 and the highest score is 6.54, namely item 3 which is an appropriate combination of multimedia elements. Multimedia elements are expected to be the main contributor to conveying information in PD. Because, combining text, images, and audio in a storytelling presentation is important to make it more interactive and interesting. The last measure is PD per minute overall, which is 6.11 and the highest score is 6.39, in item 5, namely, Storytelling attracts the audience's attention in an emotional way or with the aim of emotional argumentation. A story will be more interesting if it can maintain students' emotional interest in listening to the story presented. This is in line with previous findings which say that a teacher must present material as interesting as possible so that students have an interest in hearing the material (Girón-García & Fortanet-Gómez, 2023; Jalaluddin et al., 2020; Mishra et al., 2020).

It was found from the results of descriptive analysis involving mean values, scores, and standard deviations which were used to see the distribution of goods according to dimensions as shown in Table 6. In total, there are three dimensions involved, namely tablet interface, multimedia, and PD. The first dimension is the tablet interface with full minutes = 5.78, and the highest score is 6.56, that is, the second item is the match between the system and the real world. This is important regarding the clarity of the language or instructions used in this storytelling tool. This is because there are respondents from non-technical backgrounds who have difficulty understanding instructions and terminology correctly. The second dimension is multimedia with an overall mean = 6.07 and the highest score is 6.54, namely item 3 which is an appropriate combination of multimedia elements. Multimedia elements are expected to be the main contributor to conveying information in PD. Because, combining text, images, and audio in a storytelling presentation is important to make it more interactive and interesting. The last measure is PD per minute overall, which is 6.11 and the highest score is 6.39, in item 5, namely, Storytelling attracts the audience's attention in an emotional way or with the aim of emotional argumentation. A story will be more interesting if it can maintain students' emotional interest in listening to the story presented (Ferguson et al., 2020; Gilliam et al., 2020; Silvia, 2020).

Overall, the findings of this research answer the research objectives regarding the Reliability of Multimedia Elements on Tablets and Evaluation of Digital Stories and to determine the Correlation of Multimedia Elements on Tablets and Evaluation of Digital Stories. Based on the findings, from the respondents' responses, the average of all dimensions is above the Important Scale 5, especially the highest PD average on a scale above 6 (Very Important) to strengthen the importance of PD elements in the story results. On the other hand, a standard deviation value of less than 1 for all dimensions indicates that the smaller the standard deviation, the smaller the spread of scores in the distribution, which means the data are close to each other. other (homogeneous). This homogeneous data distribution proves the high reliability of the instrument and illustrates that there are obstacles to the use of multimedia elements and the correlation of multimedia elements with tablet use. This finding is in line with previous research findings which stated that the use of multimedia was related to the use of tablets and digital stories (Davy Tsz Kit et al., 2022; Hafeman et al., 2020). Pearson Correlation analysis was used to determine whether there was a connection between the three drivers of change: tablet faces, multimedia, and PD. The relationship between these three variables was tested by considering the strength of the relationship based on the Relationship Strength Scale by (Chvala, 2020; Kalantari et al., 2023). as shown in Table 7. The results of the Pearson Inter Correlation Analysis in Table 9 show that there is a significant relationship between the three variables with a significance value of $p < 0.05$. There is a strong and positive correlation between Digital Storytelling and Multimedia with a significant value of $p = 0.000$ and a coefficient value of $r = 0.703$. The relationship between PD and multimedia that influences storytelling production is in line with the research conducted (Talan, 2021; Tohiran et al., 2023) which states that

multimedia injection has a positive impact on storytelling. Meanwhile, there is a moderate and positive correlation between PD and tablets with an importance value of P = 0.003 and a coefficient value of r = 0.424. This proves the suitability of the tablet interface with the Digital Storytelling element which has elements of involvement (Abdulrahaman et al., 2020; Latini et al., 2020). Meanwhile, the relationship between the last two variables, namely multimedia interface, and tablet, has a significant value of p = 0.001 and a coefficient value of r = 0.495 which has a moderate and positive correlation. Where, the suitability of the tablet interface can facilitate user interaction with multimedia elements such as text, images, and audio.

The implication of this research is to provide an idea for teachers and students to actively use multimedia as a tool to help the learning process. This research shows a correlation between the use of multimedia in digital and tablet stories. Teachers can prepare learning plans and implement material using multimedia because these elements are very supportive. This research has a positive impact in providing images and information as well as convincing teachers and students to use multimedia rather than just using digital stories or just using tablets. Meanwhile, the weakness of this research is that it did not carry out development and training on the use of multimedia, tablets, and digital stories. Another weakness is that the research did not conduct tests using multimedia, digital stories, or tablets on students to see improvements in student learning outcomes using these media. The evaluation is only limited to looking at the correlation of multimedia, digital Stories, and tablets. This weakness is also a recommendation for future researchers to conduct further research by conducting development research to measure the effectiveness of multimedia use

4. CONCLUSION

The research conducted shows that the research instrument with three variables, namely PD, tablet interface and multimedia, is suitable for use in story evaluation because it has high trustworthiness, a high average score and a standard deviation value close to 1. In addition, there is a significant relationship with positive magnitude between the three variables in the evaluation of storytelling on touch screen tablets. Where each variable is directly proportional to each other, namely the higher the PD, the higher the multimedia and the higher the tablet interface. This proves that these three variables are significant as elements of evaluating storytelling with appropriate storytelling tools. The transformation of traditional storytelling into PD becomes more interactive through the use of multimedia elements suitable for interacting with tablet interfaces. This research suggests the use of more reliable and robust analyzes such as regression analysis as future research to determine the main predictors in the evaluation context. In addition, the research population and sample must be expanded to all IPG students in Malaysia to facilitate generalization.

5. REFERENCES

Abdulrahaman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, *6*(11), e05312.1-14. https://doi.org/10.1016/j.heliyon.2020.e05312.

Alghazi, S. S., Wong, S. Y., Kamsin, A., Yadegaridehkordi, E., & Shuib, L. (2020). Towards sustainable mobile learning: A brief review of the factors influencing acceptance of the use of mobile phones as learning tools. *Sustainability (Switzerland)*, *12*(24), 1–19. https://doi.org/10.3390/su122410527.

Beykmirza, R., Nikfarid, L., Negarandeh, R., Sarkhani, N., & Moradi Cherati, M. (2022). Development and validation of an instrument to measure pediatric nurses' adherence to ethical codes. *BMC Medical Ethics*, *23*(1), 1–8. https://doi.org/10.1186/s12910-022-00753-4.

Botsis, T., Fairman, J. E., Moran, M. B., & Anagnostou, V. (2020). Visual storytelling enhances knowledge dissemination in biomedical science. *Journal of Biomedical Informatics*, *107*(August 2019), 103458.1-13. https://doi.org/10.1016/j.jbi.2020.103458.

Chevalier, M., Giang, C., El-Hamamsy, L., Bonnet, E., Papaspyros, V., Pellet, J. P., Audrin, C., Romero, M., Baumberger, B., & Mondada, F. (2022). The role of feedback and guidance as intervention methods to foster computational thinking in educational robotics learning activities for primary school. *Computers and Education*, *180*(December 2021), 104431.1-15. https://doi.org/10.1016/j.compedu.2022.104431.

Chvala, L. (2020). Teacher ideologies of English in 21st century Norway and new directions for locally tailored ELT. *System*, *94*(November 2020,), 102327.`-11.

https://doi.org/10.1016/j.system.2020.102327.
Davy Tsz Kit, N. G., Luo, W., Chan, H. M. Y., & Chu, S. K. W. (2022). Using digital story writing as a pedagogy to develop AI literacy among primary students. *Computers and Education: Artificial Intelligence*, *3*(October 2021), 100054.1-14. https://doi.org/10.1016/j.caeai.2022.100054.
De Juan-Roldán, J. I., Castillo-Jimena, M., González-Hevilla, A., Sánchez-Sánchez, C., García-Ruiz, A. J., & Gavilán-Moral, E. (2022). Cross-cultural adaptation and psychometric validation of a Spanish version of the revised Patients' Attitudes Towards Deprescribing (rPATD) questionnaire. *BMJ Open*, *12*(4), 1-41. https://doi.org/10.1136/bmjopen-2021-050678.
Debnath, R., Darby, S., Bardhan, R., Mohaddes, K., & Sunikka-Blank, M. (2020). Grounded reality meets machine learning: A deep-narrative analysis framework for energy policy research. *Energy Research and Social Science*, *69*(July), 101704.1-14. https://doi.org/10.1016/j.erss.2020.101704.
Dubé, A. K., & Wen, R. (2022). Identification and evaluation of technology trends in K-12 education from 2011 to 2021. *Education and Information Technologies*, *27*(2), 1929–1958. https://doi.org/10.1007/s10639-021-10689-8.
Ferguson, C., van den Broek, E. L., & van Oostendorp, H. (2020). On the role of interaction mode and story structure in virtual reality serious games. *Computers and Education*, *143*, 1–13. https://doi.org/10.1016/j.compedu.2019.103671.
Gilliam, E. H., Brunner, J. M., Bolan, J., Lee, S., Nuffer, W., Franson, K. L., & Thompson, M. E. (2020). Cultivating a culture of reflection among pharmacy students through storytelling. *American Journal of Pharmaceutical Education*, *84*(4), 489–497. https://doi.org/10.5688/ajpe7633.
Girón-García, C., & Fortanet-Gómez, I. (2023). Science dissemination videos as multimodal supporting resources for ESP teaching in higher education. *English for Specific Purposes*, *70*(April 2023), 164–176. https://doi.org/10.1016/j.esp.2022.12.005.
Hafeman, D. M., Ostroff, A. N., Feldman, J., Hickey, M. B., Phillips, M. L., Creswell, D., Birmaher, B., & Goldstein, T. R. (2020). Mindfulness-based intervention to decrease mood lability in at-risk youth: Preliminary evidence for changes in resting state functional connectivity. *Journal of Affective Disorders*, *276*(April), 23–29. https://doi.org/10.1016/j.jad.2020.06.042.
Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285. https://doi.org/https://doi.org/10.1016/j.susoc.2022.05.004.
Hermann, R. R., & Bossle, M. B. (2020). Bringing an entrepreneurial focus to sustainability education: A teaching framework based on content analysis. *Journal of Cleaner Production*, *246*(2), 1–57. https://doi.org/10.1016/j.jclepro.2019.119038.
Jääskeläinen, I. P., Sams, M., Glerean, E., & Ahveninen, J. (2021). Movies and narratives as naturalistic stimuli in neuroimaging. *NeuroImage*, *224*(October 2020), 1-14. https://doi.org/10.1016/j.neuroimage.2020.117445.
Jahnke, I., & Liebscher, J. (2020). Three types of integrated course designs for using mobile technologies to support creativity in higher education. *Computers and Education*, *146*(March 2020), 103782.1-28. https://doi.org/10.1016/j.compedu.2019.103782.
Jalaluddin, I., Ismail, L., & Darmi, R. (2020). Developing vocabulary knowledge among low achievers: Mobile augmented reality (MAR) practicality. *International Journal of Information and Education Technology*, *10*(11), 813–819. https://doi.org/10.18178/ijiet.2020.10.11.1463.
Jensen, W., Craft, B., Löchtefeld, M., & Bjørn, P. (2022). Learning through interactive artifacts: Personal fabrication using electrochromic displays to remember Atari women programmers. *Entertainment Computing*, *40*(February 2021), 1–13. https://doi.org/10.1016/j.entcom.2021.100464.
John, S. P., & De'Villiers, R. (2020). Elaboration of marketing communication through visual media: An empirical analysis. *Journal of Retailing and Consumer Services*, *54*(April 2019), 102052.1-14. https://doi.org/10.1016/j.jretconser.2020.102052.
Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A review of the quality indicators of rigor in qualitative research. *American Journal of Pharmaceutical Education*, *84*(1), 138–146. https://doi.org/10.5688/ajpe7120.
Kalantari, S., Rubegni, E., Benton, L., & Vasalou, A. (2023). "When I'm writing a story, I am really good" Exploring the use of digital storytelling technology at home. *International Journal of Child-Computer Interaction*, *38*(July), 100613.1-10. https://doi.org/10.1016/j.ijcci.2023.100613.
Khosrawi-Rad, B., Grogorick, L., & Robra-Bissantz, S. (2023). Game-inspired Pedagogical Conversational Agents: A Systematic Literature Review. *AIS Transactions on Human-Computer Interaction*, *15*(2), 146–192. https://doi.org/10.17705/1thci.00087.
Kim, D., Yatsu, D. K., & Li, Y. (2021). A multimodal model for analyzing middle school English language

learners' digital stories. *International Journal of Educational Research Open*, *2*(August), 100067.1-9. https://doi.org/10.1016/j.ijedro.2021.100067.

Klima Ronen, I. (2020). Action research as a methodology for professional development in leading an educational process. *Studies in Educational Evaluation*, *64*(June 2019), 100826.1-9. https://doi.org/10.1016/j.stueduc.2019.100826.

Latini, N., Bråten, I., & Salmerón, L. (2020). Does reading medium affect processing and integration of textual and pictorial information? A multimedia eye-tracking study. *Contemporary Educational Psychology*, *62*(April), 101870.1-13. https://doi.org/10.1016/j.cedpsych.2020.101870.

Li, M. (2020). Multimodal pedagogy in TESOL teacher education: Students' perspectives. *System*, *94*(November 2020), 102337.1-13. https://doi.org/10.1016/j.system.2020.102337.

Lowery, B., Dagevos, J., Chuenpagdee, R., & Vodden, K. (2020). Storytelling for sustainable development in rural communities: An alternative approach. *Sustainable Development*, *28*(6), 1813–1826. https://doi.org/10.1002/sd.2124.

Mascini, A., Cnudde, V., & Bultreys, T. (2020). Event-based contact angle measurements inside porous media using time-resolved micro-computed tomography. *Journal of Colloid and Interface Science*, *572*(2), 354–363. https://doi.org/10.1016/j.jcis.2020.03.099.

Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J. M., Ramírez-Montoya, M. S., Navarro-Tuch, S. A., Bustamante-Bello, M. R., Rosas-Fernández, J. B., & Molina, A. (2021). The core components of education 4.0 in higher education: Three case studies in engineering education. *Computers and Electrical Engineering*, *93*(February), 1-13. https://doi.org/10.1016/j.compeleceng.2021.107278.

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, *1*(September), 100012.1-8. https://doi.org/10.1016/j.ijedro.2020.100012.

Mohammad, A., & Pedersen, L. (2022). Analyzing the Use of Heuristics in a Virtual Reality Learning Context: A Literature Review. *Informatics*, *9*(3), 1-9. https://doi.org/10.3390/informatics9030051.

Mohtar, S., Jomhari, N., Mustafa, M. B., & Yusoff, Z. M. (2023). Mobile learning: research context, methodologies and future works towards middle-aged adults – a systematic literature review. *Multimedia Tools and Applications*, *82*(7), 11117–11143. https://doi.org/10.1007/s11042-022-13698-y.

Muhanna, M. A., Amro, R. N., & Qusef, A. (2020). Using a new set of heuristics in evaluating Arabic interfaces. *Journal of King Saud University - Computer and Information Sciences*, *32*(2), 248–253. https://doi.org/10.1016/j.jksuci.2018.05.014.

Nair, V., & Yunus, M. M. (2021). A systematic review of digital storytelling in improving speaking skills. *Sustainability (Switzerland)*, *13*(17), 1–17. https://doi.org/10.3390/su13179829.

Naqvi, A. A., Mahmoud, M. A., AlShayban, D. M., Alharbi, F. A., Alolayan, S. O., Althagfan, S., Iqbal, M. S., Farooqui, M., Ishaqui, A. A., Elrggal, M. E., Haseeb, A., & Hassali, M. A. (2020). Translation and validation of the Arabic version of the General Medication Adherence Scale (GMAS) in Saudi patients with chronic illnesses. *Saudi Pharmaceutical Journal*, *28*(9), 1055–1061. https://doi.org/10.1016/j.jsps.2020.07.005.

Neuman, S. B., Samudra, P., & Wong, K. M. (2021). Two may be better than one: Promoting incidental word learning through multiple media. *Journal of Applied Developmental Psychology*, *73*(February), 101252.1-8. https://doi.org/10.1016/j.appdev.2021.101252.

Rangraz Jeddi, F., Nabovati, E., Bigham, R., & Farrahi, R. (2020). Usability evaluation of a comprehensive national health information system: A heuristic evaluation. *Informatics in Medicine Unlocked*, *19*(2), 100332.1-9. https://doi.org/10.1016/j.imu.2020.100332.

Rodríguez, C. L., García-Jiménez, M., Massó-Guijarro, B., & Cruz-González, C. (2021). Digital Storytelling in Education: A Systematic Review of the Literature. *Review of European Studies*, *13*(2), 1-13. https://doi.org/10.5539/res.v13n2p13.

Rubegni, E., Landoni, M., Malinverni, L., & Jaccheri, L. (2022). Raising Awareness of Stereotyping Through Collaborative Digital Storytelling: Design for Change with and for Children. *International Journal of Human Computer Studies*, *157*(October), 1-27. https://doi.org/10.1016/j.ijhcs.2021.102727.

Sailer, M., Schultz-pernice, F., & Fischer, F. (2021). Computers in Human Behavior Contextual facilitators for learning activities involving technology in higher education : The C ♭ -model. *Computers in Human Behavior*, *121*(March), 106794. 1-13. https://doi.org/10.1016/j.chb.2021.106794.

Salminen, J., Jung, S. gyo, Nielsen, L., Şengün, S., & Jansen, B. J. (2022). How does varying the number of personas affect user perceptions and behavior? Challenging the 'small personas' hypothesis! *International Journal of Human Computer Studies*, *168*(August 2022), 1-17. https://doi.org/10.1016/j.ijhcs.2022.102915.

Sánchez-Velasco, L. E., Arias-Montiel, M., Guzmán-Ramírez, E., & Lugo-González, E. (2020). A Low-Cost EMG-Controlled Anthropomorphic Robotic Hand for Power and Precision Grasp. *Biocybernetics and Biomedical Engineering*, *40*(1), 221–237. https://doi.org/10.1016/j.bbe.2019.10.002.

Shinas, V. H., & Wen, H. (2022). Preparing teacher candidates to implement digital storytelling. *Computers and Education Open*, *3*(June 2021), .1-8. https://doi.org/10.1016/j.caeo.2022.100079.

Silvia, R. J. (2020). The arts in health professions education: A music assignment to develop pharmacy students' empathy toward people with opioid use disorder. *American Journal of Pharmaceutical Education*, *84*(4), 484–488. https://doi.org/10.5688/ajpe7631.

Sobrino-Duque, R., Martínez-Rojo, N., Carrillo-de-Gea, J. M., López-Jiménez, J. J., Nicolás, J., & Fernández-Alemán, J. L. (2022). Evaluating a gamification proposal for learning usability heuristics: Heureka. *International Journal of Human Computer Studies*, *161*(April 2021), 1-15. https://doi.org/10.1016/j.ijhcs.2022.102774.

Suryaman, M., Cahyono, Y., Muliansyah, D., Bustani, O., Suryani, P., Fahlevi, M., Pramono, R., Purwanto, A., Purba, J. T., Munthe, A. P., Juliana, & Harimurti, S. M. (2020). COVID-19 pandemic and home online learning system: Does it affect the quality of pharmacy school learning? *Systematic Reviews in Pharmacy*, *11*(8), 524–530. https://doi.org/10.31838/srp.2020.8.74.

Taghizadeh, G., Martinez-Martin, P., Meimandi, M., Habibi, S. A. H., Jamali, S., Dehmiyani, A., Rostami, S., Mahmuodi, A., Mehdizadeh, M., & Fereshtehnejad, S. M. (2020). Barthel Index and modified Rankin Scale: Psychometric properties during medication phases in idiopathic Parkinson disease. *Annals of Physical and Rehabilitation Medicine*, *63*(6), 500–504. https://doi.org/10.1016/j.rehab.2019.08.006.

Talan, T. (2021). Dijital Öyküleme Yönteminin Meta-Analitik ve Meta-Tematik Analizi. *Bartın University Journal of Faculty of Education*, *10*(1), 18–38. https://doi.org/10.14686/buefad.706231.

Tavares, N. (2022). The use and impact of game-based learning on the learning experience and knowledge retention of nursing undergraduate students: A systematic literature review. *Nurse education today*, *117*(March), 105484.1-6. https://doi.org/10.1016/j.nedt.2022.105484.

Tohiran, K. A., Nobilly, F., Zulkifli, R., Yahya, M. S., Norhisham, A. R., Rasyidi, M. Z., & Azhar, B. (2023). Multi-species rotational grazing of small ruminants regenerates undergrowth vegetation while controlling weeds in the oil palm silvopastoral system. *Agricultural Systems*, *210*(September), 103720.1-12. https://doi.org/10.1016/j.agsy.2023.103720.

Tuma, F. (2021). The use of educational technology for interactive teaching in lectures. *Annals of Medicine and Surgery*, *62*(December 2020), 231–235. https://doi.org/10.1016/j.amsu.2021.01.051.

Vackova, P., Cermakova, A. L., & Kucirkova, N. I. (2023). Children's Digital Books: Development, Testing and Dissemination of Quality Criteria. In *Children's Digital Books: Development, Testing and Dissemination of Quality Criteria* (Nomor August). https://doi.org/10.31265/usps.268.

Xu, K. (2020). Language, modality, and mobile media use experiences: Social responses to smartphone cues in a task-oriented context. *Telematics and Informatics*, *48*(June 2019), 101344.1-13. https://doi.org/10.1016/j.tele.2020.101344.

Zhang, X., Tan, S. S., Bilajac, L., Alhambra-Borrás, T., Garcés-Ferrer, J., Verma, A., Koppelaar, E., Markaki, A., Mattace-Raso, F., Franse, C. B., & Raat, H. (2020). Reliability and Validity of the Tilburg Frailty Indicator in 5 European Countries. *Journal of the American Medical Directors Association*, *21*(6), 772-779.e6. https://doi.org/10.1016/j.jamda.2020.03.019.