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USABILITY ASSESSMENT OF FLIPO-AR: NAVIGATING LEARNING IN A VUCA WORLD WITH AUGMENTED REALITY

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Abstract

In today's rapidly evolving volatile, uncertain, complex, and ambiguous (VUCA) world, innovative educational tools are essential to enhance learning experiences and outcomes. The method used in this study is descriptive quantitative. This study evaluates the usability of a flipbook with an augmented reality (AR)-based learning application (FLIPO-AR), in such a dynamic environment. Usability testing focused on key aspects: usefulness, ease of use, ease of learning, and user satisfaction. Results indicated highly positive feedback, with scores ranging from 85-87% across all categories, placing FLIPO-AR in the "Excellent" category. These findings suggest that FLIPO-AR is an effective and user-friendly tool for contemporary education. Future research should explore the long-term impact of FLIPO-AR on learning retention and outcomes, its integration with other educational technologies, and its applicability across diverse demographics and educational programs. This comprehensive approach will help to further understand and enhance the utility of AR in education.

Keywords: Augmented reality, Assessment, Flipbooks, Usability assessment, VUCA.

1. Introduction

Many reports regarding vocational education (Table 1). Although the vocational school have an important role, they still face challenges in improving the quality of education and skills. Low levels of education and skills have an impact on lower productivity, so vocational school graduates often have difficulty entering the job market [1]. On the other hand, the ~~labor~~labour industry needs human resources who possess competence and ability to work hard in order to produce high-quality products [2].

Table 1. Previous studies on vocational education.

No.	Title	Ref.
1	A design model of special vocational high school for children with visual impairment.	[3]
2	Green skills understanding of agricultural vocational school teachers around West Java Indonesia	[4]
3	Trends in expert system development: A practicum content analysis in vocational education for over grow pandemic learning problems	[5]
4	Distance learning in vocational high schools during the ~~covid-19~~Covid-19 pandemic in West Java province, Indonesia	[6]
5	An instructional design for online learning in vocational education according to a self-regulated learning framework for problem solving during the ~~covid-19~~Covid-19 crisis	[7]
6	The urgency of online learning media during the Covid-19 pandemic at the vocational school in Indonesia	[8]
7	Ergo design of mentoring in the national ecosystem of vocational education in the period of the 10th technological order	[9]
8	Teaching of the production and acceptance analysis of instant urap seasoning in the vocational school	[10]
9	Portfolio-based assessment in research methodology course students in vocational education.	[11]
10	Portfolio-based assessment in research methodology course students in vocational education.	[12]

The AR flipbook application has reached the alpha testing stage and has been validated by experts. This study will include user usability testing to evaluate its effectiveness and user-friendliness. The application uses AR technology to provide real-time simulations of complex topics like Occupational Safety and Health (K3LH), enhancing student understanding and engagement. FLIPO-AR aims to better prepare students for the workforce by emphasizing safety, health, and environmental protection.

2.Method

This research uses descriptive quantitative methods, which aim to describe and ~~analyze~~analyse data systematically and measurably. In this study, emphasis is given to schools that have implemented flipbooks with AR in the context of vocational education at Vocational Schools namely Vocational School 5 Bandung, Vocational School 1 Cibinong, and Vocational School 1 Sukabumi to provide users' views on

usability testing. These schools were selected for several reasons, including their position as one of the ~~Center~~Centre of Excellence Schools in Indonesia and their Building Construction Engineering specialty program. Data was collected from 172 students of the Building Construction Engineering program through a survey conducted at one time on the aspects of usefulness, ease of use, ease of learning and satisfaction when using Flipbook learning media with AR.

3. Results and Discussion

The study included 172 respondents (Table 2). The majority, 97 participants or 56.4%, were female, while 43.6% were male. This gender distribution offers a thorough perspective on perceptions and responses related to the research topic. Demographic data is crucial for understanding diversity and representation in the analysis and interpretation of research findings. This data helps researchers identify patterns and differences between different groups, ensuring that research results reflect a wider and more relevant population, and supporting more appropriate and inclusive decision-making [13].

Table 2. Respondents data.

Dimension	Category	Frequency	Percentage (%)
Gender	Male	75	43.60
	Female	97	56.40
Expertise program	Building Construction Techniques	172	100

Based on Table 3, in the indicator of usefulness, there are four declaration items. The item with the highest average score is the statement "Learning media helps more efficient time in learning" with a score of 86.80% in the category Excellent. Students felt that using this media enabled them to understand material faster and with less effort compared to traditional learning methods, thereby improving overall efficiency in learning. Whereas for the lowest average score is on the statement "Learning media can be used as expected" of 84.88% and is in the very good category, which means that users still rated FLIPO-AR very effective and in line with their expectations. It shows that the learning media meets user expectations well, although there is room for further improvement [14, 15].

Of the eight statements, the statements with the highest average score were "FLIPO-AR is flexible / can be used as needed" with a score of 87.21%, which falls into the category of excellent. This indicates that the learning media is very flexible and easy to use at any time [16]. This flexibility allows learning media to be adapted to a variety of contexts and situations, making it a very useful tool in supporting dynamic and responsive learning. This flexibility enables learning media to accommodate various learning styles, fostering a more inclusive and personalized learning experience. Therefore, the flexibility of FLIPO-AR not only improves accessibility but also the overall quality of learning, making it an excellent choice for a variety of educational environments. On the contrary, statements with the lowest average score were "When used, FLIPO-AR is consistent" with a score of 83.72%, which is in the good category. Although this is the lower score among all statements, it still shows that users rated this learning medium quite consistently in

its use. The overall evaluation confirms that the learning media used has met the standards of ease of use expected by users [17, 18].

Table 3. Score and indicator of usability testing.

Indicator	Statement Item	Average	TCR (%)	Category
Usefulness	FLIPO-AR helps learning to be more effective	4.42	88.40	Excellent
	FLIPO-AR helps to be more productive in learning	4.33	86.63	Excellent
	FLIPO-AR helps make learning more time efficient	4.34	86.80	Excellent
	FLIPO-AR can fulfil the needs of the learning process	4.33	86.51	Excellent
	FLIPO-AR can be used as expected	4.24	84.88	Excellent
Average Usefulness Indicator Score			**86.64**	**Excellent**
Ease of use	FLIPO-AR can help me understand the learning material	4.40	87.91	Excellent
	FLIPO-AR is practical to use	4.31	86.28	Excellent
	FLIPO-AR is user friendly / easy to operate	4.22	84.30	Excellent
Average Usefulness Indicator Score			**86.64**	**Excellent**
Ease of use	FLIPO-AR is flexible / can be used according to needs	4.36	87.21	Excellent
	When used, FLIPO-AR is consistent	4.19	83.72	Good
	FLIPO-AR can be accessed according to your needs	4.31	86.16	Excellent
	Obstacles when FLIPO-AR is used can be overcome easily	4.20	84.07	Excellent
Average Ease of Use Indicator Score			**85.39**	**Excellent**
Ease of learning	The material in FLIPO-AR is easy to learn	4.28	85.70	Excellent
	FLIPO-AR is easy to remember how to use	4.38	87.56	Excellent
	FLIPO-AR is easy to master how to use	4.39	87.79	Excellent
	FLIPO-AR can be mastered how to use it quickly	4.37	87.33	Excellent
Average Ease of Use Indicator Score			**85.39**	Excellent
Satisfaction	Feel satisfied with FLIPO-AR	4.35	87.09	Excellent
	Learning media will be recommended to friends	4.25	85.00	Excellent
	FLIPO-AR is fun to use	4.35	86.98	Excellent
	FLIPO-AR is interesting	4.42	88.37	Excellent
	FLIPO-AR is comfortable to use	4.40	87.91	Excellent
Average Satisfaction Indicator Score			**87.23**	**Excellent**
Average Score in Usability Testing			**86.37**	**Excellent**

Of the four statements, the one with the highest average score is "learning media is easy to master the way it's used," with a score of 87.79% in the category of very good. This ease of use is crucial in an educational environment, as it allows users

to focus more on learning content rather than being distracted by technical difficulties in using such media [19]. Thus, this easy-to-learn learning medium has the potential to improve the effectiveness of the teaching-learning process [20]. On the contrary, the statements with the lowest average score were "easy learning media to learn" with a score of 85.70%, which despite being in the very good category, remained the lower among all statements analysed. Despite this, these scores still indicate that users rated this learning medium fairly easy to learn. The fact that even the lowest score is still in the very good category indicates that the entire learning media used has been well designed and user-friendly [21, 22].

Of the five statements, the one with the highest average score is "interesting learning media," with a score of 88.37% in the category of very good. It indicates that the learning media not only succeeds in meeting educational needs but is also able to attract the attention of users [23]. This attraction is very important in the context of education because an attractive media can increase student learning motivation. When students are attracted to the learning media, they tend to be more actively involved in the learning process, pay more attention to the material, and are more enthusiastic about taking lessons [24]. Interesting learning media also have the potential to make the learning process more enjoyable and not boring [25]. On the contrary, statements with the lowest average score are "Learning media will be recommended to friends" with a score of 85.00%, which is still in the very good category. Although this is a lowest score among all statements analysed, it still indicates that users have a positive view of FLIPO-AR to the point that they are willing to recommend it to others [26].

The survey results show an 86% satisfaction rate for FLIPO-AR, placing it in the "Excellent" category. This suggests that FLIPO-AR meets user expectations effectively, providing a satisfying experience and has strong potential for further growth and development across various industries. The ease of learning indicator scored 85%, with 68% of respondents agreeing that the application is easy to use and quickly learned, enhancing user adaptation, efficiency, and overall satisfaction [27].

Over 120 respondents strongly agreed that the application was easy to use during learning. Such user-friendly applications enhance participation and engagement, contributing to a more effective and enjoyable learning environment. The ease of use, combined with its attractiveness, creates a positive and satisfying user experience, strengthening the favourable impression of the FLIPO-AR application. This ease of use is crucial as it reduces barriers to accessing and utilizing the application's features [28].

The usefulness criterion scored the highest at 87%, making it the top-rated aspect. FLIPO-AR is seen as highly beneficial, enhancing material comprehension, encouraging frequent use, and increasing the likelihood of recommendations, thereby boosting its adoption and success. In addition, the focus on usability also encourages the development of relevant and innovative features that are tailored to user needs. This contributes to improving the overall quality of user experience and supports the achievement of optimal learning outcomes [29].

4. Conclusion

The FLIPO-AR learning media received highly positive feedback, with usability testing scores of 85-87% in the "Excellent" category across all aspects. This

indicates its effectiveness and user-friendliness. Future research should explore its long-term impact on learning, involve diverse demographics, and consider integration with other educational technologies, along with gathering qualitative feedback for a deeper evaluation and continued development.

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