

Improving the Collaboration Skills of Vocational School Students Through Flipbook with Augmented Reality in Society 5.0

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ABSTRACT

In the age of Society 5.0, digitalization has completely changed the educational landscape and made it necessary for schools to foster students' critical thinking, cooperation, communication, and creative thinking abilities. (4C). Students can be better prepared for change by attending vocational institutions, such as the Vocational School (SMK). The continued development of learning technologies is crucial, particularly those that rely on virtual learning. R&D (Research and Development) combined with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model is the research methodology used for the creation and assessment of learning media. Quasi-experimental (Non-equivalent Group Pretest Posttest Design) methods are used to measure students' increased capacity for collaboration through group controls and experiments. Two material experts and two media experts who are also students in class X at one of the Bandung SMKs serve as the subjects of the ADDIE model. Students in classes X.3 and X.4 are used for quasi-experimental procedures. The study's findings demonstrated that Flipbooks with augmented reality fell into a respectable category, with revisions observed in the presentations of 80.5% of subject matter experts and 80.8% of media professionals. In the experimental class, students' levels of collaboration were 91% with great categories, compared to 70% in the control class with good categories. These findings demonstrate how successfully using flipbooks with augmented reality can enhance SMK students' collaboration skills.

Keywords: Collaboration skills; Flipbook; Augmented Reality; Vocational.

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INTRODUCTION

The By-Pass Pariaman road section is a road that connects several regencies/cities in West The world is now moving into the "society 5.0" period, which is characterized by significant changes in technology that affect many aspects of life, including education [1]. According to the idea of "Society 5.0," individuals should be able to maximize the use of technology to improve people's lives on an ongoing basis [2] [3] [4]. In order for today's vocational schools to produce human resource candidates, they must first innovate in their curricula so that their graduates can compete and thrive in the workforce in the age of society 5.0 [5] [6]. According to research by [7] [8] [9], candidates for human resources positions in the period of society 5.0 were expected to possess 4C skills (Critical thinking, collaboration, communication, and creativity). In Society 5.0, the 4Cs—Critical Thinking, Collaboration, Communication, and Creativity—became indispensable. These technologies and competencies worked together to produce graduates who were capable of raising the standard of living in their communities [10] [11].

The study's emphasis is on collaboration skills. Students need to learn how to collaborate if they want to achieve in society 5.0. Thus, it can be said that society 5.0 integrates technology and collaboration skills to produce skilled graduates who can compete in the job market and raise the standard of living for everyone. On the other hand, while learning media like as power points and modules have been utilized extensively in the field of education, not all of them have attained the best degree of effectiveness. In order to meet the needs of students in the period of Society 5.0 in terms of honing other skills and technical advancements, innovation is required in the form of virtual-based learning media, such as flipbooks with Augmented Reality (AR). Because of its portability and ease of use, Flipbooks are a type of virtual interactive multimedia that can be utilized in learning activities [12] [13]. While augmented reality (AR) is described as a technology that allows real-time projection of virtual items onto the real world[14] [15] [16]. Further research indicates that augmented reality (AR) technology can be advantageous in the field of education since it can enhance the way that lessons are taught and raise student enthusiasm and retention [17] [18] [19] [20] [21].

Vocational School (SMK) will employ flipbooks with augmented reality (AR) as a teaching tool in this research. The research by [22] [23] that discovered SMK pupils had little interest in learning activities served as the basis for this study. Students find it challenging to focus as a result, which has an impact on the anticipated competencies for graduates. In addition, SMK students have three career possibilities as one of their learning objectives: employment, further education, or entrepreneurship [24]. The study centers on SMKN 5 Bandung, a Center of Excellence (PK) school and one of the SMKs whose graduation rates are falling in terms of their capacity for collaboration. A few educators at SMKN 5 Bandung claimed that the root of the problem is interactive and poor instructional materials. The need for digital isolation of education in the context of society 5.0 makes this research essential. The creation of defense media, such as flipbooks with augmented reality built in, is one of these demands that can improve SMK pupils' 4C skills.

As for previous research on similar topics, it has been done by other researchers. In a study entitled "Developing an E-Flipbook On Environmental Change Topics To Develop Students' Digital Literacy" conducted by [25], the use of flipbooks has been shown to improve students' digital literacy skills. Then there's a study conducted by [26] stating that Virtual and AR can improve the skills required by 21st-century students with the title research (Virtual and augmented reality effects on K-12, higher and tertiary education students' twenty-first century skills). Next, the research by [27] with the title "The Effectiveness of STEAM-Based Augmented Reality Media in Improving The Quality of Natural Science Learning In Elementary School" proves that the use of AR can improve the quality of learning. From that, there has never been a study explaining that flipbooks with AR can improve students' ability to collaborate specifically and in depth. Therefore, the innovation in this research is a virtual-based learning media that is flipbook with Augmented Reality (AR) which is specially designed according to the needs of students and response to technological advances in the era of society 5.0.

MATERIALS AND METHODS

This study focuses on Vocational School (SMK) 5 Bandung, a center for excellence. Research subjects include class X students in the disciplines of Teknik Konstruksi dan Perumahan (TKP 2), Desain Pemodelan dan Informasi Bangunan (DPIB 3) and DPIB 4. The ADDIE (Analysis, Design, Development, Implementation, Evaluation) development methodology is used in this study together with the R&D (Research and Development) approach.

Research or analysis of the need to identify problems, such as the evaluation of audiences, content, media, and technology, is the first stage in learning media development. Following that stage, the researchers move into the "Design" step. This phase's tasks include making storyboards and flowcharts, then coming up with concepts for learning media that align with the collaboration element.

The next step is design, where researchers develop augmented reality flipbooks and teaching modules. There are multiple steps involved in testing the development stage in this study. The Alpha phase comprises of a validation test by a media expert and a test of validation by a material expert and the Beta phase is a product usage test. To determine the results of the qualification test, consult Table 1. The media revision is carried out once the validation phase is completed, so it can be considered worthy of usage.

Table 1: Eligibility Criteria for Judgement Expert Validation Results

Percentage	Category
81% - 100%	Very Eligible
61-80%	Eligible
41-60%	Quite Eligible
21-40%	Not Eligible
0-20%	Very Less Eligible

By using flipbooks with augmented reality, the research was carried out up until the implementation phase. In order to complete this phase, a small sample of 30 students from class X TKP 2 were given flipbooks with AR. The evaluation stage is the last in the ADDIE technique. At this point, each student receives a lift in order to gather their feedback on utilizing the flipbook with AR. This stage attempts to gauge how well users are evaluating flipbook-style instruction using augmented reality technology, which has been created with Table 2.

Table 2. Validation Results Eligibility Criteria and Presentation of Response Results

Percentage	Category
80% - 100%	Very Eligible
60-79,9%	Eligible
40-39-59,9%	Quite Eligible
20-39,9%	Not Eligible
0-19,9%	Very Less Eligible

Additionally, the study went on to examine students' enhanced collaboration skills using a quasi-experimental method (Non-equivalent Group Pretest Posttest Design) using control and experimental groups. Researchers use case studies and the Project Based Learning (PjBL) approach built into the application to test collaboration abilities. They also conduct observations and compare the results to the experimental and control groups using an evaluation rubric. In this study, observation was the method of data collecting. With the information in tables 3 and 4 serving as a guide for classifying students' levels of collaboration skills, the observation's

objective is to witness and document students' capacity for productive work, respect, and compromise.

Table 3. Indicators of Student Collaboration Skills

Collaboration Skill Indicator	4. Very Capable	3. Capable	2. Enough Capable	1. Less Capable
Work productive	Use all the time efficiently to stay focused on the task and give the necessary contrivances. Each student works on his or her assignment and often contributes more in discussions and presentations.	Collaborate well and stick to the important thing until the job is done. Everyone contributes in discussions and presentations	Sometimes they work together, but they don't contribute or work on them in discussions and make the work difficult to complete to a minimum in presentations.	Couldn't work together well. Want to work on your own and interrupt others about what to do, instead of focusing on the task until the discussion doesn't go well and the presentation is less than maximum
Shows respect	Always put respect in listening and discussing ideas shared	Listening and interacting well most of the time	Difficulty appreciating someone else's worth	Don't listen to other people's opinions
Compromise	Collaborate flexibly in discussions to joint goals	Compromise to improve performance in discussions	Less can compromise in discussions so work is slower	A lot of disagreement in the discussion and just following his own wishes
Sharing responsibility	Doing his best work and based on the assignment	Doing his own part	It's hard to get everybody to do their part of the job.	Could not solve his own part

Table 4. Collaboration Results Category

Score	Category
$86\% \leq A \leq 100\%$	Very good
$76\% \leq B \leq 85\%$	Good
$60\% \leq C \leq 75\%$	Enough
$55\% \leq D \leq 59\%$	Less
$E \leq 54\%$	Very less

RESULTS AND DISCUSSION

The findings of needs analysis or analysis indicate that there is Wi-Fi, teachers continue to use PowerPoint, and pupils utilize smartphones. But education still only consists of lectures and PowerPoint or desktop computers. The researchers used Unity and Vuforia software to construct interactive learning with flipbooks and augmented reality in order to address this issue. The Flipbook with AR program may be used on Android version 7 smartphones that support augmented reality features. It has two primary menus which is Flipbook and Augmented Reality. Up until the development stage, research is conducted [28] asserts that in order to keep up with technological advancements, students must be able to use digital media successfully and freely. Expert conclusions are displayed in Figure 1, where 80.8% of the total was accounted for by the validation components of the average expert material. Aspects of self-concept compatibility scored 90%, which was the highest.

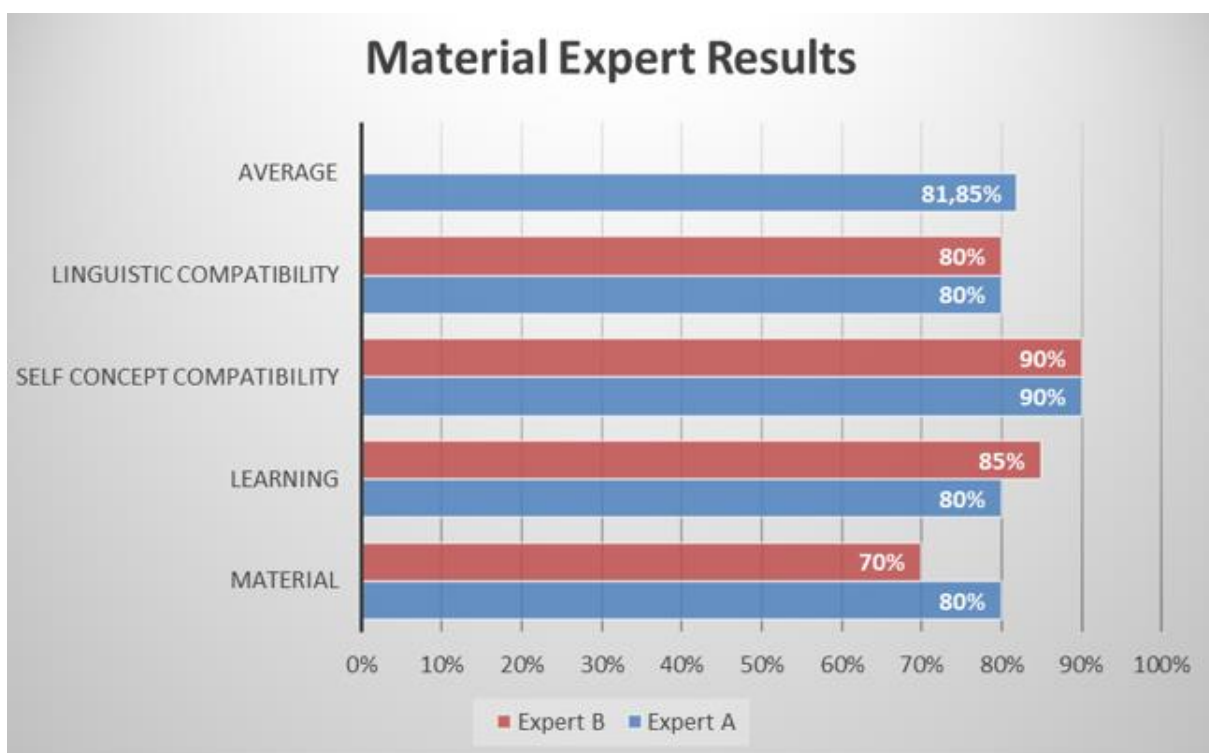


Figure 1: Expert Results on Material

Figure 2 illustrates the mean proportion of evaluations of media validation, which amounts to 80.5%. With 81% of the total percentage, the visual aspect is the one with the largest percentage. Integrating media becomes essential for enhancing comprehension and bolstering information retention [29]. Therefore, it can be said that flipbook with augmented reality is suitable for usage with some modifications based on the findings of evaluations by material experts and media experts.

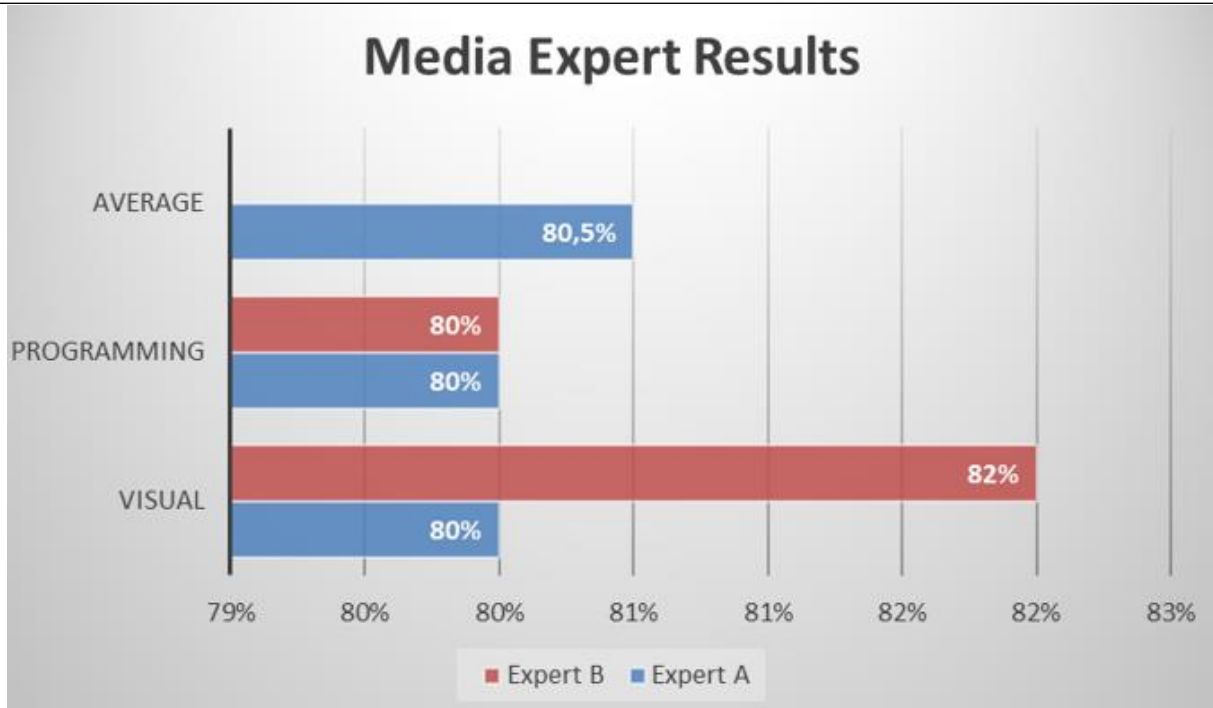


Figure 2: Expert Results on Media

Following expert review, the flipbook with AR was used to distribute questionnaire to students in SMKN 5 Bandung's X TKP 2 class in order to gather input on the utilization of learning media. As a crucial component of an endeavor to improve the application and development of cutting-edge learning media, the responses provided by respondents hold significant importance in the field of media development [30]. Figure 3 displays the user's evaluation results.

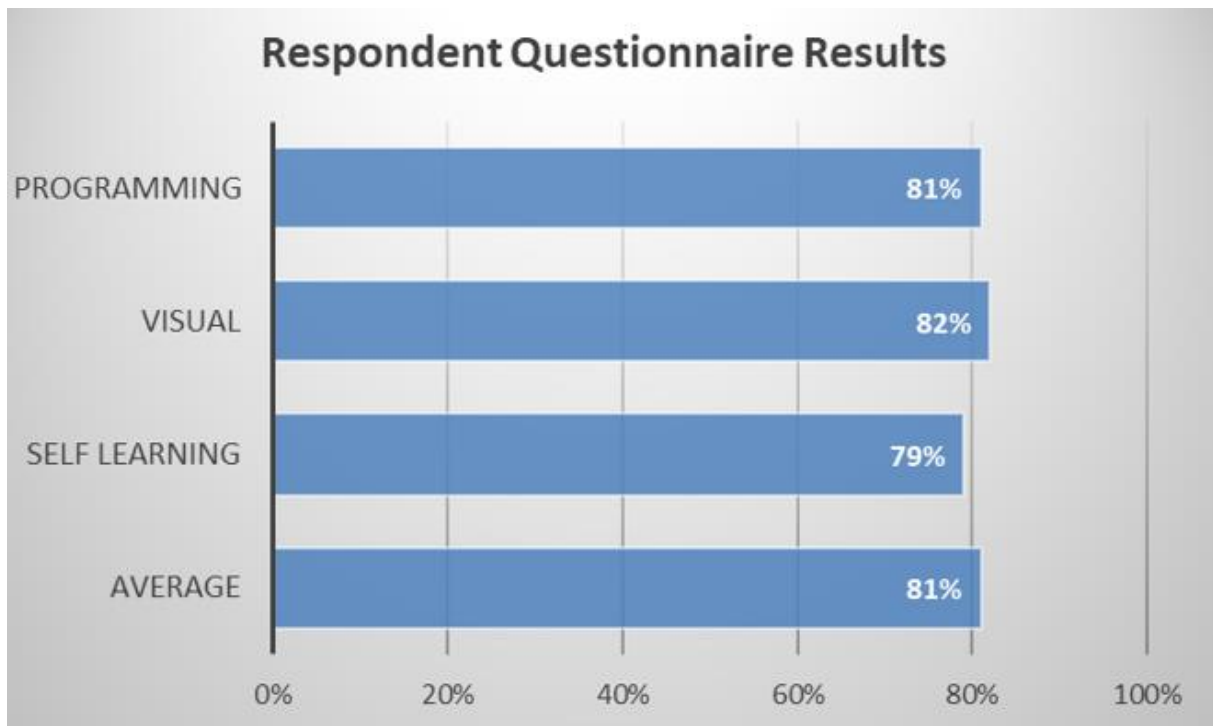


Figure 3: Respondent Questionnaire Results

The average score for all aspects is 81%, as seen in Figure 4, with the average detail for each aspect being 79% for self-learning, 82% for the visual component, and 81% for programming. The study's findings indicate that using flipbooks with AR as a kind of learning media falls under the "good to use" category. Numerous paragraphs of assessment indicate that users judge the majority of the flip-book media's features [31].



Figure 4: Percentage of Collaboration Skill Results

Figure 4 illustrates the outcomes of the students' enhanced collaboration abilities. Regarding working productivity, the experimental class has 88% great categories while the control class has 70% sufficient categories. According to research [32], SMK students' attitude toward using time to be able to work creatively and productively is explained as one of their soft skills. It is as a result of the instructor's capacity to explain the subject. However, one component of collaboration capabilities can be enhanced by utilizing flipbooks with AR. Regarding the respect component, the experimental class scores 90% with a very good category, whereas the control class scores 70% with a sufficient category. One of the soft talents that is necessary in the business sector and demanded by generations of characters is respect [33] [34]. Because the content stored in the flipbook with augmented reality is more interactive, students in the experimental classroom participate more actively in information sharing during presentations. Regarding the compromising element, the experimental rate is 96% with a great category, while the control class has a percentage of 69% with a sufficient category. One of the difficulties encountered in the Industrial 4.0 and Society 5.0 eras is the ability to communicate and reach a compromise [35]. The experimental class's results show that students may compromise with one another and engage in discussion and presenting activities. This is seen in the way that pupils give in to a shared objective. The average result of the students' collaborative skills is displayed in Figure 6. There are 70% of suitable categories in the control class and 91% of outstanding categories in the experimental class. Collaboration becomes essential for problem-solving and attaining the best learning outcomes when it is assumed that two heads are better than one [36]. The study's findings indicate that the experimental group outperforms the control group, supporting the notion that educational materials might improve students' capacity for teamwork in vocational education.

CONCLUSION

The study's findings showed that media experts gave the flipbook learning medium with augmented reality a score of 80.8% while material experts gave it an 80.5%. Flipbooks with AR were thus given a category that could be useful after revision. 81% of pupils responded favorably to the Flipbook with AR category. In addition to the enhancement of collaboration skills, the results were derived from the scores for each productive work element; the experiment class had an 88% percentage and the control class had a 70% percentage. The experimental class's average score was 91%, whereas the control group's was 70%. However, respect was shown; the experimental courses had 90% and the control classes had 70%. Next, concerning the compromised element, the self-experimental class scored 96% and the control class scored 69%. It is possible to draw the conclusion that educational media could enhance students' capacity for teamwork. It is evident from this that the research findings hold significant promise for the advancement of interactive learning technologies in the field of education.

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