

## Developing Videos Through Project-Based Learning: Improving Aviation Cadets' Basic Airport Civil Engineering

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### ABSTRACT

This study aimed to explain project-based learning (PjBL) in the context of making airside and landside learning videos for aviation cadets and measure the effectiveness of the learning videos in improving their understanding of basic airport civil engineering material. This study used ADDIE development method to develop learning videos integrated in a project-based learning process with a quantitative approach. There were 48 cadets included in this study selected using a purposive sampling technique. A total of 24 cadets joined the control class taught using conventional learning method and a total of 24 cadets participated in the experimental class taught using PjBL by developing learning videos. Data were collected using needs analysis questionnaire, rating scale for understanding basic airport civil engineering material, and validation sheet. The obtained data were analyzed using descriptive statistics and t-test to address the research questions. Results showed that the cadets were able to develop valid learning videos through ADDIE procedure and they could increase their understanding on basic airport civil engineering significantly ( $F = 3.533$ ;  $t = .969$ ;  $p = .000$ ).

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## **INTRODUCTION**

Project-based learning (PjBL) is a learning method that uses projects or activities as media. Students conduct exploration, evaluation, interpretation, synthesis, and information gathering to achieve a variety of learning outcomes (Hamidah et al., 2020). Project-based learning is a learning technique that transforms traditional learning into something more inventive and autonomous by experiencing realm (Parrado-Martínez & Sánchez-Andújar, 2020). This strategy is based on constructivist learning theory and focuses on students while producing real products and encouraging communication, problem solving, and organizational abilities. The processes include exploration, activity planning, and a description of the experience. Project-based learning has several advantages, including increased student motivation, problem-solving abilities, and making students more active and successful problem solvers. Aside from that, this strategy gives students experience structuring a project, allocating time, and leveraging existing resources to complete assignments (Kovalyova et al., 2016; Larmer et al., 2015).

A good learning video should carry the essence and learning of higher-order thinking skills (HOTS) (Adri et al., 2020). Students must develop HOTS in order to build critical thinking, problem-solving, and decision-making abilities. HOTS teach students how to analyze, evaluate, and synthesize information (Sada, 2019), which is essential for success in the twenty-first century. HOTS development is especially crucial in the context of project-based learning (PjBL), where students must apply their knowledge and abilities to real-world problems and challenges. PjBL allows students to develop HOTS by engaging in complex problem-solving, collaboration, and communication activities (Prananda et al., 2020). The incorporation of HOTS into PjBL can assist students in becoming more independent, self-directed learners who are better equipped for future challenges. Therefore, developing a good learning video in the context of project-based learning should occupy HOTS integration.

Unfortunately, to the best of the researchers' knowledge, there had been less detailed learning videos on basic airport civil engineering namely on topics of landside and airside facilities. These topics are important to be mastered by airport civil engineer as they give portrayal of information regarding airport facilities separated by land and air sides. Moreover, to the best of the researchers' knowledge, no study conducted learning video development on those topics. However, almost similar studies only conveyed about the learning of basic airport civil engineering in which the information carried out in the videos still lacked of detailed information and the videos were not developed to train higher order thinking skills (HOTS) (Baldo et al., 2021; Fillola Caraballo et al., 2018; Pasandín & Pérez, 2021). Several studies also conducted a study on developing learning videos through project-based learning method (Febiyanti et al., 2021; Rozal et al., 2021), however, those studies did not give an opportunity for student to create the videos. It is indeed important to give an opportunity for students to create a learning video project as part of realizing Outcome-based education (OBE) model (Kumar, 2022).

Therefore, the present study aimed to develop learning videos on basic airport civil engineering on topics of landside and airside facilities through the implementation of project-based learning and the integration of HOTS practices. The novelty of this study lays on the authentic materials developed by students after several developmental stages in the form of learning videos. Moreover, the learning video is not only comprising landside and airside detailed materials, but also the HOTS-based question practices. It is expected that the present study can be a reference of developing an English for Specific Purpose (ESP) learning media but still considering the importance of 21<sup>st</sup> century education model and national curriculum of higher education namely outcome-based education (OBE) model.

## LITERATURE REVIEW

### *Project-based Learning in Outcome-based Education*

Project-Based Learning (PjBL) is an integral component of Outcome-Based Education (OBE) due to its significant impact on student learning outcomes and the development of essential skills (Parrado-Martínez & Sánchez-Andújar, 2020). Several studies and resources highlight the importance of PjBL in OBE (Chen et al., 2022; Muis & Dewi, 2021; Rustam & Priyanto, 2022). A meta-analysis study found that PjBL can significantly improve students' learning outcomes compared to traditional teaching methods. While there may not be complete agreement on its effects on the development of students' thinking skills, academic performance, and affective attitudes, many studies have shown that PjBL can enhance students' learning motivation, problem-solving skills, teamwork, and communication skills (De los Ríos-Carmenado et al., 2015; Zhang & Ma, 2023). PjBL is effective in enhancing student outcomes by requiring students to practice essential skills and reflect on their growth over time (Chintya et al., 2023). It has been found to lead to a decline in absenteeism, an increase in cooperative learning skills, and improvement in student achievement. PjBL also fosters the development of 21st-century skills, such as critical thinking, reasoning, creativity, and strong communication skills (Almazroui, 2023). Research confirms that PjBL leads to deeper understanding, greater retention of content knowledge, and the ability to apply knowledge to new situations. It also helps students become better decision-makers and gain competence in critical thinking, problem-solving, and collaboration, thus preparing them for success in today's rapidly changing and complex world (Mamuaja et al., 2023). Thus, PjBL plays a crucial role in OBE by significantly improving student learning outcomes, fostering the development of essential 21st-century skills, and preparing students for success in an ever-evolving world (Syukriah et al., 2020). The evidence overwhelmingly supports the positive impact of PjBL on students, teachers, and school communities.

### *Basic Airport Civil Engineering: Introducing*

Basic Airport Civil Engineering involves the planning, design, construction, and maintenance of airport infrastructure, including runways, taxiways, aprons, hangars, and terminal buildings (Koseoglu & Arayici, 2019). Airport civil engineering is crucial for ensuring safe and efficient operations,

compliance with federal and local regulations, and meeting the needs of passengers and freight (Hubbard & Hubbard, 2019; Koseoglu & Arayici, 2019). In details, there are several key aspects of basic airport civil engineering encompassing airside and landside design and engineering services, surveying and geotechnical investigation, airport classifications and features, airport markings and signage, air traffic control, safety during construction, and compliance with standards (Koseoglu & Arayici, 2019). However, the present study only focuses on landside and airside facilities as the foundation of understanding further complex airport civil engineering materials and issues.

Landside facilities, which include passenger and cargo terminals, access systems, parking, roads, public transportation facilities, loading and unloading areas, and other aviation and non-aviation related activities, are an essential component of airport infrastructure (Janić, 2018; Koseoglu & Arayici, 2019). Landside facilities are open to the public and are in charge of catering to the needs of passengers and cargo (Janić, 2018). The landside facilities are intended to facilitate the movement of passengers, cars, and commodities to and from the airport. The present study only focuses on terminal building facilities and parking area (Janić, 2018). First, the airport terminal building is a critical component of an airport, serving as the central hub for passenger processing, including check-in, security, customs, and boarding. It also houses amenities such as retail outlets, restaurants, lounges, and gates for aircraft boarding and disembarkation (Bertolini et al., 2023; Modić et al., 2018). Second, Airport parking areas are an essential component of airport infrastructure, providing a safe and convenient place for passengers and visitors to park their vehicles while traveling (Wang & Zhang, 2019). Adequate parking is crucial for ensuring punctuality among employees and passengers, which is essential in an industry that promises timeliness (Sun & Schonfeld, 2017). However, inadequate parking can lead to unnecessary traffic and congestion, inefficient employee parking, damaged vehicles, and dissatisfied customers.

Airside facilities are the support facilities on the airside of the field at an airport, including areas such as meteorology, fire and rescue, power and other utilities, aircraft maintenance, and airport maintenance (Bertolini et al., 2023; Pacheco et al., 2014). In this study, there are runway, taxiway, and apron as the basic airside facilities that must be apprehended by first-year aviation cadets. These three facilities are the primary areas where aircraft operate and are typically restricted, controlled, and require passing through security checkpoints (Rajapaksha & Jayasuriya, 2020; Wilson et al., 2006). The runway is a designated area where aircraft take off and land (Ikli et al., 2021). It is typically a long, straight, and flat surface made of concrete or asphalt. The taxiway is a designated path for aircraft to move between the runway and the apron. It is typically a narrower surface than the runway and is used for aircraft to taxi to and from the runway (Wang et al., 2022). The apron, also known as the ramp, is a designated area of an airport where aircraft are parked, unloaded, loaded, refueled, and boarded by passengers. It is typically located adjacent to the terminal building and is where the aircraft are serviced and prepared for their next flight. The apron is also where ground support equipment, such as

baggage carts, fuel trucks, and catering trucks, operate in close proximity to the aircraft. The apron is typically divided into different sections, depending on the type and size of the aircraft, as well as the functions that are being performed (Korkmaz et al., 2023).

## **METHODOLOGY**

This study used research and development design using ADDIE model (analyze, design, development, implementation, and evaluation) proposed by Molenda (2015) with a quantitative approach. There were 48 research participants chosen based on several inclusion criteria such as the study program and year of study times. The forty-eight participants were aviation cadets enrolled in the second semester of study time majoring in Airport Civil Engineering Study Program at one of state polytechnic under Indonesian Ministry of Transportation. The total participants were divided into two classes namely control and experimental class. The control class consisted 24 cadets who were taught by using conventional lecturing teaching mode while the experimental class involved 24 cadets who were taught using project-based learning by developing learning videos on basic airport civil engineering especially on the topics of landside and airside facilities. Both classes shared similar characteristics of the cadets, thus, the essence of fairness or equality of participants were upheld. Data were collected using field note implemented during needs analysis in forum group discussion (FGD), rating scale to measure understanding of basic airport civil engineering materials, and validation sheet. The rating scale adopted Likert's scaling method with four options from strongly disagree (1) to strongly agree (6). The scale had been trialed and revealed its validity and was considered valid with  $\alpha = .877$ . The rating scale consisted of ten items (see Appendix 1). In addition, the validation sheet was given to two independent validators who became the class teacher and understood the English terminologies for specific purposes. The obtained quantitative data from rating scale and validation sheet were analyzed using descriptive statistics and t-test to reveal differences of the cadets' understanding of landside and airside topics by the assistance of IBM SPSS 25. Whereas, the obtained qualitative data from the forum group discussion were analyzing using Miles and Huberman's (1984) theory consisting of data reduction, data display, and conclusion.

### ***Project-based Learning Process in Experimental Class***

Project-based learning carried out in the experimental class was undertaken in three stages, namely the opening stage, the core stage and the closing stage. At the opening stage, the lecturer greeted the cadets, checked attendance, and had a small conversation about their emotional, mental condition, and readiness before taking part in the lesson. The lecturer then explained that the basic airport civil engineering would focus on airport facilities material with airside and landside topics. The lecturer provided stimulus questions related to airside and landside material. Some cadets were able to explain their initial knowledge regarding airside and landside, but most were not able to provide an overview of what they knew regarding airside and

landside. At the core stage, the lecturer began to explain in general terms the airport facilities and showed several pictures categorized into airside and landside. The lecturer divided the class into five groups where each group was given a project to look for material related to airside and landside. Group 1 discussed about runway (airside), group 2 discussed about taxiway (airside), group 3 discussed about apron (airside), group 4 discussed about airport terminal (landside), and group 5 discussed about parking area (landside). After the cadets got into their respective groups, the cadets began to be given the concept of learning videos by the class lecturer. The lecturer explained that simple and easy learning videos could be done using PowerPoint with the extension .ppt/.pptx and could be saved in video form with the extension .mp4. However, this method was not a limitation for cadets' creativity like using other video editing software such as Adobe and others. The resulting video must include a detailed explanation along with a description of the facilities, HOTS (higher order thinking skills) practice questions, along with the references used. The preparation of explanatory material and practice questions always required assistance from the lecturer so that it could be completed well. At the video making stage, each explanation must be done through a cadet's voice recording so that before the voice recording, the cadets were expected to be able to practice with the lecturer. After the cadets understood what kind of learning video they had to make, they could do research regarding the material that each group received. At the closing stage, the lecturer reinforced the material and asked each group to present their project work. The video was assessed or validated by the teaching lecturer along with 1 English lecturer colleague who also teaches as a team in the class. The resulting value was then recorded as an additional assignment value. Although this value was not the focus of this study, the cadet learning videos were categorized as good by the video validators.






## **RESEARCH RESULT**

### *Developing Learning Videos in PjBL Class through ADDIE stages*

At the analysis stage, cadets carried out an analysis of the material needs that would be used in the learning videos. Basically, cadets produced the same material requirements formulation, which included (1) definition of the material topic, (2) function of the material topic, (3) relevant detailed information such as several problems that arise related to the material topic, (4) practice HOTS questions, and (5) list of references. The five aspects of material requirements contained in the video were then developed in the form of short essays to later be used as voice over material (especially aspects 1 to 4). Regarding the need for learning video models, all cadets referred to the results of the analysis of learning media needs carried out by lecturers and colleagues in FGD. The result of FGD regarding the needs of the learning media was namely necessary learning media that could be used in blended learning with a focus on informative video with the practice of HOTS. At the design stage, cadets held group discussions to determine the color tones and fonts used so that the learning video display was attractive and not boring. The cadets designed various designs with almost the same tendencies, namely using neutral fonts

such as Times New Roman and Arial so that the readability of the letters could be maximized, placing the video title and names of group members in the first minute of the video, and using informative videos as the background of the videos they made. The color contrast settings used were also good so that they supported the delivery of the material. Table 1 shows examples of designs and color tones used by each group.

Table 1. Design Learning Videos for Each Group of Material Topics

Group	Example of Screenshot of Learning Video Design	Design Description
1 (Runway)		<p>The background design is a video with a black tone and dominant orange, so the use of black font with white embossing creates an elegant impression with good readability.</p>
2 (Taxiway)		<p>The background design is video footage of a plane landing with good brightness so that the use of black font color provides good readability.</p>
3 (Apron)		<p>The background design is video footage with brightness tones that tend to be dark so that the use of yellow makes the text read clearly.</p>
4 (Airport Terminal Building)		<p>The background design is a video clip with a dark color tone on the left side so that the use of white font makes the text read well, but the use of white font in the middle of the video makes it a little less legible because the background brightness is quite high.</p>
5 (Parking Area)		<p>The background design is video footage with brightness tones that tend to be dark so that the use of white Times New Roman font makes the text read well.</p>

The next stage was the development stage. At this stage, all groups developed learning videos that were made with a design that had been agreed upon by each group member. Several materials were also prepared to support the content of the learning videos that would be developed. In this case, each group member was also required to record sound for the voice over learning video. Therefore, each group member was required to consult on pronunciation training with the lecturer. After the pronunciation was said to be good, the group then recorded the sound and included it in the learning video. Apart from using relevant material and voice overs, each group was also required to create a minimum of 6 HOTS questions related to the material topic and consulted them with the teaching lecturer. The existence of HOTS questions in this learning video was to support 21<sup>st</sup> century skills, one of which was critical thinking so that cadets were trained to think critically. After the development stage, the cadets were required to present the video as a form of implementation of the learning video they created. The cadets saw the results of video projects created by each group with information that was easy to understand and enrichment in each video. After the implementation stage, each group member received feedback from the lecturer as a whole. When giving feedback, two lecturers also validated the appearance and content of the video that had been developed by the cadets. In general, the learning videos developed were good and the validation results show good results (see Table 2 and Table 3). In the final stage, groups that required revision were given time to revise and collect the revised videos. The following is a video link that has been collected <http://bit.ly/VideoPembelajaranAirsidesLandside>.

Table 2. Video Assessment Results by Validator 1

No.	Rated aspect	Validator 1				
		Group 1	Group 2	Group 3	Group 4	Group 5
1	<i>Face Validity</i>	5	5	4	5	4
2	<i>Content Validity</i>	5	5	5	5	5
<i>M</i>		5	5	4.5	5	4.5

Table 3. Video Assessment Results by Validator 2

No.	Rated aspect	Validator 1				
		Group 1	Group 2	Group 3	Group 4	Group 5
1	<i>Face Validity</i>	4	5	4	5	4
2	<i>Content Validity</i>	5	5	5	5	5
<i>M</i>		4.5	5	4.5	5	4.5

Based on Tables 2 and 3, both validators agreed that the learning video had met the appearance and content criteria so that a score of  $3.6 \leq \bar{x} \leq 5$  or sentences included in the video, and the suitability of the images and video illustrations used. Apart from that, the learning videos created by cadets have fulfilled the sub-aspects of assessing the availability of information on definitions of material topics, detailed information related to material topics, the

availability of HOTS practice questions, and the completeness of the references used. Furthermore, this study explained how effective videos created through project-based learning could increase cadets' understanding of airside and landside material by comparing the final understanding scores in the experimental class versus the control class.

***Project-Based Learning through the Development of Learning Videos: Effect on Cadets' Understanding of Basic Airport Civil Engineering Materials***

The effectiveness of project-based learning through the development of learning videos on cadets' understanding of basic airport civil engineering material was examined using the t-test. Before carrying out the t-test, Table 4 shows the demographic data of the control and experimental classes.

Table 4. Demographic Data for Control and Experiment Classes

No	Aspects	Control Class		Experimental Class	
		N	Percentage (%)	N	Percentage (%)
1	Gender				
	- Male	18	81%	19	80%
	- Female	5	19%	5	20%
2	Government cooperation class (ASN-future class)	23	100%	24	100%

Regarding Table 4, the number of cadets in the control and experimental classes was not significantly different, where the number of cadets in the control and experimental classes was also the same and the number of cadets in each class was also the same. This showed that the data used in the control and experimental classes could not be concluded on the influence of gender. Apart from that, both classes were government cooperation classes where selection to enter the polytechnic went through the same type of test. In these two classes, cadets would also be appointed as ASN staff after graduating. Thus, demographic data showed that there were no significant differences related to the background of the research participants. Afterward, Table 5 shows the results of the rating scale for understanding basic airport civil engineering material in the control class and Table 6 shows the results of the rating scale for understanding basic airport civil engineering material in the experimental class.

Table 5. Rating Scale Results for Understanding Basic Airport Civil Engineering in Control Class

No.	Items	N	M	SD	Swanson's Percentage	Category of Understanding level
1	I understand the Basic Airport Civil Engineering material which is delivered through applied learning methods.	23	3.2609	0.54082	54.35%	High

2	I understand airside material easily through the learning methods applied.	23	3.3043	0.55880	55.07%	High
3	I understand landside material easily through the learning methods applied.	23	3.2609	0.86431	54.35%	High
4	I understand taxiway material easily through the learning methods applied.	23	3.2174	0.59974	53.62%	High
5	I understand runway material easily through the learning methods applied.	23	3.3478	0.64728	55.80%	High
6	I understand the apron material easily through the learning methods applied.	23	3.3043	0.70290	55.07%	High
7	I understand airport terminal material easily through the learning methods applied.	23	3.2174	0.67126	53.62%	High
8	I understand the parking area material easily through the learning methods applied.	23	3.3478	0.64728	55.80%	High
9	I understand the importance of airside and landside material for my future professional development with the learning methods applied.	23	2.6087	0.78272	43.48%	Low
10	I understand several problems related to airside and landside and how to solve the problems through applied learning methods.	23	2.3478	0.98205	39.13%	Low

Based on Table 5, cadets' understanding of basic airport civil engineering material, especially airside and landside topics, was in the high category. However, there were two aspects that had low scores, namely item 9 and item 10. Item 9 showed how high the cadets' understanding was regarding the importance of knowing the benefits of studying airside and landside to support their work profession in the future (43.48%). This phenomenon showed that even though their understanding of airside and landside material was high, they apparently did not yet understand the implications of what they had learned for the needs of supporting their professional activities in the workplace. Apart from that, item 10 which showed problem understanding and problem solving, which indicated HOTS exposure, also showed a low value (39.13%). This value was the lowest value compared to other items. This showed that in learning, cadets were still not exposed to learning based on Critical Thinking Skills or critical thinking or higher-level thinking (HOTS). The lecture method used by lecturers was not yet able to provide a full picture of airside and landside problems and their solutions. This was because the lecture

method used was followed by structured assignments in the form of summaries, not problem solving that integrated HOTS.

Table 6. Rating Scale Results for Understanding Basic Airport Civil Engineering in Experimental Class

No.	Items	<i>N</i>	<i>M</i>	<i>SD</i>	Swanson's Percentage	Category of Understanding
1	I understand the Basic Airport Civil Engineering material which is delivered through applied learning methods.	24	5.8333	0.38069	97.22%	Very High
2	I understand airside material easily through the learning methods applied.	24	5.6250	0.49454	93.75%	Very High
3	I understand landside material easily through the learning methods applied.	24	5.5833	0.50361	93.05%	Very High
4	I understand taxiway material easily through the learning methods applied.	24	5.7083	0.46431	95.14%	Very High
5	I understand runway material easily through the learning methods applied.	24	5.7917	0.41485	96.53%	Very High
6	I understand the apron material easily through the learning methods applied.	24	5.8333	0.38069	97.22%	Very High
7	I understand airport terminal material easily through the learning methods applied.	24	5.7083	0.46431	95.14%	Very High
8	I understand the parking area material easily through the learning methods applied.	24	5.7083	0.46431	95.14%	Very High
9	I understand the importance of airside and landside material for my future professional development with the learning methods applied.	24	5.4583	0.50898	90.97%	Very High
10	I understand several problems related to airside and landside and how to solve the problems through applied learning methods.	24	5.7500	0.44233	95.83%	Very High

Based on Table 6, all aspects of understanding the material showed a very high category. This showed that the cadets' understanding in this category was very good in understanding basic airport civil engineering material in general, airside and landside material in general, and specific material related to taxiways, runways, aprons, airport terminals and parking areas. In addition,

project-based learning with a learning video development project accompanied by exposure to HOTS practice questions showed that cadets were able to understand several problems and solve problems that might occur related to the five material topics. Investigating understanding of the material using this rating scale as considered very relevant and valid because it directly measured understanding in the construct area. Furthermore, Table 7 shows the difference between understanding the material in the control class and the experimental class using the aggregate t-test.

Table 7. T-Test Results on the Control Class and Experimental Class  
Aggregately

Comparative Aspect	<i>F</i>	<i>t</i>	<i>df</i>	<i>p</i>	Description
Comparison of the understanding scores of the control class and the experimental class	3.533	21.969	45	0.000	There was a significant difference between the understanding scores of the control class and the experimental class

Table 7 portryas that the t-test results on the fact that there was a significant difference between the understanding scores of the control class and the experimental class. In other words, the use of a project-based learning method by creating learning videos for airside and landside material with exposure to HOTS practice questions conveyed that this method could improve cadets' understanding in the experimental class. Meanwhile, the lecture method with structured assignments and material summaries were less able to improve cadets' understanding of material topics as a whole. Table 8 shows the differences in scores for each item.

Table 8. T-test results on ten aspects of assessing understanding of airside and landside material

Comparative Aspects	<i>F</i>	<i>t</i>	<i>df</i>	<i>p</i>
Understanding Basic Airport Civil Engineering material delivered through applied learning methods.	4.802	18.922	45	0.000
Understanding airside material easily through applied learning methods.	0.066	15.093	45	0.000
Understanding landside material easily through applied learning methods.	7.206	11.314	45	0.000
Understanding taxiway material easily through applied learning methods.	0.593	15.962	45	0.000
Understanding runway material easily through applied learning methods.	9.392	15.338	45	0.000
Understanding apron material easily through applied learning methods.	14.347	15.427	45	0.000
Understanding airport terminal material easily through applied learning methods.	2.300	14.850	45	0.000

Understanding parking area material easily through applied learning methods.	4.670	14.413	45	0.000
Understanding the importance of airside and landside material for future professional development with the learning methods applied.	4.893	14.860	45	0.000
Understanding several problems related to airside and landside along with how to solve the problems through applied learning methods.	16.494	15.423	45	0.000

Based on Table 8, there was a significant difference between the understanding scores of the control class and the experimental class. So, based on the statistical data presented, cadets could understand basic airport civil engineering material on airside and landside topics well when they learned using project-based methods compared to when they had to be exposed to conventional lecture methods. Apart from that, the development of learning videos could support the creation of an independent learning environment and independent group discussions as well. The video developed also had an important meaning as a product of the project carried out in bridging understanding of the material and especially in supporting the HOTS-based thinking process.

## DISCUSSION

A comparison of project-based learning with conventional learning using the lecture method certainly showed differences in cadets' understanding of the material being taught. Several studies had shown that there were weaknesses in the continuous lecture method which had an impact on students' level of understanding or level of student achievement (Jayara, 2020; Lamanuskas & Makarskaite-Petkeviciene, 2021). Jayara (2020) explained that students could lose interest in the subject matter if the teaching approach did not involve them actively in the learning process, in this case the lecture method. Akhter et al. (2021) added that there was limited interaction between students and teachers in lecture-based methods, which could limit students' ability to ask questions, debate concepts, or contribute valuable personal experiences. Fifadhilni (2022) explained that the lecture technique involved the teacher doing most of the talking with little or no participation from students, which could result in passive learning and inhibit students' ability to interact actively with the topic. Lectures might be boring for students because they were not involved in the learning process and only listened to the teacher. In accordance with previous research, Wirabumi (2020) also explained that if clear objectives were not given to students and good supporting material was not provided in the lecture method, students might find it difficult to learn the material effectively. This was also shown in the results of the present study, where the control class with the lecturing method still had less understanding than the experimental class with the project-based learning method.

Previous research on project-based learning (PjBL) had provided valuable insights into its effectiveness, implementation, and potential to improve student learning outcomes. De Vivo (2022) showed that an authentic and student-based approach to PjBL improved student learning outcomes and had a strong effect on student achievement. These studies also found that PjBL programs improved certain aspects of social and emotional learning, with consistent effects across racial and socio-economic groups. Markula and Aksela (2022) presented a multiple case study analyzing how teachers implemented PjBL in K-12 science education. The study found that PjBL encouraged collaboration, the use of technology tools, and the development of 21st century learning and skills. However, the study also noted that some projects did not focus solely on learning key concepts, which rose questions about the nature of PjBL. Maros et al. (2023) showed a study on the impact of PjBL on minority student achievement highlighting PjBL's instructional approach, which was designed to engage students in the investigation of real-world problems to create meaningful and relevant educational experiences. Almulla (2020) indicated that PjBL required students to plan, develop, and build immediate solutions to challenges, with the aim of strengthening students' creative capacity to address complex or unstructured problems. According to research, students learned more when they worked on unstructured or poorly organized assignments than on highly structured assignments. So, it could be concluded that the learning experience using project-based learning could increase student achievement or the level of understanding of the material which could be measured by any construct instrumentation. The results of previous research showed similarities with the current research.

Regarding the use of learning videos, previous research on video-based learning had highlighted several best practices that could be used when developing instructional videos using the ADDIE model. Santagata et al. (2021) pointed out that it was very important to determine the learning objectives that a video should achieve before developing it. This helped ensure that the video was on target and relevant to the learning objectives. What the class lecturers and their colleagues did in the present study was very much in line with previous research. This was to ensure that the video to be developed met the criteria for learning media needs by cadets. Apart from that, Zahwa and Syafi'i (2022) also added that after identifying learning objectives, video content could be designed to meet these objectives. This included selecting acceptable graphics, writing a video script, and preparing the pacing and structure of the film. This was very relevant to the design stage carried out in this research. In the present study, cadets developed designs assisted by discussions with class lecturers. After this stage, Kainde et al. (2022) added that during the development process, video content was created using appropriate tools and software. This might include video recording, editing, and adding appropriate graphics or animations. This was also in accordance with the present study because the software used as a device that cadets could easily access and use.

Once the video was developed, it could be implemented in the learning environment (Syafdaningsih & Pratiwi, 2022). This could be done by uploading videos to the learning management system or sharing them with students via email or other means such as presentations (Mulyadi et al., 2023). This presentation method was then adapted in this research so that evaluation could be carried out later. Finally, Mayer et al. (2020) indicated that it was important to evaluate the effectiveness of videos in achieving learning objectives. This could be done by collecting feedback from students or analyzing student performance data to determine whether the video was effective in supporting learning. In this case, the evaluation was carried out to improve the video, while its effectiveness could be known through collecting feedback in the form of a rating scale for understanding airside and landside material.

This present study showed that the use of project-based learning methods with learning video development projects could increase cadets' understanding. Learning videos had been proven to be a powerful tool for improving student learning (Mayer, 2021). These videos were integrated into basic courses, form the basis of many blended courses, and were often the primary means of delivering information in online courses. Several studies had shown that videos could be a useful learning medium in blended learning (Mayer, 2021; Puspaningtyas & Ulfa, 2020). Videos could be a powerful tool for improving student learning and increasing student engagement in various subjects (Puspaningtyas & Ulfa, 2020). To optimize the effectiveness of learning videos, it was essential to evaluate cognitive load, features that influenced engagement, and elements that encouraged active learning (Jalinus, 2021; Puspaningtyas & Ulfa, 2020)

## CONCLUSIONS AND RECOMMENDATIONS

This research uses two types of classes, namely control classes and experimental classes to see the effectiveness of using project-based learning methods by developing learning videos on basic airport civil engineering material, especially on airside and landside topics. This research uses the ADDIE model for developing learning videos and uses a t-test to see the effectiveness of using project-based learning methods with video development. This research shows that cadets can develop learning videos using the ADDIE model. In addition, based on the results of the t-test, the score for understanding the material in the experimental class was higher than the score in the control class. This shows that the project-based learning method can increase the cadets' level of understanding of the material. Meanwhile, conventional lecture methods cannot improve understanding of the material due to lack of exposure to independent learning and HOTS-based assignments. This research suggests that further research can use project-based learning methods as the chosen learning method to see the effectiveness of cadets' learning success. Future research can compare this method with other methods such as inquiry or discovery-based learning methods, scientific approaches, or problem-based. The use of different material topics can also be done to determine possible differences in cadet achievement if done with different topics. This is possible because there is a possibility that the level of difficulty of

the material topic affects the learning motivation and efficacy of cadets in understanding the material topic. For ESP English teachers, this research can be developed on different topics, especially in the aviation domain, so that they can see cadet engagement on these different topics. For vocational education institutions, this research can be a reference that vocational education can develop authentic independent learning media with the character of vocational education accompanied by the HOTS application so that students at the vocational level not only have specific skills, such as skills in building and foundation techniques, but also has HOTS-based problem-solving skills.

### ADVANCED RESEARCH

In writing this article the researcher realizes that there are still many shortcomings in terms of language, writing, and form of presentation considering the limited knowledge and abilities of the researchers themselves. Therefore, for the perfection of the article, the researcher expects constructive criticism and suggestions from various parties.

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