

Creating Digital Media-Based Content as Output of Project-Based Learning: Exploring Students' Perspectives on Implementation, Challenges, and Solutions.

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Abstract. Given the emphasis on case or team-based projects as the crucial performance indicators in syllabus, lecturers from Raja Ali Haji Maritime University have designed a syllabus that promote digital media content creation as the project output to support society 5.0 and environmental awareness in the context of language learning. This study explores the perspectives of second-semester English students who participated in creating digital media-based content that included maritime context as their group-project in vocabulary building course. This study applied an exploratory descriptive-qualitative design. Data were collected from questionnaires, focus-group interviews and observation. The data were collected, thematically categorized, and interpreted. Findings revealed that two types of digital media were created in the course: a Canva-based E-Book and a website-based learning reference. Most students perceived the implementation of creating digital media-based content positively. However, challenges such as vocabulary limitations, skill gaps, communication issues, and self-adjustment were encountered during the project. Additionally, metacognitive strategies such as planning, information management strategies, monitoring, debugging strategies and evaluation are utilized by the students throughout the project.

1 Introduction

Both technically and philosophically, the educational industry has been profoundly impacted by the quick development of digital technology. Teachers must adapt to this change by managing, creating, and integrating digital resources into the teaching and learning process [1]. Cyber-physical system-based technology is becoming an essential component that needs to be incorporated into teaching and learning activities in the age of industry 4.0 [2]. A response to the times is shown in the pervasive use of digital technology in the classroom, which not only enhances the educational process but also satisfies students' demands for the newest innovations in technology.

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However, the acceleration of digitalization demands that educators quickly adapt while enhancing their skills in technology management, which they may not have mastered previously [3]. The integration of digital media in education offers opportunities to create more interactive and collaborative teaching methods, which in turn can enhance students' learning experiences. Digital media such as videos, podcasts, and infographics enrich learning materials and support diverse learning preferences [4].

One of the best ways to use digital media is through project-based learning (PBL). Through projects that are applicable to real-world circumstances, PBL involves students in creating knowledge, with the instructor serving more as a facilitator who offers direction [5]. This methodology cultivates students' teamwork skills and creativity in solving real-world challenges, two essential 21st century competencies [6]. As a result, PBL promotes students' increased independence, creativity, and engagement in acquiring the knowledge and abilities they require.

Meanwhile, the implementation of PBL integrated with digital media still faces many challenges. One of the main challenges is limited digital infrastructure and technological readiness, including inadequate access to devices and stable connectivity, especially in low access region [7]. Other challenge is lack of technological skills among educators, who often unconfident in operating digital devices [8]. The lack of adequate facilities hinders institutions from providing quality education, conducting research, and supporting their daily operations [9]. School environments that do not support the development of digital skills among teachers further aggravate the issue, where many institutions still lack policies that optimally support technology integration [10].

Difficulties in understanding and managing digital technology, particularly in PBL, pose a challenge for students. Some students struggle with integrating artificial intelligence (AI) technology into their projects due to a lack of practical understanding [11]. Additionally, many students feel overwhelmed when combining mechanical knowledge with more advanced digital technology [12], [13]. Coordination difficulties among team members also present a unique challenge, as each student has different goals, skills, and interpretations [14].

Digital media also offers interactive learning experiences that engage students in active exploration and discovery like educational games [15]. In the educational context, developing adequate digital infrastructure is essential to ensure stable internet access and the availability of technological resources [9]. The lack of timely and adaptive feedback also presents a major obstacle in PBL. Many students complain about delayed feedback on complex projects, making it difficult for them to assess their progress [8].

In the context of the digital era and Industry 4.0, students are not only expected to be recipients of information but also creators of digital content that is creative and relevant to real-world needs. Creating digital media-based contents, which has been included in Project based learning (Team-based project) are widely implemented in the syllabus in English language teaching. Following the stages of team-based project method, students are fostered to produce educational resources, interactive content, and instructional materials, such as online English video simulation, English presentation, published-scientific article, and creating other digital media-based contents. Creating digital media-based content in higher education support student centred approach. It promotes critical thinking, peer learning, and building on one another's abilities among students [16]. Students must cooperate in order to complete collaborative assignments, which helps them build their interpersonal and communication skills [17]. It promotes critical thinking, peer learning, and building on one another's abilities [16].

To achieve student's critical thinking and problem solving skill, the metacognitive awareness is needed. Metacognitive strategies refer to learners' awareness and control over their own cognitive processes [18]. These strategies include planning, monitoring, and evaluating one's thinking during learning tasks. In creating the project, the students automatically will use their metacognition awareness. Without metacognition, the students are unable to critically synthesise multiple resources, assess reliable evidence, and respond to diverse audience needs, tasks, goals, and disciplines in order to create topic knowledge [19]

A curriculum that promotes active learning and student collaboration encourages the use of metacognitive strategies [18]. Self-regulated learning as a dynamic activity, which includes self-generated thoughts, feelings, and actions aimed at achieving learning goals [20]. Schraw & Dennison defined that metacognitive strategies build the students' awareness of their learning, such as planning, information management, monitoring, debugging, and evaluation strategies [21].

The urgency of this research is to get insights based on students' experiences and perspectives on implementation the digital-integrated project. Moreover, this research in the field of education is to meet the future needs of learners in English especially in maritime area. It is hoped that through exploratory research can answer the needs of education in creating digital media content for English learning can be fulfilled by integrating digital and project in university. The students as the actor in this project are the key for gaining information related to project and digital in learning activity. Thus, this research can also to improve the quality of project that integrate digital technology and foster students' digital literacy. Moreover, the researchers are also interested in investigating students' metacognitive strategies in the project.

2 Method

This study will use explorative-descriptive qualitative design. According to Creswell, descriptive qualitative describes explains a fact or occurrence in the subject to highlight trends and themes associated with certain enquiries [22]. Since this study aims to explore students' perspectives and their metacognition strategies in project-based learning, this study will use observation, questionnaire, and focus group interview. The data will be collected by observation, focus-group interviews, open-ended questionnaires, and Metacognition Awareness Inventory (MAI) questionnaires. According to Miles & Huberman (1984), these data collection techniques are used to support data triangulation and to obtain accurate data for research understanding. Data collection, data reduction and categorization, data display, and conclusion are the steps of data analysis in qualitative research. The result of the observation, interview and questionnaire will be described and analyzed. Data are coded and similar codes are categorized and themed. Depending on Miles & Gray, the information gathered in the field, the researcher critically analysed the data [23]. According to Miles and Huberman (1984) in [18], "Narrative text has historically been the most common form of display data for qualitative research data." Therefore, the researcher will use narrative to display data in this research. The population of this research were students of English department, Raja Ali Haji Maritime University. The samples were the students of vocabulary building course who joined the project of digital media content creation. The samples of the research will be taken purposefully. The samples of this study were 7 groups of students consisting of 30 students overall. The concern letter was used as a supporting data.

3 Results and Discussion

These research results were obtained through observation, focus-group interviews, and open-ended questionnaire.

3.1 Integrating digital media content creation in project-based learning

Based on the observation, there are few stages of project-based learning conducted at vocabulary building course at English Language Education, Raja Ali Haji Maritime University. In line with [5] that PBL engages students in constructing knowledge through projects relevant to real-life situations, where the teacher's role is more as a facilitator who provides guidance. First is providing essential questions or need analysis. This stage is necessary to explore the initial idea for creating digital media content creation. The students brainstormed the vocabulary or words that suitable to their target learners. According to the lecturer, brainstorming as the foundation for selecting appropriate vocabulary, students will discuss the students' needs that engaging and accessible. The lecturer reminded the target language must be acceptable with the target audience. Secondly is Grouping. To start the project, the students were divided into seven groups, each consisting of four to five people, and they focused on creating digital media-based content for vocabulary building, aimed at junior and senior high school students. Each groups selected the type of media, with most choosing to develop Canva-based e-books and websites. The next stage is monitoring and feedback.[6] (Prasetyo et al., 2023) has explained that PJBL fosters students' abilities to work in teams and develop creativity in formulating solutions to real-world problems, which are crucial 21st century skills.

Digital media based on Canva and websites were implemented from the 3rd to the 14th meeting. The students were required to attend each meeting in the classroom, and the lecturer monitored their progress. During the monitoring, the lecturer asked students questions about the progress of the media, the content, obstacles, and possible solutions. It was so significant because many students complain about delayed feedback on complex projects, making it difficult for them to assess their progress [8]. The students engaged in a collaborative process within their teams, dividing tasks, holding meetings on Zoom and WhatsApp to report on and discuss vocabulary lists, and reviewing each other's work. It motivates students to use critical thinking skills, absorb knowledge from others, and build on one another's advantages [16]. Each group had a coordinator who directed the project. Last stage is presentation and evaluation. The students presented their media projects. Five of the seven groups created e-books using the Canva application. These e-books focused on vocabulary building for teenagers or junior high school students (ages 13-16) and elementary school students (ages 10-11). Meanwhile, two of the seven groups designed websites that explained vocabulary for vocational school students in the tourism sector.

Furthermore, the implementation of digital media creation in project based learning encourages students to collaborate and handle problems within their teams. They were eager to find resources together by dividing tasks. The contents of the e-books and websites include a cover, title, preface, learning objectives, table of contents, sub-chapters, English vocabulary materials for each chapter, such as nouns, verbs, adjectives, adverbs, and maritime-related vocabularies and context, exercises or quizzes, a glossary, and references. Students also added more engaging pictures to their e-books. As has been explained that digital media such as videos, podcasts, and infographics enrich learning materials and support diverse learning preferences [4] .

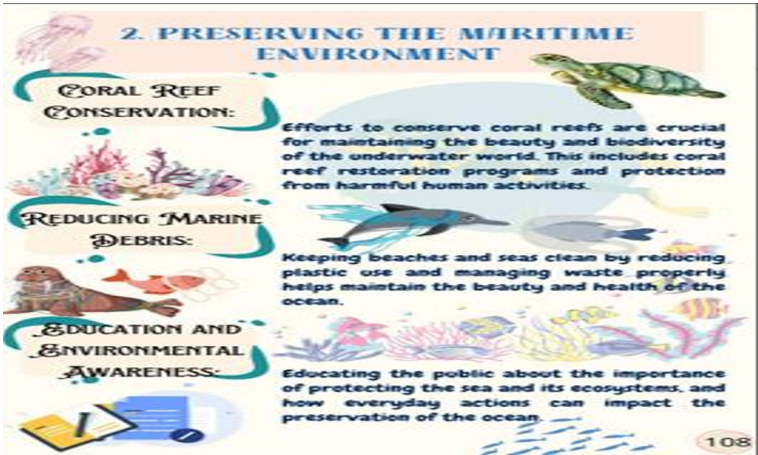


Fig 1. The material content about maritime environment



Fig 2. The material content about environmental awareness.

Furthermore, the websites were created by the students as learning references for improving the vocabulary of vocational school students. The websites contain materials and vocabularies related to accommodation, services, communication, tourist destinations, and transportation. The websites provide explanations and contexts about particular topics, vocabulary collections, conversations, and practical exercises in formats such as fill-in-the-blank, match-the-definition, and multiple choice to strengthen vocabulary understanding.

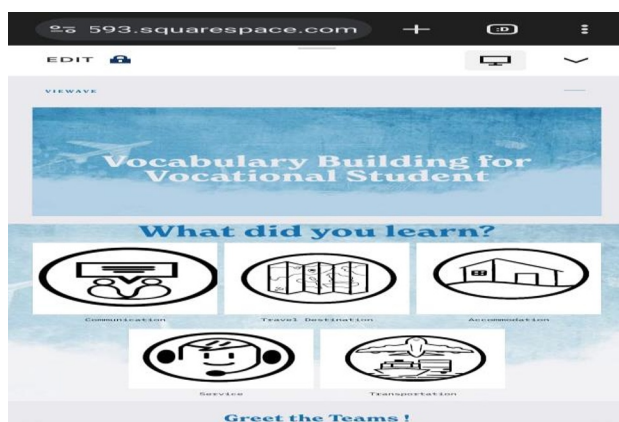


Fig. 3 The website as learning reference created by students

The process of creating digital media, whether it be a website or an e-book, consists of several stages. These include choosing a title, using Canva, dividing tasks among group members, gathering materials, organizing the content, and adding elements such as images and games. By integrating the project with digital media, it will support the transformation of education in industry 4.0 [1].

3.2 Students' perspectives on implementation, challenges, and solutions

The integration of digital media content creation and project-based learning have many benefits. First, provide new insights for the students. The majority of respondents provided positive feedback related to collaboration and creativity in learning. They mentioned that the process of learning by making product helped them in understanding the material or review the vocabularies, and new glossary related to the maritime environment, gaining new experiences, enhancing critical thinking, and improving digital literacy. As industry 4.0 exists, cyber-physical system-based technology becomes a crucial element that must be integrated into teaching and learning activities [24]. The students also noted that the project helped them become a better problem solver. They also mentioned that the project was beneficial, including gaining knowledge about digital media, developing ideas and skills in media creation and English, new learning experiences, and producing attractive, portable, and easier-to-access vocabulary learning materials. Thus, the integration of digital media in education offers opportunities to create more interactive and collaborative teaching methods, which in turn can enhance students' learning experiences [4].

Furthermore, according to Suryawidjaja (2023), the acceleration of digitalization demands that educators quickly adapt while enhancing their skills in technology management, which they may not have mastered previously [25]. In this project, students are encouraged to explore new tools and software on their own. While independence is important, monitoring and guidance throughout the project are helpful. In the project, timely feedback from lecturers and team leaders helps them refine their work in the media and content creation process. This balance between learner autonomy and support enables students to create impactful digital media while working efficiently in group setting.

Related to the implementation, creating digital media content includes choosing the product, need analysis, and process. Regarding the product, the respondents said, "*Digital media on the website*" (11/R2/ProWeb/4), "*We create e-books*" (14/R2/Pro/E-book/25). It has indeed transformed the learning and teaching process in numerous ways, and has reshaped the landscape of learning and teaching, offering both students and educators [26]. This shows

that the students felt free to choose the product they wanted to create, but they should understand why they were creating the product as part of the need-analysis. From the interviews, there are several processes involved in the need analysis for creating media carried out by the students. From need-analysis, students knew which media is suitable and what content should be included in the media to enhance the vocabulary knowledge of the learners. Three areas of needs analysis identified in creating digital media content include considering the students' learning experience, material resource patterns, and students' specific needs. Supriatnaningsih in her research explained project-based learning involves lecturers providing a problem or theme at the beginning, followed by students discussing it in groups, and finally presenting their work through zoom [27]. This allows them to prioritize vocabulary materials based on the identified needs. Examples of needs analysis in creating digital media content include considerations such as students' needs, accessibility, and vocabulary patterns as respondents said,

"according to us, as time progresses and technology advances, junior school students can easily access and read e-books. They can carry them anywhere, making them easily accessible" (I2/R1/NA/MEDIA/8).

"searching for materials initially..... first, we gather information about what junior school students are learning and what subjects they study" (I2/R3/NA/RES/10). Students' needs, such as their interests, preferred media, and learning resources, are important reasons for creating digital media content. The choice of media is also determined by the students' abilities and the time duration. As respondents said,

"we found that most high school students are still less interested in tourism. So, we decided to target vocational high schools (SMKs) that specialize in tourism, as it is more relevant to their needs and interests" (I1/R2/NA/INT/42).

However, the process of creating this project also presented difficulties for them, such as challenges in potential, time management, communication, getting suitable materials, and motivation. They reported that the project was burdensome, especially for those who struggled with teamwork [14] time management, using digital media creation tools, and had low reading literacy. Many students feel overwhelmed when combining mechanical knowledge with more advanced digital technology [12], [13].

The lack of technical expertise in using digital platforms and design tools is one of the main obstacles. It is in line with [11] students struggle with integrating artificial intelligence (AI) technology into their projects due to a lack of practical understanding. Based on interview data, several respondents found difficulty. Respondents said, *"Plan, no, we also don't have basic coding either, right now to code the game it is also a bit heavy...."* (I1/R1/Chal/PLA/38).

"For me, the material, right, we're worried that it might be too difficult or, on the other hand, too easy. Something like that. Then with the material, there are limits, like a maximum of this much and a minimum of that much" (I6/R3/EVA/Chal/189).

While facing challenges, the students use metacognition skills such as planning, information management strategies, monitoring, debugging strategies, and evaluation to control their actions and be a problem solvers. As said by [18] (Flavell, 1979), the importance of learners awareness and control over their own learning process. This is the solution offered in the project that involves creating digital media content based on the findings. First.

Planning. The first metacognitive strategy used by students includes several aspects revealed in the interview, such as goals or review learning objectives, finding content/material, target user, ability, learners' needs, and task division. Similar to need analysis, planning includes the aspects that are prepared in the process of creating digital media content. Secondly, information management strategies.

The metacognitive strategies used by students in creating digital media content include information management strategies. The students are unable to critically synthesise multiple resources, assess reliable evidence, and respond to diverse audience needs, tasks, goals, and disciplines in order to create topic knowledge [19](Popandopulo et al., 2023). Among the findings revealed by students in website creation are collecting data for media development, selecting the material, focusing on the important information or material, organizing content/material, analyzing media accessibility. Additionally, the process of creating an e-book involves collecting data where students gather material from various sources or references such as books and assess the needs of students who will use the media.

Furthermore, selecting materials like chapters, exercises, and quizzes is done through team discussions. Organizing the material is a strategy used in structuring digital media content, where each chapter includes one topic, explanations, practice, and exercises. Starting from theme selection, titles, and sections with vocabulary and practice, creative tools like Quizizz, Kahoot, or games are utilized, as mentioned by a respondent,

"In our book, first, there is a pre-activity, which includes a pre-test or introductory activity. It can be a game, questions, reading a dialogue, and so on. Then there's the building block, which is the main material. Third, there's an active dialogue section for reading dialogues. Finally, there's a create or practice section where students work on exercises." (I3/E/INF/Mat/16). In summarizing the material, students select and organize content, structuring it into specific parts within each chapter. They also create their own vocabulary examples to make material based on their understanding.

Furthermore. The next step is comprehension monitoring. During the process of creating digital media content, students had used various strategies, from gathering data to creating their own vocabulary examples. Throughout this process, they had employed metacognitive strategies by conducting monitoring processes related to the ongoing work to check if it's going smoothly or if adjustments are needed regarding strategy, material or content, media structure or format, and self-capabilities. This was needed to develop critical thinking and recognize necessary corrections [28]. As stated by one respondent, *"We're doing a revision. On the website, we want to put up material and exercises, but it's very plain, so we're planning to rent a website for 200 thousand"* (I1/R2/MON/Adj. Str/10). This monitoring process involves evaluation, as noted by a respondent, *"Initially, we did use that, but it's too... plain, there's nothing to it, and we don't have any coding basics either, right?"* (I1/R1/Mon/Med/14, I1/R2/MON/Ab/51). *"What we've already made includes the old website, icons, the website logo, team logo, material logo, vocabulary logo, and exercise logo. The material itself is divided into two parts"* (I1/R2/MON/Mat/17).

Fourth is debugging Strategies. The improvement strategy when facing challenges or problems. In debating strategies, some aspects found when students want to fix the issues or challenges, such as the revision about media, cooperating with experts' team, improving collaboration in the team by increasing the communication & setting the schedule, consult the material or content to the lecturer and resources, improve the media content. As respondents said, *"So, our plan is to rent a website for 200 thousand. After that, we want to create a system that is leveled"* (I1/R2/DEB/STR/10). Last, the students reflect on their process during the process. They tell the strengths and weaknesses when they have finished with the project. The strategy is effective in some aspects, such as progress, material, time

management, and media effectiveness. As respondent said, *“If the advantage, uh, is that there’s obviously more vocabulary since the theme is vocabulary, and... and also, this is still a plan, but we believe its strength lies in the level system and the leaderboard system” (I1/R2/EVA/Mat/36). Furthermore, the respondent said, “Yes, because it’s more effective, right? There are more options” (I1/R1/EVA/Str/59).* Some aspects to consider for project making and product development were the availability of reasonably priced media production equipment, faster internet connections, students' access to mobile devices, and an increase in media production abilities [29].

4 Conclusion

The implementation of creating digital media in Project-based learning encourages students to find resources and handle the problems in their team. By using metacognitive strategies, students do the reflection, research, or survey about the target vocabulary and find the digital media. This is an effective way to be a problem solver in project-based learning, and choosing the types of digital media they create. This stage may involve exploring apps, websites, and other resources that teach vocabulary effectively. It is related to the theory that the existence of technology in education has an impact on the learning and teaching process. Challenges and problems may arise during the project, especially digital media content creation; however, they can be solved by metacognitive strategies.

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