Impact of Web App Development Tools for Authentic Learning & Collaboration in Design Education

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Abstract. The Learning Management System (LMS) offers a centralized location for individuals to collect and store educational resources, accessible from any connected device at any time. However, design education encounters challenges in utilizing LMSs, including technical issues, difficulties with usability and navigation, limited features to support interactive and engaging learning experiences, self-discipline in an online learning environment, and inconsistencies between the LMS and academic programs offered. This study aims to address these issues and examine how web app development tools can impact collaborative learning and real-world experience in design education. The research methodology involved a mixed-method approach, encompassing a survey and comments from 50 Indonesian design students enrolled in the Commercial and Service Design course. Additionally, focus group interviews were conducted with a subset of students to augment the survey data. The findings of the research study indicated that incorporating web app development tools as alternatives to traditional learning management systems had a beneficial effect on design education. This suggests that the use of web app development tools could have a positive impact on collaborative learning and real-world experiences within the field. These tools can be leveraged to facilitate experiential learning, foster student collaboration, and nurture creativity and innovation. Moreover, web app development tools can be utilized in various educational contexts to enhance accessibility to web materials for all users. These findings demonstrate the potential of web app development tools in creating a more authentic and collaborative learning environment in design education.

Keywords: Web App, LMS, Authentic Learning, Collaboration, Design Education

1 Introduction

The Learning Management System (LMS) is now a ubiquitous tool in education, offering a central area for people to gather and store instructional resources that are accessible at any time from any connected device [1]. The LMS is continuously regarded as one of, if not the most, significant technologies in undergraduate education today, from more conventional, face-to-face lectures to entirely asynchronous online sessions. LMSs have taken over as the standard entry point for

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technology-enhanced learning in a setting where the educational institution and the learner are mainly absent [2]. However, using LMSs for design education is difficult due to technical issues, navigational issues, a lack of features to support interactive and engaging learning experiences, the need for self-discipline in an online learning environment, and discrepancies between the LMS and academic programs available [3].

With a specific emphasis on reflective practice and project-based learning, design education often embodies all the traits of a soft-applied subject. Its authentic project-based learning (PjBL) strategy is another aspect of design education that encourages students to gain knowledge by addressing "real-life" problems. It frequently entails collaboration or collaborative learning in which students cooperate with their peers and socially engage in order to explore and discover solutions to a practical challenge [4]. With nature projects that require a lot of hands-on experience, traditional LMSs are not sufficient to meet the needs of a design course.

Globally, more individuals access the internet through mobile devices than through desktop computers. This explains why making your online apps compatible with mobile devices is essential now more than ever. [5]. Not every LMS is as effective as another. Many have hidden fees, ambiguous administration, user, and developer guides, and restrictions on interoperability, integration, localization, and bandwidth needs. The best LMS for use must be chosen after careful consideration. Since LMSs typically include a lot of features, choosing one by hand has grown to be a laborious process [6].

This study examines the experiences of design students in a blended learning environment, which integrates traditional face-to-face instruction with online distance learning strategies. The goal of this blended learning approach is to gain insights from students about in-class learning and LMS usage to further develop better tools to enhance collaborative learning and an authentic learning environment. The research focused on investigating how web app development tools can impact collaborative learning and real-world experience in design education.

2 Literature Review

2.1 Learning Management System (LMS)

The phrase "learning management system" (LMS) refers to a broad category of systems that offer managers, teachers, and students access to online learning resources. The phrase "Learning Management System" (LMS) refers to a broad category of systems that students, teachers, and administrators can use to access online learning resources. These services often have certain basic features like restricted access control for authorized users, a variety of learning content, and a variety of communication options. Another alternate term occasionally used to describe LMS is "online learning platform." [7].

According to another definition, LMS (learning management system) software automates the management of training events. The LMS registers users, keeps track of courses in a database, collects data from students, and gives management reports. Typically, an LMS is made to handle courses from many publishers and providers.

The majority of the time, it doesn't have its own writing tools; instead, it focuses on managing courses made by a range of different sources [8].

2.2 Standard Web App vs. Native Apps

Web applications are built for desktop browsers and can be used on mobile devices, as long as they do not rely on features that are not present on mobile devices (such as Adobe Flash). Native web applications, on the other hand, are designed specifically for mobile devices and can take advantage of their unique features. This is challenging because there are many different mobile operating systems (OS), and new ones are constantly being developed [9].

The following table compares native apps and standard web apps [10] on a number of key metrics:

Table 1. Comparison between Native App and Standard web app.

Parameters	Native App	Standard Web App
Installation	Need to download in the Apps store or Play Store	Not require installation
Updates	Need to be submitted and downloaded by users	Instant updates
Size	Heavy, mostly take device's storage	Small and fast
Offline access	Available	Not required
User experience	Excellent when the application is well designed	Sometimes confusing between app menu and browser menu
Push notification	Yes	Yes (possible with third party services)
Discoverability	Need to work on app store optimization	Not required

2.3 Blended Learning

The term "blended learning systems" refers to the combination of face-to-face training and computer-mediated instruction [11]. It entails intentionally integrating in-person and online learning experiences within the classroom setting, as defined by another perspective [12]. Ultimately, there is a consensus that the fundamental components of blended learning encompass both in-person and online instruction or learning [13]. This highlights the importance of incorporating a balanced approach that combines traditional classroom methods with digital resources. This balanced approach recognizes the value of utilizing technology to enhance traditional classroom methods, fostering a comprehensive and effective learning environment.

2.4 Authentic Learning

In an authentic learning environment, students do real-world tasks in real-world settings. They look into a variety of perspectives and sources, consult experts, conduct research, and collaborate in order to construct and explain their growing

understanding. Students produce really useful goods (texts, artifacts, resources) while working in academic contexts (not necessarily real world environments), which can be assessed using real-world standards and shared online to advance knowledge [14].

Elements of Authentic Learning:

1. Offer real-world examples that demonstrate how the knowledge will be applied.
2. Offer authentic tasks and activities.
3. Access to professional experts
4. Describe various stances and opinions.
5. Encourage the creation of knowledge collaboratively.
6. Encourage reflection so that abstractions can form.
7. Encourage articulation to make implicit knowledge explicit.
8. The teacher should offer coaching and scaffolding where necessary.
9. Authentic assessment of learning within the tasks should be offered.

3 Methodology

Using a mixed-method approach, the quantitative research involved a survey of 50 Indonesian design students who were enrolled in the Commercial and Service Design course. Meanwhile, the qualitative research was obtained from the comments of the students who participated in the survey. The purpose of the survey was to gauge students' perceptions towards collaborative and authentic learning that were affected by web app development technologies. Focus group interviews with a portion of the students were used to enhance the survey data.

The survey and interview questions were created based on the effect of authentic activities [15], which includes several questions aimed at exploring perceptions of authentic activities, real-world relevance, authentic tasks, and opportunities for collaboration. Additionally, the survey questions also sought to gather information about lifelong learning and project-based learning in the utilization of technology [16]. Some of the questions focused on opportunities for reflection, technology-enhanced environments, and learning satisfaction.

An authentic approach is used in blended classrooms for the Commercial and Service Design course. The class is split into four modules, as seen in Figure 1.

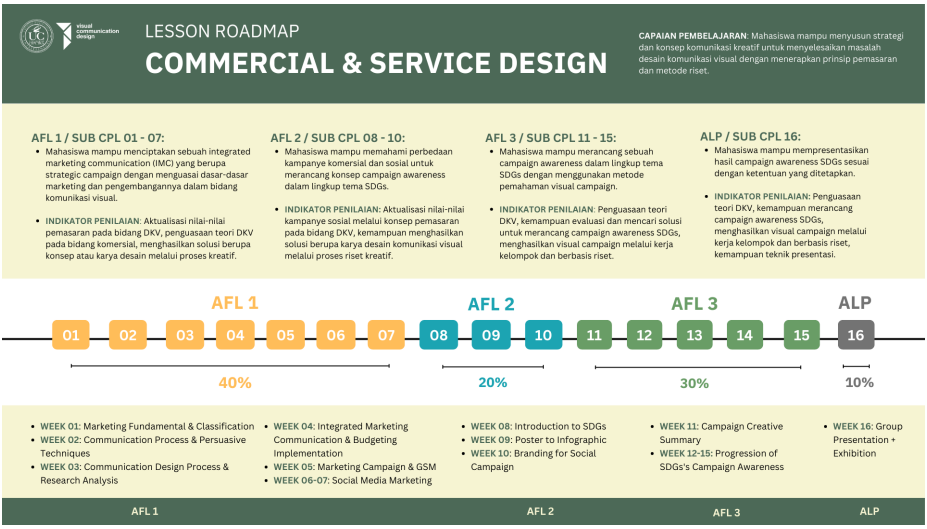

Fig. 1. Learning roadmap of Commercial and Service Design course.

4 Findings

The findings of this research revealed that the integration of web app development tools in place of traditional learning management systems had a positive impact on design education. According to the survey results, students had generally favorable perceptions of how these technologies influenced collaborative learning and authentic learning. They found it easier to apply theoretical concepts in practical scenarios, engage in hands-on learning activities, and effectively collaborate with their peers. The focus group interviews provided additional insights into the students' experiences, highlighting the tools' contribution to their creativity, understanding of the design process, and capacity for innovation.

In terms of authentic learning environments, the students expressed high levels of satisfaction. They particularly enjoyed engaging in real-world scenarios and found the learning activities to be conducive to critical thinking and problem-solving. The students felt that the learning environment facilitated detailed learning and allowed them to create their own examples to enhance their understanding. Collaboration with peers and the immediate application of acquired knowledge were also highly valued.

Overall, students' perception of authentic learning environments is excellent. They greatly enjoy the learning setting with real-world scenarios (4) with a mean of 4.69. This also supports their understanding of the topics presented (1) with a mean of 4.57. According to the students, the learning activities also encourage them to think critically when completing tasks (2) with a mean of 4.51. A mean of 4.57 also indicates that students can find appropriate solutions to each problem encountered (3). When faced with real-world problems, students also feel that they can learn in more detail and create their own examples to further understand the concepts being taught (7) with a mean of 4.57. A mean of 4.27 also shows a preference for collaborating

with peers (6) and a strong motivation to apply the acquired knowledge promptly (8) with a mean of 4.67.

Table 2. Students' views on an authentic learning environment.

Questions	Mean	Standard Deviation
1. I feel that the activities in class support my understanding of the material	4.57	0.728
2. The learning activities allowed me to think critically about the tasks	4.51	0.703
3. I am able to find solutions to problems according to the needs of each project	4.57	0.640
4. I enjoyed the way my course was set up with real-world scenarios	4.69	0.648
5. I learned the details during the projects better although the content was covered in the lecture	4.63	0.599
6. I prefer to learn with friends/groups rather than by myself	4.27	0.981
7. I created my own examples to help me understand the important concepts I learned	4.57	0.671
8. I am eager to learn about the applications of my knowledge once I learn something new	4.67	0.554

To support the survey results, some comments from students regarding their experience in an authentic learning environment include: *"I think I will implement the projects in real-world situations in a big company where there is a need for some kind of contract with Terms of Service and a good portfolio for the company," "It's nice to know more about real-world situations," "I feel very well prepared when facing real-life situations, knowing how to solve the problem or how to face the real-life situation."*

Regarding the use of technology and various media in the classroom, the survey indicated positive results, with students expressing a preference for instructors who utilized diverse media to support learning. While improvements were suggested for the engagement of videos and task instructions on the Learning Management System (LMS), overall, students found the provided learning activities enjoyable and beneficial. They appreciated instructors who effectively communicated learning objectives, assignment deadlines, and utilized web tools to enhance collaborative activities.

The survey shows positive results regarding the use of technology and various media in the classroom, with scores approaching the maximum value of 5. There is only a need for improvement in the videos presented to make them more engaging so that students are willing to watch them before the lessons begin (12) with a mean of 3.78. However, the majority of students feel the benefit of the videos shared by the instructors to review the material covered in class (18) with a mean of 4.47. Apart from that, students feel happy when instructors use various media to support learning (9) with a mean of 4.67. They also admit to seeking information through social media or forums (14) with a mean of 4.37. Although most students (mean of 4.47) state that the task instructions on the Learning Management System (LMS) are clear and

complete (10), the majority prefer to receive task instructions through group chat only (11) with a mean of 4.43.

Students also agree that instructors communicate the learning objectives and assignment deadlines (19) with a mean of 4.47 and have utilized several web tools (15) to enhance collaborative activities with a mean of 4.53. They also feel that the LMS helps them collaborate with their peers (16) with a mean of 4.31. Students also utilize the internet to acquire additional knowledge (17) with a mean of 4.59. Overall, students express satisfaction and enjoyment with the presented learning activities (20) with a mean of 4.61.

Table 3. Students' views on face to face instruction and the use of online learning resources

Questions	Mean	Standard Deviation
9. I like it when the lecturer uses various media to explain the topics (videos, games, pictures,etc.)	4.67	0.728
10. The assignment instructions given on the LMS is clear and comprehensive	4.47	0.809
11. I prefer given the detailed information on the group chat rather than read in the eLearn (LMS)	4.43	0.944
12. I watch the videos posted on eLearn (LMS) before the lectures	3.78	1.238
13. I search on the Internet before starting a project or homework rather than searching in books	4.41	0.867
14. I search for information in forums or social networks, such as Twitter, Facebook, etc	4.37	0.799
15. The lecturer uses different web tools to enhance the activities	4.53	0.612
16. I found the eLearn (LMS) useful in helping me collaborate with my peers	4.31	0.905
17. I found the Internet useful in terms of resources and expert knowledge.	4.59	0.606
18. I find that the video provided by the lecturer makes me able to refer back to my learning materials whenever I needed to	4.47	0.703
19. Lecturer communicates the learning objective informed the deadline of every assignments	4.47	0.748
20. Overall, I am very enjoy the learning activities	4.61	0.635

Some students' opinions about classroom activities and given projects include: *"The class is fun, and the projects are also enjoyable because we work together with friends who want to help each other in completing them," "This class and the projects are useful for me because they align with what I want to do in the future and provide me with new insights," "I really love the class and the projects, I learned a lot, everything about this class is just helpful and useful for the short term as well as the long term."*

Students also mention that the given projects can enhance their creative and critical thinking abilities, supported by the following statements: *"By giving real-life problems," "The project made me think critically, searching for ideas and solutions to*

the problems through references for this project," "This project made me improvise in terms of creative thinking."

To delve deeper into the use of web apps and learning support tools, the interview results with students provide some feedback that can help in the development of a suitable web app for design classes. *"Internet access is sometimes limited in certain areas of the campus, causing online access to be obstructed," "By utilizing collaboration tools like Canva, Figma, Miro; we divided our work evenly, but it's a hassle to change from one platform to another platform" "We divided our job lists and always tried to complete every missing detail in our project, such as the concept, framework, etc.," "Collaboration has taught us some soft skills such as communication, fair and equal task distribution, and mutual assistance."*

5 Conclusion

Based on the findings, it can be concluded that web app development tools have the potential to positively influence collaborative learning and real-world experiences in design education. These tools can support experiential learning, foster student collaboration, and stimulate creativity and innovation. Additionally, web app development tools can expand the accessibility of web materials in various educational contexts. Ongoing efforts are required to optimize the use of these tools and address challenges such as limited internet access and platform switching.

Furthermore, the study suggests that online collaboration tools enable global collaboration among students, facilitating discussions, document sharing, and feedback exchange. Virtual learning environments offer diverse information and resources, including textbooks, articles, films, and simulations. Personalized learning platforms can provide tailored experiences that cater to individual student needs and interests while allowing for progress monitoring and feedback from both students and teachers.

It should be noted that this study focused on design students' experiences in a blended learning environment, combining face-to-face instruction with online distance learning strategies. Future research and projects can explore the development of web app tools as companions to existing Learning Management Systems, aiming to enhance collaborative learning and authentic learning environments. Key considerations for future development include addressing low internet bandwidth and ensuring device flexibility. The goal is to create technology that enhances productivity rather than hinder it, enabling students to learn effectively and be well-prepared for real-world challenges.

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