The E-Learning Design for *Problem Based Learning* in Dynamic Fluid Topic using *Microsoft Sway*

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Abstract

The development of information and communication technology (ICT) based on education can be an opportunity to improve the learning process. Learning in the pandemic era Covid-19 needs media that help teachers and students enthusiasm for learning. The lessons with e-learning are flexible and easy to use. Microsoft Sway 365 is one of the e-learning that can be used because of the features such as presentation, text, images, video, and sound. This study aims to produce e-learning using Microsoft Sway on Dynamic Fluid. This study uses an R&D method with the 4D model but only defines, designs, and develops stages. Media experts and material experts validated the e-learning. The validity test result from content experts showed that the e-learning using sway was feasible with 77.7% and from media experts was feasible with 77.5%. The study concludes that e-learning with Microsoft Sway is flexible, easy to use, can support physics learning with fun, and feasible to be used as a teaching medium that helps students in explanatory activities.

Keywords: e-learning, microsoft sway, dynamic fluid, problem based learning

INTRODUCTION

It's been almost a year that Covid-19 has hit the world (Guntara & Utami 2021). The COVID-19 pandemic is a significant challenge for the education system. This viewpoint offers guidance to teachers, institutional heads, and officials in dealing with the crisis (Daniel 2020). Online learning has become a new educational pattern during the COVID-19 pandemic and is likely to complement conventional schools in the post-pandemic world (Zuo et al. 2021). Therefore, it is not surprising that Information and Communication Technology (ICT) based learning is increasingly becoming a trend in educational research.

ICT has become one of the essential parts of our lives (Cha et al. 2020). ICT development has encompassed all technologies that facilitate the processing, transfer, and exchange of information and communication services. These days, system education in Indonesia has developed following ICT advancement (Rahmadani & Setiawati 2019). ICT makes education unique when enhancing teaching, learning, innovation, and creativity. In addition, the use of ICT can encourage the development of educational policies that promote a creative and innovative educational institution environment (Abdullah 2019).

In addition, the use of ICT can encourage the development of educational policies that enhance creative and innovative educational institution environments (Faraj M. Abdullah 2019). Currently, the trend of Indonesian education is online learning by using the internet to connect learning interactions between teachers and students (Mahendra 2021). The Ministry of Education and Culture informs that

several platforms can be used during online learning for free, such as Ruangguru, Zenius, Google, Microsoft, Quipper, Sekolahmu, and Kelas Pintar. According to a survey in 2021 from January to June, Ruang Guru ranks first in average daily use, followed by Quipper and Zenius (Roza 2021).

TABEL 1. Average Daily User Data

No	Application's name	Daily users (average)					
		January	February	Maret	April	May	June
1	Ruang Guru	746,700	63,600	108,730	71,700	54,800	54,400
2	Quipper	76,500	75,600	10,400	9,420	7,440	12,200
3	Zenius	24,860	33,100	44,200	47,300	36,730	38,330

According to the Ministry of Education and Culture of the Republic of Indonesia 2021/2022

TABEL 2. Data on the Number of Student

No	Schools Level	Number of Students
1	Elementary School	24,150,168
2	Junior High School	9,987,610
3	Senior High School	5,045,526
4	Vocational High School	5,115,027
5	Total	44,298,331

One of the Information and Communication Technologies (ICT) and online learning media that is currently being widely used is E-learning (Muliyati et al. 2019) (Bakri 2018). E-learning (Web-based learning) is defined as "an educational method that uses information and communication technology to facilitate learning and provide students with access to all necessary educational programs" (Regmi 2020). Based on the management system, web-based learning are divided into two, namely Content Management System (CMS) and Learning Management System (LMS) (Muliyati et al. 2019). CMS is a system that allows teachers to create and modify digital content such as files, images, electronic documents, and audio files directly or on-demand. CMS is designed to develop and publish all types of websites. Examples of CMS are Drupal, Joomla, and WordPress.

On the other hand, LMS is a web-based technology that helps teachers plan and evaluate the learning process, provides users 24/7 access to learning materials, and facilitates reporting and monitoring user activity. LMS is a software application designed to manage student interactions and provide learning resources to users or students. LMS also focuses on learning management, learning performance, and monitoring the progress of student activities. Examples of LMS are Schoology, Moodle, ATutor, Google Classroom, Edmodo, and Microsoft Office 365 (Krouska et al. 2017) (Alshammari 2018) (Kiryakova 2017).

Problem-based learning (PBL) is student-centered learning that aims to increase students' content knowledge (Silver & Cindy 2004), requiring students to develop thinking skills, problem-solving and intellectual skills, foster collaboration skills, and develop social attitudes. This model designs problems that require students to acquire essential knowledge, develop problem-solving skills, have their learning strategies, and participate in group activities (Diani et al. 2018). This model represents real problem situations in everyday life and can facilitate the investigation and application of concepts in various cases (Malik 2015).

PBL is a learning and teaching approach with the following characteristics: (1) The use of problems as a starting point for learning, (2) Small group collaboration, and (3) Flexible tutoring (Yaniawati 2019). From previous research, the implementation of PBL can make students put forward an argument appropriately, provide detailed and correct explanations, identify the processes or concepts involved in the problem, identify the relationship between the concepts so that they can make appropriate conclusions, analyze algorithms or procedures (Martyaningrum 2021). The application of PBL can also create more conducive learning, increase student participation in-class activities, and create student-centered learning.

E-learning has become a significant change in the implementation of education in Indonesia, which can "force" every component of education to adapt to future challenges using technology (Setyowati et al. 2020). One of the existing problems is the lack of planning in analyzing the feasibility of schools

in building internet-based learning systems (Costaner 2020). In some countries, the implementation of e-learning experiences several obstacles such as lack of management support, inadequate infrastructure, financial problems, language barriers, inadequate IT problems, and lack of e-learning knowledge and barriers to teacher change (Halim 2018). The development of e-learning is targeted to support the overall learning process that allows: (a) Learners to quickly and effectively assimilate or access learning materials; (b) Teachers when carrying out the learning process are more productive and effective and (c) Teachers can supervise to organize, implement, monitor, and evaluate online learning processes (Savidis 2016). To develop e-learning, there is an easy-to-use application, namely Microsoft Sway 365.

Microsoft Sway 365 is an application that facilitates teachers in creating and sharing interactive tutorials, educational resources, and documents with different content (Astuti, 2019). Microsoft Sway is software that students and teachers can use as a medium to publish study results, research results, reports, or presentations. Microsoft Sway is flexible and can be used to develop content that supports various media types, such as text, images, video, sound, diagrams, and create presentations, etc. Microsoft sway is responsive. When accessing sway, the display adjusts to the size of the screen you are accessing. When accessing it on a smartphone, the design also adjust to the smartphone and when accessed on a laptop, the design also adjust to the laptop design. Learning with Microsoft Sway can be accessed by students anytime, anywhere, regardless of space and time (Usman 2020).

On the sway.com page, there are various presentation design templates that creators can choose. To use multiple features on sway.com, users need to create an account first and use an email with outlock.com. There are several advantages of Microsoft Sway (1) It has a variety of content choices so that it can increase students' creativity, (2) Invites students to think systematically and report the results found conceptually, (3) Can use audio, video, image media without downloading the media, (4) Can be designed according to the needs of the teacher so that the display is more attractive, (5) Can add attendance and questions that have been made on the Microsoft form (6) The teacher can see how many people have opened the media, (7) If the internet connection is not good attendance or questions that will automatically become links, (8) The Sway application is equipped with applications to make it easier for users to collaborate with other users in creating Sway projects (Ardian et al. 2020).

Using sway students enable to learn in a self-regulated manner and is considered to be a way to assist learners individually. Students also can study anytime and anywhere, increase learning activities, organization of students' project work, the use of cloud technologies, the use which is intended to improve the efficiency of communication and collaboration between the student and the educator (Glazunova & Kusminska 2017). Based on this background, the researchers researched the development of e-learning using Microsoft sway on physics materials in dynamic fluids.

METHODS

A related study that uses e-learning according to (Chang 2016) E-learning consists of the seven main areas presented. (1) New technology E-learning is regarded as a new technology that affects the workforce. (2) E-learning brings new concepts and implementations to training. (3) The advantages and disadvantages of e-learning compared to traditional learning are explained to emphasize the advantages and disadvantages of e-learning (4) Both face-to-face education and e-learning. Interactive learning has its strengths and weaknesses. In the other study, E-learning can increase the level of learning interaction tools or complete learning tools including materials, methods, boundaries, exercises, assignments, and evaluation methods that are systematically and attractively designed to achieve the expected abilities (Kamarudiin & Wijaya 2021).

This study aims to produce e-learning using Microsoft sway on Dynamic Fluid in high school with problem-based learning. This research uses R&D, a research method used to create certain products and test their effectiveness (Sugiyono 2013). This study uses a 4D model but only includes defining, designing, and developing stages. This product was validated by material physics experts, media experts, and learning experts, and material experts are lecturers from the Physics Department of Universitas Negeri Jakarta. The following is an explanation of the three steps.

Define

At this stage, a literature study is to assess the essential competencies of second grade in senior high schools. The basic competencies studied in cognitive levels are analyzing the dynamic fluids, including the debit, continuity equation, Bernoulli's equation, and Bernoulli's Law in life. And competencies in skills is designing and testing simple projects that apply fluid dynamics principles and their physical meaning. The materials can be learned on the website as text, animation, and video.

Design

At the design stage, some media and learning content for dynamic fluid materials need to be designed for learning purposes.

Develop

In this stage, expert validators such as media experts and material experts validated the materials. The researchers will revise the material for improvement until the material is declared viable. The results of the evaluation were performed using a Likert scale questionnaire. The components evaluated were PBL material requirements, physical material range, and e-learning component compatibility (literary research, video, images, material representation). The assessment was conducted on learning for chapters on dynamic fluids topics.

RESULTS AND DISCUSSION

The e-learning using Microsoft Sway 365 for high school physics material consists of several components.

Product Description

The development of a product using Microsoft Sway on Dynamic Fluids for 11th high school. The user does not need to install applications. Learning materials can be provided via links and accessed anywhere, anytime, and using any smartphone.

FIGURE 1. Initial View of Learning Material

After entering the initial section, the user will be directed to enter the problem section. This section introduces everyday issues related to the theme. The problem is regarding the increase in river water discharge due to the rainy season.

FIGURE 2. Problem Section

FIGURE 3. Learning Materials

FIGURE 4. Application In Daily Life

Validity of Product

The development of e-learning using Microsoft Sway 365 was validated by material and media. The results of expert validation are shown in TABLE 3. Based on the data in TABLE 3, the validation results of media experts indicate that the e-learning using Microsoft Sway 365 developed is feasible with revisions for use in 11th grade for Dynamic topic Fluids.

TABEL 3. The results of the Validation by media experts

Aspect	Percentage	Interpretation
Usability	72.5 %	Feasible
Fuctionality	80 %	Very feasible
Visual Communication	80 %	Very feasible
Average	**77.5 %**	**Feasible**

The results of expert validation are shown in TABLE 4. Based on the data in TABLE 4, the validation results of media experts indicate that the e-learning using Microsoft Sway 365 developed is feasible with revisions for use in 11th grade for Dynamic topic Fluids.

TABEL 4. The results of the Validation materials experts

Aspect	Percentage	Interpretation
Learning Design	73.3 %	Feasible
Learning Content	80 %	Very Feasible
Communication Language	80 %	Very Feasible
Average	**77.7 %**	**Feasible**

The results of media validation by experts indicate that media use is feasible, with a score of 77.5%. The button and export menu on the website also functions well. The website design is also attractive and exciting. On the other hand, the result of material validation is feasible, with a score of 77.7%—learning design and content relevant to learning objectives. Similar to other research that presents videos too (Ardian et al. 2020). E-learning with Microsoft sway is very effective in eliminating student boredom during online learning. This service requires students to do exercises, but without realizing it, they must read and watch videos of the learning material delivered.

CONCLUSION

This research has produced e-learning using Microsoft Sway 365 to assist students in exploring dynamic fluid material. In this development, the active fluid material developed consists of Debit, Continuity Equation, Bernoulli's Equation, and Bernoulli's Law in daily life. Material experts have validated this e-learning with possible results worthy of being continued, and media experts' value with possible results is worth being continued. These results indicate that the E-learning using Microsoft Sway 365 in Dynamic Fluids Materials developed is feasible as a teaching medium that helps students in explanatory activities. Students are guided to study regardless of the learning requirements of the 21 century. The problem-based learning design also allows students to think critically, be creative, collaborate, and communicate. We can use sway for some material with fewer equations, a storyline, and a lot of explanation through pictures. This study suggests that the material's content needs to be continually improved and adjusted over time. During the Covid-19 pandemic and the implementation of e-learning could be a solution for the limited learning process due to social restrictions and keeping a distance.

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