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Innovation Utilization of Digital Applications Efforts to Improve College Achievement of Civil Engineering Students

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Abstract

This paper intended to discuss what experts say about innovating digital applications to improve student achievement in civil engineering in digital days was essential. The author believes that one of the innovative solutions to improve learning outcomes is using technology applications in both teaching and evaluation. The reason is that technological innovation can transform learning compared to traditional strategies. To complete the discussion of the above issues, we will conduct a series of data searches with the help of electronic searches on databases of journals and books published by several publications with international reputations such as Elsevier, ERIC, Google Book, Taylor & Francis, and other database sources published ten years ago. Furthermore, data analysis involves a phenomenology approach. We explored as much data as possible until we could answer the above problems with high validity and reliability. Our study involved data coding systems, evaluation, and interpretation of in-depth data, and concluding. Based on the existing data, we can conclude that the use of digital technology applications can improve the learning outcomes of civil engineering students. Digital technology serves as a means of conveying, obtaining, processing, and communicating information more effectively than the classical methods that have been used so far, especially in the case of work involving civil engineering work systems.

Keywords
data improve; engineering; digital; civil; and technology

I. Introduction

Advances in computerized innovation make teaching practice fast and cause the world wide open without limits (Serdyukov, 2017). Various types of data and information can be obtained quickly, precisely, and orally. This excellent rapid progress has limited the area of education to re-evaluate all that has been done, such as the system of learning, teaching, and evaluation of learning both in schools and colleges. Innovative anxiety must also be balanced with rebuilding training, education, and schools oriented towards efficiency practices to high productivity in this era of free competition (Stewart, 2012). Over time, the increase in teaching innovation is overgrowing at all levels and majors. Adults who use computers and today's children also enjoy the benefits of this innovation with all the conveniences and challenges. Teaching innovations now help save time doing just about anything. Many tools are made to make things simpler to save time. Data-driven digital innovation and advanced technology are essential instruments in all scientific and practical practice.

Technological innovations allow humans to use the internet. (Toffler, 2022; Putra et al., 2020). Hobbs, (2010) sees digital media and literacy activities in education as contributing to real action. So that white paper is now increasingly being defeated by digital screens. There is no digital now that there is no web. The web also has all the different resources and ways to help society, including academics, for example, helping individuals learn, research without spending energy going to the library the traditional way with face-to-face learning. However, this innovation can help improve learning outcomes at all levels, from elementary school to university (Sevillano-Garcia and Vázquez-Cano, 2015).

Education is a very important human need because education has a duty to prepare Human Resources (HR) for the development of the nation and state (Pradana et al, 2020). Education is one of the efforts to improve the ability of human intelligence, thus he is able to improve the quality of his life (Saleh and Mujahiddin, 2020). Education is expected to be able to answer all the challenges of the times and be able to foster national generations, so that people become reliable and of high quality, with strong characteristics, clear identities and able to deal with current and future problems (Azhar, 2018).

In the area of accelerating training and learning, the presence of technological innovations in the education area can make the increase in student learning in learning decline if these children are not controlled or left alone, students can take advantage of innovative programs that do not educate and even make students lethargic and dependent. Hence, they hesitate to learn; technological innovation can also provide positive incentives in learning (Kirkwood and Price, 2014). To build inspiration for student learning, of course, this requires the role of educators/guardians in controlling children using computers and other devices. However, not only the control of the lecturer can cause students to have high learning inspiration, but it is also vital to develop digital learning programs that are explicitly intended to be used in internet-assisted learning (Lee, 2014). Digital innovation can play an essential role in learning when used correctly. Technological innovations can help teachers work with learning and can even stimulate and accelerate student learning. However, internet-based computers can also make teachers like robots and machines and make students like outsiders who need assets (Mahmood, 2012).

The role of digital technology in civil engineering courses is undeniable when the world is in the design of development in all fields. Digital technology is used in other construction planning systems through planning programs, such as Computer-Aided Design and AUTOCAD (McCaffery et al., 2013). In fact, with the aim that the ideal infrastructure can be planned quickly, effectively, and with high precision. For example, drawing vehicle configuration shapes is time-consuming and generally inconvenient whenever done physically (Lowther and Silvester, 2012). However, with a CAD program, everything can hold up. Indeed, this program can describe the original structural configuration of the building viewed from various measurement points. From this explanation, it seems reasonable that the task of digital applications in industry and assembling is enormous, including as an instrument to plan new items quickly, effectively, and productively (Chua et al., 2010).

The building design cycle can be completed with a minimum of human work, which is expected to reduce the real risks carried out by humans (Robichaud and Anantatmula, 2011). The field of design and innovation from the beginning has been the field that has used the computer framework the most with its application as a tool for researchers to support their work (Little and Loy, 2017). This is because complex work and estimates must be carried out quickly and precisely. Digital ways of working and inspection and

exploration that can harm people and require huge costs can now be done again by applying technology. For example, in preparing expenditure plans, designers can use computers to make the calculation results more precise and quickly completed and as much as possible following the plan (Kettner et al., 2015).

The breadth of this part of the structural design makes it fully adaptable in the workplace (Fadali and Visioli, 2013). Calls received from experts in this field include planning and execution of construction and maintenance of road foundations, spans, burrows, structures, air terminals, traffic (land, sea, air), trench network frameworks, seepage, water management, lodging, structure, seismic earthquake disaster minimization, ecological assurance, clean water supply, land review, project financing ideas, project implementers and so on. All parts of life are included in the substance of technology-assisted structural design (Madni et al., 2019). There are many types of structural design tools or programs available today, which will help with structural design workstructural design work through digital assistance. Meanwhile, as an expert in Structural Engineering, Civil Engineering Software will be assisted but must be accompanied by information to utilize Civil Engineering Software. In the same way, current construction calculations require a short time frame compared to non-digital means (OMAR, 2017).

II. Research Method

This essay aims to see what experts think about the method of using new digital applications to improve student performance in the field of civil engineering. According to the author, one of the innovative methods to improve student learning outcomes is using technology applications in teaching, evaluation, and entering the world of work. Compared to traditional learning techniques, technological innovation can transform learning in a promising direction. To complete the discussion of the problem above, we conducted a series of data searches using an electronic search on a database of journals and books published by several international publications with international reputations such as Elsevier, ERIC, Google Book, Taylor & Francis, and other databases (de Casterlé et al., 2012). Sources published ten years ago estimate the data to be more recent and updated. In addition, a phenomenological approach is used to obtain data, examine data analysis, and reporting. We look at the data as much as we present to arrive that the data findings are valid and reliable answers to the questions above. Our study includes data coding techniques, evaluation and interpretation of in-depth data, and concluding in the review process. This study uses entirely secondary data, considering that we carried out this study during a period of movement restriction during national policy efforts against the dangers of the coronavirus. We also designed this study is a descriptive qualitative format (Sgier, 2012).

III. Results and Discussion

In this section of the findings, we will describe the study results on many publications that discuss the use and innovation of digital technology in efforts to improve the quality of learning outcomes for midwives in civil engineering studies—reasons for increasing advanced innovation in civil engineering work. The advancement of digital applications in learning and carrying out the construction engineer's job tasks provides enormous benefits. Interactive media are used in all fields for various purposes, including in teaching and learning (Scheurich, 2014).

3.1 General Information Facilities

Kobylitsky et al., (2020) examine the economics of implementing digital information exchange technology at Transenergo's electric power plants, a subsidiary of JSC Russian Railways. A universal and scalable information infrastructure governed by standard operating rules is one of the objectives of the Digital traction substation project. Advanced equipment diagnostics and prompt condition-based maintenance are important economic indicators for digital traction substations. The advantage of digital applications in civil engineering tasks is that it is easier for infrastructure work to disseminate data by sight and sound (Chen et al., 2017). It only takes a satisfactory framework of gadgets to introduce in essential areas. Where managers, in general, can directly access and obtain data without any constraints (Greenwood et al., 2019). Media began to be found in various places, such as inns, stations, air terminals, retail outlets, and specific vacation destinations. Interactive media instruments are accessible that spread common data without guests going to extraordinary channels. This execution can cut time and reduce costs for data staff. However, it will require an extraordinary workforce to convey more definitive data (Mobley and MBB, 2014).

3.2 As learning Media in Engineering

In learning civil engineering sciences in universities, digital media will become the kind of media that supports an integrated learning system (Stav et al., 2010). Until now, digital media shows innovative civil engineering learning strategies, which are seen as non-repetitive and tiring strategies. With advantages in sight and hearing, information can be conveyed exciting so that students can easily remember and apply it (Wang et al., 2018). One illustration of media use is in lecture-performance assignments, where students also use intuitive media to introduce evaluation results using computers and projectors. After all, the media is also a great way to find out the interests of students. Students have the opportunity to choose the number one field master at their own pace to make them more dynamic in getting teaching. However, sight and sound do not kill a teacher's job. Dynamic students need direction and direction from teachers and guardians to get positive learning (Zaneldin et al., 2019).

3.3 Multimedia Components

Yang et al., (2020) examine the development and possibilities of multimedia systems cantered on historical buildings such as Ethiopia's Lalibela cathedral, the Great Canal of China, and China's Great Wall. Graduate students and other audiences generally give this system favorable reviews. This chapter's discussion methods and tools can be helpful on any academic topic when new material is accessible for teaching. The point is that the multimedia system is significantly superior to improving the learning of civil engineering studies. Similar research was also submitted by Deliktas, (2011) who examined how digital technology to develop curriculum modules in engineering mechanics courses was successfully published in Computer Science Applications and Civil Engineering Education Development.

3.4 Digital Playing Components

According to Fatahi and Khabbaz, (2015) compared to conventional teaching techniques, digital gameplay can be an effective informal learning environment, encouraging civil engineering learning to be more active and critical. Well-designed civil engineering discipline-based computer games can aid student learning and experience in higher education. A study is intended to assist Civil Engineering students with information

gathering techniques, creative thinking, problem-solving, and lifelong learning skills through learning-based computer games. The findings of this study indicate that using creative techniques such as computer game-based tasks can create a fun, competitive, and cooperative learning environment so that students will continue to be motivated because the elements of Oleg games are exciting and challenge students to continue playing when in fact, they are in the learning area and completing Morsi and Mull, (2015) completed a similar civil engineering project. A 3D adventure game for engineering education, based on the study of digital lockdown.

3.5 Multimedia in Structural Design

At first, there were many characterizations in structural design with interactive media because of the different types of designs. From the entrance, sight and sound are isolated into two types, especially in the web and independent interactive media (Parhi and Nishitami, 2018). The difference lies only in its clients who need a web organization. Judge on the presentation technique; digital media is divided into five kinds. Paper-based media such as books and magazines, light slideshows and transparencies), sound, radio and tape, motion pictures, and advanced. Integrated digital media uses very different factors. Based on the idea of utilization, mixed media correspondence is organized into three types: intelligence, hyperactivity, and direct vision and sound (Branson, 1978).

Furthermore, digital media in civil engineering work uses computers to present and consolidate messages, sounds, images, activities, sounds, and videos with instruments and associations so that clients can explore, collaborate, create, and deliver. Interactive media are often used in the realm of informatics. In addition to the world of informatics, interactive media is also embraced by the world of games and creating websites. In today's era, where everything that uses innovation cannot be separated from interactive media that complements the innovation, sight and sound play an essential role from all angles because media is a trigger for readers to get 'more' from the point of view being contemplated. Not only that, the work of sight and sound will be compelling in conveying data; reality today, as shown by Computer Technology Research (Schmalstieg and Hollerer, 2016).

Related to structural design, Ibrahim and Rahimian, (2010) comparing CAD with manual sketching tools for high-level architectural design applications, they explained that using mixed media learning would be more intuitive than traditional strategies previously. However, in practice, interactive media in learning is often used for inappropriate reasons, such as only focusing on student involvement or basically because of regulatory pressures. Currently, mastery of media and human-computer interaction is a significant factor in completing technical tasks with the help of sight and sound by focusing on actual problems in everyday life and finding settings. This is where the principle of innovation works, answering the problem of work assignments (Seufert and Meier, 2018).

Then, the speaker who made this other application also revealed the side effects of studies related to the function of sight and sound in learning. From the many studies carried out at Multimedia University, experts found that by utilizing civil engineering technology innovations, students are more inspired to be associated with learning systems, material understanding is also better, and students can utilize higher intuition skills for critical thinking. Lynch et al., (2012) also carried out a similar study to promote education in teaching design and peer review.

3.6 Digital Benefits in Construction

An illustration of the advantages of digitalization in the teaching of civil engineering is in the estimation, which is difficult to do physically (Ham and Lee, 2019). In the field of

infrastructure design and development, there is no doubt that it requires easy calculation solutions and high accuracy, which cannot be understood without the help of digitalization technology. As in the stage of further inspection before the business starts, the calculations will usually be very confusing and will be completed with the help of a computer system. In design, computerization covers several fields, including gadgets, building design, structural design, and computers in development (Hirz et al., 2013).

3.7 What Experts Say

Lee et al., (2011) an instructive PC game based on an idea map for improving understudies' learning performance in fundamental science courses. An idea map-inserted game-based learning method is suggested for developing digital instructional games by organizing idea preparation as a component of the gaming circumstances. A pretending game based on the suggested method has been created for a grade school intrinsic science lesson. According to the trial findings, the novel technique may improve understudies' learning achievement while also reducing their intellectual load. Mubarok et al., (2018) this study uses a questionnaire as a feasibility test tool to validate learning experts, media experts, and material experts and see student responses. The E-Learning learning assessment product obtains the development results by learning expert lecturers using a Likert scale score of 1-4 getting a score of 2.5, which is said to be feasible.

Surya and Rizal, (2019) analyzed the results of learning to draw using software for students majoring in Modelling and Information Design Engineering in West Sumatra to know the relationship between learning to draw with software for students majoring in Building Engineering and Information Modelling, Descriptive of the Department of Analytical Design. The results of the normality test and linearity test, and hypothesis testing reveal that the information analysis technique used shows a strong relationship between the ability of information technology and the ability to draw development engineering majors. We also find the same research from Wertz et al., (2013) in their study of the efforts to assess the skills and academic literacy that emerged in the completion of engineering design tasks.

Next are Uyun, (2021) regarding the adequacy of online learning in increasing learning outcomes of civil engineering students during a covid-19 pandemic. The Covid-19 pandemic that has hit Indonesia since the beginning of 2020 impacts all fields that are not identified with learning so that the learning system is carried out remotely or firmly. The motivation behind this review is to obtain data on the feasibility of instructional media in bold learning steps during the Covid-19 pandemic for structural design students. This review involved 125 structural design engineering students. The result is a side effect of the review; it can be said that online learning in improving student learning outcomes is very high in developing different structural design student learning outcomes.

Likewise, Apriansyah, (2020) are used to describe how to improve learning outcomes by using animation-based video learning media for the Building Materials Science course at the Building Engineering Education Study Program, Faculty of Engineering, State University of Jakarta. The structure of inquiry is used in this study to evaluate the achievement of the media through the approval of the master and the media master, as well as student evaluation. Students' evaluation of learning media for video-creating activities for the test class scored 89.00 percent ordered for easy use. Strongly agree that students understand the material and significantly reduce involvement in learning interactions for science courses on construction materials.

Further evidence from Manzoor et al., (2021) with a systematic literature review on the impact of artificial intelligence in Civil Engineering on sustainable development was

essential. The widespread application of artificial intelligence in structural design has provided structural engineers with various benefits and opportunities, including data collection, feasibility evaluation, and utility. This article provides a well-written survey to test the influence of artificial intelligence on structural design towards tangible results. According to these findings, the United States has made the most significant commitment from artificial intelligence distribution to management in construction science automation.

A study by Shirazi and Behzadan, (2015) planned and evaluated a portable enhanced reality-based data transport instrument for structural design and development education programs. This exploration aims to plan and efficiently survey the viability of a versatile expanded reality apparatus (CAM-ART) in educational programs' development and structural design. General textbook content is enhanced using digital technology-generated three-dimensional (3D) objects and other virtual sights and sounds and delivered to students via AR applications running on their mobile phones or tablet computers. Examination of the information shows that CAM-ART dramatically affects student learning both now and in the long term.

Báez et al., (2016) findings in the study of presenting the idea of building modeling information in the design of the educational plan structure, building Information Modeling changes the way tasks are developed. This emerging practice requires a new attitude and mechanical expertise to achieve critical improvements in building productivity. AEC centers on using this information model as a creative innovation to enable the acquisition of new skills by students and prepare them for a more serious world. The previous study of Zhang et al., (2018) aims to improve the ability to display structural data between structural design and student councils with group-based learning. Improve students' individual and group skills in implementing a data building project demonstrating building information modeling, and this exploration uses the group-based learning (TBL) method. TBL can assist students by creating basic BIM information, abilities, and capacities (KSA) and achieving higher learning demands through mocks in connection with genuine BIM projects. This examination augments information gathering by providing appropriate evidence of the adequacy of TBL in the School's Information Modelling Build training.

IV. Conclusion

At the end of this chapter, we repeat the purpose of this study to discuss what experts say about the advantages of digital technology in improving learning outcomes in civil engineering studies and work. So, we have reviewed dozens of literature published from several reputable publishers in scientific studies, especially the priority of digital applications in supporting learning and civil engineering work in the current digital era. As for the results, we describe digital applications as information facilities for civil engineering studies. Other advantages include learning media, multimedia components, digital playing components, media structuring designs, benefiting civil engineering, and several other advantages that experts conveyed from various contexts of study in the international world.

Thus, we can say that our findings have met the principles of validity and reliability. We realize that in addition to the advantages, this finding also has weaknesses which we carry out in a single approach. Hopefully, this finding will contribute to digital science studies and excellence in civil engineering projects in the future.

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