



THE ROLES OF DIGITAL APPLICATION INNOVATES STUDENT ACADEMIC IN HIGHER EDUCATION

Herlan Suherlan^{1*}, Abd. Basir², Abdul Wahab Syakhrani³, Besse Arnawisuda Ningsi⁴,
Nofirman⁵

Poltekpar NHI Bandung, Indonesia¹

Universitas Islam Negeri Antasari Banjarmasin, Indonesia²

STAI RAKHA AMUNTAI Kalimantan Selatan, Indonesia³

Universitas Pamulang, Tangerang Selatan, Indonesia⁴

Universitas Prof. Dr. Hazairin, SH Bengkulu, Indonesia⁵

hel@stp-bandung.ac.id, abdulbasir@uin-antasari.ac.id, aws.kandangan@gmail.com,

dosen00205@unpam.ac.id, nofirman@unihaz.ac.id

Received: 14-02-2022

Revised: 24-04-2022

Accepted: 02-06-2022

Abstract

This research examines students' efforts to improve academic achievement in higher education the research method used in literature. The literature used comes from books and national and international journals. The results of this study indicate that for students, the application of digital technology to improve student academic achievement can innovate and change student learning achievement so that it is in line with the goals and ideals of the nation. For further research, it is hoped that field studies can prove that students' academic achievement by relying on the internet is only honed from their cognitive abilities without understanding what they take on the internet.

Keywords: Digital Application, Achievement Innovation, Give High, and Increase Academy.

Abstrak

Tujuan dari penelitian ini adalah bagaimana upaya mahasiswa untuk meningkatkan prestasi akademik di perguruan tinggi. Metode penelitian yang dilakukan adalah literatur. Literatur yang digunakan berasal dari buku, jurnal nasional dan internasional. Hasil penelitian ini menunjukkan bahwa bagi mahasiswa penerapan teknologi digital untuk meningkatkan prestasi akademik mahasiswa dapat berinovasi dan mengubah prestasi belajar mahasiswa sehingga selaras dengan tujuan dan cita-cita bangsa. Untuk penelitian selanjutnya diharapkan dengan kajian lapangan sehingga dapat dibuktikan bahwa pencapaian prestasi akademik mahasiswa dengan mengandalkan internet, hanya terasab dari kognitifnya saja tanpa memahami dari apa yang diambilnya di internet.

Kata Kunci : Aplikasi Digital, Inovasi Pencapaian, Akademik Tinggi dan Tingkatkan Hasil.

INTRODUCTION

Instruction should be done as well as could be expected to accomplish the objectives that are not entirely set in stone. The progress of the execution of this schooling decides the fate of a country.¹ If the nature of Instruction is excellent, HR will likewise increment. Instructive organizations should complete informational projects as well as could be expected, so the heart of the training is further developed. To conduct training as well as could be expected, having excellent administration or institutional management is essential. This administration additionally influences the validity of an instructive establishment. Instructive foundations with excellent quality and license can be guaranteed to have efficient schooling, the executive's assets, and the board.² In advanced education organizations like colleges, foundations, and other secondary schools, instructive administration is applied uniquely in contrast to auxiliary or essential training establishments since it is intricate. Effectiveness is required in general administration so the board can run well and foundations can zero in on the execution of the training. Innovation with its quick improvement can help the administration of advanced education establishments. Numerous jobs and systems can be supplanted with the invention's use in organizations.³

The job of data and correspondence innovation (ICT) in the administration of progressive education organizations is not just applied in organizations like information stockpiling and handling but also different issues.⁴ It tends to be seen today that pretty much every advanced education establishment has a computerized information stockroom and an advanced library or e-library, which demonstrates that data and correspondence innovation is required in advanced education the executives in practically all fields. Von Heyking,⁵ expresses five jobs connected with the most common way of getting sorted out and dealing with the administration of progressive education and organizations, including ICT, to help with functional and managerial exercises. ICT allows dynamic interaction. ICT to help correspondence and connection exercises between partners. ICT to empower cycle and asset improvement. ICT to produce key organizations with outside parties.⁶

Data and correspondence innovation have been applied in the administration of progressive education organizations and show that their application can positively affect them. Advanced education foundations typically make coordinated programs that make it simpler for workers, instructors to understudies. Typically these projects are, for the most part, separated into the executives' frameworks and academic frameworks. The advancement of data and correspondence innovation plays many features in the realm of Instruction. It is not just applied

¹ Hanan Aldowah dkk., "Internet of Things in Higher Education: A Study on Future Learning," *Journal of Physics: Conference Series* 892 (September 2017): 012017, <https://doi.org/10.1088/1742-6596/892/1/012017>. Purniadi Putra dkk., "The Relevancy on Education Release Revolution 4.0 in Islamic Basic Education Perspective in Indonesia (An Analysis Study of Paulo Freire's Thought)," *Test Engineering & Management* 83 (2020): 10256–63.

² Sujit Subhash dan Elizabeth A. Cudney, "Gamified Learning in Higher Education: A Systematic Review of the Literature," *Computers in Human Behavior* 87 (1 Oktober 2018): 192–206, <https://doi.org/10.1016/j.chb.2018.05.028>.

³ Veronica Udeogalanya, "Aligning digital literacy and student academic success: Lessons learned from Covid-19 pandemic," *International Journal of Higher Education Management* 8, no. 2 (2022).

⁴ Kazi Enamul Hoque, Ahmad Zabidi Abdul Razak, dan Mosa Fatema Zohora, "ICT Utilization among School Teachers and Principals in Malaysia," *International Journal of Academic Research in Progressive Education and Development* 1, no. 4 (2012): 17–34.

⁵ Amy von Heyking, "Implementing Progressive Education in Alberta's Rural Schools," 2012, <https://opus.uleth.ca/handle/10133/4701>.

⁶ Md Al Amin, "BEST model of CSR: An Analysis of the Impact of Corporate Social Responsibility for Improving the Social Development of the Stakeholders-A study on Four Private Commercial Banks" 18 (15 Mei 2016): 79–109.

in direct learning but also in the administration of instructive establishments to uphold the course of learning and talks.⁷

The education of citizens will be better and based on the provisions of the constitution, which aims to build the quality of Indonesian human resources who are cultured, technologically characterized, and pious.⁸ Moreover, shape the personality of citizens who are highly civilized and respect human rights and educates the nation's life by increasing the ability of students to become pious children, have character, and have good character. The role of Technology is as an effort to increase the acceleration of learning, with this being impossible if it does not rely on adequate equipment so that quality education focuses on the interaction of information technology which is not only a tool but as a determinant of student success in learning as well as long to compete and increase capacity. Themselves with the quality of learning that is following expectations, with high dedication to making healthy Indonesian children bright and characterized by one teaching innovation through technological education assistance so that equitable distribution of learning can occur while protecting the nation's culture, namely educating the lives of all the nation's children.⁹

In innovation schooling, the instructive substance is chosen by a group of specialists in specific fields. The instructive substance is accurate information and abilities that lead to professional capacities.¹⁰ The implication is organized as a program plan or showing plan and conveyed utilizing electronic media and understudies advance separately. Students look to dominate countless materials and examples of action effectively without reflection. His new abilities were promptly used in the public arena. Teachers work as overseers of Learning (Head of Learning), more administration assignments than the conveyance and extension of material. Instructive innovation is a hotspot for the improvement of a mechanical educational program model, specifically an educational program model that expects to give capability dominance to understudies through individual learning strategies, books, or electronic media so that they can dominate specific fundamental abilities. Among innovation items in schooling, particularly in learning, is the utilization of new advancements, for instance, discovering that involve cellphones as a premise or learning apparatus by understudies. Versatile learning (m-learning) alludes to handheld and portable IT gadgets like PDAs, cell phones, workstations, and tablet PCs in Learning and education.¹¹

Connected with the massive number of cell phone clients, versatile learning can be utilized as a choice to take care of issues in the field of training in schools, particularly in

⁷ Joachim Børge Ulven dan Gaute Wangen, "A Systematic Review of Cybersecurity Risks in Higher Education," *Future Internet* 13, no. 2 (Februari 2021): 39, <https://doi.org/10.3390/fi13020039>.

⁸ Napatcha Pradubthong, Sirirat Petsangsri, dan Paitoon Pimdee, "The Effects of the SPACE Learning Model on Learning Achievement and Innovation & Learning Skills in Higher Education | Mediterranean Journal of Social Sciences," 2 Agustus 2020, <https://www.richtmann.org/journal/index.php/mjss/article/view/10268>.

⁹ Kaouther Ardhaoui, Marina Serra Lemos, dan Susana Silva, "Effects of New Teaching Approaches on Motivation and Achievement in Higher Education Applied Chemistry Courses: A Case Study in Tunisia," *Education for Chemical Engineers* 36 (1 Juli 2021): 160–70, <https://doi.org/10.1016/j.ece.2021.05.004>.

¹⁰ Vladimir Kryukov dan Alexey Gorin, "Digital technologies as education innovation at universities," *Australian Educational Computing* 32, no. 1 (2017): 1–16.

¹¹ Jay Alden, "Accommodating Mobile Learning in College Programs," *Journal of Asynchronous Learning Networks* 17, no. 1 (Januari 2013): 109–22. Gunawan Widjaja dan Aslan Aslan, "Blended Learning Method in The View of Learning and Teaching Strategy in Geography Study Programs in Higher Education," *Nashruna: Jurnal Pendidikan Islam* 5, no. 1 (2 Februari 2022): 22–36, <https://doi.org/10.31538/nzh.v5i1.1852>. Aslan Aslan dkk., "Teacher's Leadership Teaching Strategy Supporting Student Learning During The Covid-19 Disruption," *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam* 5, no. 3 (21 November 2020): 321–33, <https://doi.org/10.31538/ndh.v5i3.984>.

colleges.¹² However, the truth on the ground, there are as yet numerous instructors or speakers who have not used data and correspondence innovation in the learning system. Even though utilizing ICT, educators and teachers request the material in the book without using intelligent sight and sound. Educators and instructors will generally incline toward utilizing the talk strategy and pack understudies' minds with material with notes. This should be visible from understudies studying electrical designing professional Instruction in 2016-2017 whose learning accomplishments are beneath the predefined worth or standard worth of 50, so another development change is required in learning for fluffy rationale courses in the electrical designing professional training office, staff of educator and science.¹³

With the reasons and any activities carried out in it all are nuanced to develop the student learning result. Likewise, one of the innovations which can be done to achieve this is Technology in teaching and primary education and evaluation. Based on the two arguments above, we want to get a deeper understanding by analyzing the results of various studies in the field, which state that technological innovation can quickly increase the achievement of high-level student learning outcomes. Therefore we will win and be able to improve the quality of learning through digital technology innovation. As is known, we have always been able to enter all people's lives, no exception; we will give the whole world there is a basis for evidence and arguments that we prove by examining the literature in order to answer problem of scientific studies.¹⁴

METHOD

In this method section, the study will discuss the stages of the study implementation method to understand better how technology applications can change or innovate the academic learning outcomes of students in higher education.¹⁵ Today reality and melodies are not only used in specific sectors such as government finance and mandatory themselves but have become a very innovative reason to be applied, especially for high-level people whose learning has gone through thinking labeling. Hence, the solution is to adopt digital information and Technology to accelerate learning.¹⁶ For this, of course, we will need data. We have collected several data from various publications, including books of academic scientific journals, proceedings, and various websites. He actively discusses application issues in higher organs where the meaning is to improve learning outcomes. Data will not solve anything without first is what we do.

For this reason, we have collected data electronically and then analyzed it with a phenomenological approach, a study method that outlines problems and a big train to understand something phenomenal in a context.¹⁷ The data is coding and evaluation of data to

¹² Jeanne Lam, Jane Yau, dan Simon K. S. Cheung, "A Review of Mobile Learning in the Mobile Age," dalam *Hybrid Learning*, ed. oleh Philip Tsang dkk., Lecture Notes in Computer Science (Berlin, Heidelberg: Springer, 2010), 306–15, https://doi.org/10.1007/978-3-642-14657-2_28.

¹³ Lawrence Meda dan Arthur James Swart, "Analysing learning outcomes in an Electrical Engineering curriculum using illustrative verbs derived from Bloom's Taxonomy," *European Journal of Engineering Education* 43, no. 3 (4 Mei 2018): 399–412, <https://doi.org/10.1080/03043797.2017.1378169>.

¹⁴ Daniel W. Turner III, "Qualitative interview design: A practical guide for novice investigators," *The qualitative report* 15, no. 3 (2010): 754.

¹⁵ M. B. Bradshaw dan E. Stratford, "Qualitative Research Design and Rigour," 2010, http://www.oup.com.au/titles/higher_ed/geography/9780195430158. Lea Sgier, "Qualitative data analysis," *An Initiat. Gebert Ruf Stfj* 19 (2012): 19–21.

¹⁶ Martha Gabriel dkk., "The Role of Digital Technologies in Learning: Expectations of First Year University Students," *Canadian Journal of Learning and Technology / La Revue Canadienne de l'apprentissage et de La Technologie* 38, no. 1 (22 Februari 2012), <https://www.learntechlib.org/p/178056/>.

¹⁷ Jim Daily dan Jeff Peterson, "Predictive Maintenance: How Big Data Analysis Can Improve Maintenance," dalam *Supply Chain Integration Challenges in Commercial Aerospace: A Comprehensive Perspective on the Aviation Value Chain*,

in-depth interpretation and conclusions that experts believe answer questions convincingly. This study entirely depends on publication or secondary data from various sources and literature, both national and international.¹⁸ We do digital searches by relying on keyboards such as digital applications, learning innovation, developing learning results, and typical improvement in university level. Next, we format the report as inactive qualitative, where we see how the literature review is reviewed, namely several experts who have proven this study is related to problem-solving. This is the study and process of this salary payment method from the beginning of problem formation to the end of reporting.¹⁹

RESULTS AND DISCUSSION

Learning Achievement in College

All parties always give student achievement attention. Students are human capital and valuable assets to the state. Among the focus is student achievement in STEM. According to Stewart et al.,²⁰ innovation and best education practice require systems thinking approach. According to him, there is no program yet to analyze and act by looking at a phenomenon as a whole systematically. Accordingly, it is inadequate to criticize a police officer without systematically understanding the situation systematically. Therefore, according to him again, as long as it has not been developed with a program like this, changes to the whole system will not take effect effectively. Usually, conventional studies in science provide an in-depth focus on the phenomenon being investigated, namely, the entire system is summarized in small parts (reductionist research strategy). Human achievement technology also uses the opposite case to examine all interconnected components in one system.²¹

Therefore, understanding all the relationships in a complex system requires a new framework for the study; according to Gilbert,²² if the problem of human achievement applies, efforts to improve performance are carried out without seriously questioning the impression of a strategy made previously. This is known as single-loop learning. On the other hand, if an alternative response is given, all previous appearances will be questioned critically. This is known as double-loop learning. TPM supports all learning organizations to understand the Learning System Model as in Diagram 1 towards efforts to improve achievement.²³

Systematic Thinking Concept with Technology

ed. oleh Klaus Richter dan Johannes Walther (Cham: Springer International Publishing, 2017), 267–78, https://doi.org/10.1007/978-3-319-46155-7_18.

¹⁸ A. McCarthy Wilcox dan N. NicDaeid, “Jurors’ Perceptions of Forensic Science Expert Witnesses: Experience, Qualifications, Testimony Style and Credibility,” *Forensic Science International* 291 (1 Oktober 2018): 100–108, <https://doi.org/10.1016/j.forsciint.2018.07.030>.

¹⁹ Ahmet Önder Gür, Şafak Öksüzer, dan Enis Karaarslan, “Blockchain Based Metering and Billing System Proposal with Privacy Protection for the Electric Network,” dalam *2019 7th International Istanbul Smart Grids and Cities Congress and Fair (ICSG)*, 2019, 204–8, <https://doi.org/10.1109/SGCF.2019.8782375>.

²⁰ I. I. Stewart dkk., “A multilevel analysis of distance learning achievement: Are college students with disabilities making the grade?” *Journal of Rehabilitation* 76, no. 2 (2010).

²¹ R. R. Tummala, Eugene J. Rymaszewski, dan Alan G. Klopfenstein, *Microelectronics Packaging Handbook: Technology Drivers Part I* (Springer Science & Business Media, 2012).

²² Thomas F. Gilbert, *Human Competence: Engineering Worthy Performance* (John Wiley & Sons, 2013).

²³ Paul M. Leonardi, “When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies,” *MIS Quarterly* 35, no. 1 (2011): 147–67, <https://doi.org/10.2307/23043493>.

The concept of systems thinking is derived from general systems theory.²⁴ Systematic thinking is concerned with the framework of thinking that is almost the same as the situation or reality being studied. Usually, analysis involves the process of separating or segmenting a case. An analysis is a thinking tool that has the potential to understand something. If the system is broken down into small components, the investigator cannot see the interactions between the components. Accordingly, another thought is needed to explain the interaction between these components, namely synthesis. Synthesis is made to see how the components interact with each other. Synthesis is about putting a component back after breaking the system into more concise components. In short, analytical thinking allows us to understand and identify the components in a system. Synthetic thinking also allows understanding and describing the way these components interact. Systematic thinking combines analytical thinking and synthetic thinking.²⁵

Analytical thinking is easier to apply, considering this kind of thinking is always applied in learning. However, synthetic thinking is more challenging because most students are not trained consciously. However, humans often do it unconsciously all the time. Interaction is challenging to understand. The interaction is not visible to the naked eye, which is also dynamic. Interactions change over time and affect each other in different ways. Accordingly, it is not easy to see the interactions and consequences in the whole system. Synthetic thinking consciously seeks to find recurring patterns (or general themes) across a system or phenomenon under study. However, analytical thinking is necessary before allowing general patterns and common themes to be sought. This is not adequate or impressive if only analytical thinking is used because analytical thinking focuses more on identifying differences than similarities.²⁶ Therefore, synthetic thinking, which involves intuition, which identifies patterns, requires a more substantial effort to find patterns, and sometimes patterns are found by accident than study design. Usually, the brain uses the common parts of its neural network to sort out equations while analyzing something, and sometimes, new patterns are noticed. Therefore, one of the interests of training to use synthetic thinking consciously needs to be carried out at the learning level so that discoveries can continue to be improved.²⁷

Technological Innovation in Higher Education

Understudy learning results have generally been a benchmark for the progress of learning interaction. It can nearly be said that assuming understudy learning results are low, it implies that instructors' skill in it is likewise low to educate understudies.²⁸ This has been a 100%

²⁴ Yan Zexian dan Yan Xuhui, "A Revolution in the Field of Systems Thinking—a Review of Checkland's System Thinking," *Systems Research and Behavioral Science* 27, no. 2 (2010): 140–55, <https://doi.org/10.1002/sres.1021>.

²⁵ Federico Davila, Roel Plant, dan Brent Jacobs, "Biodiversity Revisited through Systems Thinking," *Environmental Conservation* 48, no. 1 (Maret 2021): 16–24, <https://doi.org/10.1017/S0376892920000508>.

²⁶ Peter J. Brown dan Mario G. Beruvides, "The heuristic-based framework for attitude certainty: How technology and the attention economy are systematically eroding systematic thinking," *The Psychologist-Manager Journal* 23, no. 2 (2020): 76–94, <https://doi.org/10.1037/mgr0000107>.

²⁷ Patcharaporn Paokanta, "A new methodology for web-knowledge-based system using systematic thinking, KM process and data & knowledge engineering technology:FBR-GAs-CBRC5.0-CART," 1 Desember 2013, <http://cmuir.cmu.ac.th/jspui/handle/6653943832/52501>.

²⁸ Andrew Whitworth, "Invisible Success: Problems with the Grand Technological Innovation in Higher Education," *Computers & Education*, CAL 2011, 59, no. 1 (1 Agustus 2012): 145–55, <https://doi.org/10.1016/j.compedu.2011.09.023>. Purniadi Putra dkk., "The Students Learning from Home Experiences during Covid-19 School Closures Policy In Indonesia," *Jurnal Iqra': Kajian Ilmu Pendidikan* 5, no. 2 (5 September 2020): 30–42, <https://doi.org/10.25217/ji.v5i2.1019>. Prasetyono Hendriarto dkk., "Understanding the Implications of Research Skills Development Framework for Indonesian Academic Outcomes Improvement," *Jurnal Iqra': Kajian Ilmu Pendidikan* 6, no. 2 (15 Juli 2021): 51–60, <https://doi.org/10.25217/ji.v6i2.1405>.

of the time "scourge" for teachers. It appears to be that this is one reason which makes teachers generally legitimize any means so that learning results increment. Consequently, instructors must have sufficient scholar and expert capacities, solid character characteristics, and experience in their calling as teachers. The instructive calling is a movement that requires abilities, while abilities require preparing, either as limited abilities preparing or coordinated and autonomous abilities. The arrangement of the capacity of impressive instructive skill requires utilitarian joining between hypothesis, practice, and the material and philosophy of its conveyance. Learning capacity is a perplexing demonstration that is a finished combination of different parts of capacity.²⁹

The parts of these capacities are information, perspectives, and abilities. The arrangement of essential acquiring abilities requires field experience, which is completed in stages, deliberately beginning from the presentation of the field. Abilities preparing is restricted to the execution and enthusiasm for instructive undertakings in general and genuine.³⁰ The errand of instructors is to instruct, educate and prepare an intricate demonstration, to be specific, the integrative utilization of various abilities to pass on acquiring messages with the expectation that learning messages can be acknowledged so that adjustments of conduct in understudies are as per what not entirely settled. The coordination of the abilities being referred to depends on many hypotheses and is coordinated by knowledge. At the same time, its application happens mainly because all learning parts impact it, precisely the objectives to be accomplished, the message passed on, understudies, offices, learning climate, and the teacher part itself.³¹

Learning is an interpretation of the word informative; Learning depends on comprehensive mental brain research, which is then trailed by a productive, humanistic view. Learning is likewise impacted by mechanical turns of events, that learning can be worked with through learning sources other than instructors, hence changing teachers' jobs in learning.³² At first, instructors as the main wellspring of learning, then facilitators in learning. The role of educators is more emphasized on how to design the various sources and facilities available to be used by students in learning. There are several differences between teaching and learning. Teaching a translation of teaching is footing from the flow of psychology, centered on educators. Students are considered learning objects; teaching and learning occur at certain times and places; how vital are external factors in learning? Learning is an activity to convey knowledge. Educators are present to teach. While the translation learning of Instruction, the footing of the flow of cognitive psychology is centered on students, students are considered learning subjects; Learning can occur anywhere, anytime, and anywhere; how vital are internal factors in learning? Teaching is part of learning; the presence facilitates Learning to become effective, efficient, and goal-directed.³³

²⁹ Chang Zhu, "Organisational culture and technology-enhanced innovation in higher education," *Technology, Pedagogy and Education* 24, no. 1 (1 Januari 2015): 65–79, <https://doi.org/10.1080/1475939X.2013.822414>.

³⁰ Guangyou Zhou dan Sumei Luo, "Higher Education Input, Technological Innovation, and Economic Growth in China," *Sustainability* 10, no. 8 (Agustus 2018): 2615, <https://doi.org/10.3390/su10082615>.

³¹ William G. Tierney dan Michael Lanford, "Conceptualizing Innovation in Higher Education," dalam *Higher Education: Handbook of Theory and Research*, ed. oleh Michael B. Paulsen, Higher Education: Handbook of Theory and Research (Cham: Springer International Publishing, 2016), 1–40, https://doi.org/10.1007/978-3-319-26829-3_1.

³² Robert Ellis dan Peter Goodyear, *Students' Experiences of e-Learning in Higher Education: The Ecology of Sustainable Innovation* (New York: Routledge, 2009), <https://doi.org/10.4324/9780203872970>.

³³ Chrysi Rapanta dkk., "Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity," *Postdigital Science and Education* 2, no. 3 (1 Oktober 2020): 923–45, <https://doi.org/10.1007/s42438-020-00155-y>.

Learning Technology Innovation Develops Character

"Learning can be done anywhere, especially in a pandemic situation; it can be done from home. The Independent Learning Policy is more actualized in the current learning process, where teachers and students are free to determine the methods, media, and learning resources," said Emil.

Emil added that digitizing schools is an investment that will not be in vain, to build schemes and generations that have characters ready to face all challenges in the future. Therefore, the East Java government will continue to prepare infrastructure for ICT facilities in the village hall and even at the hamlet level in supporting the learning process for using ICT from home. Wicki & Hansen,³⁴ said that East Java Province is one of the provinces with the highest utilization rate of Internet data quota assistance given by the government some time ago. This indicates that students in East Java Province welcome innovation in the learning process during the pandemic.

Hasan added that this learning innovation is one way to develop the character of Pancasila students. This technological disruption must be based on the Pancasila philosophy, namely, taking positive values from the application of ITC for the teaching and learning plus evaluation process led by teachers to become a trigger in keeping the flame of learning awake. Churiyah et al.³⁵ explained the learning innovations carried out by the East Java Provincial Government during this pandemic—considering that 60% of the contribution to the success of the educational component on educational outcomes is determined by the teacher. Therefore, every teacher in East Java must quickly adapt by utilizing various *digital platforms* and the *Learning Management System* during this pandemic.³⁶

To support this, the government has taken various ways to improve the ability of teachers to use digital for learning. "The applause of a teacher on a student's shoulder will not be replaced by any sophisticated learning technology."³⁷ The profile of students who have the spirit of Pancasila is a character that every student and student must possess. Have faith, piety to God Almighty, noble character, independence, critical reasoning, cooperation, and creative and global pluralism. This must be done holistically or comprehensively, namely, with an understanding of the legal umbrella, digital content that has been provided by the Center for Education and teaching on character building, the government, and the use of Technology of which is a study. "Because utilizing Technology is part of the *soft skills* possessed by students, it will impact increasing their global insight."³⁸

³⁴ Samuel Wicki dan Erik G. Hansen, "Green Technology Innovation: Anatomy of Exploration Processes from a Learning Perspective," *Business Strategy and the Environment* 28, no. 6 (2019): 970–88, <https://doi.org/10.1002/bse.2295>.

³⁵ Madziatul Churiyah dkk., "Indonesia Education Readiness Conducting Distance Learning in Covid-19 Pandemic Situation," *International Journal of Multicultural and Multireligious Understanding* 7, no. 6 (3 Agustus 2020): 491–507, <https://doi.org/10.18415/ijmmu.v7i6.1833>.

³⁶ Taufiq Rahman Ilyas, "Optimization Of Agropolitan Of East Java Province As An Effort To Restore Local Economy During The Covid 19 Pandemic," *PERCIPIENCE International Journal of Social, Administration, & Entrepreneurship* 2, no. 1 (30 Maret 2022): 52–60.

³⁷ Mangaratua Simanjourang, "Integrating Ethics into Mathematics Education: A Philosophical Auto/Ethnographic Inquiry into Indonesian Mathematics Education," *Simanjourang, Mangaratua* <<https://researchrepository.murdoch.edu.au/View/Author/Simanjourang,Mangaratua.html>> (2016) *Integrating Ethics into Mathematics Education: A Philosophical Auto/Ethnographic Inquiry into Indonesian Mathematics Education. PhD Thesis, Murdoch University.* (phd, Murdoch University, 2016), <https://researchrepository.murdoch.edu.au/id/eprint/35052/>.

³⁸ R. de Villiers, "The incorporation of soft skills into accounting curricula: preparing accounting graduates for their unpredictable futures," *Meditari Accountancy Research* 18, no. 2 (1 Januari 2010): 1–22, <https://doi.org/10.1108/10222529201000007>.

Because government plays a role in supporting the learning process, not replacing teachers, for this reason, the LMS owned by the Ministry of Education and Technology, namely the Learning House portal, can provide a simulation menu that can train students' character abilities according to the Pancasila student profile in the form of *Edu games*.³⁹ Especially in primary education, a teaching team consisting of teachers and experts can assist students in utilizing actual education content on the Learning House Portal. The utilization of Technology by the Rumah Belajar portal can develop content that schools can make according to school needs as part of their learning innovation.⁴⁰

Meanwhile, a resource person from *the Mabacita Institute Psychologist and Hypnotherapist*, Dian Kurniati, stated that it is essential for educators to be able to know, understand, and have guidelines about their students, by understanding their learning styles, intelligence and personality types students can find the right way to deal with the needs of their students. Especially in the current distance learning process, teachers can create fun learning and accommodate all students in the adaptation of digital application in their education process so that students' learning demotivation can be avoided. The excellent practice delivered was the use of *Liveworksheets* for the interactive Pancasila Student Worksheet. This platform has online worksheets for teachers who can create teaching materials and support the needs of teachers in the daily learning process. The way to use it is to prepare a design in the form of a document, then prepare material assets in the form of supporting images, audio, or video, then prepare questions that are by the basic profile of Pancasila students.⁴¹

Mobile Technology and Learning Improvement

M-Learning Mobile learning is a learning media that uses phone innovation. As per Martin & Ertzberger,⁴² Portable picking up is learning where the student does not remain in one spot or learning exercises that happen when the student utilizes versatile innovation gadgets. Versatile learning is an option for creating learning media. The presence of mobile learning is expected to supplement Learning and open doors for understudies to learn less dominated by material anyplace and whenever. Numerous understudies use workstations or even manuals to help to learn at school. Involving a PC as a learning medium will make it challenging for understudies to convey the gadget since it is weighty and problematic. Seeing this potential, the improvement of learning media by using cells is to make versatile discoveries planned for all cells with the Android stage. The explanation is that the Android working framework has turned into the most broadly utilized framework on cell phones. M-learning is excellent since understudies can get to materials, bearings, and applications connected with learning.⁴³

This will build regard for learning materials, make learning influential, and can energize student inspiration for deep-rooted learning. Portable Learning is essential for electronic

³⁹ Abdullah Aljaber, "E-Learning Policy in Saudi Arabia: Challenges and Successes," *Research in Comparative and International Education* 13, no. 1 (1 Maret 2018): 176–94, <https://doi.org/10.1177/1745499918764147>.

⁴⁰ Melda Fajra dkk., "Project Based Learning: Innovation To Improve The Suitability Of Productive Competencies In Vocational High Schools With The Needs Of The World Of Work," *International Journal of Multi Science* 1, no. 08 (3 November 2020): 1–11.

⁴¹ Didin Saripudin, Kokom Komalasari, dan Diana Noor Anggraini, "Value-Based Digital Storytelling Learning Media to Foster Student Character," *International Journal of Instruction* 14, no. 2 (April 2021): 369–84.

⁴² Florence Martin dan Jeffrey Ertzberger, "Here and Now Mobile Learning: An Experimental Study on the Use of Mobile Technology," *Computers & Education* 68 (1 Oktober 2013): 76–85, <https://doi.org/10.1016/j.compedu.2013.04.021>.

⁴³ Hosam El-Sofany dan Nahla El-Hagggar, *The Effectiveness of Using Mobile Learning Techniques to Improve Learning Outcomes in Higher Education* (International Association of Online Engineering, 2020), <https://www.learntechlib.org/p/216981/>.

learning or also called e-learning. Connected with the significant number of cell phone clients, mobile learning can be utilized to tackle issues in training at the auxiliary school level as a rule, particularly in secondary school, particularly the issue of impartial admittance to instructive data. To deliver decent versatile learning media, it should be helped by the out-group. Numerous offices are engaged in creating versatile learning media that can be represented given material and media rules. Versatile learning is a learning model completed between spots or conditions utilizing compact innovation, paying little mind to existence.⁴⁴

Versatile advancing as the crossing point of Mobile Computing and E-Learning gives assets that can be gotten to anyplace having abilities in a brilliant pursuit framework, rich and full help towards practical learning and execution-based appraisal.⁴⁵ Likewise, it has attributes that do not rely upon reality. Instruction requires elective learning models that are usually free of existence. It is also trusted that elective models can work with information sharing and representation to make information fascinating and straightforward. The utilization of data and correspondence innovation in Instruction in Indonesia generally evolves in an assortment of methodologies and anticipated designs. E-Learning framework as a discovering that utilizes many electronic gadgets and advanced media or mobile learning (m-Learning) alludes to an advancement principally utilizing cell phones and correspondence innovation. The utilization of m-realizing this innovation intends to help understudies or general society have the option to address materials or data whenever, anyplace, and for any reason. Portable learning applications can be created utilizing different versatile advancements and stages. Every execution of versatile learning has various qualities. Portable learning applications comprise Mobile Devices, Software, and Application content.⁴⁶

Learning technologies in higher education

Learning System Design is a coordinated methodology made out of examination (the most common way of planning what is realized), plan (the most common way of clarifying how to learn it), advancement (the most common way of composing and delivering or creating learning materials), application/application usage of materials and procedures) Moreover, appraisal (is the method involved in deciding the exactness of learning).⁴⁷

Learning System Design is also called a linear and interactive procedure that demands accuracy and stability. Acting as a tool to control each other, all these stages must be completed. The process has the same meaning as the product because trust in the product is based on the process. Message Design; is a plan to engineer the physical form of the message so that communication occurs between the sender and the recipient, taking into account the rules of attention, perception, and capture power. Messages are cues or symbols that achieve cognitive, affective, and psychomotor behavior changes. Message design relates to various microstructures, such as visual material, sequences, separate pages, and screens. The design must be specific, both from the media and the learning task. Message design will differ

⁴⁴ Matthew L. Bernacki, Jeffrey A. Greene, dan Helen Crompton, "Mobile Technology, Learning, and Achievement: Advances in Understanding and Measuring the Role of Mobile Technology in Education," *Contemporary Educational Psychology* 60 (1 Januari 2020): 101827, <https://doi.org/10.1016/j.cedpsych.2019.101827>.

⁴⁵ Darrell M. West, "Connected learning: How mobile technology can improve education," *Center for Technology Innovation at Brookings*, 2015, 1–8.

⁴⁶ Shazia Zaheer dkk., "Do Mobile Technology in the Classroom Really Improve Learning Outcomes?," *International Journal of Evaluation and Research in Education* 7, no. 3 (September 2018): 188–93.

⁴⁷ Valentina Arkorful dan Nelly Abaidoo, "The role of e-learning, advantages and disadvantages of its adoption in higher education," *International Journal of Instructional Technology and Distance Learning* 12, no. 1 (2015): 29–42.

depending on the media type, whether static, dynamic, or both (for example, a portrait, film, or computer graphic).⁴⁸

Moreover, whether the learning task involves concept formation, attitude development, skill development, learning strategies, or memorization, he is learning strategies, namely specifications for selecting and learning events or activities in a lesson. The concept of learning strategies includes learning situations and learning/teaching components. A designer uses the concept or component of a learning strategy as a principle of learning technology. Implementing a learning strategy depends on the learning situation, and the desired type of education process. Characteristics of Learners, namely aspects of the background of the learner's experience, affect the effectiveness of the learning process. The characteristics of the learner include the socio-psycho-physical condition of the learner. Psychologically, what needs to get interested in the learner's characteristics is related to his ability (ability), potential and fundamental skills and personalities, such as attitudes, emotions, motivation, and other personality parts.⁴⁹

Improvement is the method of interpreting plan particulars into the actual structure, which incorporates: printing innovation, general media innovation, PC-based innovation, and collaborative innovation. Print innovation is a method for making or conveying materials, like books and static visual materials, mainly through mechanical or visual printing. Innovation is traction for the turn of events and usage of most other learning materials. The consequence of this innovation is a shape.⁵⁰ The text shown on a PC is an instance of involving PC innovation for creation. The text contains a "print" design for learning whenever the text is printed. It is an illustration of conveyance through printing innovation. Verbal and visual text materials are essential for innovation. Visual insight hypothesis, understanding hypothesis, data handling by people, and learning hypothesis are improvements in learning. Print/visual innovation has qualities, specifically: the text is perused directly, then visuals are recorded by space, both ordinarily give uninvolved one-way correspondence, both are static visuals; Its improvement depends intensely on phonetic standards and visual insight, the two of which are student-focused, data can be coordinated and rebuilt by the client.⁵¹

General media gadget innovation; is an approach to creating and conveying materials utilizing electronics and hardware to introduce sound and visual messages. General media learning can be utilized effectively because it involves equipment in the instructing system. General media offices improve the projecting of live pictures, playback of sound, and enormous estimated visuals.⁵² General media learning is characterized as creating and utilizing materials connected with visual and hear-able realization, which do not necessarily need to depend solely on getting words and similar images. General media innovation has the accompanying attributes: straight in nature, shows dynamic visuals, is remarkably utilized such that it has not entirely set in stone by the fashioner/engineer, a type of actual portrayal of genuine and conceptual thoughts, created in light of the standards of cognitive, social brain science

⁴⁸ Jaziar Radianti dkk., "A Systematic Review of Immersive Virtual Reality Applications for Higher Education: Design Elements, Lessons Learned, and Research Agenda," *Computers & Education* 147 (1 April 2020): 103778, <https://doi.org/10.1016/j.compedu.2019.103778>.

⁴⁹ Wan Ng, "Can We Teach Digital Natives Digital Literacy?," *Computers & Education* 59, no. 3 (1 November 2012): 1065–78, <https://doi.org/10.1016/j.compedu.2012.04.016>.

⁵⁰ Joanne Gikas dan Michael M. Grant, "Mobile Computing Devices in Higher Education: Student Perspectives on Learning with Cellphones, Smartphones & Social Media," *The Internet and Higher Education* 19 (1 Oktober 2013): 18–26, <https://doi.org/10.1016/j.iheduc.2013.06.002>.

⁵¹ Jorge Martín-Gutiérrez dkk., "Augmented Reality to Promote Collaborative and Autonomous Learning in Higher Education," *Computers in Human Behavior*, Computing for Human Learning, Behaviour and Collaboration in the Social and Mobile Networks Era, 51 (1 Oktober 2015): 752–61, <https://doi.org/10.1016/j.chb.2014.11.093>.

⁵² Ghulam Muhammad Kundi, Allah Nawaz, dan Shadiullah Khan, "The predictors of success for e-learning in higher education institutions (HEIs) in NW. FP, Pakistan," *JISTEM-Journal of Information Systems and Technology Management* 7, no. 3 (2010): 545–78.

frequently focused on instructors, giving little consideration to the intuitiveness of the student's learning.⁵³

Informatics-Based Technology; is a model of making and conveying materials utilizing gadgets controlled by microchips. Essentially, PC-based innovation passes data on to students on a screen show. Different PC applications are typically called "PC-based guidance (CBI), "PC helped guidance (CAI)," or "PC oversaw guidance (CMI).⁵⁴ These applications were, on the whole, in light of social hypothesis and customized learning, yet are currently put together more vigorously concerning mental hypothesis. These applications can be: instructional exercises, fundamental illustrations are given, activities, and reiterations to assist students with creating familiarity with recently concentrated material, games, and reenactments to give potential chances to utilize recently educated information and information sources that permit students to get to their arrangement of materials. Information through remotely resolved information access systems conventions is essential.⁵⁵

Coordinated Technology; is a method for creating and conveying materials by joining a few kinds of PC-controlled media. The specialty shown by this innovation - particularly by utilizing a PC with high determinations, is the presence of high student intelligence with different sorts of learning assets.⁵⁶ Thoughts are often introduced sensibly regarding the student's insight, pertinent to the student's condition, and influenced quite a bit by control. The standards of cognitive science and constructivism are applied in the turn of events and the use of learning materials. Learning is focused and coordinated by mental information, shaping information when utilized. Usage is an action that incorporates cycles and assets for learning. Use is essential for connecting the student and the learning material or framework. Partners who use must coordinate students with explicit materials and exercises, get ready students to associate with the chosen materials and exercises, give direction during exercises, appraise the outcomes accomplished by students, and consolidate them into progressing hierarchical methods.⁵⁷

Media Utilization, specifically the efficient utilization of learning assets, is essential. The method involved with using the media is vital for the emotional cycle because of the details of the educational plan.⁵⁸ For instance, how a film is presented or followed up and designed by the ideal type of learning. Use rules are additionally connected with student qualities. Learning students might require visual or verbal abilities to help with requests to profit from training or learning assets. Management includes, among others: planning, organizing, coordinating, and supervising. Management includes media center administration, media programs, and media services. Combining the library with media programs produces a school media center and specialist. This educational unit media program combines printed and non-printed materials, increasing the use of technological resources in the curriculum. The success

⁵³ Jorge Reyna, Jose Hanham, dan Peter Meier, "A Taxonomy of Digital Media Types for Learner-Generated Digital Media Assignments," *E-Learning and Digital Media* 14, no. 6 (1 November 2017): 309–22, <https://doi.org/10.1177/2042753017752973>.

⁵⁴ Rangga Firdaus, Basuki wibawa, dan Khaerudin Khaerudin, "Ubiquitous Learning An Alternative Assessment In Learning Test Proficiency For Increasing Human Resources Field Of Informatics," *International Journal of Civil Engineering and Technology (IJCIET)* 10, no. 3 (Maret 2019): 2220–30.

⁵⁵ E. B. Priyanka dan S. Thangavel, "Influence of Internet of Things (IoT) In Association of Data Mining Towards the Development Smart Cities-A Review Analysis.," *Journal of Engineering Science & Technology Review* 13, no. 4 (2020).

⁵⁶ Graham Wilson, Gavin Davidson, dan Stephen A. Brewster, "In the Heat of the Moment: Subjective Interpretations of Thermal Feedback During Interaction," dalam *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, CHI '15 (New York, NY, USA: Association for Computing Machinery, 2015), 2063–72, <https://doi.org/10.1145/2702123.2702219>.

⁵⁷ Monika Akbar, "Digital Technology Shaping Teaching Practices in Higher Education," *Frontiers in ICT* 3 (2016), <https://www.frontiersin.org/article/10.3389/fict.2016.00001>.

⁵⁸ Gráinne Conole dan Panagiota Alevizou, "A literature review of the use of Web 2.0 tools in Higher Education," *A report commissioned by the Higher Education Academy*, 2010.

of a distance learning system depends on its management due to the spread of locations. With the development of new technology, it is possible to provide new ways to obtain information. Increased knowledge about information management is very potential. The theoretical foundation of information management comes from the information science discipline. The resulting information opens up many possibilities for instructional design, particularly in developing and implementing self-designed curricula and learning.⁵⁹

Assessment is the activity of evaluating the learning progress which includes: problem analysis, reference measurement, formative assessment, and summative assessment. The objectives and functions of the assessment system in schools can be classified into four) categories: Provide feedback to students as a basis for improving the learning process and administering student remedial programs, To determine the progress/learning outcomes of each student required, among others, to provide reports to parents of students, determine class promotions and determine whether or not students pass. They are placing students in appropriate learning situations according to the level of ability (characteristics) of other students and having, Knowing the background (psychological, physical, and environmental) of students who have Learning difficulties whose results can be used as a basis for solving these difficulties.⁶⁰

CONCLUSION

In this final section, we will conclude that this is an important point that we found after a series of studies on many literature sources to get a strong understanding of digital applications capable of integrating the achievement of academic learning outcomes of college students. Through a study of scientific evidence published in various sources regularly, we believe we have answered the main problem of this kingdom, which is that digital Technology is so phenomenal that academics have adopted Technology as a form of innovation to accelerate learning and improve results. It is undeniable that many secret and hidden documents prove that the effectiveness of Technology can innovate learning to achieve infinite results. Because of the effectiveness of the Technology, they no longer do their higher education with the determination to use or stir to adopt Technology to accelerate learning to adapt to the digital era where Ra demands the speed and accuracy of humans working to solve the problems they face.

The leading roles that we have summarized include, among others, that Technology is indeed an important thing to achieve teaching goals in the high week. This is because Technology can accelerate learning outcomes compared to other conventional methods. So technological innovation in tall trees is no longer negotiable considering the extraordinary work of innovating aquatic products. Other evidence that technology-based learning is an innovation that not only forms combustion products but also develops the character of learning for the better as well as various methods or tools that have been successfully used in learning contexts such as technology cars and learning approaches in universities

Likewise, this high learning technology uses various design systems, including learning technology that is more effective, dynamic, and productive. Furthermore, we summarize that this technology-based learning is no longer effective because Technology is not only the mainstay of education managers today but has penetrated the entire business of human life from state banking and also exposed the critical points that we have obtained from a series of

⁵⁹ Constantinos Nicolaou, Maria Matsiola, dan George Kalliris, "Technology-Enhanced Learning and Teaching Methodologies through Audiovisual Media," *Education Sciences* 9, no. 3 (September 2019): 196, <https://doi.org/10.3390/educsci9030196>.

⁶⁰ Arild Raaheim dkk., "Digital assessment – how does it challenge local practices and national law? A Norwegian case study," *European Journal of Higher Education* 9, no. 2 (3 April 2019): 219–31, <https://doi.org/10.1080/21568235.2018.1541420>.

information studies to gain a belief that how Technology can innovate learning, significantly accelerating results in this digital era. We believe that this data certainly has weaknesses. Therefore feedback and other inputs are very much appreciated to improve the quality of this study in the future.

REFERENCES

- Akbar, Monika. "Digital Technology Shaping Teaching Practices in Higher Education." *Frontiers in ICT* 3 (2016). <https://www.frontiersin.org/article/10.3389/fict.2016.00001>.
- Al Amin, Md. "BEST model of CSR: An Analysis of the Impact of Corporate Social Responsibility for Improving the Social Development of the Stakeholders-A study on Four Private Commercial Banks" 18 (15 Mei 2016): 79–109.
- Alden, Jay. "Accommodating Mobile Learning in College Programs." *Journal of Asynchronous Learning Networks* 17, no. 1 (Januari 2013): 109–22.
- Aldowah, Hanan, Shafiq Ul Rehman, Samar Ghazal, dan Irfan Naufal Umar. "Internet of Things in Higher Education: A Study on Future Learning." *Journal of Physics: Conference Series* 892 (September 2017): 012017. <https://doi.org/10.1088/1742-6596/892/1/012017>.
- Aljaber, Abdullah. "E-Learning Policy in Saudi Arabia: Challenges and Successes." *Research in Comparative and International Education* 13, no. 1 (1 Maret 2018): 176–94. <https://doi.org/10.1177/1745499918764147>.
- Ardhaoui, Kaouther, Marina Serra Lemos, dan Susana Silva. "Effects of New Teaching Approaches on Motivation and Achievement in Higher Education Applied Chemistry Courses: A Case Study in Tunisia." *Education for Chemical Engineers* 36 (1 Juli 2021): 160–70. <https://doi.org/10.1016/j.ece.2021.05.004>.
- Arkorful, Valentina, dan Nelly Abaidoo. "The role of e-learning, advantages and disadvantages of its adoption in higher education." *International Journal of Instructional Technology and Distance Learning* 12, no. 1 (2015): 29–42.
- Aslan, Aslan, Silvia Silvia, Budi Sulistiyo Nugroho, M. Ramli, dan Rusiadi Rusiadi. "TEACHER'S LEADERSHIP TEACHING STRATEGY SUPPORTING STUDENT LEARNING DURING THE COVID-19 DISRUPTION." *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam* 5, no. 3 (21 November 2020): 321–33. <https://doi.org/10.31538/ndh.v5i3.984>.
- Bernacki, Matthew L., Jeffrey A. Greene, dan Helen Crompton. "Mobile Technology, Learning, and Achievement: Advances in Understanding and Measuring the Role of Mobile Technology in Education." *Contemporary Educational Psychology* 60 (1 Januari 2020): 101827. <https://doi.org/10.1016/j.cedpsych.2019.101827>.
- Bradshaw, M. B., dan E. Stratford. "Qualitative Research Design and Rigour," 2010. http://www.oup.com.au/titles/higher_ed/geography/9780195430158.
- Brown, Peter J., dan Mario G. Beruvides. "The heuristic-based framework for attitude certainty: How technology and the attention economy are systematically eroding systematic thinking." *The Psychologist-Manager Journal* 23, no. 2 (2020): 76–94. <https://doi.org/10.1037/mgr0000107>.
- Churiyah, Madziatul, Sholikhhan Sholikhhan, Filianti Filianti, dan Dewi Ayu Sakdiyyah. "Indonesia Education Readiness Conducting Distance Learning in Covid-19 Pandemic Situation." *International Journal of Multicultural and Multireligious Understanding* 7, no. 6 (3 Agustus 2020): 491–507. <https://doi.org/10.18415/ijmmu.v7i6.1833>.
- Conole, Gráinne, dan Panagiota Alevizou. "A literature review of the use of Web 2.0 tools in Higher Education." *A report commissioned by the Higher Education Academy*, 2010.

- Daily, Jim, dan Jeff Peterson. "Predictive Maintenance: How Big Data Analysis Can Improve Maintenance." Dalam *Supply Chain Integration Challenges in Commercial Aerospace: A Comprehensive Perspective on the Aviation Value Chain*, disunting oleh Klaus Richter dan Johannes Walther, 267–78. Cham: Springer International Publishing, 2017. https://doi.org/10.1007/978-3-319-46155-7_18.
- Davila, Federico, Roel Plant, dan Brent Jacobs. "Biodiversity Revisited through Systems Thinking." *Environmental Conservation* 48, no. 1 (Maret 2021): 16–24. <https://doi.org/10.1017/S0376892920000508>.
- Ellis, Robert, dan Peter Goodyear. *Students' Experiences of e-Learning in Higher Education: The Ecology of Sustainable Innovation*. New York: Routledge, 2009. <https://doi.org/10.4324/9780203872970>.
- El-Sofany, Hosam, dan Nahla El-Haggar. *The Effectiveness of Using Mobile Learning Techniques to Improve Learning Outcomes in Higher Education*. International Association of Online Engineering, 2020. <https://www.learntechlib.org/p/216981/>.
- Fajra, Melda, SUPARNO, SUKARDI, AMBIYAR, dan Rina Novalinda. "PROJECT BASED LEARNING: INNOVATION TO IMPROVE THE SUTTABILITY OF PRODUCTIVE COMPETENCIES IN VOCATIONAL HIGH SCHOOLS WITH THE NEEDS OF THE WORLD OF WORK." *INTERNATIONAL JOURNAL OF MULTI SCIENCE* 1, no. 08 (3 November 2020): 1–11.
- Firdaus, Rangga, Basuki wibawa, dan Khaerudin Khaerudin. "UBIQUITOUS LEARNING AN ALTERNATIVE ASSESSMENT IN LEARNING TEST PROFICIENCY FOR INCREASING HUMAN RESOURCES FIELD OF INFORMATICS." *International Journal of Civil Engineering and Technology (IJCIET)* 10, no. 3 (Maret 2019): 2220–30.
- Gabriel, Martha, Barbara Campbell, Sean Wiebe, Ronald MacDonald, dan Alexander McAuley. "The Role of Digital Technologies in Learning: Expectations of First Year University Students." *Canadian Journal of Learning and Technology / La Revue Canadienne de l'apprentissage et de La Technologie* 38, no. 1 (22 Februari 2012). <https://www.learntechlib.org/p/178056/>.
- Gikas, Joanne, dan Michael M. Grant. "Mobile Computing Devices in Higher Education: Student Perspectives on Learning with Cellphones, Smartphones & Social Media." *The Internet and Higher Education* 19 (1 Oktober 2013): 18–26. <https://doi.org/10.1016/j.iheduc.2013.06.002>.
- Gilbert, Thomas F. *Human Competence: Engineering Worthy Performance*. John Wiley & Sons, 2013.
- Gür, Ahmet Önder, Şafak Öksüzer, dan Enis Karaarslan. "Blockchain Based Metering and Billing System Proposal with Privacy Protection for the Electric Network." Dalam *2019 7th International Istanbul Smart Grids and Cities Congress and Fair (ICSG)*, 204–8, 2019. <https://doi.org/10.1109/SGCF.2019.8782375>.
- Hendriarto, Prasetyono, Agus Mursidi, Nawang Kalbuana, Nurul Aini, dan Aslan Aslan. "Understanding the Implications of Research Skills Development Framework for Indonesian Academic Outcomes Improvement." *Jurnal Iqra': Kajian Ilmu Pendidikan* 6, no. 2 (15 Juli 2021): 51–60. <https://doi.org/10.25217/ji.v6i2.1405>.
- Heyking, Amy von. "Implementing Progressive Education in Alberta's Rural Schools," 2012. <https://opus.uleth.ca/handle/10133/4701>.
- Hoque, Kazi Enamul, Ahmad Zabidi Abdul Razak, dan Mosa Fatema Zohora. "ICT Utilization among School Teachers and Principals in Malaysia." *International Journal of Academic Research in Progressive Education and Development* 1, no. 4 (2012): 17–34.
- Ilyas, Taufiq Rahman. "OPTIMIZATION OF AGROPOLITAN OF EAST JAVA PROVINCE AS AN EFFORT TO RESTORE LOCAL ECONOMY DURING THE

- COVID 19 PANDEMIC.” *PERCIPIENCE International Journal of Social, Administration, & Entrepreneurship* 2, no. 1 (30 Maret 2022): 52–60.
- Kryukov, Vladimir, dan Alexey Gorin. “Digital technologies as education innovation at universities.” *Australian Educational Computing* 32, no. 1 (2017): 1–16.
- Kundi, Ghulam Muhammad, Allah Nawaz, dan Shadiullah Khan. “The predictors of success for e-learning in higher education institutions (HEIs) in NW. FP, Pakistan.” *JISTEM- Journal of Information Systems and Technology Management* 7, no. 3 (2010): 545–78.
- Lam, Jeanne, Jane Yau, dan Simon K. S. Cheung. “A Review of Mobile Learning in the Mobile Age.” Dalam *Hybrid Learning*, disunting oleh Philip Tsang, Simon K. S. Cheung, Victor S. K. Lee, dan Ronghuai Huang, 306–15. Lecture Notes in Computer Science. Berlin, Heidelberg: Springer, 2010. https://doi.org/10.1007/978-3-642-14657-2_28.
- Leonardi, Paul M. “When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies.” *MIS Quarterly* 35, no. 1 (2011): 147–67. <https://doi.org/10.2307/23043493>.
- Martin, Florence, dan Jeffrey Ertzberger. “Here and Now Mobile Learning: An Experimental Study on the Use of Mobile Technology.” *Computers & Education* 68 (1 Oktober 2013): 76–85. <https://doi.org/10.1016/j.compedu.2013.04.021>.
- Martín-Gutiérrez, Jorge, Peña Fabiani, Wanda Benesova, María Dolores Meneses, dan Carlos E. Mora. “Augmented Reality to Promote Collaborative and Autonomous Learning in Higher Education.” *Computers in Human Behavior, Computing for Human Learning, Behaviour and Collaboration in the Social and Mobile Networks Era*, 51 (1 Oktober 2015): 752–61. <https://doi.org/10.1016/j.chb.2014.11.093>.
- McCarthy Wilcox, A., dan N. NicDaeid. “Jurors’ Perceptions of Forensic Science Expert Witnesses: Experience, Qualifications, Testimony Style and Credibility.” *Forensic Science International* 291 (1 Oktober 2018): 100–108. <https://doi.org/10.1016/j.forsciint.2018.07.030>.
- Meda, Lawrence, dan Arthur James Swart. “Analysing learning outcomes in an Electrical Engineering curriculum using illustrative verbs derived from Bloom’s Taxonomy.” *European Journal of Engineering Education* 43, no. 3 (4 Mei 2018): 399–412. <https://doi.org/10.1080/03043797.2017.1378169>.
- Ng, Wan. “Can We Teach Digital Natives Digital Literacy?” *Computers & Education* 59, no. 3 (1 November 2012): 1065–78. <https://doi.org/10.1016/j.compedu.2012.04.016>.
- Nicolaou, Constantinos, Maria Matsiola, dan George Kalliris. “Technology-Enhanced Learning and Teaching Methodologies through Audiovisual Media.” *Education Sciences* 9, no. 3 (September 2019): 196. <https://doi.org/10.3390/educsci9030196>.
- Paokanta, Patcharaporn. “A new methodology for web-knowledge-based system using systematic thinking, KM process and data & knowledge engineering technology:FBR-GAs-CBRC5.0-CART,” 1 Desember 2013. <http://cmuir.cmu.ac.th/jspui/handle/6653943832/52501>.
- Pradubthong, Napatcha, Sirirat Petsangsri, dan Paitoon Pimdee. “The Effects of the SPACE Learning Model on Learning Achievement and Innovation & Learning Skills in Higher Education | Mediterranean Journal of Social Sciences,” 2 Agustus 2020. <https://www.richtmann.org/journal/index.php/mjss/article/view/10268>.
- Priyanka, E. B., dan S. Thangavel. “Influence of Internet of Things (IoT) In Association of Data Mining Towards the Development Smart Cities-A Review Analysis.” *Journal of Engineering Science & Technology Review* 13, no. 4 (2020).
- Putra, Purniadi, Fahrina Yustiasari Liriwati, Tasdin Tahrim, Syafrudin Syafrudin, dan Aslan Aslan. “The Students Learning from Home Experiences during Covid-19 School

- Closures Policy In Indonesia.” *Jurnal Iqra’: Kajian Ilmu Pendidikan* 5, no. 2 (5 September 2020): 30–42. <https://doi.org/10.25217/ji.v5i2.1019>.
- Putra, Purniadi, Hilmi Mizani, Abdul Basir, Ahmad Muflihah, dan Aslan Aslan. “The Relevancy on Education Release Revolution 4.0 in Islamic Basic Education Perspective in Indonesia (An Analysis Study of Paulo Freire’s Thought).” *Test Engineering & Management* 83 (2020): 10256–63.
- Raaheim, Arild, Ketil Mathiassen, Vegard Moen, Irene Lona, Vidar Gynnild, Bente Ringlund Bunæs, dan Emil Trygve Hasle. “Digital assessment – how does it challenge local practices and national law? A Norwegian case study.” *European Journal of Higher Education* 9, no. 2 (3 April 2019): 219–31. <https://doi.org/10.1080/21568235.2018.1541420>.
- Radianti, Jaziar, Tim A. Majchrzak, Jennifer Fromm, dan Isabell Wohlgenannt. “A Systematic Review of Immersive Virtual Reality Applications for Higher Education: Design Elements, Lessons Learned, and Research Agenda.” *Computers & Education* 147 (1 April 2020): 103778. <https://doi.org/10.1016/j.compedu.2019.103778>.
- Rapanta, Chrysi, Luca Botturi, Peter Goodyear, Lourdes Guàrdia, dan Marguerite Koole. “Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity.” *Postdigital Science and Education* 2, no. 3 (1 Oktober 2020): 923–45. <https://doi.org/10.1007/s42438-020-00155-y>.
- Reyna, Jorge, Jose Hanham, dan Peter Meier. “A Taxonomy of Digital Media Types for Learner-Generated Digital Media Assignments.” *E-Learning and Digital Media* 14, no. 6 (1 November 2017): 309–22. <https://doi.org/10.1177/2042753017752973>.
- Saripudin, Didin, Kokom Komalasari, dan Diana Noor Anggraini. “Value-Based Digital Storytelling Learning Media to Foster Student Character.” *International Journal of Instruction* 14, no. 2 (April 2021): 369–84.
- Sgier, Lea. “Qualitative data analysis.” *An Initiat. Gebert Ruf Stift* 19 (2012): 19–21.
- Simanjourang, Mangaratua. “Integrating Ethics into Mathematics Education: A Philosophical Auto/Ethnographic Inquiry into Indonesian Mathematics Education.” *Simanjourang, Mangaratua* <[https://researchrepository.murdoch.edu.au/View/Author/Simanjourang, Mangaratua.Html](https://researchrepository.murdoch.edu.au/View/Author/Simanjourang,Mangaratua.Html)> (2016) *Integrating Ethics into Mathematics Education: A Philosophical Auto/Ethnographic Inquiry into Indonesian Mathematics Education*. PhD Thesis, Murdoch University, 2016. <https://researchrepository.murdoch.edu.au/id/eprint/35052/>.
- Stewart, I. I., F. James, Coretta Mallery, dan Jaehwa Choi. “A multilevel analysis of distance learning achievement: Are college students with disabilities making the grade?” *Journal of Rehabilitation* 76, no. 2 (2010).
- Subhash, Sujit, dan Elizabeth A. Cudney. “Gamified Learning in Higher Education: A Systematic Review of the Literature.” *Computers in Human Behavior* 87 (1 Oktober 2018): 192–206. <https://doi.org/10.1016/j.chb.2018.05.028>.
- Tierney, William G., dan Michael Lanford. “Conceptualizing Innovation in Higher Education.” Dalam *Higher Education: Handbook of Theory and Research*, disunting oleh Michael B. Paulsen, 1–40. Higher Education: Handbook of Theory and Research. Cham: Springer International Publishing, 2016. https://doi.org/10.1007/978-3-319-26829-3_1.
- Tummala, R. R., Eugene J. Rymaszewski, dan Alan G. Klopfenstein. *Microelectronics Packaging Handbook: Technology Drivers Part I*. Springer Science & Business Media, 2012.
- Turner III, Daniel W. “Qualitative interview design: A practical guide for novice investigators.” *The qualitative report* 15, no. 3 (2010): 754.
- Udeogalanya, Veronica. “Aligning digital literacy and student academic success: Lessons learned from Covid-19 pandemic.” *International Journal of Higher Education Management* 8, no. 2 (2022).

- Ulven, Joachim Børge, dan Gaute Wangen. "A Systematic Review of Cybersecurity Risks in Higher Education." *Future Internet* 13, no. 2 (Februari 2021): 39. <https://doi.org/10.3390/fi13020039>.
- Villiers, R. de. "The incorporation of soft skills into accounting curricula: preparing accounting graduates for their unpredictable futures." *Meditari Accountancy Research* 18, no. 2 (1 Januari 2010): 1–22. <https://doi.org/10.1108/10222529201000007>.
- West, Darrell M. "Connected learning: How mobile technology can improve education." *Center for Technology Innovation at Brookings*, 2015, 1–8.
- Whitworth, Andrew. "Invisible Success: Problems with the Grand Technological Innovation in Higher Education." *Computers & Education*, CAL 2011, 59, no. 1 (1 Agustus 2012): 145–55. <https://doi.org/10.1016/j.compedu.2011.09.023>.
- Wicki, Samuel, dan Erik G. Hansen. "Green Technology Innovation: Anatomy of Exploration Processes from a Learning Perspective." *Business Strategy and the Environment* 28, no. 6 (2019): 970–88. <https://doi.org/10.1002/bse.2295>.
- Widjaja, Gunawan, dan Aslan Aslan. "Blended Learning Method in The View of Learning and Teaching Strategy in Geography Study Programs in Higher Education." *Nazhruna: Jurnal Pendidikan Islam* 5, no. 1 (2 Februari 2022): 22–36. <https://doi.org/10.31538/nzh.v5i1.1852>.
- Wilson, Graham, Gavin Davidson, dan Stephen A. Brewster. "In the Heat of the Moment: Subjective Interpretations of Thermal Feedback During Interaction." Dalam *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 2063–72. CHI '15. New York, NY, USA: Association for Computing Machinery, 2015. <https://doi.org/10.1145/2702123.2702219>.
- Zaheer, Shazia, Saad M. Butt, Gnevasheva Vera Anatolyevna, dan Hosna Salmani. "Do Mobile Technology in the Classroom Really Improve Learning Outcomes?" *International Journal of Evaluation and Research in Education* 7, no. 3 (September 2018): 188–93.
- Zexian, Yan, dan Yan Xuhui. "A Revolution in the Field of Systems Thinking—a Review of Checkland's System Thinking." *Systems Research and Behavioral Science* 27, no. 2 (2010): 140–55. <https://doi.org/10.1002/sres.1021>.
- Zhou, Guangyou, dan Sumei Luo. "Higher Education Input, Technological Innovation, and Economic Growth in China." *Sustainability* 10, no. 8 (Agustus 2018): 2615. <https://doi.org/10.3390/su10082615>.
- Zhu, Chang. "Organisational culture and technology-enhanced innovation in higher education." *Technology, Pedagogy and Education* 24, no. 1 (1 Januari 2015): 65–79. <https://doi.org/10.1080/1475939X.2013.822414>.