

21ST CENTURY SKILLS FOR DEVELOPING VOCATIONAL AND TECHNICAL EDUCATION SECTOR IN PALESTINE

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Abstract

The major purpose of this study is to discuss how 21st-century skills can positively influence the relevancy of the VTE sector in Palestine. It would be a correct suggestion and conclusion for the management of VTE to consider and create a platform for all modern skills in Palestine. Digital technology skills, for example, would indeed help the providers of vocational and technical training move more

digital than traditional. The study attempts to highlight the ways of enhancing the learning and teaching outcomes of VTE through 21st-century skills. The study addresses how the VTE sector could provide and handle contemporary labour market needs through 21st-century skills, and further outlined the essential roles that could be played by teachers in the process. An exploratory research approach was employed to search for trending and

relevant skills for the Palestinian environments. The findings of the study emphasized the fact that 21st-century skills could be largely achieved through teachers, instructional patterns, teaching methods and learning approaches. The study outcomes show that 21st-century skills have not been critically and creatively used in Palestine, thus distant the Palestinian VTE sector from being relevant and contemporary in the 21st-century era. The study suggested that VTE teaching methods, learning approaches and training initiatives should be reviewed toward improving the sector digitally and skillfully. The study recommended that curriculum, infrastructure, institutions, human capital and human resources need to be prepared and developed toward accommodating 21st-century skills.

Keywords: 21st-century skills, instructional patterns, teaching methods, learning approaches.

* INTRODUCTION

Empirical studies associating VT education with 21st-century skills are limited (Ronzhina, Kondyurina, Voronina, Igishev & Loginova, 2021; Zhao, Llorente & Gomez, 2021). Empirical evidence and arguments that

teachers' digital technology skills in the 21st century is relatively low remain undeniable (Mutohhari, Sofyan & Nurtanto, 2021; Zimmer, McTigue & Matsuda, 2021). Covid-19 creates no alternative for teachers than to use online technologies to deliver their primary assignments (Silalahi, 2020; Amiti, 2020, Cloonan et al., 2020; Garad, Al-Ansi & Qamari, 2021; Ariebowo, 2021). Hence, it is worth stressing that VT education will be more effective and marketable if the learning and teaching delivery methods are considered digitally.

In a developing nation like Palestine, several factors, skills, competencies and preparations may determine VTE success. For instance, any educational institutions including vocational and technical institutions need cyber-based infrastructures and facilities to succeed and remain unique among others (Kim et al., 2020; Apriansyah, Fransinatra & Ririen, 2020). Toward developing the VTE sector, learning methods and approaches must be structured as per trending skills, competencies and technologies. Learners and the providers of VTE training are expected to possess 21st-century skills including digital technology skills (Adnan et al.,

2020; Bayles et al., 2021) to enhance and transform the sector.

All these skills and competencies required of VTE learners can largely be facilitated by vocational and technical training providers. These training providers must possess the highest level of competence in being familiar with these skills, understand the skills deeply, be capable of teaching the skills, creative enough to solve industrial and labour market problems with these skills. In this regard, appropriate skills that can provide meaningful and productive solutions to industrial and labour market demands in Palestine will be explored below.

*** RESEARCH OBJECTIVES**

The focus of this study is to examine how 21st-century skills can positively influence the relevancy of the VTE sector in Palestine. It attempts to highlight the ways of enhancing the learning and teaching outcomes of VTE through 21st-century skills. It also examines how the VTE sector could provide and handle contemporary labour market needs through 21st-century skills, and further outlined the essential roles that could be played by teachers in the process.

*** RESEARCH SIGNIFICANCE**

The study would serve as a framework for the management of VTE to consider and create a platform for all modern skills in Palestine. Digital technology skills, for example, would indeed help the providers of vocational and technical training move more digital, faster and efficient than traditional system. Thereby, accelerating and increasing the availability of skilled labour in Palestine. At the same time, improving the quality of learning curriculum and skills among teachers and learners.

*** CONCERNS IN UPGRADING VOCATIONAL AND TECHNICAL EDUCATION WITH 21ST CENTURY SKILLS**

Technological advancement raises wider challenges for developing nations like Palestine, as it changes traditional educational approaches to modern 21st-century patterns (Helyn Kim, Esther Care & Alvin Vista, 2019). These changes imply that the implementation and integration of 21st-century methods and skills to learning and teaching will become challenging. The issue of updating textbooks, reviewing curriculum and teaching materials, and evaluating teaching methodology standards might be a

great concern for educational management. Renewing educational facilities and vocational and technical education curriculum, and aligning them with 21st-century skills including digital technology skills may not be an easy task, most especially for those that are used to traditional patterns. Teachers and professionals may find it punishing and burdensome to bear the expenses of attending workshops and training exercises. Meanwhile, 21st-century global competitors and industrial players are increasingly daring every sector including the TVE sector for trending demands.

Another ongoing and steadily growing concern in the field of vocational and technical education is the sector's capacity to cope with the characteristics of the fourth industrial revolution (4IR) such as Quantum computing, Big Data, Robotics, Artificial Intelligence (AI), 3D printings and Internet of things (Kayembe & Nel, 2019). The existing structure in the Palestinian VTE sector is yet to upgrade the human resources department for designing necessary measures, frameworks and guidelines toward understanding the skills useful for these technologies in the 21st century.

Developing and underdeveloped countries like Palestine might also find it challenging to constantly review and update TVE contents and courses, as the process may incur an unbearable cost and eventually affects the income and expenses of the sector. In other words, it might be somehow difficult to improve the subsisting VTE system in Palestine since it may involve protocols and processes. Although, stakeholders may financially and by proposing suggestions as regards industrial and labour market demands, assist meaningfully in the curriculum update, however, connecting these stakeholders might not be as simpler as envisaged. This is in addition to the fact that the stakeholders' willingness to intervene and help may be lacking and staggering.

Besides, there is a need for the government and policymakers to guaranty the control over online security issues in going digital (Yahya, 2018), however, the most touching concern in the transformational process is the absence of readiness from the side of the government toward catering for this and exploring for 21st-century skills. The willingness among traditionally brought-up individuals in the Palestinian societies

is relatively low and weak. Given these concerns, it is however helpful and healing to constructively address these concerns in the Palestinian context. Presenting and finding solutions to these concerns will increase the substantial contribution of the VTE sector to Palestinian national socio-economic growth.

*** TOOLS AND SKILLS FOR SURVIVAL IN 21ST CENTURY**

It is fundamental to understand the required and suitable equipment, tools and skills that positively influence survival. Nurtanto, Sofyan, Fawaid & Rabiman (2019) contended that competencies simplify work and work challenges in this era. Understanding the skills that can support, contribute, realize and deliver 21st-century demands is also significant. Nasir (2018) suggested blended learning models as a suitable skill to combine physical and online learning environments, thus enhancing the delivery of vocational and technical training. The blended learning method enables students to communicate with teachers and friends through the internet beyond classrooms (Zainuddin & Keumala, 2018). Blended learning focuses on human literacy, technology literacy,

data literacy and cognitive skills; embraces interactions and collaborative discussions, and flexibly increases the achievement of learning, thus positively influencing learning outcomes (Lubis et al., 2019; Nofrianto, et al., 2020). Therefore, blended learning models and skills will be valuable for upgrading the educational objectives and outcomes in the Palestinian VTE sector. With a blended learning pattern, VTE trainers and students would remain relevant in the working world, labour market and 21st century.

Creative enthusiasm and innovative capacity are fitting skills for professional and personal development. Critical thinking skills will benefit the possessor within and outside the learning environment. Communication skills would enable graduates and individuals to efficiently articulate ideas and thoughts verbally, nonverbally and by writing across diverse communities and societies (Nizwardi, et al., 2021). Collaborative skills allow students or graduates to retain friends and relationships after graduation.

Wahidin (2018) argued and affirmed that technology literacy, data literacy and human literacy are the

main and essential skills to confront the challenges and developments brought by industrial revolution 4.0. These skills would indeed enhance the performance of the VTE sector in Palestine. Vocational and technical education graduates will be recognized as 21st century productive and successful students if they are efficiently and adequately skilled at prioritizing, collaborating, solving problems, making decisions and developing strategies (Nizwardi, et al., 2021). It would be a valuable opinion to equip the 21st century generation with socio-economic skills (Mustakim et al., 2020). As confirmed by Wlodkowski & Ginsberg (2017) and Rieckmann (2017), innovative pedagogical skills will create a successful and productive lifestyle for students in the 21st century. This skill will promote activity-based and learner-centred methods that enable learners to acquire relevant knowledge, marketable skills and professional attitudes (Rieckmann, 2017). Contemporary scholars and authors believe that possessing the tools and skills to access global trending updates will assist in becoming current about emerging ideas (Dede, 2010).

At a time when fake news is gaining momentum, in-depth information literacy and quality information processing skills are essential to protect the values of vocational and technical education. Thinking ability is also a meaningful skill that arranges processes, approaches and strategies thereby influencing the decision-making process. In the road to personal development, Hamdani et al., (2020) recommended contextual learning skills. The authors also pinpointed media literacy as an essential skill to interact and convey vital information and ideas via media platforms.

21st-century teachers, instructors, education planners and VTE training providers need to concentrate on building and producing students that are capable of accessing, analyzing and converting information to modern knowledge. A greater understanding of the use of information technologies and internet-based communication is adequately needed. 21st-century competition substantially values leadership skills, negotiation skills, evaluation skills and decision-making skills. The students must be capable of developing skills that can guaranty self-sustainability. It

would be an added advantage for 21st-century students and learners to be skilful at delivering services to customers at a satisfactory level (Sudira, 2018).

Given this, the table below represents the 21st-century skills that are largely needed in the vocational and technical education sector.

NEEDED SKILLS	
Competency	Blended learning skills
Human literacy	Technological literacy
Cognitive skills	Data Literacy
Creative enthusiasm	Innovative capacity
Creative thinking skills	Communication skills
Collaborative skills	Prioritizing skills
Problem-solving skills	Decision-making skills
Strategy development skills	Socio-economic skills
Innovative pedagogical skills	Information literacy
Information processing skills	Thinking ability skills
Contextual learning skills	Media literacy skills
Analytical skills	Information technology skills
Internet-based communication skills	Leadership skills
Negotiation skills	Evaluation skills
Self-sustainable skills	Effective service delivery skills

Undoubtedly, the aforementioned skills will be a valuable investment for the VTE sector in Palestine. The sector should ensure structuring curriculum objectives and outcomes in the direction of acquiring these skills. Learning methods,

learning designs, learning materials, teaching approaches and teaching techniques that represent 21st-century skills should be prepared and developed.

*** PREREQUISITIES FOR ACQUIRING THE AFOREMENTIONED SKILLS**

A brief and detailed explanation as regards the challenges facing Palestine must be provided in the preceding process. 21st-century learners and students need to be encouraged about their respective critical thinking ability skills in all matters. In trying to equip them with 21st-century demands, they should be familiarized with realities that happen in their communities, countries and global space.

Enabling environment that can make them apply their skills to the confronted challenges should be provided. It is crucial and essential to give the students opportunities to independently search for problems to solve. In other words, restrictions and limitations should be removed for the students on the road to explore and resolve problems. It would be improper to block the students from viewing issues and analyzing information from different

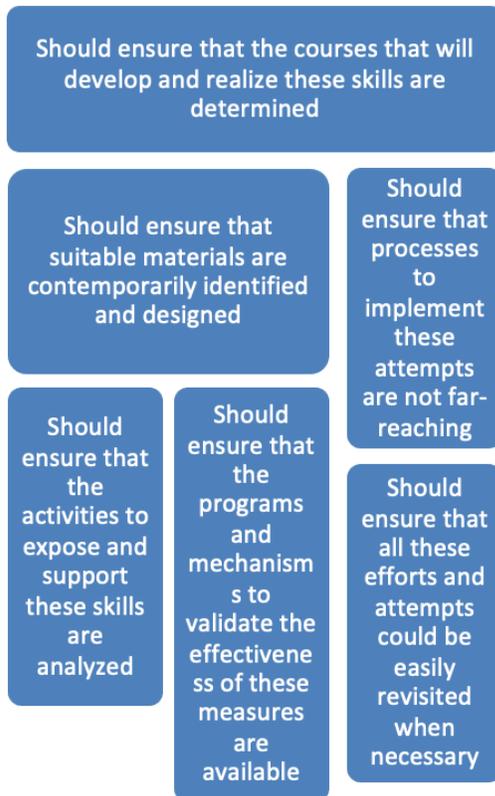
dimensions. The efforts of 21st-century students should be encouraged toward offering alternative solutions, evaluating alternatives, developing, formulating and determining the best solutions (Director General of GTK 2019 HOTS, 2019).

Teachers and VTE training providers should often be ready to learn and update themselves as each student or a particular group of students may require dissimilar learning styles. It would be helpful if learning topics, materials, contents, environments and resources are prepared and developed as needed in acquiring these skills. There is a need to put in place a comfortable atmosphere that facilitates the process of acquiring those skills. This means that all learning barriers in the VTE sector should be identified and eliminated.

It would be promising if learning methods like cooperative learning, simulations, case studies, simulations, group discussions, collaborative learning, problem-based learning and project-based learning approaches are promoted. Field practice, workshop practice, studio practice and student-exchange programs should not be disregarded in

the preparatory process. The intervention and encouragement of student exchange programs would be wise, healthy and productive for the Palestinian VTE sector.

Palestinian labour market needs and 21st-century demands must be largely considered and prioritized in the process. The learning materials, resources and activities that would achieve these needs and demands should not be strictly narrow to a mere source or pattern. The resources and materials to achieve this must be multifaceted by including workshops, studios, classrooms and practical fields. In meeting up with the demanded skills of the 21st century, independent learning methods are essential. There would be a positive turning point if the following processes are put in place:



*** CONCLUSION**

It is foundational to understand that informal, formal and non-formal learning instruments constitute vocational and technical skills and knowledge. The 21st century dares VTE to learn about modern technologies, acquire additional contemporary practical skills and possess occupational-related knowledge to cater for industrial and labour market demands. VTE sector should prepare students for job markets toward becoming responsible citizenship. The importance of VTE points to the fact that graduates are not

supposed to be of no value in any society. They are expected to possess creative, productive and modern skills.

Teachers have major responsibility toward building trainers, learners and students of the 21st century. The demands of this era can never be fulfilled when teachers insist and rely on outdated needs, practices and skills in carrying out their primary duty. Teachers need 21st-century competencies, training and skills to engage 21st-century learners. It might appear unfair if the teachers ignore the idea of enhancing their skills, knowledge, learning techniques and teaching methods as efficiently demanded by the 21st century. Toward upgrading teaching practices and filling the knowledge gap in learning environments, it is recommended that teachers focus more on learning environment observations than all other factors and measures.

One of the reasons for echoing the importance of 21st-century skills is to ensure that learners and students are prepared for 21st-century socio-economic challenges. It is an established argument that 21st-century skills will undoubtedly prepare students, learners and individuals for seasonal changes. In other words,

socio-economic transformations and upcoming phases of development can be adequately and effectively handled by acquiring 21st-century skills.

Palestinian VTE sector needs to project its curriculum, objectives and plans toward creating additional job opportunities in the country. The focus should be on producing skilful individuals rather than knowledgeable graduates. This means that their practical abilities, competencies and skills should supersede and overshadow their theoretical understanding. Modern initiatives are required from the sector while exploring 21st-century skills and knowledge. Skills like creativity, critical thinking, information literacy, innovative capacity, problem-solving, the list is long, should be taken into consideration. The knowledge that can maximize job opportunities, address socio-economic challenges and facilitate transformational processes should not be disregarded by the sector. A crucial suggestion for the Palestinian government and policymakers is to research how 21st-century skills can be planted, developed and be of benefit to the VTE sector and the country at large.

* REFERENCES

- Adnan, W. I. W., Wahid, N. A., Majid, N. A., Jaafar, F. W., Ismail, N. A., & Wahab, N. A. (2020). Do We Need You? The Roles of Teacher Supervisor in Embracing Industrial Revolution 4.0. *Journal of Physics: Conference Series*, 1529(4), 1–7. <https://doi.org/10.1088/1742-6596/1529/4/042046>.
- Akhter, Z., Malik, G., & Plummer, V. (2021). Nurse educator knowledge, attitude and skills towards using high-fidelity simulation: A study in the vocational education sector. *Nurse Education in Practice*, 53. <https://doi.org/10.1016/j.nepr.2021.103048>.
- Amiti, F. (2020). Synchronous and asynchronous E-learning. *European Journal of Open Education and E-Learning Studies*, 5(2), 60–70. <https://doi.org/10.46827/ejoe.v5i2.3313>.
- Apriansyah, R., Fransinatra, Z., & Ririen, D. (2020). The Influence of Instructors Competency and Facilities on

- The Quality of Education and Training Center (ETC) Graduates in Facing the Industrial Revolution 4.0. *Jurnal Manajemen Dan Bisnis*, 9(2), 13–25.
<https://doi.org/10.34006/jmbi.v9i2.223>.
- Ariebowo, T. (2021). Autonomous learning during COVID-19 pandemic: Students' objectives and preferences. *Journal of Foreign Language Teaching and Learning*, 6(1), 56–77.
<https://doi.org/10.18196/ftl.v6i1.10079>.
- Bayles, J., Peterson, A. D., Pitts, S. J., Bian, H., Burkholder, S., Hegde, A. V., & Stage, V. C. (2021). Food-Based Science, Technology, Engineering, Arts, and Mathematics (STEAM) Learning Activities May Reduce Decline in Preschoolers' Skin Carotenoid Status. *Journal of Nutrition Education and Behavior*, 53(4).
<https://doi.org/10.1016/j.jneb.2020.10.017>.
- Cloonan, M. R., Cloonan, D. J., Schlitzkus, L. L., & Fingeret, A. L. (2020). Learners with Experience in Surgical Scrub Benefit from Additional Education with an Interactive E-Learning Module. *Journal of the American College of Surgeons*, 4(2).
<https://doi.org/10.1016/j.jamcol Surg.2020.08.521>.
- Dede, C. (2010) Comparing frameworks for 21st-century skills. In Bellanca, J, Brandt, R (eds.), *21st Century Skills: Rethinking How Students Learn*. Bloomington: Solution Tree Press, pp.51–76.
- Devi, M., Annamalai, M. A. R., & Veeramuthu, S. P. (2020). Literature education and industrial revolution 4.0. *Universal Journal of Educational Research*, 8(3), 1027–1036.
<https://doi.org/10.13189/ujer.2020.080337>.
- Director General of GTK 2019 *HOTS 2019 Learning Guidelines Book* (Jakarta: Ministry of Education and Culture of Republic of Indonesia).
- Garad, A., Al-Ansi, A. M., & Qamari, I. N. (2021). The Role Of E-Learning Infrastructure and Cognitive Competence In Distance Learning

- Effectiveness During The Covid-19 Pandemic. *Cakrawala Pendidikan*, 40(1). <https://doi.org/10.21831/cp.v40i1.33474>.
- Hamdani, Aam., Abdulkarim, Aim., Cahyani, P Diah & Nugraha, Eki. (2020). Vocational Education in the Industrial 4.0 Era: Challenges and Opportunities. Proceedings of the 6th UPI International Conference on TVET 2020 (TVET 2020). *Advances in Social Science, Education and Humanities Research*, vol. 520.
- Helyn Kim, Esther Care, and Alvin Vista. (2019, Jan 30). Education and Development. Retrieved May 6, 2020, from www.brookings.com: www.brookings.com
- Ivanov, D., Dolgui, A., & Sokolov, B. (2019). The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics. *International Journal of Production Research*, 57(3), 829–846. <https://doi.org/10.1080/00207543.2018.1488086>.
- Jones, M. D., Hutcheson, S., & Camba, J. D. (2021). Past, present, and future barriers to digital transformation in manufacturing: A review. *Journal of Manufacturing Systems*, 15. <https://doi.org/10.1016/j.jmsy.2021.03.006>.
- Kayembe, C. & Nel, D. (2019). Challenges and Opportunities for Education in the Fourth Industrial Revolution. *African Journal of Public Affairs*. Vol. 11. No. 3.
- Kergroach, S. (2017). Industry 4.0: New challenges and opportunities for the labour market. *Foresight and STI Governance*, 11(4), 6–8. <https://doi.org/10.17323/2500-2597.2017.4.6.8>.
- Kim, S., Heo, G., Zio, E., Shin, J., & Song, J. (2020). Cyber-attack taxonomy for digital environment in nuclear power plants. *Nuclear Engineering and Technology*, 52(5). <https://doi.org/10.1016/j.net.2019.11.001>.
- Lange, S., Pohl, J., & Santarius, T. (2020). Digitalization and energy consumption. Does ICT

- reduce energy demand?
Ecological Economics, 176.
<https://doi.org/10.1016/j.ecolecon.2020.106760>.
- Llopis-Albert, C., Rubio, F., & Valero, F. (2021). Impact of digital transformation on the automotive industry. *Technological Forecasting and Social Change*, 162(1), 1–9.
<https://doi.org/10.1016/j.techfore.2020.120343>.
- Lubis, A. L., Jalinus, N., Abdullah, R., & Hayadi, B. H. (2019). Project-Based Entrepreneurship Education Model In Vocational High Schools. *International Journal of Scientific & Technology Research*, 8(06), 145–147.
- Miller, A. (2020). Development through vocational education. The lived experiences of young people at a vocational education, training restaurant in Siem Reap, Cambodia. *Heliyon*, 6(12).
<https://doi.org/10.1016/j.heliyon.2020.e05765>.
- Mustakim, S. S., Sulaiman, T., Manaf, U. K. A., Minghat, A. D., Rabindarang S. (2020). An Evaluation on Strategic Plan of Transformation in Vocational Education (SPTVE) 2011-2025 and Its Relevance Towards the Thrive of 4th Industrial Revolution. *Solid State Technology*, Vol. 63(6), 1008-1016.
- Mutohhari, F., Sofyan, H., & Nurtanto, M. (2021). Technological Competencies: A Study on the Acceptance of Digital Technology on Vocational Teachers in Indonesia. *Proceedings of the 1st International Conference on Law, Social Science, Economics, and Education, ICLSSEE 2021*, 1–11.
<https://doi.org/10.4108/eai.6-3-2021.2305971>.
- Nasir, M. (2018). Peningkatan mutu vokasi dalam Menghadapi era revolusi industri 4.0. *Kementerian Riset, Teknologi, Dan Pendidikan Tinggi*.
- Nizwardi Jalinus, Unung Verawardina, Krismadinata, Rahmat Azis Nabawi & Yudi Darma. (2021). Developing Blended Learning Model in Vocational Education Based On 21st Century Integrated Learning and Industrial

- Revolution 4.0. Turkish Journal of Computer and Mathematics Education, Vol.12, No.8, 1239-1254.
- Nofrianto, H., Jama, J., & Indra, A. (2020). Validity of Cooperative-Discovery Learning Model to Improve Competencies of Engineering Students. Systematic Reviews in Pharmacy, 11(12), 1134-1138.
- Nurtanto, M., Sofyan, H., Fawaid, M., & Rabiman, R. (2019). Problem-based learning (PBL) in industry 4.0: Improving learning quality through character-based literacy learning and life career skill (LL-LCS). Universal Journal of Educational Research, 7(11), 2487–2494.
<https://doi.org/10.13189/ujer.2019.071128>.
- Ollikainen, J.-P., & Karhunen, H. (2021). A tale of two trade-offs: Effects of opening pathways from vocational to higher education. Economics Letters, 205.
<https://doi.org/10.1016/j.econlet.2021.109945>.
- Pershina, R., Soppe, B., & Thune, T. M. (2019). Bridging analog and digital expertise: Cross-domain collaboration and boundary-spanning tools in the creation of digital innovation. Research Policy, 48(9).
<https://doi.org/10.1016/j.respol.2019.103819>.
- Puriwat, W. and Tripopsakul, S. (2020). “Preparing for Industry 4.0 -- Will Youths Have Enough Essential Skills?” An Evidence from Thailand, International Journal of Instruction, Vol.13, No.3, pp. 89-104.
- Rieckmann, M (2017) Education for Sustainable Development Goals: Learning Objectives. Paris: UNESCO.
- Ronzhina, N., Kondyurina, I., Voronina, A., Igishev, K., & Loginova, N. (2021). Digitalization of Modern Education: Problems and Solutions. International Journal of Emerging Technologies in Learning, 16(4), 122–135.
<https://doi.org/10.3991/ijet.v16i04.18203>.
- Rotatori, D., Lee, E. J., & Sleeva, S. (2021). The evolution of the

- workforce during the fourth industrial revolution. *Human Resource Development International*, 24(1), 92–103. <https://doi.org/10.1080/13678868.2020.1767453>.
- Silalahi, M. V. (2020). Development of E-Modules Based on Exe-Learning on Topics of Reaction Rate Against Student Learning Outcomes Mechanical Engineering. *International Journal of Education and Research and Curriculum Application*, 3(2), 114–120. <https://doi.org/10.31764/ijeca.v3i2.2672>.
- Sprenger, D. A., & Schwaninger, A. (2021). Technology acceptance of four digital learning technologies (classroom response system, classroom chat, e-lectures, and mobile virtual reality) after three months' usage. *International Journal of Educational Technology in Higher Education*, 18(1), 1–17. <https://doi.org/10.1186/s41239-021-00243-4>.
- Sudira 2018 *Metodologi Pembelajaran Vokasional Abad XXI, Inovasi, Teori, dan Praksis* (Yogyakarta: UNY Press)
- Sukartono. 2018. Revolusi Industri 4.0 dan Dampaknya terhadap Pendidikan di Indonesia, FIP PGSD Universitas Muhammadiyah Surakarta.
- Wahidin, D. (2018). Mencari format kegiatan kemahasiswaan di era revolusi industri 4.0. Ditjen belmawa Kemenristekdikti.
- Wlodkowski, R. J., & Ginsberg, M. B. (2017). Enhancing adult motivation to learn: A comprehensive guide for teaching all adults. John Wiley & Sons.
- Xu, M., David, J. M., & Kim, S. H. (2018). The fourth industrial revolution: Opportunities and challenges. *International Journal of Financial Research*, 9(2), 90–95. <https://doi.org/10.5430/ijfr.v9n2p90>.
- Yahya, M. (2018). Era Industri 4.0: Tantangan Dan Peluang Perkembangan Pendidikan Kejuruan Indonesia. Pidato Pengukuhan Penerimaan Jabatan Professor. <https://doi.org/10.1080/15298868.2011.636509>.

- Zainuddin, Z., & Keumala, C. M. (2018). Blended learning method within Indonesian higher education institutions. *Jurnal Pendidikan Humaniora*, 6(2), 69–77.
- Zhao, Y., Llorente, A. M. P., & Gómez, M. C. S. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, 168. <https://doi.org/10.1016/j.compedu.2021.104212>.
- Zimmer, W. K., McTigue, E. M., & Matsuda, N. (2021). Development and validation of the teachers' digital learning identity survey. *International Journal of Educational Research*, 105. <https://doi.org/10.1016/j.ijer.2020.101717>.