The Seybold Report

ISSN 1533-9211

DOI 10.5281/zenodo.7379360

SYSTEMATIC LITERATURE REVIEW: WEB LEARNING IN EDUCATION 4.0

FEBRI YANTI*[1], LUFRI[2], YUNI AHDA[2]

[1]Doctoral Program Students, Universitas Negeri Padang, Padang, West Sumatra, Indonesia and Biology Education Study Program and Universitas PGRI Sumatera Barat, Padang, West Sumatra, Indonesia. *Corresponding author: febriyanti1985@yahoo.co.id
[2]Biology Department, Universitas Negeri Padang, Padang, West Sumatra, Indonesia.

Abstract

The industrial revolution 4.0 in the field of education is a response to technological needs for innovative and creative learning processes. I4.0 technology is developing rapidly along with the development of smart technology in the 21st century which makes it easy for humans. Teachers must be able to create and use learning media that are interesting, innovative, and fun, and can improve student learning outcomes, such as the use of Web learning. The purpose of writing a systematic literature review is to identify the development of web learning in the Era of education 4.0. This study uses a systematic literature review using Preferred Reporting Items for Systematic Review (PRISMA). The results of screening and selection of articles obtained 96 potential articles that met the inclusion criteria. Furthermore, the articles explored web learning in education 4.0. The conclusion shows that Web learning is created as a forum for information resources and for improving student learning outcomes. A web-based learning system can improve academic performance.

Katakunci: I4.0, digital technology, 21st century, digital learning, web learning

INTRODUCTION

The employment of digital technology in the learning process known as the cyber system, the industrial revolution 4.0, also known as Education 4.0 (E4.0), has had an impact on the development of education. Cyber systems have the ability to make learning occur continually, without regard to time or space constraints. Cyberspace is the term for the Internet's limitless realm. The regulatory organization set up to safeguard this cyberspace is called cyber security. Studies have shown that e-learning systems are becoming more and more popular, and this trend is only expected to continue (Catota et al., 2019; Bila & Bilal, 2022).

Education must adapt to technological advancements in order to meet the difficulties of the E4.0 era, beginning with elementary, secondary, and higher education (Anaelka, 2018). Education is a conscious and planned effort to create a good learning atmosphere and learning process. E4.0 presents education differently, especially by using technology-based tools and resources.

Big data, digital economic robots, artificial intelligence, and other disruptive innovations are prioritized in the E4.0 era. The era of disruptive innovation coincides with the quickening pace of technological advancement (Schmidt & Druehl, 2008). Color and huge improvements have been made possible by technology in many different places of the world.

Technology offers a variety of innovations and new methods of doing things while displacing a number of traditional systems that were designed to make life simpler, more effective, and

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

more efficient (Christensen et al., 2018). The development of information technology continues to experience very rapid development so that to get information that suits your needs there are almost no limits. In the age of technology, students live in an all-digital and fast-paced world, and traditional classroom learning has almost fallen behind. Research, communication, job applications, and online learning around the world via mobile phones or computers can easily be done (Boholano, 2017).

Learning that is often conducted in person but abruptly shifts to online learning (Pedroso et al., 2022); (Adnan, 2020); Of course, this presents the newest difficulties for educational institutions, educators, learners, and parents. To ensure that the teaching and learning process continues as it should (Reuge et al., 2021), these parties must take the initiative and employ technology. The presence of the Internet causes computers to become increasingly important were communicating online, working online, and learning online.

The internet age is the era of the information technology society where people spend more time in front of the computer. The form of media can be changed into the written form which causes different understandings of the actual conditions. Websites are important for various purposes in our lives as a tool to communicate with people all over the world. It is intended for business, education, marketing, advertising, and health, and as a platform for producing customized software and applications.

Websites play an important role in education, for example, web-based learning (Abdoulkhaleq & Abdulrazak, 2021; Din, 2017; Moss & Gunn, 2007). The internet has many roles in distance education, such as getting information, communicating, providing activity space, and distributing assignments for students (Nachmias & Segev, 2003). The Internet can be used by students to communicate with students and teachers, share information and increase student knowledge through web learning. The purpose of writing a systematic literature review is to identify the development of web learning in the Era of education 4.0.

METHOD

Preferred Reporting Items for Systematic Review, a systematic strategy for reviewing the literature, is used in this study (PRISMA). The research was conducted methodically over the course of the necessary research stages. The information offered is thorough, and impartial, and attempts to combine pertinent study findings. The stages of a systematic literature review include developing research questions, searching for relevant literature, screening and selecting pertinent articles, filtering and choosing the best research findings, analyzing, synthesizing qualitative findings, and preparing research reports (Perry & Hammond, 2002).

Writing background and study objectives, gathering research questions, scanning the literature, choosing articles, extracting articles, judging the caliber of basic studies, and synthesizing data are the steps taken in systematic literature review research (Vasconcelos et al., 2013).

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

RESULTS

A systematic literature review is a research technique that tries to locate, examine, and assess all of the findings from earlier studies. The stages of the research have been completed, and the findings are consistent with those stages.

Research Questions:

Table 1 displays the findings of the development of study questions linked to enhancing learning outcomes through web-based learning media.

Table 1: Presents research inquiries for a comprehensive literature evaluation

Code	Pertanyaan Penelitian	Motivation
RQ1	What is the relationship between I4.0 and 21st-century technological developments?	Identify articles related to I4.0 and 21st-century technological developments
RQ2	How is the development of web learning?	Identify articles related to the development of web learning
RQ3	How is web learning used in learning in the education 4.0 era?	Identify articles related to the use of web learning in learning in the education 4.0 era.

Library Research

Using the terms "digital learning," "web learning," "Education 4.0," and "E.4.0," a literature search was conducted on pertinent papers. The databases Scopus, Web of Science, and Research gate are among those from which articles are gathered. Predetermined inclusion and exclusion criteria were utilized as the search approach to find articles. It seeks to inspire determination in locating the article you want.

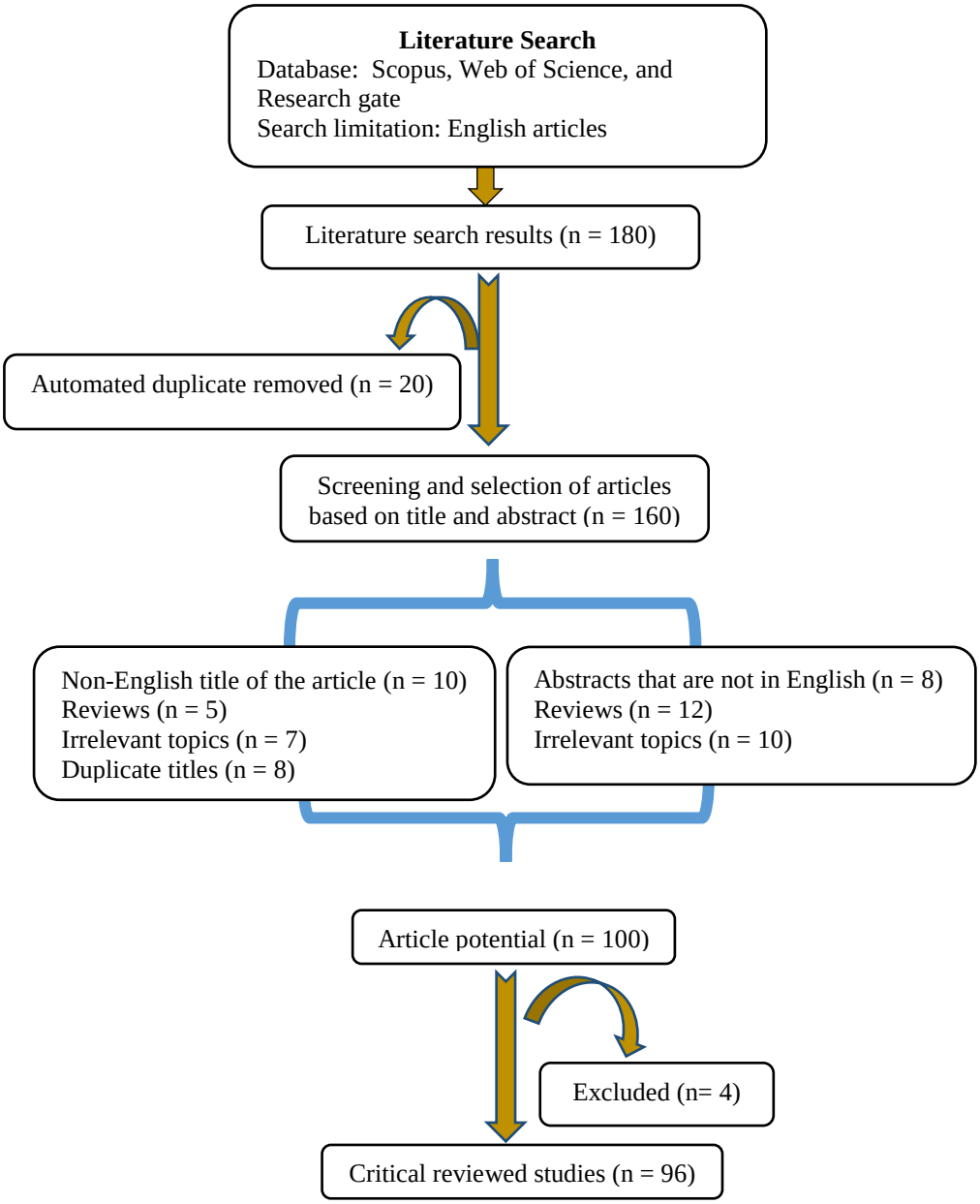
Article Selection and Screening

Searching for and choosing research articles in English that were comprehensive, published in international journals between 2010 and 2022, indexed in the database, and had the web learning in education 4.0 subject were all done using inclusion criteria (Figure 1).

ISSN 1533-9211

DOI 10.5281/zenodo.7379360

Figure 1. PRISMA method



DISCUSSION

180 items were found after successful article searches across three databases. 96 prospective articles that satisfied the inclusion requirements were found after the articles underwent screening and selection. The meta-analysis of 96 papers produced a new statement theme, "web learning in education 4.0." The discussion of the industrial revolution (I4.0), which began in Germany in 2011, serves as the introduction to this theme and serves as a suggestion for the creation of a new German economic policy concept based on a high-tech strategy. The idea of

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

the technological revolution in I4.0 is based on ideas and innovations in the fields of cyber-physical systems, the Internet of Things (IoT), and the Internet of Services (IoS). These concepts and technologies are based on continuous Internet communication that allows for continuous interaction and information exchange not only between humans (C2C) and humans and machines (C2M) but also between the machines themselves. According to Antunes et al. (2018), this communication interaction shapes knowledge management in the 4.0 era (Yang & Gu, 2021).

The goal of I4.0 is to provide IT-enabled mass customization of product production, to make an automatic and flexible adaptation of the production chain, and to track parts and products. In addition to facilitating communication between parts, products, and machines, apply the human-machine interaction (HMI) paradigm, to achieve IoT-enabled production optimization in smart factories; and to provide new types of services and business interaction models in the value chain (Shafiq et al., 2015); (Shafiq et al., 2016). According to (Lu, 2017); (Roblek et al., 2016); (Habeb et al., 2020). The principles of Industry 4.0 are interoperability, virtualization, decentralization, real-time capabilities, onboarding services, and modularity. The main features of I4.0 are digitization, optimization, and production customization; automation and adaptation; human-machine interaction (HMI), value-added services and business, and automated data exchange and communication, discussion flexibility, cloud/intranet, data integration, flexible adaptation, intelligent, self-regulating, interoperability, manufacturing process, optimization, secure communication, and service orientation.

Utilizing modern technology's potential in numerous domains so the 4.0 industrial revolution led to automation, mechanization, and digitalization, which led to the emergence of several technological and informational advancements. The fourth industrial revolution in education is a response to the need for cutting-edge, imaginative learning methods. As a result, teachers must be able to better communicate themselves in the area of media literacy and comprehend the material that will be given to pupils (Sulaiman & Shahrill, 2015). By incorporating technology into learning and producing digital learning media, instructors can more aesthetically arrange learning resources for increasing abilities.

I4.0 technology is advancing quickly alongside smart technology in the twenty-first century, making life easier for people. Every aspect of modern life (economic, social, technological, and educational) is undergoing fast change (Jan & Jrf, 2017). Teachers in the field of education and learning must provide pupils with soft skills for the twenty-first century. The impact of good teaching is increasingly cited as a key determinant of the economic well-being of society. A productive & beneficial teacher compensation system serves as an important lever to attract well-qualified and motivated people into the teaching profession. 21st-century teachers need content mastery teaching skills as well as integrating teaching with technology. The caliber of teachers affects educational quality and is linked to a country's development. With the advent of new technology, learning settings are shifting from being teacher-centered and lecture-based to becoming student-centered (Jan & Jrf, 2017). There are pupils who are focused on century learning 21st. The 4Cs—communication, collaboration, creativity, and innovation—which comprise problem-solving and critical thinking abilities, as well as creativity and innovation,

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

are the foundation of 21st-century learning. In an effort to meet the demands and challenges of 21st-century learning, teachers need to take into account, research, and improve this crucial topic in learning activities. The learning model used in the instructional process must result in the learning of 21st-century learning qualities. Recognizing 21st-century learning's qualities and ensuring that the learning model used in the learning process meets its requirements are essential. Integrative, holistic, scientific, contextual, thematic, efficient, collaborative, and student-centered are the traits of 21st-century learning. Concurrently, problem-based learning, project-based learning, contextual learning, cooperative learning, and discovery learning are some of the 21st-century learning methods (Wulandari, 2021); (Rojko, 2017).

The use of technology to improve student learning is crucial in the twenty-first century. Instructional technology has been linked to higher academic accomplishment and can boost students' motivation to complete their homework by giving them the chance to evaluate, synthesize, and present data in ways that are useful to instructors and their peers. The basic objective of instructional technology is to use the right technology in the planning, creation, implementation, and evaluation of education. With the aid of technology, students now have better access to a wider variety of information and resources and can design personal learning experiences that are valuable even outside of the classroom (Stehle & Peters-Burton, 2019); (Mahumot et al., 2020). In order to prepare his students for the problems of the future, the teacher of the twenty-first century must pay close attention to their requirements. The teacher's job is considered complex and demanding. To create high-quality professional teachers it is important to have quality professional teacher development programs (Rifin et al., 2019).

Commonly accepted definitions of 21st-century abilities include critical thinking, problem-solving, creativity, metacognition, communication, technology and digital literacy, civic responsibility, and global awareness. In other words, how can we use teachers' 21st-century talents to assist create students who are ready for that century? 2019 (Kim et al.). The use of technology integration in the classroom must be incorporated into program development, and teachers must be able to produce and employ engaging, cutting-edge, enjoyable learning materials that can enhance student learning outcomes, such as web-based learning.

In order to adapt to new ways of learning and teaching in the new era, there is a significant increase in the requirement for access to ICT and educational models included in E4.0 which are technology-savvy, artificial intelligence, and robotics. Students are switching from face-to-face to virtual learning approaches, but they are running into a system where the teachers aren't ready to adopt new models and give up the old ones. For remote connections, the majority of nations have access to platform-appropriate digital resources (Daniel, 2020); (Kogan et al., 2020). Many people felt the need to accelerate to previously unheard-of speeds in this area. People around the world are benefiting every day from technology, as it brings a series of advantages, especially in the field of education where it has revolutionized the way of teaching and learning, such as the use of digital learning media.

E4.0 is a 21st-century movement that is expanding quickly in all facets of education, from elementary school to higher education. Higher education in the I4.0 era focuses on providing open-door energy that may influence society in order to enhance situations (Heriyanto et al.,

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

2019). False awareness is the driving force behind IR4.0, which will transform the workplace from one where people are prioritized over tasks to one where they are (Asikin, 2019). In order to stay up with the pace of knowledge and technological advancement, teacher proficiency must also be raised (Hermann et al., 2015). In order to meet the challenges of the industrial era 4.0, teachers must be able to adapt and be willing to change. Teachers are necessary to mold students' character, serving as positive role models who encourage zeal, creativity, and social empathy. Students need to be capable of critical thinking, problem-solving, creativity, and innovation, as well as communicating and collaborating in the industrial era 4.0 (Kotynkova, 2017); (Burritt & Christ, 2016).

Students today must possess advanced technological abilities for locating, organizing, and disseminating knowledge (Anaelka, 2018). According to the World Economic Forum (2016), students need to have the following abilities to be prepared for the demands of the future: (1) Complex Problem Solving, (2) teamwork, (3) people management, (4) critical thinking, (5) negotiation, (6) quality control, (7) service orientation, (8) assessment and decision making, (9) active learning, and (10) creativity (Panagiotopolos & Karanikola, 2020).

The internet can be used in the learning process to increase knowledge and develop students' mindsets. The internet will bring information sources closer to students so that they can access information from various sources, especially those related to the most actual subject matter. The internet has become an information center for learning activities and the internet is used in various activities (Kavita, Abdul & Purohit, 2014). The application of web tools such as websites, blogs, and social media in formal education will increase student collaboration and allow the expansion of student learning resources through digital learning materials (Tony, 2011).

In the 21st century, web-based learning is increasingly being used in education (Liu, 2017). Web-based learning activities can be done by posting or distributing materials, quizzes, practice questions, practicums, tests, projects, and discussions. There are several web learning that has been widely used in learning activities, such as Coursera, PhET, Indonesia, and Massive Online Open Courses (MOOC). Web learning http://PhET.colorado.edu is a site that provides a place for interactive learning simulations packaged in games that make it easier for students to explore learning (Supurwoko et al., 2017).

Web learning http://coursera.org is an online learning platform from America. Coursera provides a variety of online learning in collaboration with universities around the world (Silvia, 2015). Indonesia serves the needs of learners through free online courses every day. Course participants can take topics according to their individual needs. MOOC is a large-scale, free, and accessible distance-learning method for anyone in the world. MOOC provides university-level courses for those wishing to become undergraduates in study abroad. Many professors teach at MOOC, which is supported by universities, interacting with students through discussion forums, telephone groups, or e-learning. Local meetings and online study groups are arranged through online classes, so they can share ideas, group assignments, and assignments from lecturers.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

Various advantages are obtained from web-based learning to carry out distance education, such as convenience, fast, practicality, providing convenience for teachers and students, use of visuals, writing can be read, writing problems can be solved and punctuation, and page layout (Tizel & Tok, 2013). Used a web-based learning module wherein web learning there are learning activities, such as quizzes, discussions, and chat rooms. Teachers and students can work together, share textbooks that students are very interested in, and learning tests can be done using the web, questions, fun, and interesting learning. According to (Coiro & Fogleman, 2011) web learning should use text, videos, and photos so that students can use web learning to read and view the information provided. Thus teachers can use this learning website to give homework and homework. Web learning is created as a forum for information resources and for improving student learning outcomes. A web-based learning system can improve academic performance, level of task achievement, and level of achievement of learning objectives (Chen et al., 2008).

The LAN-Designer web development has successfully improved the teaching and learning process. Web LAN-Designer provides a repository of various knowledge resources, such as learning videos, quizzes, tutorials, network design scenarios, knowledge terms and definitions, questions, and answers. Web LAN-Designer helps students in learning and can be accessed anytime and anywhere. This learning approach will contribute to distance learning. Web-Designer is very effective in providing feedback to students. Web-Designer has positive benefits in learning activities and increases student understanding during online learning (Sarkar & Petrova, 2011).

E-School has been designed and used in online-based teaching institutions to improve learning using e-learning has been successfully developed by Rana et al., (2018). E-School is an innovative web learning that connects teachers and students for various education and teaching using computers or smartphones. Through this website, collaboration occurs between teachers, students, and parents on one website. Teachers can interact with students directly and share assignments and activities with parents. This e-School aims to modify the traditional system of education and facilitate learning but does not replace the role of the teacher.

The “solve” website was developed using a problem-based learning approach in engineering and vocational learning. Solve website provides opportunities for students to learn 3D independently. Students can learn to model in an online 3D course using a problem-based learning approach. Students can access the solution from various locations and solves for students who do not have the time and money. The website follows the learning syllabus and is used as a teaching tool for students. The results show that a website that is built according to the syllabus can improve teaching. The software content developed to build web learning must be based on the syllabus and learning objectives so that the teaching process will be more focused, structured, timely, and interesting (Hassan et al., 2020).

Web-based learning education can support and assist teachers and students in learning, such as accessing information (eg online libraries) more easily with the help of a domain hosted on a website (Murthy et al., 2014). The researchers point out some of the importance of learning using the web, namely that students can connect to various library resources, make it easier to

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

deliver content, can be used when needed, and carry out active and independent learning. The results of the study also mention that discussion spaces are useful for bringing together isolated individuals and getting feedback easily. Technological innovations that are integrated with the education sector can improve the quality of website-based learning and learn in the 4.0 education. The information and technology of effective methods used in the creation of all students learning, and can be employed in the university environment, to provide for the students they teach courses at any time they want content, and communicate with the teacher (Gokalp, 2013).

Website learning is a platform to provide education for students. Website development is useful for effective education, improving the quality of teachers, and learning resources. Information technology and computers have been applied in all fields of activity, especially in learning. Learning by using the internet can be done at any time and effective learning will be achieved. Build a platform for the implementation of education from the perspective of the needs of students and teachers. The Internet is influential for student education and provides modern learning tools for education. Innovative education will be realized if it is in line with the characteristics of students and has an important application value in improving the quality of education (Chen, et al., 2021).

Education must make innovations by utilizing information technology, such as services, administration, curriculum, and academics to the development of students' interests and talents. Innovation in education can be done from the service side to get a recap of student activities in real-time, legalize or validate transcripts and diplomas easily, and more open assessments, entrance exams, and exams in the learning process that can be done independently and not limited to space and time, a digital-based student card that can be connected to various services in schools. The various innovations above make it easier for students and educate consumers to get services from the school, especially during long distances. This innovation in educational services will facilitate the delivery of information from educational institutions and make it easier for educational consumers to be able to access information and get real-time updates from the school from time to time.

Multimedia can be used as a medium in learning to inform various knowledge by combining sound, images, videos, images, and texts with high quality to support interactive learning (Aloraini, 2012). The important thing that needs to be considered in building web learning is accessibility. If a learning website is built for student learning, then student characteristics must be considered. Students with disabilities, such as learning disabilities, cognitive disabilities, color blindness, low vision, limited mobility, photosensitivity, or others.

Therefore, learning websites must be created and designed to be accessible to students with disabilities. The accessibility of web learning means that people with disabilities can use the web without experiencing any obstacles. Web learning can be accessed and used effectively by anyone, both people with disabilities and normal people. Consumers can choose materials according to their needs, as well as a high level of flexibility and not limited by space and time, of course, this will answer the needs of the students themselves. As we know that our current

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

education is not oriented to the needs of consumers themselves but they have to choose from existing educational packages.

Several important requirements must be done by teachers and web designers in building web learning, namely teacher and student interaction, special needs, cooperation, pedagogy, and accessibility. Site display and web learning navigation buttons must match. The material text must be used for cognitive assessment to be carried out (Din, 2017). Learning websites are well designed otherwise they are useless, no one looks for them, and no one learns anything on the learning web.

CONCLUSION

The industrial revolution 4.0 in the field of education is a response to technological needs for innovative and creative learning processes. The conclusion shows that Web learning is created as a forum for information resources and for improving student learning outcomes. A web-based learning system can improve academic performance.

REFERENCE

- Abdoulkhaleq, Y. A., & Abdulrazak, N. S. (2021). Design and implementation of an adaptive-intelligent website-based E-learning for Higher Education. International Journal of Computing and Business Research, 11(2).
- Adnan, M. (2020). Online learning amid the COVID-19 pandemic: Students perspectives. Journal of Pedagogical Sociology and Psychology, 1(2), 45–51. https://doi.org/10.33902/jpsp.2020261309
- Anaelka, A. H. (2018). Education 4.0 Made Simple: Ideas For Teaching. International Journal of Education and Literacy Studies, 6(3), 92. https://journals.aiac.org.au/index.php/IJELS/article/view/4616
- Aloraini, S. (2012). The impact of using multimedia on students' academic achievement in the College of Education at King Saud University. Journal of King Saud University - Languages and Translation, 24(2), 75–82. https://doi.org/10.1016/j.jksult.2012.05.002
- Asikin, Z. (2019). Legal Education in Indonesia Towards an Industrial Revolution 4.0. International Journal of Multicultural and Multireligious Understanding, 6(4), 377. https://doi.org/10.18415/ijmmu.v6i4.994
- Bilal, Hysa, E., Akbar, A., Yasmin, F., Ur Rahman, A., & Li, S. (2022). Virtual Learning During the COVID-19 Pandemic: A Bibliometric Review and Future Research Agenda. Risk Management and Healthcare Policy, 15(June), 1353–1368. https://doi.org/10.2147/RMHP.S355895
- Boholano, H. (2017). Smart social networking: 21st-century teaching and learning skills. Research in Pedagogy, 7(2), 21–29. https://doi.org/10.17810/2015.45
- Burritt, R., & Christ, K. (2016). Industry 4.0 and environmental accounting: a new revolution? Asian Journal of Sustainability and Social Responsibility, 1(1), 23–38. https://doi.org/10.1186/s41180-016-0007-y
- Catota, F. E., Granger Morgan, M., & Sicker, D. C. (2019). Cybersecurity education in a developing nation: The Ecuadorian environment. Journal of Cybersecurity, 5(1), 1–19. https://doi.org/10.1093/cybsec/tyz001
- Chen, G.D., Chang, C.K., & Wang, C.Y. (2021). Ubiquitous learning website: Scaffold learners by mobile devices with information-aware techniques. Computer & Education, 50(1), 77-90
- Christensen, R., & Knezek, G. (2017). Validating a Mobile Learning Readiness Survey: Assessing Teachers' Dispositions Toward Adoption. Journal of Digital Learning in Teacher Education, 33(4), 148–159.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

https://doi.org/10.1080/21532974.2017.1347536

- Coiro, J., & Fogleman, J. (2011). Use websites wisely. Educational Leadership, 68(5), 34–38.
- Daniel, S. J. (2020). Education and the COVID-19 pandemic. Prospects, 49(1–2), 91–96. https://doi.org/10.1007/s11125-020-09464-3
- Din, E. (2017). Web-based Education and Accessibility. International Journal of Technology in Education and Science (IJTES), January 2017.
- Gokalp, M. S. (2013). Perceptions of the Internet and Education : A Study with Physics Education Website Users. 8(2), 289–302. https://doi.org/10.12973/ijese.2013.210a
- Habeb Al-Obaydi, L. (2020). Using Virtual Learning Environment as a Medium of Instruction in EFL Context: College Teachers. Attitudes Intensive Journal, 3(2), 2020. http://ojs.uniska-bjm.ac.id/index.php/EJBE
- Hassan, A., Tun, U., Onn, H., Ariffin, A., Tun, U., Onn, H., Ahmad, F., Tun, U., & Onn, H. (2020). " SolveMe " Website Development using Problem-based. May.
- Heriyanto, H., Sator, D., Komariah, A., & Suryana, A. (2019a). La educación del carácter en la era de la revolución industrial 4.0 y su relevancia en el proceso de transformación del aprendizaje en la escuela secundaria. Utopia y Praxis Latinoamericana, 24(5), 327–340. https://dialnet.unirioja.es/descarga/articulo/7531750.pdf
- Hermann, M., Pentek, T., & Otto, B. (2015). Design Principles for Industrie 4.0 Scenarios: A Literature Review. Technische Universitat Dortmund, 1(1), 4–16. https://doi.org/10.13140/RG.2.2.29269.22248
- Jan, H., & Jrf, N. /. (2017). Teacher of 21 st Century: Characteristics and Development. 7(9), 2225–0484. www.iiste.org.
- Kavita S., Abdul, W., & G. N Purohit. (2014). Traditional Learning versus Web-Based Learning: Performance Analysis. International Journal of Computer Science and Information Technologies, 5 (4), 5182-5184
- Kim, S., Raza, M., & Seidman, E. (2019). Improving 21st-century teaching skills: The key to effective 21st-century learners. Research in Comparative and International Education, 14(1), 99–117. https://doi.org/10.1177/1745499919829214
- Kogan, M., Klein, S. E., Hannon, C. P., & Nolte, M. T. (2020). Orthopaedic Education during the COVID-19 Pandemic. Journal of the American Academy of Orthopaedic Surgeons, 28(11), E456–E464. https://doi.org/10.5435/JAAOS-D-20-00292
- Kotynkova, M. (2017). Re-Industrialization of Europe : Industry4 . 0 and the Future of Work. 7881(April), 249–256.
- Lu, Y. (2017). Industry 4.0: A survey on technologies, applications, and open research issues. Journal of Industrial Information Integration, 6, 1–10. https://doi.org/10.1016/j.jii.2017.04.005
- Mahumot, G. A., Pablo, M., & Memorial, O. L. (2020). Journal of World Englishes and Educational Practices (JWEEP) Original Research Article Schools ' Fiscal Management , Organizational Climate and Teachers ' Morale s. 2(2), 81–91.
- Moss, G., & Gunn, R. (2007). Gender differences in website design: Implications for education. CITSA 2007 - Int. Conference on Cybernetics and Information Technologies, System, and Applications and CCCT 2007 - Int. Conference on Computing, Communications, and Control Technologies, Proceedings, 1(6), 54–59.
- Murthy, B. V. R., District, R. R., & Sharfuddin, M. (2014). Designing a Web Education Model For Effective Teaching-Learning Process Designing a Web Education Model For Effective Teaching-Learning Process.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

March 2002.

- Panagiotopolos, G. A., & Karanikola, Z. A. (2020). Education 4.0 and Teachers: Challenges, Risks, and Benefits. European Scientific Journal ESJ, 16(34). https://doi.org/10.19044/esj.2020.v16n34p114
- Pedroso, J. E., Crudo, M. L., Magno, L., & Mellizo, H. (2022). Social Studies Working Students' Experiences of Online Learning. Journal of Digital Learning and Distance Education, 1(1), 18–36. https://doi.org/10.56778/jdlde.v1i1.9
- Perry, A., & Hammond, N. (2020). Systematic Reviews: The Experiences of a PhD Student. Psychology Learning & Teaching, 2(1), 32–35. https://doi.org/10.2304/plat.2002.2.1.32
- Rana, S., Bhuiyan, T., & Satter, A. K. M. Z. (2018). e-School : Design and Implementation of Web-Based Teaching Institution for Enhancing E-Learning Experiences : 10th International Conference, ICCCI e-School : Design and Implementation of Web-Based Teaching Institution for Enhancing E-Learning Experiences (Issue September). Springer International Publishing. https://doi.org/10.1007/978-3-319-98443-8
- Reuge, N., Jenkins, R., Brossard, M., Soobrayan, B., Mizunoya, S., Ackers, J., Jones, L., & Taulo, W. G. (2021). Education response to COVID 19 pandemic, a special issue proposed by UNICEF: Editorial review. International Journal of Educational Development, 87, 102485. https://doi.org/10.1016/j.ijedudev.2021.102485
- Rifin, F., Mahzan Awang, M., Razaq Ahmad, A., & Che Dahalan, S. (2019). Issues and Challenges in 21st Century Learning of History Education. 2, 59–63. https://doi.org/10.32698/gcs.0171
- Roblek, V., Meško, M., & Krapež, A. (2016). A Complex View of Industry 4.0. SAGE Open, 6(2). https://doi.org/10.1177/2158244016653987
- Rojko, A. (2017). Industry 4.0 concept: Background and overview. International Journal of Interactive Mobile Technologies, 11(5), 77–90. https://doi.org/10.3991/ijim.v11i5.7072.
- Sarkar, N. I., & Petrova, K. (2011). Design and Evaluation of a Web-Based Tool for Teaching Computer Network Design to Undergraduates. May 2014. https://doi.org/10.4018/jwltt.2011100103
- Silvia, A. (2015). Coursera Online Course: a Platform for English Teachers' Meaningful and Vibrant Professional Development. TEFLON Journal -A Publication on the Teaching and Learning of English, 26(2), 228. https://doi.org/10.15639/teflinjournal.v26i2/228-246
- Sulaiman, N. D., & Shahrill, M. (2015). Engaging collaborative learning to develop students' skills of the 21st century. Mediterranean Journal of Social Sciences, 6(4), 544–552. https://doi.org/10.5901/mjss.2015.v6n4p544
- Supurwoko, S., Cari, C., Sarwanto, S., Sukarmin, S., Budiharti, R., & Dewi, T. S. (2017). Virtual Lab Experiment: Physics Educational Technology (PhET) Photo-Electric Effect for Senior High School. International Journal of Science and Applied Science: Conference Series, 2(1), 381. https://doi.org/10.20961/ijsascs.v2i1.16750
- Schmidt, R., Möhring, M., Härting, R. C., Reichstein, C., Neumaier, P., & Jozinović, P. (2015). Industry 4.0 - Potentials for creating smart products: Empirical research results. Lecture Notes in Business Information Processing, 208(June), 16–27. https://doi.org/10.1007/978-3-319-19027-3_2
- Shafiq, S. I., Sanin, C., Szczerbicki, E., & Toro, C. (2016). Virtual Engineering Factory: Creating Experience Base for Industry 4.0. Cybernetics and Systems, 47(1–2), 32–47. https://doi.org/10.1080/01969722.2016.1128762
- Shafiq, S. I., Sanin, C., Toro, C., & Szczerbicki, E. (2015). Virtual engineering object (VEO): Toward experience-based design and manufacturing for industry 4.0. Cybernetics and Systems, 46, 35–50.

The Seybold Report
ISSN 1533-9211
DOI 10.5281/zenodo.7379360

https://doi.org/10.1080/01969722.2015.1007734

- Stehle, S. M., & Peters-Burton, E. E. (2019). Developing student 21st Century skills in selected exemplary inclusive STEM high schools. International Journal of STEM Education, 6(1), 1–15. https://doi.org/10.1186/s40594-019-0192-1.
- Tony, B. (2011). Understanding Web 2.0 and its Implications for E-Learning. New York: Information Science Reference.
- Tizel S., & Tok M. (2015). Retmen adaylar n n dijital yazma deneyimlerinin incelenmesi (Examining teacher candidates' digital writing experiences). Tarih Okulu Dergisi, 6(15), 577-596
- Wulandari, R. (2021). Characteristics and Learning Models of the 21st Century. Social, Humanities, and Educational Studies (SHEs): Conference Series, 4(3), 8. https://doi.org/10.20961/shes.v4i3.49958
- Yang, F., & Gu, S. (2021). Industry 4.0, a revolution that requires technology and national strategies. Complex & Intelligent Systems, 7(3), 1311–1325. https://doi.org/10.1007/s40747-020-00267-9