Investigating Characteristics of Learning Environments During the COVID-19 Pandemic: A Systematic Review

Enquêtes caractéristiques des environnements d'apprentissage pendant la pandémie de COVID-19 : Une revue systématique

Abdullah M. Al-Ansi, *Universitas Mahammadiyah Yogyakarta, Indonesia*

Abstract

Dramatic change in learning environments during the COVID-19 pandemic highlighted the significance of virtual learning and led to more interactive learning environments. Quick adoption of online and social interactive learning in many universities around the world raised challenges and emphasized the importance of investigating different learning environments. This paper investigates the accelerated transition in education from traditional learning environments through online learning environments to social innovative learning environments, and the latest trends of this change. The stages of transition were divided into three parts: before, during, and after the COVID-19 pandemic, which was the reason for this accelerated change. Features and characteristics of each stage of transition were analyzed and discussed, based on the following factors: edu-space and classrooms, the learning and teaching process, curricular choices, information and communication technology applications, students' and educators' perceptions, edu-approaches, and knowledge transformation. A systematic review approach was used to investigate learning environments based on the literature reviews of previous publications. Analysis of these features revealed the main characteristics and differences in each stage. New trends in online learning environments and social innovative learning environments were identified including cloud platforms, massive open online courses, digital learning management systems, open educational resources, open educational practices, m-learning, and social network applications. Finally, this study makes two recommendations: 1) the adoption of online learning environments and social innovative learning environment applications to continue the e-learning process during the pandemic, and 2) the enhanced usage of online learning environments and social innovative learning environment applications in the future by educational institutions and governments.

Keywords: traditional learning environment; online learning environment; social learning environment; Tech-Edu-Trends; COVID-19

Résumé

Le changement majeur des environnements d'apprentissage pendant la pandémie de COVID-19 a mis en évidence l'importance de l'apprentissage virtuel et a conduit à des environnements d'apprentissage plus interactifs. L'adoption rapide de l'apprentissage interactif en ligne et social dans de nombreuses universités du monde entier a soulevé des défis et souligné l'importance d'étudier différents environnements d'apprentissage. Cet article étudie la transition accélérée dans l'éducation, des environnements d'apprentissage traditionnels aux environnements d'apprentissage sociaux et innovants en passant par les environnements d'apprentissage en ligne, ainsi que les dernières tendances de ce changement. Les étapes de la transition ont été divisées en trois parties : avant, pendant et après la pandémie de COVID-19, qui a été la raison de ce changement accéléré. Les caractéristiques de chaque étape de la transition ont été analysées et discutées, en fonction des facteurs suivants : l'espace éducatif et les salles de classe, le processus d'apprentissage et d'enseignement, les choix curriculaires, les applications des technologies de l'information et de la communication, les perceptions des étudiants et des éducateurs, les approches éducatives et la transformation des connaissances. Une approche de revue systématique a été utilisée pour étudier les environnements d'apprentissage en se basant sur les revues de littérature des publications précédentes. L'analyse de ces caractéristiques a révélé les principales caractéristiques et différences de chaque étape. Les nouvelles tendances des environnements d'apprentissage en ligne et des environnements d'apprentissage sociaux et innovants, notamment les plateformes en nuage, les cours en ligne ouverts et massifs (MOOCs), les systèmes de gestion de l'apprentissage numérique, les ressources éducatives ouvertes, les pratiques éducatives ouvertes, le m-learning et les applications de réseaux sociaux, ont été identifiées dans le cadre de cette étude. Enfin, cette étude formule deux recommandations : l'adoption d'environnements d'apprentissage en ligne et d'applications d'environnements d'apprentissage social et innovant pour poursuivre le processus d'apprentissage en ligne pendant la pandémie, et l'utilisation accrue des environnements d'apprentissage en ligne et des applications d'environnements d'apprentissage social et innovant à l'avenir par les établissements d'enseignement et les gouvernements.

Mots clés : environnement d'apprentissage traditionnel ; environnement d'apprentissage en ligne; environnement d'apprentissage social ; tendances technologiques éducatives ; COVID-19

Introduction

Early in 2020, the COVID-19 pandemic caused serious problems in education by disrupting traditional learning and closing most schools around the world, resulting in cancelled examinations, academic seminars, and workshops as well as disruptions in distance learning. This impact raised many questions about the challenges, opportunities, and solutions of educational system problems. In addition, the sudden transition from traditional learning to online learning opened other doors of discussion for scholars, researchers, and decision-makers about the future of education. Traditional learning spaces in a brick-and-mortar building (Weller, 2007) were changed to online learning spaces by adopting information and communication technology (ICT) and availability of Internet access (Al-Ansi et al.,

2019). Because of the sudden change, learning environments were transformed to interactive social learning environments. These changes are significant as the future of education depends on the educational institutions' ability to adopt ICT and the new implications following the pandemic.

Dramatic changes in learning environments during COVID-19 have affected students, teachers, families, and policy-makers in education. Also, rapid technology development has helped transition the world to distance learning by the possibility of accessing the high volume of information online and the various approaches of receiving such information (Finger et al., 2007). Studies have highlighted the different results from learning in different environments, including traditional, online, blended, and distance learning. Between 1996 and 2008, a report by the United States Edu-Department identified 50 independent factors in traditional and online learning instruction (Means et al., 2009). This report asserts that students who participate in online or blended classes are more effective than those who have face-to-face traditional learning. Another study by Means et al. (2013) found that "Distance learning is more effective than traditional learning or face-to-face learning and learning in blended environments is more effective than learning in person" (p. 35). Studies by Shachar and Neumann (2010) and Wu (2015) suggest that students who take online courses have better grades than students who take traditional courses.

Predicting education's future is fraught with challenges due to the quick transition to and unsuccessful use of online learning; using technologies and e-learning systems (Almaiah & Al Mulhem, 2019), lack of technical support to facilitate various activities (Eltahir, 2019), lack of awareness and interest from the students to do more and inconsistent e-learning readiness (Al-Araibi et al., 2018), lack of security and privacy (Almaiah & Alyoussef, 2019), and other problems related to the lack of ICT infrastructure (Almaiah & Al Mulhem, 2019). However, many opportunities have been created to implement new methods and practices in the online and social learning environments, including new trends in learning such as cloud platforms, massive open online courses (MOOCs), m-learning, digital learning management system (LMS), open education resources (OER), open educational practices (OEP), and social networking applications.

Usage of e-materials during online learning is significant to conduct virtual learning (Almaiah & Al Mulhem, 2018). Acceptance of online learning during the pandemic, adoption of successful experiences, and awareness of consequences were the main factors facing students and lecturers in higher education (Almaiah & Al-Khasawneh, 2020). In addition, new technological approaches have been emerging to integrate learning and teaching through LMS such as m-learning and cloud computing (Almaiah & Al-Khasawneh, 2020), as well as a focus on the adoption of successful models (Alamri et al., 2020b) and learning from previous experiences using e-learning systems as part of traditional learning. Based on previous literature, the main objectives of this study are as follows:

- Reviewing features and characteristics of learning environments (traditional, online, and social innovative learning environments) to understand the changes regarding the transition before and during COVID-19.
- Exploring new trends in education post COVID-19 to gain best practices and improve the learning/teaching process.

Literature Review

Since the beginning of the COVID-19 pandemic, traditional learning environments have been replaced by online and interactive learning environments. During this change, many challenges and obstacles have needed overcoming (Garad et al., 2021); researchers have been exploring and investigating the best approaches and practices to continue the learning process online. During the pandemic, many studies were conducted to keep pace with such dramatic change. Social media (Alamri et al., 2020a), cloud computing (Almaiah & Al-Khasawneh, 2020), m-learning (Almaiah & Al Mulhem, 2019), augmented reality, and virtual reality were included as part of these studies to help students and lecturers continue learning and teaching. Table 1 shows recent studies in using e-learning systems, social media applications, learning platforms (Alraimi et al., 2015), and new e-learning models (Al-Ansi, 2017). In addition, some of these studies investigated other factors such as the challenges of implementing effective e-learning (Almaiah & Al-Khasawneh, 2020), anxiousness of students and lecturers during online learning (Al-Ansi, 2021), assessments of classrooms, benefits of using social media (Al-Ansi et al., 2021), and the role of ICT in e-learning. New trends have been emerging in the integration of e-learning and using ICT in education such as MOOCs, digital LMS, OER-OEP, m-learning, and social network applications (Almaiah & Alismaiel, 2019). These technologies have played an important role in conducting online learning. The main results of some of the important studies are summarized in Table 1 including areas of studies, methods and analysis, and the contribution of each study.

Table 1

Recent Research in e-Learning Environments

Subject	Methods/ Analysis	Main Outcomes
Critical challenge influencing e-learning during COVID-19 (Almaiah et al., 2020)	Interview method using thematic analysis through NVivo software	Highlighting many key features for policymakers, designers, developers, and researchers to adopt/develop e-learning systems effectively.
Task technology fit (TTF) in social networking applications (Alamri et al., 2020a)	Surveys: structural equation modeling (SEM)	Role of TTF has positive impact on the sustainability of education and reflected students' satisfaction.
Unified Theory of Acceptance and Use Technology (UTAUT) model of mobile learning and its acceptance in higher education. (Almaiah et al., 2019)	Online questionnaire/ SEM method for analysis.	Students' acceptance of m-learning is motivated by perceived information quality, compatibility, trust, and awareness.

Subject	Methods/ Analysis	Main Outcomes
E-learning infrastructure and cognitive competence during COVID-19 (Garad et al., 2021)	Quantitative approach, descriptive statistical analysis	There is significant positive impact of e-learning infrastructure and cognitive competence in conducting online learning during COVID-19.
Empirical study in using mobile phones in e-learning systems. (Almaiah & Alismaiel, 2019)	Quantitative approach-questionnaires/ regression analysis	Quality factors including System-Quality, Information-Quality and Service-Quality have a positive impact on mobile usage and students' satisfaction.
Delphi technique of using success factors of e-learning implementation. (Almaiah & Al Mulhem, 2018)	Investigation/Delphi technique	Eleven critical factors grouped as quality, technology options, top management support, and e-learning awareness are highlighted.
A model of social media in sustainability of higher education. (Alamri et al., 2020b)	Constructivism theory and Technology Acceptance Model (TAM), quantitative method, survey, SEM	Results show significant relationships among usage of social media applications and interactions, collaboration, and perceived ease of use.
Usage of mobile Information System in the University of Jordan. (Almaiah, 2018)	Questionnaire, SEM	Trust, perceived ease of use, perceived security, and perceived usefulness are the main factors for Management Information System acceptance.
Malay Language Mobile Learning System (MLMLS) using Near Field Communication (NFC) technology (Shawai & Almaiah, 2018)	Mobile Application Development Lifecycle (MADLC) model	The MADLC model was utilized to safeguard effective Mobile Language framework conveyance.
Adoption of mobile cloud computing in campuses (Almaiah & Al-Khasawneh, 2020)	Quantitative approach, integrated model	Quality of service, perceived usefulness, perceived ease of use relative advantage and trust are the main determinants of mobile cloud computing.

Methodology

A systematic approach was appropriate for conducting this study. The process of investigation three learning environments was conducted by analyzing 10 factors for each learning environment: 1)

educational space, 2) classrooms, 3) learning process, 4) teaching process, 5) curriculum, 6) technology use, 7) educational approaches, 8) knowledge transformation, 9) student role, and 10) teacher role. These factors were chosen based on the pervious literature reviews and works related to each environment. In addition, the latest trends in e-learning during the pandemic were investigated. A systematic approach is helpful to explore and identify relevant research in addition to collecting and analyzing data of previous studies (Liberati et. al., 2009) and depends on reviewing previous studies for three different learning environments. Furthermore, a systematic review is designed to answer specific questions (Dewey & Drahota, 2016). The literature included in this study is introduced in three stages: before the pandemic (traditional learning), during the pandemic (online learning), and after the pandemic (social innovative learning).

Research Questions

To conduct a systematic review, these two questions were designed:

1. What are the characteristics and features of the three learning environments, i.e., traditional learning environment, online learning environment, and social innovative learning environment?

2. What are the latest trends in education environment during and post COVID-19?

Data Collection Approach

The process of collecting data depends on two approaches. First, recent studies in the field of e-learning, m-learning, cloud computing in education, and ICT in education were the keywords used for the literature-based research. Second, to investigate the main characteristics and features of each stage, many recent and older studies were included which were based on the nature of factors in each learning environment stage. For the first part of the process, regarding the data about the phenomena of full online learning due to the pandemic, all research was completed in the last two years, which correlated to the beginning of pandemic, and published in Scopus or Web of Science (Table 1). For the second part, the researcher used Google Scholar in addition to Scopus and Web of Science to include more information about the 10 factors being researched and their characteristics.

Procedures of Systematic Approach

The research procedure shown in Figure 1 presents the different steps used in this methodology. Stage one included the literature review for each learning stage (traditional, online, and social innovative environments). Stage two introduced the different factors of each learning environment and its characteristics, using a systematic approach to identify and classify each learning environment. Stage three was about gathering characteristics and features of learning environments as presented in Table 1.

Figure 1

Methodological Framework (Stages of Investigation)
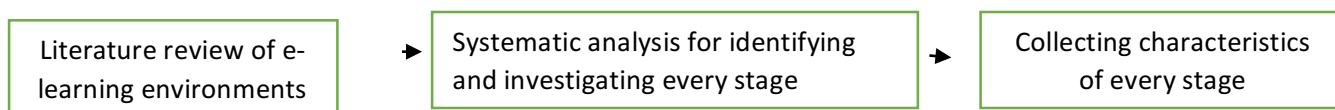
Process of Investigating Learning Environment

Many different steps were taken to start the investigation of learning environments by following the systematic approach as follows:

1. The questions of research were determined, which included the main objectives for conducting this research about learning environments and the latest trends in e-learning.

2. Preliminary research was conducted to search the features and characteristics of each stage. Then, the researcher investigated every stage compared to each other as a conclusion of the study. In addition, interactive and social learning are new trends during COVID-19, where there are limited studies that have investigated these approaches.

3. Inclusion and exclusion criteria were determined: for the first part (including the phenomena and problem) only research related to COVID-19 and for the second part (characteristics and features) much broader research was included.

4. In terms of searching the database, all papers included for the first part were selected from high quality journals indexed in Scopus or the Web of Science, while in the second part, data was collected from both resources as well as Google Scholar.

5. The main factors of each stage were used as keywords to search for related papers. Four titles were designed for each stage including (Educational Space and Classrooms, Learning/Teaching Process, Curriculum and Educational Approaches, and Knowledge Transformation). In addition, one more title was chosen for the latest trends.

6. Data was collected for each title and subtitle separately and each part was investigated by the researcher to ensure the validity of the data and correlation between them.

7. Finally, each learning environments' characteristics and features were summarized (Table 2).

Stages of Transitions in Learning Environments

At the beginning of the new millennium, many educational institutions adopted technology in the learning process using digital devices in the classroom, Internet access, ICT-based learning, blended learning, and distance learning. This section investigates the transition from the traditional learning environment (TLE) before COVID-19 through online learning environments (OLE) during the pandemic to social innovative learning environment (SILE) after the pandemic.

Traditional Learning Environments

This first stage is the traditional learning environment before the COVID-19 pandemic. Characteristics of this stage include physical classrooms where students and teachers attend classes at campus or school, teacher-based learning where the teacher is the transmitter of knowledge, many educational materials and books which are printed, the use of the transition of knowledge approach, and many ICT tools which are part of classrooms.

Educational Space and Classrooms

Traditionally, this type of learning is based on a face-to-face approach in a physical environment, which is also known as brick-and-mortar classes (Weller, 2007). Students who learn in these places adopt the concept of a broadcast model of learning (Long & Ehrann, 2005). Traditional learning creates what is called sensory memories, also referred to as the "ability of emotional responses" that work to influence their cognitive and behaviour (Graetz, 2006). Some researchers believe the concept of traditional classes limits the student and teacher activities and interactions (Mulcahy et. al., 2015) and hamper the ability of teachers to easily activate different approaches such as student-centred and ICT-based learning (Dovey & Fisher, 2014). Traditional or conventional classrooms are ideal for teacher-based learning methods that prefer linear and standardized instruction (Dumont & Istance, 2010). Physical learning environment designs and features also impact the students' experience and orientation towards learning (Wilson & Cotgrave, 2016). Some of these features include learning space, lecture hall, teaching rooms, access to library, toilets and open social areas, room layout, colors and furniture, and up-to-date technology. Understanding the students' needs is critical to developing a suitable learning space (Kollar, 2014) that supports learning strategies and provides a suitable environment for students to manage the space for their own work productivity (Shouder et al., 2014).

Learning/Teaching Process

In traditional learning environments, teachers are the transmitters of knowledge, the controllers of the class, and the responsible parties for all activities; the students are the receivers of instruction. Traditional learning focuses on rote learning and memorization in addition to examination as the end of the educational process. Teacher-centred learning communicates and facilitates learning approaches and materials for students where teachers have a primary role (Mascolo, 2009). This approach depends on the teacher and leads to an exam-centred approach to save time and focus on the test content (Grant & Hill, 2006). Paper and pencil exams, scripted curriculum, and face-to-face teaching in the traditional learning approach makes students increasingly bored and unmotivated, and the teacher more stressed about teaching techniques (Fullan & Langworthy, 2013). Some researchers prefer teacher-centred learning when the teachers are knowledgeable in content and can apply motivational techniques to their teaching approach (Espenshade & Radford, 2009). These teachers spend more time explaining the content and discussing related issues by using black/whiteboards and projectors while students take notes and ask questions (Peyton et al., 2010).

Curriculum

Traditional learning environments depend on teacher-centred learning, textbook instruction, blackboards, and a pen and paper approach. In this stage, even though many non-traditional educational methods have been implemented such as team-based learning, problem-based learning (PBL), content-based learning, flipped classrooms, and self-directed learning, the curriculum plays the main role and textbooks are the basis of the learning process (Choi et al., 2014; Nishigawa et al., 2017). In addition to using textbooks, visualizations and 3D pictures, presentations, and videos also play a significant role.

Educational Approaches and Knowledge Transformation

Traditional learning depends on a transitional approach where information and knowledge are transmitted from educators to learners. The teacher's beliefs and role determine the type of educational approach used and knowledge selected to be delivered to students (Domović et al., 2017; Rapoport et al., 2016). Several studies confirmed the importance of the teacher role in teaching and learning in traditional environments (James, 2013; Domović et al., 2017; Rapoport et al., 2016). Although many educational institutions use traditional learning approaches for delivering knowledge and practices, during the last two decades, many ICT and technologies have been brought to classrooms. This interaction between students and technology has facilitated students' future careers and improved their skills and competences. Future jobs depend on the ability of graduates to interact with ICT and possess general skills such as the creation and sharing of collaborative knowledge as well as metacognitive skills (Kozma, 2005). Transitional learning outcomes are related to cognition, projective, application, synthesis, group strengthening, and self-direction (James, 2013).

Online Learning Environments

This stage introduces the approaches and techniques used in OLE during the COVID-19 pandemic. The main features of this stage include learning from home, online classes, student-based learning, an interaction environment between students and teacher, e-learning books and materials, and creation of knowledge approaches.

Educational Space and Classrooms

In online learning, students, educators, and administrative staff no longer need to go to the school building. The physical learning environment is the home or any place students can learn. The LMS is controlled by educational institutions and educators, while students have specific space to do their activities online (Väljataga et al., 2011). Socialization and interaction have changed from the campus to interactive platforms and social media. In fact, many students prefer to use social media where they can interact more with their classmates and teachers. Previous studies show that students and teachers spend significant time on social media interacting and participating in different activities (Junco, 2012; Garad et al., 2021). In addition to social network and online applications, the educational space at home facilitates gathering the family and community around.

Learning/Teaching Process

During COVID-19, online learning has become the only approach to continue learning. Many educational institutions have offered online learning and teaching as extra activities or limited use for those unable to attend in-person classes. The requirement to teach and learn online during the pandemic enabled students and teachers to improve their skills and transform to online learning and teaching, however, many are struggling to learn different skills to adopt this approach even though online learning has become compulsory, since the closure of schools/universities. Student-based learning is the main feature of the online learning process, which includes both Problem-Based Learning (PBL) and Project-Based Learning (PjBL). These two approaches are similar (Hung, 2011) but each has unique features. Problem-based learning introduces the problem for students to solve, whereas PjBL introduces the

artifact to be achieved. Students in PBL produce conclusions of problem-solving, while students in PjBL end with a product. In both approaches, the teacher is the facilitator of the learning process but not the transmitter of knowledge. The online learning and teaching process also includes many different approaches like using an LMS, virtual classroom, MOOC, and educational gaming applications. These tools and approaches enable virtual interaction to be more flexible than physical interaction by including student to student, student to teacher, student to content, teacher to teacher, teacher to content, and content to content interaction (Zornić & Hasanović, 2011).

Curriculum

In OLE, the use of printed textbooks is rare as students prefer e-books, presentations, and audio and video content. In traditional learning, e-learning materials remain unchanged as all materials simply become e-learning materials. Although interactive and social platforms have been adopted as part of the e-learning process, this progress is limited due to the difficulties related to full e-learning, lack of infrastructure, and lack of student and teacher competence in using the interactive platforms. Regardless of such challenges, the curricula are not typically separated into individual subjects, which allows students to develop skills across the curriculum, and to learn and apply their knowledge wherever they need it (Papert, 2001).

Educational Approaches and Knowledge Transformation

In online learning environments, interactive learning is the approach to learning where students and teachers use online applications and platforms to communicate and interact with each other. Knowledge is created through this interaction, and the participation of students and teachers is in opposition to traditional learning where teachers are the transmitters of knowledge. Sharing and creating e-learning materials, videos, presentations, and e-books enhance the learning, allow for the sharing of experiences, and improve teaching performance (Lee & Wu, 2006; So et al., 2008; Yung et al., 2007). Technology is the base in online learning, and the tool for creating knowledge. Teaching is conducted by constructivism, Web 2.0 tools, and interactive platforms. Teachers are responsible for planning classes, determining the approaches and applications of learning, and facilitating an integrated learning technology, while students are responsible for building and demonstrating knowledge as well as collaborating with their peers to create knowledge.

Social Innovative Learning Environments

In social innovative learning environments, there are many predictable specifications after facing COVID-19 such as technology-rich spaces, interactive platforms, ICT-blended learning, community learning environments, student and teacher learning and teaching everywhere the Internet is available, social media interaction, and innovative applications of knowledge. In this stage, there is a specific selection on the use of ICT and teaching conducted through innovative and open social environments.

Educational Space and Classrooms

Social innovative learning environments are multi-social media based, technology-integrated, and attractive, including numerous practices in education (OECD, 2015). Several studies have evidence

of effective SILE as a better learning method than traditional classrooms (Dovey & Fisher, 2014; Garad & Al-Ansi, 2021; Al-Ansi & Al-Ansi, 2023). In SILE, there are no physical classrooms or learning online at home. The space of learning is anywhere having Internet access and mobile phone such as coffee shops, clubs, or open outdoor space. Moreover, social media has enriched the learning process where students and teachers can easily interact and communicate anytime and anywhere. In SILE, learning space is not restricted by physical boundaries; classrooms are transformed into social networks and groups into social media applications. Facilitating learning spaces depends on social media application features and how comfortable, affordable, reachable, and easy they are to use. Learning virtual spaces in SILE are represented as electronic emulations of the multidimensional natural world.

Learning and Teaching Process

As opposed to traditional and online learning, where traditional learning adopts teacher-centred and online learning represents student-centred approaches, learning in innovative social environments is an ICT-based method. The teaching process in SILE also depends on the interaction of the community with technology, which means not only teacher-student interaction, but family, technology, space, and community have a part in this learning environment. Teaching and learning in SILE requires different approaches, collaboration, and communication, and includes suitable knowledge and emotions (Gao et al., 2012; Greenhow & Burton, 2011; Pimmer et al., 2012; Ranieri et al., 2012). The process of learning in SILE is characterized as self-direction, self-initiation, peer- or other-influenced, unintended network effects, network support, community evaluation (rating, commentary, expertise via participation, bookmarking), and the use of other modes such as videos, pictures, ratings, and tags (Greenhow & Lewin, 2016). Social media and innovative learning approaches have enhanced the culture of the new learning environment. Learners and educators can engage and participate in digital culture, potentially benefitting from collaborative learning and developing new skills (Brenner & Smith, 2013; Ofcom, 2014). Despite learning through social media, which also enriches the skills and experience of learners and educators, many challenges must be met to understand the complexity of future learning.

Curriculum

In addition to learning e-materials, whiteboards, and interactive platforms, virtual excursions and practices are the most features of curriculum in social interactive learning environments. Learners and educators can read, edit, organize, interact, and save these learning materials anytime. Open textbooks, MOOCs, OER repositories, and open collaboration forums are available for educators and students to learn, share, and download according to their needs (Algers, 2019; UNESCO, 2015). Although many open educational materials are available online, there are some limitations and difficulties choosing materials that best suit the learners' needs including copyright, license, unfamiliarity, and quality of materials (Ozdemir & Bonk, 2017; Yang, 2020).

Educational Approaches and Knowledge Transformation

In SILE, students learn through social networks and applications. In other words, knowledge is not only transformed or created among students and teachers, but knowledge is also gained through interactive applications. As well, students are more motivated to engage in learning through open

interactive environments (Nascimbeni & Burgos, 2016). Learning through social networks enables students to create new OER and OEP in any specific topic based on available resources and references.

New Trends in the Future of Education

During the COVID-19 pandemic, many new trends resulted in new learning and teaching processes. Traditional learning transformed into distance learning where policies, strategies, techniques, applications, and suggestions reshaped and restructured the culture of learning. This section investigates these trends. It is significant that many of these trends in learning have been identified in the last few years and adopted as part of traditional learning strategies. During and after COVID-19, these forms and techniques developed and became essential in distance learning infrastructure.

Cloud Platforms

The idea of a cloud or interactive platform is to facilitate the use of ICT to create a better learning environment. Cloud platforms depend on ICT applications, an LMS, interactive websites, and social media (Almaiah & Al Mulhem, 2019). They enable components of traditional learning such as textbooks, note writing, group discussion, idea sharing, and accumulated cognition in a sufficient way based on ICT, LMS, and e-learning components, in addition to more chat box and news feed ability to comment in an open course system (Septiani et al., 2017). Personal computers, laptops, tablets, and cellular phones employ built-in integrated cameras, GPS sensors, and Internet access to embed real-world environments with dynamic and context-aware interactive digital content (Chiang et al., 2014). These are the cloud platform tools where learners/educators can interact with each other. In addition, teleconferencing applications, such as Zoom, Google Meet, Facebook Groups, Microsoft Teams, and many other applications, have increased during the pandemic and have facilitated communication between learners and educators and given them the ability to interact synchronously with each other.

Digital LMS

Digital LMS helps learners and educators access the learning anytime and anywhere. After school and university closures, due to COVID-19, the concept of an LMS was the lifeline for education. An LMS is an online platform that includes learning systems, content and course management systems, portals, evaluation systems, and instructional management systems. Since students are considered digital natives (Prensky, 2002) or a social media generation, using an LMS is easier and more functional for many of them. The LMS has revolutionized the approach to learning during the last few years and LMS growth is expected to increase from USD 13.14 billion in 2020 to USD 25.7 by 2025 (Markets, 2020). Learning management systems have enabled student-teacher interaction and given them the ability to connect, communicate, share information, ideas and materials, conduct examinations, manage courses, and track students' attendance and assessment. There are many open-source cloud-based systems that introduce low-cost courses, free solutions, and maintenance, but the large systems are those installed and developed by educational institutions where the university or school owns, maintains, and secures them. Well-known LMS include Moodle, Loop, Docebo, LearnUpon, Adobe Captivate Prime, Talent, and Sap Litmos (Pappas, 2018), and include characteristics like customer support and experience, software features and innovation, economic growth, friendly use, and feedback.

Mobile Learning

M-learning refers to browsing knowledge and learning through using phones and/or mobile-device applications and is categorized under e-learning and involved in mobile computing (Behera, 2013). Regardless of limitations using the m-learning approach, mobile phones have become an important tool for learning during the pandemic and will continue to be post COVID-19. Ease of use, mobility, affordability, and access to information quickly are the main characteristics of m-learning (Almaiah & Al Mulhem, 2019). In addition, mobile devices are used as a communication tool through social media, using mobile products such as scanner, printer, video, and camera to conduct teleconferencing and join cloud platforms. M-learning expands learning and teaching beyond traditional learning in classrooms, increases flexibility, and opens opportunities for learners and educators through OLEs (Kumar Basak et al., 2018). M-learning also has a fundamental perspective of e-learning including technology mobility, learning, and learner synchronously (El-Hussein & Cronje, 2010). Many studies discuss the different features, use, and parameters of m-learning including portability, social interaction, sensitivity to the context, connectivity, and ability of customization (Kothamasu, 2010), incorporating m-learning in higher education environments by student awareness and knowledge (Hashim & Ahmad, 2012), high satisfaction of students using m-learning, m-learning being a future learning unique tool (Mao, 2014), and integrating m-learning by various software and hardware technologies to facilitate communication and interaction with multimedia applications like short messaging, gaming, examinations, and multimedia contents (Mohanna, 2015).

MOOCs

Massive open online courses include formal and informal educational online resources based on connective knowledge (Siemens & Downes, 2018) and behavioural approach (content-based) theories (Yuan & Powell, 2013). The idea of c-MOOCs introduces the connection between different parties to engage in discussions and collaboration while x-MOOCs are designed as traditional learning courses but online (Yousef et al., 2014). There are many examples of e-learning MOOCs including Khan Academy, edX, Peer-to-Peer University (P2PU), Udacity, Udemy, Alison, and Coursera. The role of educators and professionals is to prepare and produce MOOC materials and upload it online for learners, a process that requires much time. Over the last few years, millions of learners have joined MOOCs (Almaiah & Al-Khasawneh, 2020). For instance, Coursera includes thousands of online courses, professional certificates, bachelors and masters online degrees, and more than 60 million learners. Also, many critiques have discussed challenges related to MOOCs such as attrition and course dropout rates (Hew, 2016). Reasons behind dropping out of completing courses include difficulty of use, workload, no motivation in addition to inequality and fake registration (Alraimi et al., 2015).

Open Educational Resources - Open Educational Practices

Open educational resources and open educational practices are new approaches to learning; a set of learning and teaching materials that enable pedagogy and define its characteristics that are available online for public use and at no cost. Users can reuse, repurpose, adopt, and redistribute these materials anytime based on their needs (Stracke et al., 2019). OER is a content-based learning approach and offers the ability to reuse, revise, remix, redistribute, and retain these educational resources (UNESCO, 2015),

while OEP is practice-based and has the potential to improve the opportunity for learners to access quality educational content, thus helping to achieve both accessible and lifelong learning (Nascimbeni & Burgos, 2019). Implementing OEPs requires reusing OERs in different ways to support students' learning and keep them active, which results in better educational outcomes. In addition, applying OEPs requires many steps such as open licensing, open learning and teaching, open collaboration and communication, available assessment, and enabling technologies (Huang et al., 2020).

Social Networking Applications

Social media networks have a significant role in modern learning and teaching approaches (Alamri et al., 2020a), whereby students and teachers can connect, communicate, interact, share knowledge, and send and receive assignments easily using cellphones and laptops (Myers et al., 2012). Popular social media applications include Facebook, Twitter, LinkedIn, Blogs, YouTube, Instagram, and Pinterest in addition to communicating applications such as WhatsApp, Telegram, Skype, Line, Imo, and Messenger (Chawinga & Zinn, 2016; Dzvapatsva et al., 2014). Social media is no longer only used for leisure but as a platform for communicating and teaching/learning (Jones, 2015). Social media also provides the opportunity for students to give feedback and for educators to identify knowledge gaps and improve the teaching methods (Menkhoff et al., 2014). In addition, whether mobile- or laptop-based, social media has many benefits such as enabling students to interact positively with contextual learning in relation to pedagogical objectives, engage in collaborative learning, and post comments and questions (Menkhoff et al., 2014; Wheeler, 2010). Despite evidence of the usefulness of social media applications in learning, there are also many critics and paradoxes that hinder the full adoption of these applications (Conole & Alevizou, 2010; Tess, 2013).

Discussion and Conclusion

This research investigated the TLE, OLE, and SILE learning environments because of the changes and dispersions of education post COVID-19. Emerging technologies and the integration of ICT enables universities to conduct online learning through LMS and virtual platforms. These results are supported by research about learning during the last two years during COVID-19 (Alamri et al., 2020a, 2020b; Garad et al., 2021). During the transformation, many challenges have been raised such as lack of experiences (Almaiah & Al-Khasawneh, 2020), lack of resources, anxiety (Al-Ansi, 2021), and difficulties using the new applications (Al-Ansi & Garad, 2021), which has led to changes in the learning environments. With the continuing impact of COVID-19, many universities depend on distance learning and ICT components.

Before the pandemic, traditional (face-to-face) learning was the most well-known and main approach adopted in universities around the world while virtual learning was conducted in some universities and exclusive for those not able to attend classes. During the pandemic, online or virtual learning became the only approach to conduct learning. Using social media and m-learning has become more effective and made e-learning more efficient (Alamri et al., 2020b; Almaiah & Al Mulhem, 2019). In future, even though it is hard to predict, the effectiveness of online learning and the attractiveness of

social and interactive learning demonstrated the ability, flexibility, and reliability of both. Social learning and traditional learning features and characteristics help to understand the changes in learning practices and policies. Different characteristics distinguish each stage of learning based on factors such as educational environment, classrooms, learning and teaching process, curriculum, technology, educational approaches, ways of acquiring knowledge, and student and educator roles. All these features have changed due to transitions in the learning environment. Table 2 summarizes these changes based on learning environments.

Table 2

Summary of Changes in Different Learning Environments

Factors	TLE	OLE	SILE
Ed-environment	Campus/school	Home	Tech-rich space
Classroom	Physical classroom	Online classes	Interactive space
Learning	Teacher-centred	Student-centred	ICT-based/task-based
Teaching	Educator/lecturer	Teacher-student	Community environment
Curriculum	Printed ed-materials	E-ed-materials	Interactive platforms
Tech-space	In-classroom	At home	Everywhere
Ed-approaches	Transition-nets	Interactive nets	Social networks - SILE
Knowledge	Transformed	Created	Innovative applications
Student	Passive	Active	Creative
Teacher	Transmitter	Coach	Participant

The traditional learning environment is still the dominant approach mixed with ICT, while online and interactive social learning have become significant in the future of education. Regardless of changes during the pandemic, where education depended on online and interactive learning, education will return to traditional learning but with significant improvement in all three environments. In addition, some new trends that have been adopted and became critical in learning, such as cloud platforms, m-learning, MOOCs, digital LMS, OERs, OEPs, and social networking applications, have been demonstrated as part of this research.

Recommendations

According to an analysis of the learning environment transition stages before, during, and after COVID-19, and the new trends that appeared, recommendations should be considered to reduce the risk and mitigate the pandemic's negative effects on education.

- Improve educator and student competences and self-motivation to adopt OLE and SILE approaches, techniques, and applications, as well as increase their ability to interact through these platforms.
- Educational institutions and governments must implement new policies and regulations and assess the transition from TLE to OLE and support the change to SILE by providing integrated ICT infrastructure and financial support.
- International collaboration and community interaction has become important to share experiences, support learning environments, and provide sustainable development of learning and should continue and be enhanced. Universities and communities must consider this when planning future collaborations.
- Reshaping, redefining, and redesigning educational systems should include the learning and teaching process, curriculum, educational space and environment, and assessment approaches.
- Consider the adoption of and adaptation with ICT, cloud platforms, MOOCs, ODRs-OEPs, m-learning, and social network applications.

Implications

Theoretical Implications

The COVID-19 pandemic is ongoing at the time of this writing with no certainty over the duration and extent that the pandemic will continue to affect education systems around the globe. COVID-19 has changed the perceptions and understandings of the traditional learning process and, for the first time in history, education has been conducted completely through online learning. This event will continue to change the methods, approaches, strategies, and policies for education for the coming years. Some important criteria remain to be measured, such as the way in which social and cultural dimensions affect education patterns in the context of the current crisis. As the situation continues and the crisis is prolonged, education expectations need to be continuously revised and new theories, policies, and collaboration implemented.

Practical Implications

Education after COVID-19 will change traditional learning and therefore educational institutions need to be ready to implement new strategies and adopt ICT equipment and tech-ed approaches. During the pandemic many students have dropped out of learning and will continue to dropout of schools, based on many socioeconomic reasons. In addition, many students will not be able to pay for schools, in the case of primary education where families may have lost their jobs due to the pandemic, or for

universities in case of higher education, where students themselves are working part-time and may have lost work. The financial burden of low-income students has pushed many families to send their children to work to support their family facing the pandemic. In addition, many students who live in conflict or war-affected areas, who are displaced, or who already face challenges to remain in schools have been affected more than other groups.

Social Implications

During and after the pandemic, people must still care about social distancing, where they are not allowed to directly interact with each other. This realization has led to physical separation where the relationship between students and teachers now depends on ICT tools and/or social media applications. Many students have stress and depression because they must stay home to pursue online classes while in traditional learning they could spend time at school and home.

Further Directions

For future research, the question is if education's future will remain as in the pandemic time (online or blended) or if it will return to traditional education. The role of offline systems, community engagement and international collaboration, entertainment in education, and privacy and security challenges will remain important subjects for future studies in education.

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Author

Abdullah M. Al-Ansi is Assistant Professor in Educational Management at Universitas Muhammadiyah Yogyakarta, Indonesia. His main interest is in e-learning and ICT in education. He holds an education doctorate from Universitas Islam Negeri Maulana Malik Ibrahim Malang with a focus on ICT applications in learning. Email: ebrar.ansi@yahoo.com ORCID: https://orcid.org/0000-0002-1682-3154