

A Scientometric Review of the Impacts of Digital Technologies on teaching and learning in HEIs during the Covid-19 pandemic

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ABSTRACT

Research has shown that the importance of Digital Technologies (DT) in enhancing productivity and performance in higher education institutions (HEIs) can never be underestimated, as was apparent during the COVID-19 pandemic. This pandemic, and consequent lockdown, impacted every aspect of human life globally, and the education system was not spared. Although much research related to the COVID-19 pandemic has been published, few studies have considered the impact of DT on education/learning during this period. Educators and students of HEIs had to rapidly adapt to the use of DT in delivering lectures, as well as for learning. Unfortunately, educators and students, as major HEI stakeholders, have not yet taken full advantage of the educational benefits of DT – hence the motivation for this research. The methodology adopted entailed a comprehensive, systematic and expository review of selected published articles on DT in journals, books and conference proceedings from different databases: Web of Science, Scopus, Google Scholar, Academia.edu and Research gate. This article presents the findings of a scientometric review of literature on the impact of DTs in HIEs, with a focus on events during the COVID-19 outbreak. It is hoped that the outcomes of this review will add to the growing body of knowledge about whether or not the adoption of DTs has had any significant impact on teaching,

learning and assessment; as well as techniques for leveraging DT, even for learners in hard-to-reach communities, in this new normal.

Keyword: Scientometric Review, Impacts of Digital technology, Higher Educational Institution, COVID-19

INTRODUCTION

Digital technologies (DT) are the various technologies, tools, services, and applications with various hardware and software. (Rodrigues, Cerdeira, Machado-Taylor, & Alves, 2021; Rice, 2003). They help in the creation, storage, processing, transmitting, and display of information. Digital technologies encompass different media, including personal computers, digitalised versions of traditional media, robots. (Vuorikari, Punie, Gomez, Brande, & All, 2016).

Some claim that using digital technologies with instruction aimed at learners will cause an improvement in learning. Other researchers like Anderson and Gronlund have claimed that digital technologies give wider access at a reduced cost while still improving the quality of Education, as was the case in East Africa, where digital technologies were used alongside face-to-face teaching. (Mtebe & Raisamo, 2014; Unwin, et al., 2010; Andersson & Grolund, 2009).

With digital technologies, teaching becomes more effective while learning becomes more accessible at an improved rate. (Bolu & Egbo, 2014; Moya et al., 2011). Prior to the Covid-19 Pandemic, there has been an argument about its adoption into the educational system. Stanchev et al., believe it was still a challenge (Stanchev et al., 2014).

Research has shown that digital technologies (DT) enhance productivity and performance in higher Education (HEIs). Although NMC reports an increase in the introduction of digital technologies into the school system. (New Media Consortium, 2017), the pandemic makes it essential to introduce digital technologies and maintain their usage. Like many other sectors, Education was affected (Al-Okaily et al. 2020; Cahapay, 2020). In light of that, Education has evolved radically from the traditional means such that every educational activity could no longer be carried out face-to-face. Thus, like every other service that was once carried out face-to-face, Education was moved to online platforms (Herwin, Saptono, & Firmansyah, 2021). There has been

accelerated usage of digital technologies because it helps in facilitating physical distance and brings Education closer to students at home. (ECLAC, 2021).

THE DEBATE ON THE USE OF DIGITAL TECHNOLOGIES.

Before the Covid-19 pandemic, there were several discussions, arguments, and theories about the essence of introducing digital technologies into the educational system (Blackly, Wilson, Sheffield, Murcia, Brown, Tang, Williams, 2021). Aviram & Talmi, 2004 made it clear that the introduction of digital technologies into the human system has begun to cause a gradual change in the mode and patterns humans use in their lives. The same is believed to be the cause for the instrumental change in how Education is being regarded.

Thomas Friedman (2005) further expatiated that technology drives globalisation in his book, 'The World is Flat. It does not only cause a reform in the world and how humans operate in their day-to-day activities, it has also become the major player in social reform. The three phases can trace the understanding of these changes expected in the systems humans have gone through regarding the use of technology.

The First phase was so short and can be traced back to the period before the 18th C.E when the world leaders found it best to control others by expanding their military force while also using horsepower and wind power. As a result, Education changed its focus from farming and training in the military to using some of these things.

The Second Phase, though short-lived, lasted between the 18th C.E to the 20th C.E, where there was the introduction of steam and rail power. Human interaction and Education also transformed. Teachers can quickly move from one part to another just to give their students the best Education. Parents could also send their children out to other parts of the world to get an education.

The Third Phases is the post-millennial era driven by technology. These phases brought modernisation and reform to the system everyone used. It has grown ever since.

Also, Aviram and Talmi (2004) believe that two significant facts characterise the digital technologies' revolution:

1. Digital technologies have the power to impact every aspect of human lives and hence the human culture.

2. Digital technologies have taken the world from a modern to a postmodern culture.

As quoted in Underwood (2009), researchers like Higgins (2009) have made strong arguments about the introduction of technology into the education system with arguments about how:

- The learner becomes effective and perform better
- Improved efficiency of the learner
- Increased positive attitudes to learning.

Pathnak & Sheorey (2020) believes that although digitalising Education is important, what is more, is the need for the students to be able to navigate through the increasing number of digital initiatives. For example, modern learners are exposed to the internet and smartphones, where they get more information. It is therefore imperative that educational institutions adopt new technologies.

One cannot ignore the counter-arguments against such a case as seen in Underwood (2009), (W. Hale & Gifford, 1997) stated that the above benefits of technology in the class could also be said of a class that does not adopt the use of technology. Also, Trakhtenberg (2012) stated several drawbacks, including how technology might become useless in case of floods or other disasters.

EVIDENCE ABOUT THE IMPACT OF DIGITAL TECHNOLOGIES

Although some believe that there is no way to prove the value of digital technologies for educational purposes, there has been much evidence to show their impact in all forms of learning.

Underwood (Underwood, 2009) divided the impacts into two:

1. Behavioural Change in the Personalities involved.
2. Change in the students' academic performance.

A more significant part of the evidence was gotten from formal settings since showing evidence also means providing results that can be statistically verified.

1. Behavioural Change in the Personalities involved

Two areas were brought out as the significant areas digital technologies have impacted, and they are:

a. Readiness to learn

In research carried out in 181 schools, 82% claim that technology was instrumental to the student's improvement. In these schools, technologies were used to monitor and analyse the learner's achievement and progress (Hollignworth, Hutchings, Kuyok, & Willians, 2008)

b. Facilitating Integration

The introduction of technology into the educational system has made it easier for learners to be fully involved in the educational process. Using presentational software has boosted students' confidence to easily express their thoughts and ideas to their peers. (Underwood)

Another look is the example of some low-income Latino middle school students who became better at writing, completing their homework, and actively using web resources (OECD, 2001).

2. Change in the students' academic performance.

The outcomes of the students' performances are ambiguous, but there is more than enough evidence to support this.

In meta-analysis carried out by the United States Department of Education, much evidence helps see tangible results. (U.S Department of Education, 2009). The first thing about this result is that it corroborated the result of the previous summaries, which showed that learning students who learn from a distance could get the same result as Classroom. (Carnoy, 2004; Underwood, 2009). Another noticeable difference is an increase in the effort and devoted time for the technology users. The result of students who received lectures online or mixed performs better than those having a face-to-face class.

LIMITATIONS OF THE IMPACT OF THE DT

The impact of digital technologies is progressive but has faced certain setbacks. These sets backs are caused by different factors that will be looked into (Buabeng-Andoh, 2012). However, some of these setbacks are:

1. A large disparity of online results when compared to those done offline. An excellent example is that there are lower improvement scores from high-performing girls, which is the total opposite of what can be found with under-achieving boys, who show better results when using digital technologies. (Chandra & Lloyd, 2008)

2. The disparity between the method of teaching and the means of examining the students. While the students are taught with digital technologies, they are examined through handwritten examination answers.
3. The lack of motivation from the learners pose limits the extent of the impact of these digital technologies.
4. The teachers are not all acquainted with the method of teaching. (Underwood, 2019).

ADOPTION AND INTEGRATION OF ICT INTO THE HIGHER EDUCATION LEARNING

Adoption is defined as an individual's decision when accepting or using an innovation. (Rangasway & Gupta, 2000). Previous researchers, believes that an adoption means an individual's decision to choose innovation as the best means of acting (Tarhini, Arachchilage & Abbasi, 2015; Rogers (2003). Rogers, further argues that adoption starts with being aware of the innovation and ends with final adoption.

Many studies reveals that the ICT Integration, on the other hand, means connecting every element of a system to have wholeness and use technological tools enhances teaching and learning in traditional education (Kayode, 2019; Tomaro, 2018; Earle, 2002). A good way to exemplify this is to consider how different elements are instrumental in teaching and learning processes; invariably, contents and instructions must be effective in the teaching process. Whenever the teacher introduces any websites or IC tools, including multimedia, while teaching the student, the teacher is integrating the pedagogical aspects. (Buabeng-Andoh, 2012) This same concept, ICT integration, was what Govender and Kayode (2020) and Williams (2003) describes as the use of technological tools (like e-learning, virtual learning, blended learning etc.) to aid the teaching and learning process in educational system.

Conventionally, innovation undergoes all the necessary processes at the higher institution. It is a place for planning, testing, and implementation of innovation is meant to happen, which means that the relationship between universities and technologies will continually be mutual. (Grosseck, Malita, & BunoIU, 2020). Digital technologies, when utilized with the internet, open students to more chances to obtain information and give them access to high-quality free Education (Shulga et al., 2021; Kay, Reimann, Diebold, & Kummerfeld, 2013).

EVOLUTION OF HIGHER EDUCATION INTO THE DIGITAL ERA

With higher Education, nations have a better chance of evolving into modernisation and development. According to Hayward & Ncaviyana (2014), enrollment into higher institutions in Sub-Saharan Africa had increased in the last 40 years compared to when it was still one of the lowest in the 1970s. Bruneforth (2010) statistical report showed that enrollment doubles every eight years.

As the world population increases and technologies evolve, educational institutions have to focus on how students' needs are met. (Friesenhahn, 2016). Thus, it is imperative to toe the line of adopting digital technologies.

Even if the world was still debating the importance of digital technology, we are moved past that era. According to Beltekin & Kuyulu (2020), the world cannot stop caring about future generations because it is currently trying to maintain the health of everyone. Therefore, the need to upgrade the quality of Education must remain a necessity (Abad-Segura et al. 2020).

THE NEED FOR TECHNOLOGY ACCEPTANCE MODEL (TAM)

Despite the benefits of digital technologies, there are clear reasons to determine the level of acceptance. According to (Lee et al. 2003; Park, 2009), a proven dominant theory in this field is the Technology Acceptance Model (TAM), which determines the barriers and facilitators that helped a specific domain adopt the innovations.

The concept evolved from the Theory of Reasoned Action (Ajden & Fishbein (1980), as quoted in (Tulinayo, Ssentime, & Naijuma, 2018). According to Davis et al. (1989), TAM's original intention was to help test how people accepted word-processor technology and aid its usage. Davis et al. (1989) posited three key factors that can help in explaining users' motivation, and they are Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Attitude towards use (See, Chuttur, 2009). All these relevant concepts will be summarised below:

1. *Perceived Use (PU)*: As further explained by Davis et al. (1989), it is "the degree to which an individual believes that using a particular system would enhance his/her productivity".
2. *Perceived Ease of Use*: This concept is believed to be centered around the extent to which an individual continually uses a particular system, hoping that his productivity will be

enhanced. It is also about the way individual believes the system will reduce or free them of effort.

3. *User's Attitude Towards Use*: The idea behind this is to understand how much the user is willing to accept or reject the system's operations. Chuttur (2009) also believes that the other two concepts influence the user's attitude.

Other scholars like Chang & Zhu (2012) and Oye et al. (2011) have posited that TAM and TRA help understand how PEU and PU influence users' behavioural intention when using a system. In some ways, they all have a ripple effect on each other. (Tsellios et al., 2011). PU is casually affected by PEOU, while Attitudes is affected directly affected by PU.

CURRENT DIGITAL TECHNOLOGY METHODS ADOPTED IN HIGHER EDUCATION

An increasing number of digital technologies are being adopted into higher institutions. (Tulinayo, Ssentime, & Najuma, 2018). The introduction of digital technologies into higher learning institutions tends towards students that are well vast or have interacted with digital technologies before (Conole et al. 2008). Students expect to have enhanced knowledge as a result of their exposure to digital technologies. However, despite the interest and willingness of the faculty, they are integrating the technologies with enough rationale or understanding of the impact of their action. (Price & Kirkwood 2014) as cited in (Martin et al. 2020). Digital Technologies might not replace the teachers, but they can be used to supplement the available information, draw students' attention to the topic on hand, and help students understand better (Sovetkanova et al., 2021; Shulga et al., 2021). Previous researchers reveals that overtime time, there has been a broad introduction of current digital technologies used in Education (Governder & Kayode, 2020; Irele & Kayode, 2021). Thus, Martin et al. (2020) stressed on the prominent ones to focus, and they are:

a. Learning Management System (LMS)

LMS has become the most important means of communicating between teachers and students, submitting and grading assignments, and collaborating among students. Several studies focused on higher Education, especially the 2014 study, show that 99% of higher institutions have set up an

LMS. However, not all of them utilise it. It is recorded that just 85% of the institution use LMS. (Dahlstrom et al. 2014; Sanchez-Alonso et al. 2007). Nonetheless, updated research confirms that with the introduction of several methods, including webinars and printed resources, there has been an increase in how LMS is being used. (Rhode, Richter, Miller, & Wills, 2017).

Students also have the means of creating a way of tracking their learning journey. Through this, students can easily send media files and other content, creating a quick and seamless presentation of different things (CAIE, 2017).

b. Collaboration Tools:

With increased access to digital technologies, higher institutions have adopted collaborative tools into the systems, allowing for the use of programs including wikis, Google drive, dropbox, google products (like Google classroom), forums and other means of collaborating (Stantchev, Colomo-Palacios, Soto-Acosta, & Misra, 2014). Social media and online meeting tools have been considered but will not be practical due to different factors like cultural resistance (Manca & Ranieri, 2016).

c. Audio/Video Tools:

Higher institutions have now integrated tools and need to produce audio and video recording into their educational system. (Martin et al., 2020). Screencast has taken a top position in advancing technology use. Yet, from a survey from various faculties and students, it is glaring that most of them favour using video tutorials to study. (Lantz et al. 2018).

d. Virtual Reality and Augment Reality

The introduction of immersive technologies is becoming a tool for practical teaching and preparation for a significant event. At Stanford University's Neurosurgical Simulation and Virtual Reality centre, the system adopted uses virtual reality and augmented reality to prepare for complex brain surgery. The system allows for detailed planning of the surgery by creating simulations gotten from CT scans. (ECLAC, 2021).

Gindy (2020) explains that learners are eager to understand how situations happen in reality. Pathnak & Sheorey (2020) believe it is an innovative and easy way to solve educational challenges. Also, there has been the introduction of a virtual learning environment (VLE), a web-based classroom modeled after the traditional teaching system. (CAIE, 2017).

e. Interactive Whiteboard (IWB)

Learners get to see objects from a computer annexed through a digital projector to a large board, with the chance of interacting with the boards' content even with a finger or a stylus. (CAIE, 2017).

TRENDS OF DIGITAL TECHNOLOGIES IN HIGHER INSTITUTIONS

The trend of digital technologies is worth studying, too, seeing that it is a culture worth exploring.

a. Mobile Learning (M-learning)

According to Fu & Hwang (2018), mobile learning has grown exponentially through several innovations and studies. Students' access to quality learning opportunities has increased over the years, alongside the level at which they collaborate among themselves (Ryu & Parsons, 2012). Despite the attempt at adopting the use of mobile devices by teachers, they were met by different barriers, one of which is the lack of professional training on how to utilise the platform for teaching purposes (Pimmer, Matesscu, & Grohbiel, 2016). Therefore, the use of m-learning is hinged on the faculty's desire to use it (Fu & Wang, 2018).

b. Adaptive Learning

Several higher institutions of Education have begun the Integration of digital programs into their educational system. Thus, students can easily access learning materials, instructions, and tests that quickly adapt to individuals' abilities. This system has been tested for effectiveness and has found out that the method is more effective to some degree (Lehman, D'Mello, Cade, & Person, 2014; Vanlehn, 2011).

Adaptive learning functions on a data-based system where the students' information is used to harness the instructions and tests individual students receive by pushing past its limit to adapt to the learner's experience (Huda et al., 2019). Consequently, it is becoming popular among learners and institutions (New Media Consortium, 2017).

c. Gaming and Simulations

As pointed out in the statement about virtual reality, learners love something that makes them contend or deal with things that look like the reality they are dealing with; invariably, they need to

succeed (Herro et al., 2016; Kapp, 2012). Although this method has not been fully utilised, it remains something several researchers believe is worth using. However, others like Alsawaier (2018) and Barata et al. (2013) believe it might be hard to do, as each cannot capture the informal connotation of different games. Nevertheless, the examination from Howard et al. (2011) on the use of gamification showed how beneficial it is and why the quick adoption by all sections of the academics is essential not only to the students but to the teachers too.

THE EFFECT OF ADOPTING DIGITAL TECHNOLOGIES IN HIGHER INSTITUTION

Seeing the rate at which higher learning institutions are using digital technologies, it is proper to understand how much it has impacted higher institutions.

1. Ease the electronical means of sharing information.
2. Enables participation and maximisation of every opportunity this knowledge sharing technologies have to offer. In a survey carried out in an Indian institution by Pathnak & Sheorey (2020), 80.7 believed digital mode of Education enables them to participate better.
3. Bridging the gap between developed and developing countries.
4. Increases the need to understand and evaluate users' acceptance as well as usage of digital technologies. (Vuorikari et al. 2016; Grigera et al. 2017; Fong, 2009).
5. Clarity in academics that fosters better engagement and helps excel in academics. This can also be corroborated by the survey result done by Pathnak & Sheorey (2020). Only 11.2% of a total 151 respondents disagree with learning through a digital mode of Education.

FACTORS INFLUENCING STUDENTS' USABILITY AND ACCEPTANCE

A recent case study (Tulinayo et al. 2018) used TAM in the exploration of "students' usability and acceptance of digital technologies in resource-constrained higher institution of learning". The research focused on 3000 undergraduate students from higher institutions in Uganda (Makerere and Kyambogo), using 341 respondents as the sampling size.

The result will help serve as the focal point to help determine some factors that have contributed to students' acceptance and usability of digital technologies.

a. Lack of Access

The result shows that "40.8% of the students never use personal desktop computers, 39.3% sometimes use them, and 19.9% use them always (regularly) in their studies". The revelation showed that a larger percentage of the students do not have access to a personal laptop.

b. The Teacher's Requirement

Going further in the study by Tulinayo et al (2018), it is glaring that 39.5% have never tried university computer laboratories, and just 15% of the respondents are frequent users. Students are sometimes required to use the computer laboratories during practical classes. One glaring fact is that students' need to use a computer stems directly from their teachers' requirements.

However, the result reveals that just only 34% have used power points presentations or any interactive learning tools at that. In fact, just 2% frequently use PowerPoint to learn. In addition, just 22.3% of them have ever used a video camera to learn, which might result from little of such resources and ways to integrate them into their studies. Low usage was also recorded for the University of Learning Management System (LMS).

c. The Lack of Correspondence

Another essential aspect touched was the use of the internet and email, where it was revealed that 6.5% never used the internet to learn. However, a considerable number of students, 34.3%, use it sometimes, while 59.2% are frequent users. Also, 87.4% have used emails for their learning process, while 12.6% have never used them.

The same can be said for cloud-based storage like Dropbox, and Google docs since just 20.5% have used them for their learning process. However, the same cannot be said for YouTube, which has a considerable result of 83.3% users among the respondents. As to social media, 91.5% of the respondents reported that they use them.

d. Dearth of Sufficient Digital Technologies

The research further understood the availability of digital technologies to the students, and 81.5% of the students agree that the school needs more digital technologies. However, even the available ones are believed to be substandard ones by the students, as glaring in the result of a survey of WUT students by Grosseck et al. (2020). In this Grosseck's survey, the result also showed students' desire to use digital technologies for their classes.

e. Lecturer Usage

Another thing that influences the usage is the extent to which the lecturer uses it or does not. 43.7% of responders in the case study by Tulinayo et al. (2018) agree that their lecturers use different digital technologies to teach their classes.

Tulinayo et al. (2018) posited that

"This shows that the number of lecturers using digital technologies is still low; this, in turn, affects the students' use of these digital technologies. 40.1% responded that their lectures are approachable and always solve their problems regarding digital technologies, 8.3% neither agreed nor disagreed with that, and 51.6% did not agree. This implies that students' consultation on the use of digital technologies from their lecturers is limited. When asked whether their lecturers provide high-quality instructions to use digital technologies, 38.5% agreed with this statement, 12.8% neither agreed nor disagreed, and 48.7% did not agree. This affirms that few lecturers can guide their students to use digital technologies in their learning process productively. When asked whether their lecturers motivate them to use different digital technologies, 52.5% responded that their lecturers motivate them, 10% neither agreed nor disagreed with the statement, and 37.5% did not agree. A few of the lecturers are playing their role as far as the acceptance and usage of digital technologies is concerned in teaching and learning. From the results, it is evident that lecturers have a minimal contribution to students' digital technology usability and acceptance."

Even at that, one cannot ignore the effect the lecturers have on their students using digital technologies.

f. Students' Inability to Use Digital Technologies

The result also indicated that students' acceptance is based on their ability to use digital technologies. From the statistics, it is clear that 55.2% of the students are not trained to use any of the available technology. Even 7.8% of the respondents did not respond to their ability to use digital technologies.

Looking at their individual ability without the training, the survey shows that 42.5% agreed that they could use digital technologies personally. However, about 57.6% stated that they use digital technologies to communicate with their lecturers and share information with other students. In addition, 51.9% of the respondent can search for information through digital technologies. It is now glaring that students, when motivated, can evolve with digital technologies.

Other factors found from this case study are slow or no internet coverage, lack of stable electrical power supply, insufficient technical supply, and poor maintenance of the personal or university digital technologies.

In some situations, students' inability to use the digital technologies designed explicitly for their languages also have its negative impact, just as is the case of the Romanian respondents in WUT's case study, where 40% of respondents feel digital technologies and online resources written in their languages are not enough (Grosseck et al., 2020).

INFLUENCES OF TEACHERS' ADOPTION AND INTEGRATION OF ICT

Several issues have been championed as the factors influencing educational adoption and Integration of digital technologies before the Covid-19 pandemic. Several complex factors have created barriers to the easy and early adoption of digital technologies into the educational system, including administrative and technical support, lack of infrastructure, and little to no expertise in using digital technology tools. (Oye et al., 2011). Buabeng-Andoh (2012) expanded on the classification made by Sherry & Gibson (2002), whose framework revolves around technological, individual, organizational and institutional factions that must be considered when ICT adoption and Integration is being examined.

Personal Characteristics

According to (Schiller 2003), individuals' characteristics, including gender, age, educational experiences, and level, play a massive role in influencing the acceptance and adoption of innovation. Digital technologies will not record a high success rate until the teacher is prepared to accept ICT integration into their teaching method and not simply have it in their class (Jones, 2001). Lack of enthusiasm, confidence, competence, anxiety, and fear can also affect how teachers integrate ICT into their teaching process. (Buabeng-Andoh, 2012).

Teachers' Attitude

The successful initiation and implementation of educational technology into the school system is significant due to the teachers' support and attitude, especially when the teacher sees the need for digital technology (Hew & Brush, 2007; Keengwe & Onchwari, 2008). Positive attitudes from a teacher can change the course of understanding and the students' learning process and later serve

as an insight into the adoption and Integration of ICT in the education system (Govender & Kayode, 2020).

In Demirci (2009) research among Geography teachers in Turkey, this was the fundamental focus. Using a questionnaire to collect data, Demirci collected data from 79 teachers from 44 different high schools, asking questions about their use of Geographic Information System (GIS). The result proved that the teachers had positive attitudes, making integrating GIS into geography lessons easy. A similar study was done by Teo (2008), where he surveyed the attitudes of Singapore's pre-service teachers towards the use of computing. Sampling 139 pre-service teachers, Teo tried to understand "four factors: affect (liking), perceived usefulness, perceived control and behavioral intention to use the computer". Teo's research showed that the teachers' enthusiasm did not match their understanding of digital technologies. This set of teachers are not alone in not seeing the benefit of using digital technologies in educating their students. However, students' usage of digital technologies is influenced in all ways by teachers, as has also been proven by Drent & Meelissen (2008), whose study on Netherlands' teacher educators reveals they directly influence the use of digital technologies.

Competence

According to Tondeur et al. (2008), computer competence can handle a wide range of different computer applications for numerous purposes. Bordfar (2010) revealed that the Integration of digital technologies into teaching a particular subject could be easily predictable through the teacher's computer competence. Citing Al-Oteawi (2002, p. 253), Bordbar (2010) provided evidence to prove that teachers with computer competence are most likely to have a negative or neutral attitude towards the Integration of ICT into the educational process; invariably missing out on making "informed decision".

A survey that helps expatiate this point is the multiple case-study research by Peralta & Costa (2007). The research was carried out in five European countries and resulted in the researcher discovering that integrating digital technologies into the teaching process is more a result of technical competence. Despite the different views pointed out by the research, a glaring fact is that Integration becomes more accessible when the teachers are confident about their ability to use them, supporting this same claim by (Jones 2004).

Their confidence level is always glaring to the students, like the respondents of the WUT survey (Grosbeck et al., 2020). Radhika Kapur (2018), as cited in (Pathnak & Sheorey, 2020), used the case of the Indian education system and believes the lack of professional advancement, retaining the traditional teaching system. The poor organisation has contributed to the problems of the Indian education system. The Covid-19 pandemic also has contributed to the need for teachers to upgrade their methods of teaching, which have moved online (Herwin et al., 2021).

Computer Confidence

Peralta & Costa (2007) believes that a teachers' computer confidence is the view of their competence and the likelihood to successfully use digital technologies to carry out educational function effectively. This same belief is held by Liaw, Huang, & Chen (2007), who claim that their competence boosts computer confidence. The same can be said of computer usage and perception among Hong Kong's teachers who easily integrated digital technologies due to its simplicity. (Yuen & Ma, 2008).

In the study by Peralta and Costa (2007), Italy's result revealed that teachers who can competently use a computer are prone to show signs of confidence. On the other hand, teachers in Greece supported the claim that their pedagogical method and personal competence are the most significant reasons they confidently use digital technologies. However, one cannot overlook the positive effect of being tutored by other experienced teachers while also having more practice time available (Buabeng-Andoh, 2012).

To explain Jones' (2004) claim about teachers not being ready to use a computer as a lack of their confidence, Balanskat et al. (2007) cited "Fear of failure" and "lack of ICT knowledge" are some of the things undermining their confidence in integrating digital technologies into their studies. This corroborated the result of the research conducted by Becta (2004) that 21% of the surveyed teachers agreed that they feel anxious when teaching because of perceived incompetence.

Gender

Gender differences in digital technologies have been established in numerous studies, but a more significant percentage of them reported how female teachers have "limited technology access", skill, and interest (Volman & van-Eck, 2001). Other researchers like Kay (2006) and Wozney et al. (2006) reported that the rate at which women use digital technologies was lower than those of

men. This was further proven by a study carried out to understand gender differences in digital technologies for educational purposes. In this study, males' scores were higher than. (Markauskaite, 2006)

In another research carried out in Queensland, using 929 teachers, it was discovered that female teachers had a lower adoption rate than their male counterparts (Burnett et al. 2006). The development, however, has taken a significant change in the years to come as this was glaring in the result found in a study done by Bulut & Yukseltur (2009) that the gender gap has drastically reduced with a more significant number of females using more digital technologies than their male counterparts.

Despite the reduction in the difference, Kay (2020) posited that what can work best is the quality of the teachers' preparation.

Teaching Experience

Gorder (2008) did a report that showed that teachers' experience is instrumental to the way they use digital technologies. Further in her study, she could relate the comfort level to the way teachers use computers. In addition, she looked at the teachers' freedom to shape their instruction based on what the teacher perceived the students needed.

Professional Development

The Integration of digital technologies can also be influenced by the teachers' need to develop as a profession. From several studies, it is glaring that teachers' exposure to some form of training can help their embracing and Integration of digital technologies. (Bauer & Kenton, 2005; Franklin, 2007; Wozney et al. 2006). As described by Hew and Brush (2007), exposure to training influences teachers' attitudes to the way they use computers. The influence of being trained was corroborated by the research done among 400 pre-tertiary teachers. They showed that the teachers' development, alongside their continued learning, will help guarantee the successful integration of digital technologies (Muller 2008 as cited in Buabeng-Andoh, 2012).

Other factors are:

1. Accessibility
2. Technical Support
3. Leadership Support

THE NEED FOR DIGITAL TRANSFORMATION

According to Clark (2018), digital transformation refers to several events that allow renovation of businesses aimed at meeting customers' needs through innovative means and information. It means adopting new approaches and methods that use technology and digitalisation to meet society's needs (Grosseck, 2020; Curaj et al., 2018).

It is essential to use the following recommendations for all the bodies involved for the transformation to happen. They need to:

- Develop a digital education policy such that issuance of a certificate can be easy.
- Upgrade the current teaching method
- Build a new team that has all the necessary stakeholders
- Improve current digital platforms
- Work with industry partners.
- Use advanced means of calculating analytics.
- Increase allocations set for finances.

There are several other things like creating a better climate that enables digital cultures.

CONCLUSION

The inevitable fact is that digital technology has advanced and played a significant role in education and economic development. During the Covid-19 outbreak, its positive benefits were amplified with several innovative DT deployments for teaching, learning and assessment. This paper examines the argument around the use of DTs, assesses the evidence supporting DTs' impact, the limits of such impacts, the acceptance and integration of ICT into higher education learning, the transition of higher education into the digital age, and the growing need for TAM. The current digital technologies methods used in higher education and the trends of DTs in Higher Education were also highlighted and described. Students' usability and acceptance, teachers' adoption of and integration into the system, and the need for a digital transformation were all discussed. As a result of this study, it is concluded that there is a need for the integration of DTs into the higher educational system, as they have been shown to work collaboratively in developing, planning, and testing innovative concepts and technologies, as well as enhancing teaching and learning efforts during the COVID-19 pandemic.

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REFERENCES

- Abad-Segura, E., Gonzalez-Zamar, M.-D., Infante-Moro, J. C., and Garcia, G. R., 2020. Sustainable Management of Digital Transformation in Higher Education: Global Research Trends. *Sustainability*, 12, 2107, 1-24. doi:doi:10.3390/su12052107
- Ajzen, I., and Fishbein, M., 1980. *Understanding attitudes and predicting social behavior*. Michigan: Prentice-Hall.
- Al-Okaily, M., Alquadah, H., Matar, A., Lufti, A., and Taamneh, A., 2020. Dataset on the acceptance of e-learning system among universities students' under the covid-19 pandemic conditions. *Data in Brief*, 32, 1-5. Retrieved from <https://doi.org/10.1016/dib.2020.106176>
- Alsawaier, R. S., 2018. The effect of gamification on motivation and achievement. *International Journal of Information and Learning Technology*, 35 (1), 56-79.
- Andersson, A., and Grolund, A. 2009. A conceptual framework for learning in developing countries: A critical review of research challenges. *The electronic Journal of Information Systems in Developing Countries*, 1-16.
- Balanskat, A., Blamire, R., and Kafai, S. 2007. A Review of Studies of Ict Impact on Schools in Europe. *European Schoolnet*.
- Bauer, J., and Kenton, J., 2005. Toward technology integration in the schools: Why it isn't happening. *Journal of Technology and Teacher Education*, vol. 13, no. 4, 519-546.
- Becta B., 2004. A review of the research literature on barriers to the uptake of ICT by teachers. Retrieved 11 18, 2021, from [becta_2004_barrierstouptake_litrev.pdf](#)
- Beltekin, E., and Kuyulu, I., 2020. The effect of coronavirus (Covid19) outbreak on education systems: Evaluation of distance learning system in Turkey. *Journal of Education and Learning*, 1. doi:<https://doi.org/10.5539/jel.v9n4p1>
- Bolu, C., and Egbo, K., 2014. The Role of Higher Education Institutions in the Development of ICT Professionals for Innovation in Nigeria. *International Journal of Engineering Innovations and Research*, 3(1), 1.
- Bordfar, F., 2010. English teachers' attitudes toward computer-assisted language learning. *International Journal of Language Studies*, vol.4. no.3, 27-54.

- Bruneforth, M., 2010. *Higher education in sub-Saharan Africa- A statistical portrait*. Windhoek: UIS workshop on Education Statistics: Unesco institute for Statistic. Retrieved from . [http://www.uis.unesco.org/StatisticalCapacityBuilding/Workshop Documents/Education workshop dox/2010 Windhoek](http://www.uis.unesco.org/StatisticalCapacityBuilding/Workshop_Documents/Education_workshop_dox/2010_Windhoek)
- Buabeng-Andoh, C., 2012. Factors Influencing Teacher's Adoption and Intergration of Information Communication Technolgy: A Review of the Literature. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, Issue 1, 136-155.
- Bulut, S., and Yukseltur, E., 2009. Gender diffrence in self-regulated online learning environment. *Journal of Educational Technology & Society*, vol.2, no. 3, 12-22.
- Burnett, P., Finger, G., Jamieson-Proctor, R., and Wagon, G., 2006. ICT integration and teachers' confidence in using ICT for teaching and learning in Queensland state schools. *Australasian Journal of Educational Technology*, vol. 22, no.4, 511-530.
- Cahapay, M., 2020. Rethinking education in the new normal post-covid era: A curriculum ctudies perspective. *Aquademia*, 4(2), 1-5. doi:<https://doi.org/10.29333/aquademia/8315>
- Cambridge Assessment International Education (CAIE), 2017. Digital Technologies in Classroom. *UCLES*.
- Carnoy, M., 2004. ICT in Education: Possibilities and Challenges. *Inaugural Lecture of the UOC 2004-2005 Academic Year*. Barcelona: UOC.
- Chandra, V., and Lloyd, M., 2008. The Methodological Nettle: ICT and student acheivement. *British Journal of Educational Technology*, 1087-1098.
- Chang, Y., and Zhu, D., 2012. The role of perceived social capital and flow experience in buiding users' continuance intention to social networking in China. *Computers in Human Behaviour* 28(3), 995-1001.
- Chuttur, M., 2009. Overview of the technology acceptance model: Origins, developments and future directions. *Working Papers on Information*, 9 (37), 9-37. doi:http://scholar.google.com/scholar_lookup?&title=Overview%20of%20the%20technology%20acceptance%20model%3A%20Origins%2C%20developments%20and%20future%20directions&journal=Working%20Papers%20on%20Information%20Systems&volume=9&issue=37&pages=9-37&publication
- Clark, E., 2018. *Digital Transformation: What is it?* Retrieved from Educause: <https://er.educause.edu/article/2018/5/digital-transformation-what-is-it>
- Conole, G., laa, M. d., Dillon, T., and Darby, J., 2008. 'Diruptive technologies', 'peagogical innovation': What's new? Finding from an indepth study of students' use and perception of technology. *Computers & Education*, 50(2), 511-524. doi:10.1016/j.compedu.2007.09.009
- Curaj, A., Deca, L., and Pricopie, R., 2018. *European Higher Education Area: The Impact of Past and Future Policies*. Switzerland: Springer International Publishing AG.

- Dahlstrom, E., Brooks, D., and Bichel, J., 2014. *The current ecosystem of learning management systems in higher education: Student, faculty, and IT perspectives*. Louisville: CO:ECAR.
- Davis, F., Bagozzi, R., and Warshaw, P., 1989. User Acceptance of Computer Technology: A comparison of two theoretical models. *Management Science*, 982-1003.
- Demirci, A., 2009. How do Teachers Approach New Technologies: Geography Teachers' Attitudes towards Geographic Information Systems (GIS). *European Journal of Educational Studies*, vol 1. no. 1.
- Drent, M., and Meelissen, M., 2008. Which factors obstruct or stimulate teacher educators to use ICT innovatively? . *Computes & Education*, vol.51. no.1, 187-199.
- Earle, R., 2002. The Integration of Instructional technology into public education: Promises and challenges. *ET Magazine*, vol. 42, no. 1. 5-13.
- Economic Commission for Latin America and the Caribbean (ECLAC) 2021. *Digital technologies for a new future (LC/TS.2021/43)*. Santiago: United Nations.
- Fong, M., 2009. Digital divide: The case of developing countries. *IISIT*, 6 (2), 471-478.
- Franklin, C., 2007. Factors that influence elementary teachers use of computer. *Journal of Technology and Teacher Education*, vol. 15, no. 2, 267-293.
- Friesenhahn, I., 2016. Making higher education work for Africa: Facts and figures. Retrieved from <https://www.scidev.net/global/education/feature/higher-education-africa-facts-figures.html>
- Fu, Q., and Hwang, G., 2018. Trends in mobile technology-supported collaborative learning: A systematic review of journal publication from 2007 to 2016. *Computers & Education*, 119, 129-143. doi:<https://doi.org/10.1016/j.compedu.2018.01.004>
- Gindy, A., 2020. Virtual Reality: Development of an integrated learning environment for education. *International Journal of Information and Educational Technology*.
- Gorder, L., 2008. A study of teacher perceptions of instructional technology intergration in the classroom. *Delta Pi Elpsilon Jounral* Vol. 50, no. 2, 63-76.
- Govender, DW & Kayode, AE 2020. Examining Availability and Frequency use of Computer-Based Technology Resources among Students in Nigerian Universities. *PONTE, Academic Journal*. Apr.2020, Vol.76, Issue 4. doi:<https://doi.org/10.21506/j.ponte.2020.4.26>.
- Grigera, J., Garrido, A., and J. Rivero, 2017. Automatic Detention of usability smells in Web Application. *IJHCS*, 97, 129-148.
- Grosseckl, G., Malita, L., and Bunoiu, M., 2020. Higher Education Institution Towards Digital Transformation- The WUT Case. *European Higher Education Are: Challenge for a New Decade*, 565-581. doi:<https://doi.org/10.10007/978-3-030-56316-5-65>

- Hayward, F., and Ncaviyana, D., 2014. Confront the challenges of graduate education in Sub-Saharan Africa and prospect for the future . *IJHE 1,1*.
- Herro, D., Kings, E., Jacques, L., and Wersinger, B., 2016. Games as a unifying influence in education: Faculty and student perspectives of Game-based Learning. *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 562-566). Savannah G.A: Association for the Advancement of Computing in Education (AACE).
- Herwin, H., Saptono, B., and Firmansyah, F., 2021. Web-based evaluation for teacher professional program: Design and Development Studies. *Word Journal on Educational Technology: Current Issues, 13(4)*, 672-683. doi:<https://doi.org/10.18844/wjet.v13i4.6253>
- Hew, K., and Brush, T., 2007. Integrating Technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. . *Educational Technology*, 223-253.
- Higgins, S., 2009. *Interpreting the evidence base for the impact of digital technologies on learning*. Coventry: Beeta.
- Hollignworth, S. A., Hutchings, K. A., Kuyok, M. A., and Williams, K., 2008. *Technology and School Improvement: reducing social equity with technology?* Coventry: Becca.
- Howard, V., Englert, N., Kameg, K., and Perozzi, K., 2011. Integration of simulation across the undergraduate curriculum: Student and faculty perspective. *Clinical Simulation in Nursing*, 7(1), e1-e10.
- Huda, M., Ulftami, B. P., Luthi, M., Jasmi, K., and Basiron, B., 2019. Adaptive Online Technology: Trends in big data era. In D. Williams, & N. H. (Eds), *Diverse Learning opportunities through Technology-based Curriculum Design* (pp. 163-195). Hershey, PA: IGI Global.
- Irele AO. and Kayode, A.E 2019. Impediments to Quality Education in Nigeria Tertiary Institutions by Alternation [Journal Alternation.ukzn.ac.za/pages/volume-28-2019/alternation-special-edition-28-2019.aspx](http://www.alternation.ukzn.ac.za/pages/volume-28-2019/alternation-special-edition-28-2019.aspx) or doi.org/10.29086/2519-5476/2019/sp28.4a11
- Jones, C., 2001. Teach Support: Preparing teachers to use technology. *Principal Leadership, vol.1, no.9*, 35-39.
- Jones, C., 2004. A Review of the Research Literature on Barrier to the Uptake of ICT by Teachers. *British Educational Communnations and Technology Agency*. Retrieved 11 17, 2021, from <http://dera.ioe.ac.uk/id/eprint.1603>
- Kapp, K., 2012. *The gamification of learning and instruction: Game-based methods and strategies for training and education*. New York, NY: Wiley & Sons.
- Kay, J., Reimann, P., Diebold, E., and Kummerfeld, B., 2013. MOOCs: So many learners, so much potential... *IEEE Intelligent systems*, 28(3), 70-77.
- Kay, R., 2006. Addressing gender differences in computer ability, attitudes and use: The laptop effect. . *Journal of Educational Computing Research, vol. 34, no. 2*, 187-211.

- Kayode, A. E. (2019). Examining Computer-based Technology Skill and Academic Performance of Students in Nigerian Universities. Ph.D. Thesis, Department of Computer Science Education, University of KwaZulu-Natal, South Africa. Upload on university-website: (<https://researchspace.ukzn.ac.za+Kayode+Aderinsola>).
- Keengwe, J., and Onchwari, G., 2008. Computer technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology*, vol.17, 560-565.
- Klessen, T., Hollow, B., D. W., Oloo, J., Mutimucious, J., and I. Eduardo, F. M., 2010. Digital learning management systems in Africa: myths and realities. . *Open Learning*, 25(1), 5-23.
- Lantz, C., Insua, G., Armstrong, A., Dror, D., and Wood, T., 2018. "I'm a visual learner so I like this"; Investigating student and faculty tutorial preferences. *Internet Reference Service Quarterly*, 22(4), 181-192. doi:doi:10.1080/10875301.2018.1427171
- Lee, Y., Kozar, K., and Larsen, K., 2003. The Technology acceptance model: Past, present, and future. . *CAIS*, 12(1), 50.
- Lehman, B., D'Mello, S., Cade, W., and Person, N., 2014. How do they do it? Investigating dialogue moves within dialogue modes in expert human critical review of the role of evidence in informing practice. *Higher Education Research & Development*, 33(3), 549-564.
- Liaw, S., Huang, H., and Chen, G., 2007. Surveying instructor and learner attitudes towards E-learning. *Computer & Education* vol. 49. no.4, 1066-1080.
- Manca, S., and Ranieri, M., 2016. Facebook and the others. Potentials and obstacles of social media for teaching in higher education. *Computers & Education*, 95, 216-230.
- Markauskaite, L., 2006. Gender issues in preservice teachers' training: ICT literacy and online learning. *Australasian Journal of Educational Technology*, vol.22, no. 1, 1-20.
- Martin, F., Polly, D., Coles, S., and Wang, C., 2020. Examining Higher Education Faculty Use of Current Digital Technologies: . *International Journal of Teaching and Learning in Higher Education*, 32(1), 73-86. Retrieved from <http://www.isetl.org/ijtlhe/>
- Moya, M., Musumba, I., and Akodo, R., 2011. Management attitude, support and integration of information communication technologies in higher education in Uganda. *Journal of Modern Accounting and Auditing, USA*. Retrieved from <http://ahero.uwc.ac.za/index.php?module=cshe%26action=downloadfile%26fileid=18409092513601919673425>.
- Mtebe, J., and Raisamo, R., 2014. Investigating students' behavioural intention to adopt and use mobile learning in higher education in East Africa. *IJEDICT*, 10 (3)., 4.
- New Media Consortium. 2017. *NMC Horizon Report: 2017 higher education edition*. Retrieved 11 19, 2021, from <https://library.educause.edu/resources/2017/2/2017-horizon-report>

- New Media Consortium. 2017. *NMC Horizon Report: 2017 higher education Edition*. Retrieved 11 18, 2021, from <http://cdn.nmc.org/media/2017-nmc-horizon-report-he-EN.pdf>
- Organization for Economic Cooperation and Development (OECD). 2001. *Learning to Change: ICT in Schools*. Paris: Information Economic Press.
- Oye, N., Noorminshah, A., and Rahim, N., 2011. Examining the effect of technology acceptance model on ICT usage in Nigerian tertiary institutions. *JETCIS*, 2(10), 533-545.
- Park, S., 2009. An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *JETS* 12(3), 150.
- Pathnak, R., and Sheorey, P., 2020. Impact of Digital Technology on Teaching-learning. *Journal of Critical Reviews*, 7(11), 3937-3951.
- Peralta, H., and Costa, F., 2007. Teachers' competence and confidence regarding the use of ICT. *Educational Sciences Journal*, vol.3, 75-84.
- Pimmer, C., Matesscu, M., and Grohbiel, U.. 2016. Mobile and Ubiquitous learning in Higher Education Settings. A systematic Review of Empirical Studies. *Computers in Human Behaviour*, 63, 490-501.
- Rangasway, A., and Gupta, S., 2000. *Innovation Adoption and Diffusion in The Digital Environment: Some Research Opportunities*. Penn State: eBusiness Research Centre.
- Rhode, J., Richter, S., Miller, P., and Wills, C., 2017. Understanding Faculty use of the learning management system. *Online learning*, 21(3), 68-86.
- Rice, M., 2003. Information and communication technologies and the global digital divide: Technology transfer, development, and least development countries. *Comparative Technology Transfer and Society*, 1,1, 72-88.
- Rodrigues, A. L., Cerdeira, L., Machado-Taylor, M. D. L., and Alves, H. 2021. Technological Skills in Higher Education—Different Needs and Different Uses. *Education Sciences*, 11(7), 326.
- Rogers, E. M. (2003). *Diffusion of Innovations*. New York: Free Press.
- Ryu, H., Parsons, D., 2012. Risky business or sharing the load? Social flow in collaborative mobile learning. *Computer & Education*, 58, 707-720.
- Sanchez-Alonso, Y. V., Mitropoulou, V., and Nickmans, G., 2007. The use of elearning course management systems to support learning strategies and to improve self-regulated learning. *Educational Research Review*, 2(1), 64-74.
- Schiller, J., 2003. Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration*, vol. 41, no. 3 , 171-185.
- Sherry, L., and Gibson, D., 2002. The Path to Teacher Leadership in Educational Technology. *Contemporary issues in Technology and Teacher Education* Vol. 2, no. 2, 178-203.
- Shulga, T., Li, I., Krokhinal, Y. J., Semenov, J., Ryazanova, E., and Baranova, E., 2021. Digital Technologies' impacts on student social adaptation during coronavirus pandemic. *World*

- Journal on Educational Technology: Current Issues*, 13(4), 740-748.
doi:<https://doi.org/10.18844/wjet.v13i4.6261>
- Sovetkanova, D., Turgunbayeva, B., Chinbayeva, B., Aiman, B., and Imansyndykova, N., 2021. Innovative methods and technologies of training specialists in the conditions of postgraduate pedagogical education. *World Journal on Educational Technology: Current Issues* 13(4), 684-695. doi:<https://doi.org/10.18844/wjet.v13i4.6255>
- Stantchev, V., Colomo-Palacios, R., Soto-Acosta, P., and Misra, S. 2014. Learning management systems and cloud file hosting services: A study of students' acceptance. *Computers in Human Beavious*, 31, 612-619.
- Tarhini, A., Arachchilage, N. A. G., and Abbasi, M. S., 2015. A critical review of theories and models of technology adoption and acceptance in information system research. *International Journal of Technology Diffusion (IJTD)*, 6(4), 58-77..
- Teo, T. 2008. Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology*, vol.24, no.4, 413-424.
- Tomaro, Q. P. V. 2018. ICT integration in the educational system of Philippines. *Journal of Governance and Public Policy*, 5(3), 259-282.
- Tondeur, J., Valcke, M., and Braak, J. V. 2008. A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. . *Journa of Computer Assisted Learning* vol. 24. , 494-506.
- Trakhtenberg, K. D., 2012. *Modern Technology Advantages and Disadvantages*. Retrieved from Core: core.ac.uk/display/14060397
- Tsellios, N., Daskalakis, S., and Paappadopoulou, M., 2011. Assessing the acceptance of a blended learning university course. *Educational Technology & Society*, 14(2), 224-235.
- Tulinayo, F. P., Ssentime, P., and Najjuma, R., 2018. Digital Technologies in resource contrained higher institutions of learning: a study on students' acceptance and usability. *Internation Journal of Educational Technology in Higher Education*.
- U.S Department of Education, Office of planning., 2009. *Evaluation, and Policy Development, Evaluation of Evidence-Based Pratices in Online Learning. A Meta-Analysis and Review of Online Learning. A Meta-Analysis and Review of Online Learning Studies*. Washington D.C 2009.
- Underwood, J., 2009. *The Impact of Digital Technology: A Review of the evidence of the Impact of Digital Technologies on Formal Education*. Becta.
- Vanlehn, K., 2011. The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologies*, 46(4), 197-221.
- Volman, M., and Van-Eck, E., 2001. Gender equity and informaiton technology in education: The second decade. *Review of Educational Research*, vol.71, no.3, 613-634.

- Vuorikari, R., Punie, Y., Gomez, S., Brande, G. V., and All, E. 2016. DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model. *Technical Report, JRC-Seville Site*.
- W. Hale, B., and Gifford, B., 1997. "From Theory to Implementation" The Mediated Learning Approach to Computer Mediated Instruction, Learning and Assessment". *Educom Review*, 32:5.
- Williams, M., 2003. Technology Integration in Education. In T. S.C, & F. W. (Eds.), *Teaching and Learning Technology* (pp. 17-31). Singapore: Prentice Hall.
- Wozney, L., Venkatesh, V., and Abrami, P., 2006. Implementing computer technologies: Teachers' perception and practices. *Journal of Technology and Teacher Education*, vol. 14, no. 1, 173-207.
- Yuen, A. H., & Ma, W. W., 2008. Exploring Teacher Acceptance of E-learning technology. *Asia-Pacific Journal of Teacher Education*, vol.36, no.3, 229-343.