INNOEDUCA

International Journal of Technology and Educational Innovation

INNOEDUCA-GRUPO DE INVESTIGACIÓN
ISSN-e 2444-2925
Vol. 9 nº 1

umaeditorial

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - ISSN-e: 2444-2925

INNOEDUCA

PRESENTACIÓN

Innoeduca. International Journal of Technology and Educational Innovation es una publicación científica que nace auspiciada por el Grupo de investigación Innoeduca (grupo consolidado de la Junta de Andalucía - SEJ-533) de la Universidad de Málaga (España). Innoeduca es un grupo interdisciplinar de docentes e investigadores (pedagogos, matemáticos, informáticos, diseñadores gráficos…) de distintos niveles educativos, que desarrollan productos, investigaciones y formación en el campo de la Innovación y la Tecnología Educativa. Desde sus inicios, el grupo ha desarrollado una labor investigadora permanente y ha tenido como prioridades el contacto y la colaboración con otros investigadores y centros nacionales e internacionales.

Innoeduca. International Journal of Technology and Educational Innovation es una publicación en línea, abierta y revisada por pares, que proporciona una plataforma para exponer y compartir conocimientos en forma de artículos de investigación empírica y teórica, estudios de caso y revisión de la literatura. Los artículos enviados deberán ajustarse a las normas de publicación y tratar sobre educación, innovación y tecnología.

Esta publicación surge con un compromiso de rigor en el proceso editorial (selección de manuscritos, plazos de edición y calidad del resultado final) avalado por un comité científico de máximo prestigio internacional.

Difundir contenidos de calidad entre la comunidad científica es la finalidad de este proyecto. Por ello, se admitirán artículos escritos en inglés, español o portugués.

Esperamos que este número resulte interés al lector dada la relevancia de las investigaciones publicadas.

Julio Ruiz-Palmero
Director de Innoeduca. International Journal of Technology and Educational Innovation

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - ISSN-e: 2444-2925

ÍNDICE

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 5-26 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.16433

Barriers to Digital Inclusion among Older People: a Intergenerational Reflection on the Need to Develop Digital Competences for the Group with the Highest Level of Digital Exclusion

Barreras a la inclusión digital de las personas mayores: una reflexión intergeneracional sobre la necesidad de desarrollar competencias digitales para el colectivo con mayor nivel de exclusión digital

RECIBIDO 15/03/2023 ACEPTADO 20/03/2023 PUBLICADO 01/06/2023

Łukasz Tomczyk
Jagiellonian University, Poland
lukasz.tomczyk@uj.edu.pl

Maria Lidia Mascia
Universita' Degli Studi Di Cagliari, Italy
marialidiamascia@gmail.com

Dorota Gierszewski
Jagiellonian University, Poland
d.gierszewski@uj.edu.pl

Christopher Walker
International House Bielsko-Biała, Poland
closelyobserved@gmail.com

ABSTRACT

Over the past thirty years and with the rise of the digital society, the process of digital exclusion has become increasingly noticeable and represents a sub-type of social exclusion. Shaping digital competences in the era of the intensive development of the information society requires constant reflection on the effectiveness of such activities. This article looks at what kind of barriers are currently blocking the development of digital competences among older people. Using structured interviews, responses were obtained from 30 respondents in Poland, though the respondents themselves did not belong to the demographic of older people. The respondents identified eight main types of barriers to digital inclusion for older people: 1) Fear of new technologies, 2) No need to use ICT, 3) Self-marginalisation in the information society, 4) The characteristics of new media, 5) Attitude to Life-Long Learning, 6) Physical limitations, 7) Economic determinants, and 8) Infrastructural limitations. The results of the qualitative research provide a fresh look at the process of the formation of digital competence among vulnerable groups within the wider process of digital inclusion. This article is the result of an international project REMEDIS supported in Poland by the National Science Centre - NCN [021/03/Y/HS6/00275].

KEYWORDS Digital skills; digital competences; digital inclusion; digital divide; older people; Poland.

RESUMEN

En los últimos treinta años y con el auge de la sociedad digital, el proceso de exclusión digital se ha vuelto cada vez más notorio y representa un subtipo de exclusión social. Dar forma a las competencias digitales en la era del desarrollo intensivo de la sociedad de la información requiere una reflexión constante sobre la eficacia de tales actividades. Este artículo analiza qué tipo de barreras están bloqueando actualmente el desarrollo de competencias digitales entre las personas mayores. Mediante entrevistas estructuradas, se obtuvieron respuestas de 30 encuestados en Polonia, aunque los propios encuestados no pertenecían al grupo demográfico de personas mayores, sino desde la visión de los más jóvenes. Los encuestados identificaron ocho tipos principales de barreras para la inclusión digital de las personas mayores: 1) Miedo a las nuevas tecnologías, 2) No necesidad de utilizar las TIC, 3) Automarginación en la sociedad de la información, 4) Las características de los nuevos medios, 5) Actitud hacia el aprendizaje permanente, 6) Limitaciones físicas, 7) Determinantes económicos y 8) Limitaciones de infraestructura. Los resultados de la investigación cualitativa brindan una nueva mirada al proceso de formación de la competencia digital entre los grupos vulnerables dentro del proceso más amplio de inclusión digital. Este artículo es el resultado de un proyecto internacional REMEDIS apoyado en Polonia por el Centro Nacional de Ciencias - NCN [021/03/Y/HS6/00275].

PALABRAS CLAVE Habilidades digitales; competencias digitales; inclusión digital; brecha digital; personas mayores; Polonia.

1. INTRODUCTION

Digital exclusion is a form of social exclusion (Jaeger et al., 2012; Parsons, & Hick, 2008; Tomczyk, 2015). For almost three decades, this problem has been one of the most significant challenges for social policy as well as for non-formal education due to the intensely developing information society (Norris, & Inglehart, 2013). Digital exclusion is mainly related to either having a low level of digital competence or lack the competence entirely (Blažič, & Blažič, 2020; Shakina et al., 2021). Information and communication technology (ICT) proficiency, access to new media and the Internet, the ability to use popular e-services, motivation related to the use of ICT, and critical-constructive analysis and attitudes towards ICT are critical factors for effective function in the information society (Wątróbski et al., 2018; Ziemba, 2019).

The possession of digital and media competence has now become as obvious and natural as the use of traditional media in the so-called analogue days – the ability to swipe to turn the page of an e-book might now be taken for granted in the same way that turning a physical page is (Plebanska, 2021; Stosic, 2015). The world is now highly saturated with professional and leisure activities that have entirely ICT-based solutions - letters are rare compared to emails, and fewer people share printed photos than share via social media – but despite this enormous shift to the online realm, there remain groups that are characterized by their low levels of digital and media competence (Cheshmehzangi et al., 2022; Esteban-Navarro et al., 2020). This community includes, in particular, older people (Tomczyk et al., 2019). Given the scale of the phenomenon of digital exclusion and the still unsatisfactory level of digital competences among older people, there is a need to ask the question of why, despite the many activities related to digital inclusion, are senior citizens still characterised by a high level of exclusion? To understand this, we might first consider the barriers that stand between the senior citizen and the development of the competences needed to function in the digital world. This article reflects on these points, and fills a gap in research that considers how this group's digital competences can be developed.

Theoretical framework

With the average life span increasing in many parts of the world, the topic of ageing has itself become central (Ramia, & Voicu, 2022). Many factors (for example, the decline in mortality couple with declining birth rates) have contributed to an increasingly ageing population globally, and particularly in Europe (Alexopoulou et al., 2022; Dąbrowska, & Lubowiecki-Vikuk, 2020). The median age of the European population is expected to increase by 4.5 years, reaching 48.2 years by 2050. The ratio of people aged 65 to 74 is expected to increase by 16.6 % and those aged 75 to 84 years by 56.1 %. The number of centenarians in the European Union (EU) is predicted to reach 500000 by 2050 (Eurostat, 2023). With this demographic shift, researchers have been called upon to analyse the characteristics of the ageing population to ensure that older individuals can maintain their health and achieve active and successful ageing (Abud et al., 2022). Ageing is a gradual process of continuous change that occur at the physical, cerebral, cognitive, emotional, and social levels, and corresponds to the period that begins immediately after adulthood, at 65 years of age (De Beni, 2009). As ageing is the last stage of development in an individual's life cycle, it is often associated with the onset of physical and cognitive decline. The scientific literature has largely focused on dispelling this false myth of decline, and studies have revealed the possibility of successful ageing and of cognitive maintenance (Kourtesis, & MacPherson, 2021; Sharifian et al., 2020). Numerous studies have demonstrated that older people are capable of not only further developing existing skills and competences but also of acquiring new skills, which itself is indicative of well-maintained cognitive abilities (Vásquez-Amézquita, 2016). These abilities are particularly useful in modern society due to the rapid development of Information and Communication Technologies (ICT) that have revolutionised people's lives and lifestyles. Older people have to utilise tools that simply did not exist during the most active phase of their life (Mubarak, & Suomi, 2022). With the increasingly widespread use of the Internet, computers have transformed into a tool for communication and interaction between people and organisations, instead of being of relatively niche interest as they were to a large extent forty years ago. Coupled with the saturated coverage offered by mobile devices, this technological shift has meant that more people are available and accessible for more of the time than ever before, including both the young and the much older members of society. Recent economic changes have led to the gradual abandonment of cash, replacing it with less concrete instruments, such as online payments and credit or debit cards, which require open-mindedness and familiarity with technology. In fact, some processes, from reserving a table at a restaurant to applying for state support, have moved online to such an extent that those who lack the necessary competences find themselves excluded from actions that they once would have considered as simple or relatively unproblematic.

The older person, therefore, finds themself living in an information society that has undergone remarkable and rapid transformations within a short period of time. Although the presence of good cognitive abilities and a good cognitive reserve are fundamental to life in this transformed society, they must be supported by a system that promotes an efficient and accessible interaction between older people and ICT. If not appropriately supported, these ICT innovations can lead to the expansion of a digital divide, an invisible wall that separates those who have access to ICT and those who do not (Sparks, 2013; Van Dijk, 2017). The presence of the digital divide represents a problem for society, above all in term of exclusion. Van Dijk (2005) associates the digital divide with the inequality in the participation in society across three perspectives: lack

of innovation and economic growth; lack of economic, social, and cultural equality; and lack of security. The size of the divide is greatest and most frequently observed in terms of the age of the person.

The set of factors that characterize the digital divide among older people is today encompassed by a specific part of the literature on the subject, called the 'digital grey,' which refers to the specific gap between ICT and older people (Mubarak, & Suomi, 2022; Tomczyk et al., 2019). ICT could provide older people with considerable advantages and benefits, and has become increasingly important for accessing services (for instance digital health and mental health), circulating information, and building and maintaining social relationships (Bonfiglio et al., 2021; Chen et al., 2022; Huxhold et al., 2020; Stara et al., 2022). For instance, during the COVID-19 pandemic, technological tools provided opportunities for e-health and for social contact (Valokivi et al., 2021; Vargo et al., 2021). The grey divide can cause the digital exclusion of older people. Digital exclusion or e-exclusion can isolate an individual from the information society, leading to unequal access to ICT activities and resources. The digital exclusion of older people is a global issue above all because it is tied to quality of life and negative aspects such as loneliness, social isolation, and negative mental and physical health outcomes (Chen et al., 2022; Pedrós Barnils, & Schüz, 2022). Understanding the reasons for the digital gap is an important precursor to identifying effective actions and strategies by which to bridge the gap. The challenges of ICT use and digital exclusion among older people are complex and include many and multifarious mediating factors. These factors can be categorised as internal/individual (e.g., psychological aspects, motivational factors, fear of new technologies, attitude towards technology, cognitive overload, personal experience, self-marginalisation in the information society, physical limitations, technostress, and economic determinants) or external/contextual (e.g., resources, poor infrastructure, inadequate technology, lack of sufficient technological tools, characteristics of new media, social-cultural reasons, and lifelong learning opportunities) (Abud et al., 2022; Alexopoulou et al., 2022; Chaouali, & Souiden, 2019; Dąbrowska, & Lubowiecki-Vikuk, 2020; Kuc-Czarnecka, 2020; Van Dijk, 2005; 2017; Van Deursen, & Van Dijk, 2015).

The issue of the digital grey has grown in recent years, with even the European Parliament underlining on 13 December 2022 the importance of actions intended to increase digital inclusion (https://www.europarl.europa.eu/doceo/document/TA-9-2022-0438_EN.html). Elsewhere, Kuc-Czarnecka (2020) argues that e-exclusion in Poland is caused mainly by territorial areas being particularly vulnerable to digital deprivation due to infrastructural deficiencies, such as lack of access to stable internet connections or poor penetration of mobile network signals into rural or mountainous areas. Other research (Dziuba et al., 2021) has reported on technical restrictions concerning the availability of the Internet among older Polish adults. The same study presents mental barriers connected with a lack of interest and motivation, specifically towards Internet use.

Older citizens who attend the University of the Third Age at the University of Economics in Wroclaw report that they use the Internet for keeping in contact with people, for online shopping, and for obtaining information on their health status (for instance, by accessing laboratory tests online instead of needing to return to the doctor's office to collect a printed copy of the results). Institutions play a key role in promoting computer literacy to those that need it, and in encouraging conscious use of ICT. There are ways and means available to remove both individual and contextual barriers, and by organising training courses with teaching methods that overcome resistance to new technology, older people can be better motivated to learn about and use ICT.

2. MATERIAL AND METHOD

2.1. Aim and subject of the study

The aim of the research was to –delineate the barriers to the digital inclusion of older people according to the views espoused by the wider society, and for that purpose the subject of the response was obtained through interviews with adults who are themselves not older people. The objective of the research stems from the need to redefine the formation of the digital competences of older people, as well as to increase the effectiveness of this process, taking into account accumulated social knowledge. The research objective is also related to the need to discover new solutions to support the digital inclusion of groups with the highest digital exclusion rate. The research objective not only has a descriptive function but is one of the elements of the implementation of the international research project "REMEDIS - Rethinking Media Literacy and Digital Skills in Europe".

2.2. Survey procedure and sampling

The project is part of an effort to reveal public perceptions of the obstacles associated with digital inclusion, and in the present research thirty people between the ages of 20 and 55 answered one open-ended question about the most important factors obstructing digital inclusion in Poland. Participation in the research was voluntary and included the ethical principles of social science and the internal regulations of the REMEDIS project. The interview question that the respondents answered was made available in digital form. The research tool was subject to a pilot study as well as to evaluation by an external expert.

The sampling was carried out with a purposive approach. The selection criteria were the age of the respondents, i.e. younger or middle adulthood. The research does not allow for generalisation (i.e. the determination of the scale of the phenomenon of barriers to digital inclusion), but is primarily aimed at understanding the factors that obstruct effective digital inclusion. Thirty people were recruited to participate in the study (via snowball methodology) due to typical qualitative research procedures.

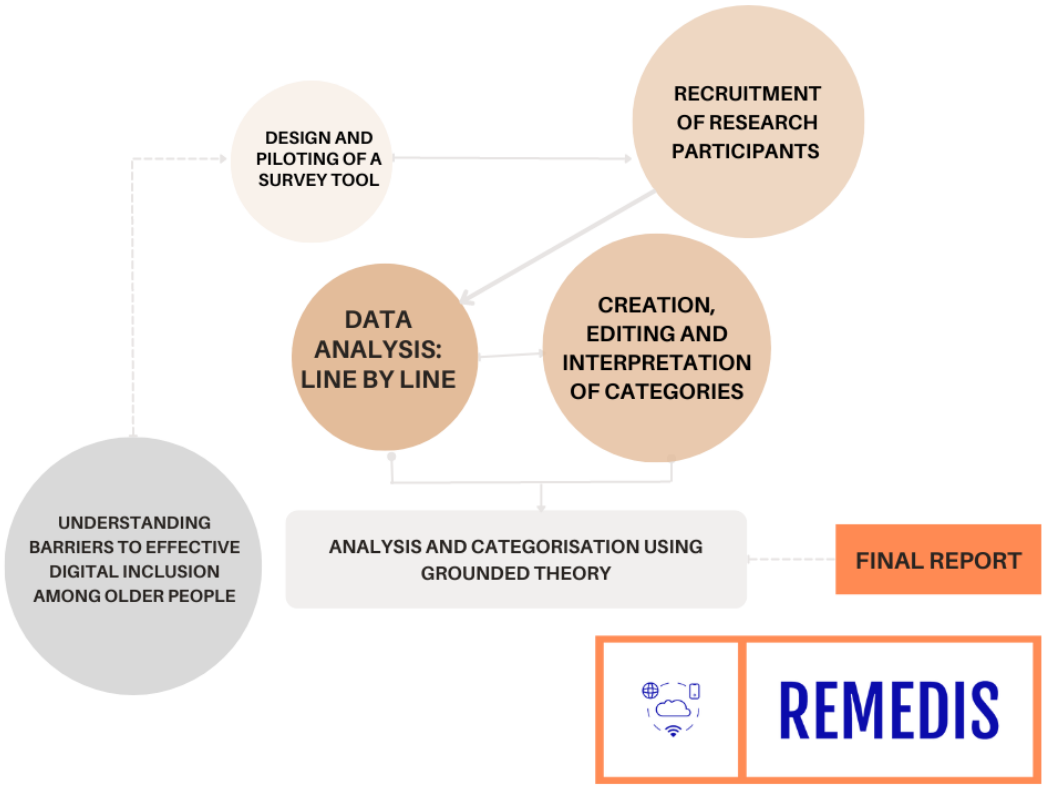
The statements obtained were analysed on an ongoing basis in terms of the emergence of categories of barriers to digital inclusion, and through this analysis the factors were either added to existing categories, or new categories were created. The analysis and categorisation were carried out using grounded theory, among other factors, due to the irreversible nature of the changes taking place in the information society over recent decades.

The research scheme used in this study is presented in Figure 1. (See next page)

2.3. Research ethics

Participation in the study was entirely voluntary. Those responding were informed of the purpose of the study, the source of funding for the study, and how the data would be processed. No information was collected in the course of the study that would identify the respondent. Each person participating in the procedure was free to opt out of the response questionnaire at any time.

FIGURE 1. Research Scheme



2.4. Research limitations

This study has methodological limitations in that it presents the phenomenon of digital exclusion and the formation of digital competences among older people by individuals who do not belong to this age group. On the one hand, this fact should be seen as a methodological limitation, as the conditions of digital inclusion are discussed by people in early and middle adulthood, i.e. individuals who are not members of the excluded group, and who can in some sense be considered as digital natives and who have developed their own competences due to the necessity of participating in an increasingly digitalised school system or of carrying out professional tasks using ICT. On the other hand, this limitation can also be seen as a strength of the present study, which goes beyond the typical research that examines the barriers to digital inclusion as it is considered by older people or experts (media educators, social and educational gerontologists) (Tomczyk, 2018).

3. RESULTS

Based on the analysis and categorisation of the contributions, eight main barriers related to the digital inclusion of older people were noted. These barriers related to: having concerns about starting to use basic ICT and e-services; lacking the need to use ICT in everyday life; feeling that new media belong to and are targeted at younger generations rather than to older age groups; problematic use of ICT due to the peculiarities of new

media; lack of educational infrastructure encouraging the formation of digital competences; physical limitations due to psychobiological conditions; and economic constraints. A summary of the categories can be found in Figure 2, while a detailed analysis of the individual barriers is presented in the following subchapters.

3.1. Fear of new technologies

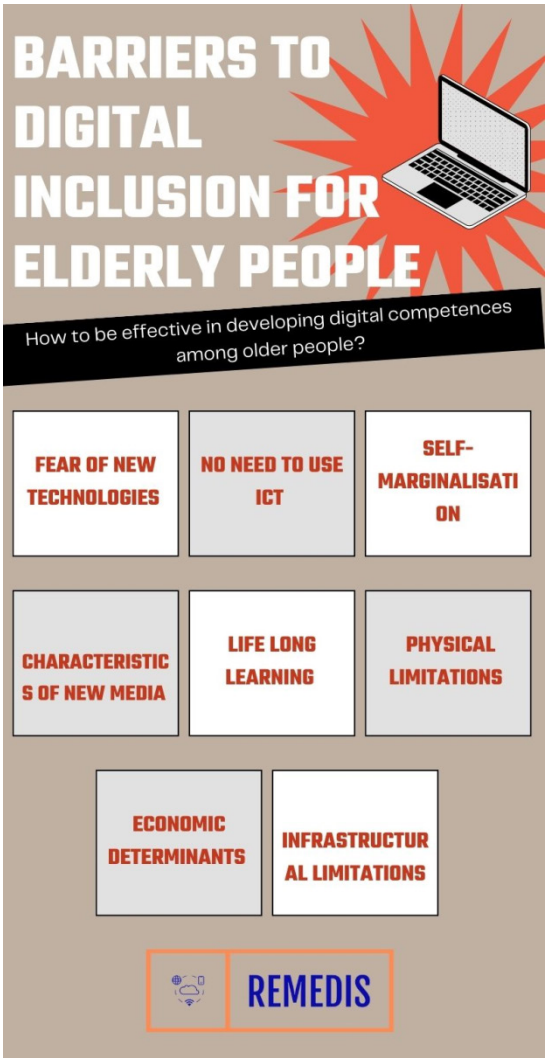
One of the most prominent suggestions put forward by the respondents concerns the perception that older people fear the use of ICT, and older people who either do not use ICT in a systematic way, or who do not use it at all, are characterized as having a fear of handling basic IT equipment and services. This condition is linked to an a priori belief that operating ICT is extremely difficult, which can be linked to the belief that any attempt to use ICT will result in failure.

> "I think one of the biggest barriers for older people towards technology is the fear of technology itself" (R1, W).

> "Fear of the unknown, belief that using modern technology is very difficult" (R14, W).

According to one respondent, older people's fears are not so much due to technical aspects (as can be seen in the responses given above), but to social conditioning regarding feedback on the style of use of new media. The same respondent also emphasises that the fears are linked to the issue of comparing the level of one's own digital competence to other people of a similar age. Thus, it is not only the perception of the difficulty of handling new media alone that obstructs, but also the social interactions resulting from handling ICT.

FIGURE 2. **Overview of the barriers to digital competence among older people**



> "Another issue is also the fear of the opinion of others, perhaps comments against them. Often this kind of fear is also related to an unjustified comparison to the abilities of others, which also affects the self-esteem of older people" (R23, W).

A factor associated with handling new media concerns the perceived dangers present in cyberspace. The respondents suggest that there is a group of older people who are very fearful of handling e-services due to a perception of the prevalence of online fraud or phishing attempts. This kind of fear can be understood in two ways. On the one hand, it demonstrates an awareness of the features of the information society, while on the other hand, it represents a fear resulting from an inadequate level of digital competences that includes not only elementary ICT skills but also a digital security component.

"My grandfather always asked me to buy him plant seeds online that he couldn't get from a traditional shop. He was always afraid of handling his bank account and buying through allegro [an online marketplace], he thought it was extremely complicated and was of the opinion that if he clicked the wrong thing he could give someone access to his bank account and his money would be stolen" (R10, M).

"They are afraid that if they click on something they will have to pay for it straight away" (R18, M).

"Older people are afraid to do a lot of online activities because they are not fully convinced of the safety of digital activities. It is a new world for them, very distant from the one in which they used to function. This is why they approach online transfers, bill payments, or other transactions that were previously only available to them in a traditional form with a certain reluctance" (R23, W).

3.2. No need to use ICT

Another barrier is not having the need to use a computer, internet, smartphone, or e-services. This is since older people do not always understand what activities can be done with ICT. In addition, their previous functioning in an analogue society allowed them to satisfy their life, work, and entertainment needs. Therefore, their lack of knowledge about the possibilities of new media to improve quality of life appears as a basic criterion obstructing digital inclusion as well as the development of digital competences.

"Older people don't always know what it can be used for and are therefore afraid to use it. Another barrier is the conviction that they don't need it at all, because they have lived so many years without it - so what do they need it for?" (R1, W).

"They think that the Internet for people their age is not necessary since they have managed without it all their lives so why introduce new possibilities in old age" (R11, W).

"They also think that the skill is unnecessary. Because they have managed all their life without it, why do they need it all of a sudden. Especially because in their perception there is nothing there for them" (R12, W).

Due to a lack of information about the potential benefits of using ICT, older people lack the intrinsic motivation to not only use elementary e-services, but also to transform habits linked to the analogue world.

"They are not fully aware of how the Internet works and the benefits that computer use can bring (quick access to information, paying bills remotely, etc.)" (R20, W).

"Seniors feel that the Internet for people their age is not necessary since they have managed without it all their lives so why introduce new possibilities in old age" (R26, W)

One respondent suggests that the paucity of content relevant to older people is one reason for the lack of motivation or need to use the Internet. Such declarations are directly linked to the low level of knowledge about how new media work and the resources that can be found in cyberspace.

"Older people often feel that there is no content on the internet that could be of interest to them" (R10, M).

Another category here has to do with family aspects. The involvement of the family in meeting the life needs of older people results in such needs being met in the analogue environment. Also, it is often the case that younger members of the family become surrogate users on behalf of older people in ICT mediated

activities, thus reducing both the need and opportunity for older people to explore the possibilities of cyberspace.

> "My grandmother doesn't want to learn how to use the computer because she takes care of the farm and she thinks she doesn't have time for it and she doesn't need it because she always has the possibility to get help from her children or grandchildren if she needs some information that can be found on the Internet" (R5, W).
>
> "They don't want to use the devices because often family members do it for them" (R19, M).

3.3. Self-marginalisation

Self-marginalisation results from a lack of confidence in one's own abilities, not only in relation to ICT use but also from a negative self-assessment of one's effectiveness in learning to use new devices.

> "Seniors are embarrassed, afraid and also distrustful of the latest technology. They are often not convinced about the value of the latest technologies, assuming in advance that they will not learn anything and, worst of all, they will definitely break something because they are older" (R11, W).

The development of digital competence is linked to the evaluation of one's own cognitive or motor processes. According to the respondents, some older people are characterised by impaired perceptual processes as a direct result of their age. This oversimplified assertion needs to be made more specific, though this does suggest that the group of older people is heterogeneous in nature. Ability to use basic ICT is not necessarily related to the age of the user but instead connects to a wide variety of biopsychosocial determinants. Age may well even come across as an excuse for not using ICT rather than a rational justification.

> "Older people say they are too old and that they are sight-impaired" (R2, W).
>
> "Age - I'm too old" (R3, W).

Self-marginalisation is associated with negative feelings linked to deficiencies in the use of ICT. Overcoming such negative emotions might well be a necessary first step in moving towards digital inclusion.

> "The main barrier to older people learning to use new technologies is embarrassment. They are ashamed of their inability in this area. They think they are too old to understand it and then operate a computer or the Internet by themselves" (R12, W).

Issues of self-perception is crucial in the context of the intensive development of technology. The dynamic development of ICT accounts for some of the digital exclusion in groups such as older people. The rate of change and innovation has no analogue equivalent – many older people likely still own the same landline telephone that they owned thirty years ago, but this year's smartphone models and the latest versions of the operating systems they use little resemble those of five years ago, and even the vocabulary around such devices and e-services can change at an intimidatingly swift pace. Words enter the language, become popular, and die out in a brief space of time – it is rare to hear people speak of 'blogging' now but it was the central activity online only twenty years ago – and so there is reason to sympathise with older people who feel that these changes occur too quickly for them to keep up with life in the information society.

"Internal barriers, on the other hand, include beliefs, older people thinking it is too late to learn, negative perceptions of themselves as an older person. This is also accompanied by a fear of new things, a lack of self-confidence, exacerbated by a poor understanding of modern technology" (R15, W).

"They think they will not be able to keep up with technological advances" (R18, M).

The respondents point to a contradiction in the thinking of older people about the very nature of the information society. There is a preconceived notion that, since ICT was brought into the world by younger people, it was created to satisfy the needs of the younger generation at the exclusion of the older. This is a false dichotomy of sorts – the fact that much innovation comes from younger generations does not mean that older generations are purposefully excluded, and in fact many new e-services, such as the ability to view laboratory test results online instead of having to go to the lab to collect the print-out, and the ability to have medical prescriptions delivered to an electronic device instead of risking infection by visiting the doctor in person, appear to have been designed with precisely this demographic in mind.

"Their belief that electronic equipment is reserved for younger generations. These people think that they are too old for that, that they won't understand it and they don't even try to learn these competences. They think that the world of technology is not for them" (R29, W).

"Stereotypical thinking - the Internet is not for seniors" (R7, M).

3.4. Physical limitations

As the body ages, there are visible biological changes that affect, for instance, hand-eye co-ordination. However, as previously mentioned, this demographic is heterogeneous and so it is not true that all older people experience the same changes at the same time. It is generally true, though, that for many within this demographic, changes in bodily function have an effect on ICT use and on the ability to learn about ICT. The deterioration of the senses and of fine motor skills can become a factor that inhibits the use of ICT.

"Physical barriers - impaired vision and hearing, trembling hands" (R4, W).

"Reduced physical fitness may be a reason why seniors do not undertake education in the use of new technologies" (R5, W).

"Physical problems e.g. impaired fine motor skills" (R20, W).

The respondents consider more than just the physical processes involved in the use of ICT, taking into account such issues as memory as well. It is important to consider the effect of such phenomena as muscle memory – the ability to learn a process and to be able to do it without conscious effort. The ability to create new patterns degrades with time, leading to issues such as those discussed below that must be accounted for in any attempt to overcome the barriers to digital inclusion in this age group.

"I have a neighbour who I help recharge her mobile phone because she can't remember what she has to click on one by one. So I think poorer memory functioning causes a lot of problems' (R8, W).

The limitations presented in this section offer important insights in the discussion on the biological determinants of the formation of digital and media competence. While the biological limitations are indisputable, they are not at the same time factors that are present in the same intensity in all older people due to the

heterogeneity of this group. In addition, contemporary developments in e-services and ICT make it possible to compensate for certain deficits through options available in software and devices – though many features of what might be termed 'accessibility' are not installed in out-of-the-box solutions. The irony is that to use such functionality, you need to have sufficient digital competence in ICT not to need that functionality in the first place.

> "Older people can be negatively affected by computer use due to, among other things, poorer eyesight, not realising that they can change the size of letters in a text and also increase colour contrast" (R10, M).

> "However, it is often the case that older people feel a physical block against new technologies. They feel they have poor eyesight, they don't feel confident, they are afraid they will do something that will break the equipment" (R13, W).

3.5. Economic Obstacles

One noticeable factor associated with the emergence and entrenchment of digital exclusion is insufficient financial resources. Older people may find that they lack the financial resources for basic ICT equipment, perhaps due to the low-level of pension benefits that they receive as well as to the prioritization of other activities, such as paying for medicine or dietary supplements. This lack of resources might also impact the older person's ability or desire to pay for training on the use of ICT equipment or for participation in professional courses shaping digital competences.

> "One of the most important barriers to older people learning to use new technologies is financial, older people live on a small income, thus they cannot afford to buy a computer and go on a paid course" (R27, W).

> "Older people cannot afford to buy equipment" (R5, W).

> "It is also a barrier that not every older person can afford to buy a computer, laptop or smartphone. Their pensions are often low and any savings are spent on medicines and medical tests" (R29, W).

The financial barrier applies not only to more expensive devices such as laptops, desktops and printers, but also to what might be considered the most basic devices such as smartphones. Though the cost of a reasonably good handset has fallen in recent years, such smartphones tend to become obsolete within a short period, and as they approach the end of their lifespan, new challenges are presented to older users, such as having to manage the limited storage capabilities of cheaper devices.

> "An example from the environment: a neighbour really wanted to learn how to use a smartphone, specifically the photo-taking function, but she could not afford to buy a new phone" (R30, M).

Having sufficient financial resources to purchase equipment is not the only barrier preventing full participation in the information society. Lack of sufficient recurrent funding is also a barrier to the use of e-services due to the systematic costs associated with fees, either connected to the use of a specific e-service with a subscription model, or to such services as mobile data. Given the current stage of development of the information society, in which access to the Internet is as important as, say, access to the electricity that powers IT equipment, the aspect of fixed Internet charges becomes a critical factor.

> "Lack of equipment connected to the network and Internet costs too high" (R17, M).

3.6. Infrastructure

Successful inclusion requires solutions to be available in the immediate area. Despite the intensive development of educational facilities aimed at older people in large cities, there is a persistent accessibility gap in smaller towns and rural areas. In addition, universities of the third age or senior citizens' clubs are institutions that do not always offer computer courses. The accessibility of institutions supporting the acquisition of digital competences appears to be an ongoing challenge.

> "They do not always have the opportunity to use the courses e.g. they are too far away" (R5, W).

> "In my area there are rarely free computer training courses, if they are organised there are few places on them. Another limitation is transport, there are many places in my municipality where there are no or very few buses. As a result, older people have no way of getting to the course" (R27, W).

It is rightly noted by one respondent that infrastructural solutions can also apply to intergenerational education within the family. Grandchildren and children in the family environment appear as natural resources that can also be included in the process of shaping basic digital competences. The potential for social or educational support resources is currently still an overlooked element for successful digital inclusion.

> "Lack of support and help from those closest to them in this respect, lack of understanding of their fear of failure, lack of people who can and want to explain technology to them in a clear, accessible and mutually satisfying way" (R14, W).

3.7. Specificity of new media

The ways in which new media are used do not build on the ways in which analogue solutions to accessing information or communicating used to work. The techniques and approaches most familiar to older people have no online equivalent – to write a letter, one had to know how to hold a pen, but with the deterioration that comes with age, older people could purchase a larger pen or use a specially-made grip; typing an email on a screen measuring only five or six inches diagonally across, with half of the screen taken up by a full QWERTY keyboard, can seem like an insuperable problem, especially for older people who are unfamiliar with the accessibility options provided by their device.

> "They find it cumbersome to operate smartphones because of the small buttons and the small size of the letters" (R10, M).

> "Some things they try to do by force, e.g. pressing the icons on the phone too hard, which makes an app not turn on" (R30, W).

The perception of the usefulness of new media is another factor limiting both the use of modern devices and useful e-services. A lack of understanding of the possibilities inherent in new media creates a number of misconceptions about the benefits of elementary solutions present in the information society.

> "Older people are of the opinion that the phone is for calling and not for playing therefore they do not invest in smartphones" (R27, W).

> "I know from my own experience that older people don't want to change anything in their lives, they prefer the traditional ways of getting information, communicating or doing things that can be done over the phone from home" (R22, W).

As technology develops, the language used to describe either the technology itself or the possibilities of new media develop in tandem, though given the global nature of technology many of these new words are

borrowed from other languages that older people might not be familiar with. This makes the problem more challenging – not only does it feel like older people must learn the language of technology, they must learn other languages too. Messages displayed on electronic devices are written in a vernacular that many older people will find obscure and impenetrable, just as a layperson listening to a conversation between doctors might find that they understand but one word in five.

> "Language barriers - incomprehensible messages for older people, often in English" (R4, W).

The new language of technology is evidenced in material such as advertisements online; advertisers use increasingly sophisticated means to attract their viewer's attention, and this too can prove an obstacle to older people.

> "Incomprehensible advertising" (R16, W).
>
> "Older people need more time to get used to using technology. Their pace is slower, which can be cumbersome, for example when using the internet, when every now and then there are adverts that you have to turn off yourself" (R6, W).

The world of ICT is virtual in a way that the analogue world never was. To send a letter, you would place the document in an envelope, affix a stamp, and place the letter in the postbox. The system was comprehensible and could be described by a non-expert. To send an email, the only connection with the analogue domain is in the icon of an envelope that some services use to denote the creation of a new email. Once sent, the process becomes hidden, and can only be explained through expert knowledge. The skeuomorphic approach of representing virtual processes with relics of the analogue age (or even the early digital age – the 'Save' icon is often represented as a floppy disc, which is an object many younger people may never have encountered) might do little to reassure older people when they use ICT, and might result in a lack of a conceptual understanding of the opaque processes involved in ICT, such as online banking (where is the money actually kept?), cloud storage (where are my files actually kept?), and online shopping (where are the things I want to buy actually kept?), to name but a few. An inability to understand the concepts that underpin these processes might itself be a barrier to digital inclusion.

> "The internet seems to them to be something abstract" (R18, M).

3.8. Life Long Learning

Activities related to the acquisition of digital competence are inextricably linked to learning and teaching processes. Developing ICT skills requires going beyond previously accumulated knowledge and skills. For older people, digital inclusion often involves entering a completely unknown and complex area.

> "It's hard for them to learn new things - there were no computers in their youth" (R17, M).

One respondent highlights the issue of not being able to enter lifelong learning due to learned helplessness. Meeting life needs mediated by new media in some families is to the detriment of the development of older people's digital competence. This is a phenomenon that, despite the best intentions, is at the same time becoming a barrier to effective digital inclusion. By performing ICT-mediated actions on behalf of their older relatives, members of the younger generation may be doing more harm than good.

> "Another barrier is that children or grandchildren do not want to teach them how to use new technologies. They think they don't need it, moreover, they constantly bail them out, they don't let them try, for example, to pick up a parcel from a parcel machine or to withdraw money from an ATM" (R27, W).

In the context of lifelong learning, the respondents point out that effective digital inclusion via the formation of digital competences is very often carried out in the home environment. However, there is a reason that teachers must first become qualified, and those who attempt an amateur version of the pedagogical process might not adopt approaches that benefit older people or that overcome some of the obstacles described thus far. Addressing this type of barrier is particularly important when older people do not have access to professional venues for acquiring digital competences (e.g. senior citizens' clubs, universities of the third age).

> "There are few people who train older people. Those close to them often do it hurriedly and on the run, with the result that the older people understand nothing and become even more discouraged. This needs patient and trained people who explain everything step by step" (R29, W).

> "They don't want to ask for help and there are often people around them who don't have enough patience or the right attitude towards older people" (R30, W).

It is difficult to haracte digital exclusion if there are internal barriers related to the acquisition of new competences, even if these are competences considered key to functioning in the 21st century.

> "They are also haracterized by an attitude full of prejudice against anything new, and overcoming their aversion to change does not come easily to them" (R24, W).

4. DISCUSSION

Digital exclusion is a multifaceted process with many determinants. The present research carried explored the barriers to digital inclusion for older people that can be identified in society. The majority of the respondents highlighted the importance of the various fears that are associated with the use of ICT in the minds of older people. The fear of new technology is a natural phenomenon (Ball, & Holland, 2009), and is associated with the belief that using the web and handling new media is difficult (Chiu et al., 2019); there is also the associated fear of being judged by others. However, it is worth emphasising here that older people also see many benefits and opportunities from using the internet and come to find it difficult to imagine life without it (Chiappe et al., 2020; Holda, 2008; Martinez-Pecino et al., 2013). However, balanced against the irrational fears held by many older people are the wholly rational fears of being a victim of cybercrimes such as phishing and identity theft. The prevalence of cybercrime has increased dramatically in recent decades and has become part of everyday life (Connolly, & Wall, 2019; Leukfeldt et al., 2013).

Motivation is another key factor, and is a prerequisite for starting to use modern technologies (Van Dijk, 2005). This appears equally true in Polish studies, the results of which show that the key form of digital exclusion that determines non-use of the Internet is motivational exclusion (Raport, 2021). Nearly 66 % of Poles who do not use the Internet justify this by their lack of a need to use the Internet to satisfy important

matters in life, coupled with a lack of knowledge of what the Internet can be useful for. Building motivation to use digital technologies and strengthening digital competences, especially among older people with a low level of education, seems to be a primary issue. In addition, promoting the availability of content designed to meet the diverse needs of older people can be an important measure to break down motivational barriers. It can also be noted that people expressing a lack of need for new technologies are generally less accustomed to using the Internet, and it is not surprising then that they have an aversion to technology (Nymberg et al., 2019). Such beliefs seem to stem from having low to zero experience with digital tools.

Self-marginalisation is often a barrier to online access. The findings indicate that older people doubt their ICT proficiency and rate their digital competences as relatively low. It is clear that impaired cognitive functions such as reduced attention span and memory, as well as problems with perception, can affect adaptation to the digital environment. Certainly, information processing is crucial in the learning process. However, it should be emphasised that cognitive impairments, if not associated with multimorbidity, do not affect basic activities of daily living and do not interfere with the learning process. Rikard et al. (2018) and Berkowsky et al. (2015) investigated factors that caused older people living in care homes and living independently to stop using ICT over time. Both studies found that older age and increased frailty (determined by limitations in daily activities) are not related to cessation of Internet use. Thus, age is not a barrier to ICT use, but is rather proffered as an excuse not to undertake new tasks. It is worth noting, however, that ageism too is a barrier to digital inclusion. This can lead to a reduced sense of self-efficacy among older people (McDonough, 2016), and a lack of motivation and confidence in using these technologies (Neves, & Amaro, 2012). Our research confirmed the stereotypical mindset of older people, indicating that ICT is only for young people. This has the effect of a turning away from modern technologies and the claim that access to them is not necessary for older people. Similar results are presented by Fischer et al. (2014) stating that older people tend not to keep up with current technology because they are limited by their interaction with technology and thus do not develop the necessary skills.

Physical limitations can also be a factor in digital exclusion. They are the effect of the biological ageing of the body, i.e. a reduction in the functional reserves of individual organs. This means that, even in its most successful model, ageing becomes a substrate for a reduction in fitness despite the absence of revealed disability characteristics. Declining fitness narrows physical capabilities, resulting in slower reaction times, the deterioration of stimulus processing and integration, a decline in sensory performance, and hearing impairment. All these factors can limit effective digital inclusion. Although the use of technology by healthy older adults has been increasing in recent years (Schulz et al., 2015), the situation differs for people with multiple diseases and functional impairments, and for the elderly.

Not insignificant are the economic constraints that clearly impede access to the Internet. Digital inequalities are a form of social inequality deeply rooted in the socio-economic context (Haight et al., 2014; Robinson et al., 2015). The lack of adequate resources to purchase basic ICT devices is often associated with low pension and disability benefits in Poland. Regardless of the issue of sources of income, the ability to manage finances in such a way that all the most important needs from the point of view of the older person are met remains an important issue. Income enables older people to live no more than modestly. The poor financial situation of a household forces its members to make various savings. In 2021, there was a comput-

er in only 46.9 % of pensioner households against the average across all groups in Poland of a computer in 75.4 % of households. (GUS, 2022). The existing inequalities between older and younger users in terms of access to ICT is also linked to the fact that older people generally connect using outdated devices (Hanson, 2010). The findings show that the financial barrier applies not only to more expensive devices such as laptops and desktops, but also to more elementary devices such as smartphones. Only 33.4 % of people over 65 in Poland use a smartphone, according to the National Media Institute, and 13.8 % of older people use a laptop or notebook. (KIM, 2022). Financial capabilities also allow access to the Internet, and the lack of such access affects the alienation of older people and excludes the possibility of actively using the web (Cruz-Jesús et al., 2016; Poushter, & Stewart, 2016; Robinson et al., 2015).

Infrastructural barriers also stand in the way of effective digital inclusion, with there being an insufficient number of places and insufficient access to such places in which older people can develop their digital competences. The report "Digital DESI for 2022. Poland" (Raport EU DESI ¡, 2022) shows that Poland ranks 24th among the 27 EU countries in terms of the human capital of the digital society. In turn, Socio-digital exclusion in Poland 2021 (Raport, 2021) reports that more than half of those (55 %) who have never used the web live in rural areas. Among all rural residents, the group particularly at risk of digital exclusion (as well as its social consequences) are older adults. This same report recommends building motivation to use digital technologies and strengthening digital competences especially among older people with a low level of education. Counteracting infrastructural barriers guides the strategy behind the launch of the Digital Development Clubs Project (Local Digital Competence Development Centres), which will provide support to older adults, among other goals. The project is planned to be implemented as part of the European Funds for Social Development 2021-2027 programme. The Digital Development Clubs to be established will be a public place for digital education and for familiarising local communities with new technologies. The plan is to launch about 2500 digital clubs, potentially in each municipality, and to prepare about 5000 educators associated with NGOs. and other agents of digital competence development. As part of the pilot programme, the Clubs are to be inaugurated in 60 municipalities in 2023.

In the context of infrastructure, it is also worth highlighting the importance of the family environment as this is where intergenerational education in digital competence often takes place. This kind of social support allows, through grandchildren or others in the family, the acquisition of the essential skills necessary for online participation (Carlo, & Bonifacio, 2020; Cheng et al., 2022; Lee, & Kim, 2019; López Seguíet al, 2019). Nowadays, intergenerational learning is becoming key to enabling older people to be part of the digital transformation. In the past, the younger generations were the concern of the older generations, but there is now evidence of a reverse process of intergenerational learning (Gadomska-Lila, 2020). The benefits of this form of learning include immediate or long-term learning outcomes. The process of intergenerational learning focuses on the two-way nature of the relationship and the learning process, and is seen as a priority strategy in encouraging older people to become more active users of technology, especially in societies with a rapidly ageing population.

New media have their own peculiarities. The increasing miniaturisation of devices makes it difficult for older people to use some devices, such as smartphones with a relatively small touchscreen, though other

devices, such as wrist-worn technologies such as smartwatches, could actually help older people to age successfully, by, for instance, making it easier to monitor blood pressure and heart rate (Lázaro et al., 2020). New media can promote independence, improve quality of life (Demiris et al, 2004; Lewis, & Neider, 2017; Wagner et al, 2012). The rapidly shifting lexical demands of new media is a barrier for older people, as new language leads either to a lack of understanding or to potentially serious misunderstanding and can cause older people to be reluctant to embrace the digital world and stay abreast of new developments. Furthermore, the use and acceptance of ICTs are closely related to older people's experience and attitudes towards ICTs (Nayak et al. 2010).

The penetration of technology into everyday life has become the basis for the learning process of older people in line with the strategy of Life-Long Learning. In Poland, the idea of lifelong learning for older people is largely implemented in Universities of the Third Age (Gierszewski, & Kluzowicz, 2021). Acquiring digital competences encompasses a variety of skills, including accessing digital media, using ICT, critically evaluating aspects of new media and media content, and communicating effectively (Sahin et al. 2010). This provides an opportunity to improve the quality of life and leads older learners towards the conviction that knowledge allows them to create themselves, i.e. to be themselves, and to go beyond the limitations accepted by others. It is noteworthy that the lifelong learning strategy responds to the growing demand for digital technology for all learners, and the goal of this learning is also connected to the prevention of social exclusion. Though sources of motivation are various, the perception of benefits could promote a greater willingness among older people to learn (Pihlainen et al., 2021). In addition, older people's motivation to acquire digital skills stems from a desire to stay up-to-date in the modern world (Costa et al. 2019; Guillén-Gámez et al., 2020; Sastre Reyes, 2019) The benefits of learning digital skills are invaluable and are always worth highlighting and reminding people of.

5. CONCLUSIONS

The results of the study provide insight into the process of the formation of digital competence among vulnerable groups in the digital inclusion process. Inclusion in the digital society is essential in the modern world, so digital inclusion interventions should focus on eliminating barriers. In our research, we sought to understand the determinants of inclusion.

Many societies face the challenge of an ageing population, and information technologies are becoming increasingly important in general as well as for older people. Older people do not constitute a homogeneous group in terms of health status, mental and physical fitness, or material situation. This forces us to consider old age as a differentiated period of life. The adaptation of the ageing population to technological developments and successful ageing have become important issues to be addressed. The findings of the article can serve as a basis for dealing with these forms of the digital exclusions of older people in order to increase their digital inclusion, which can improve their quality of functioning in the long term. The increased demand for digital skills will continue to grow rapidly. Given that their competences likely decrease with age, action for older people is essential. This study aims to contribute to raising awareness of the needs of older people and to inspire further research into overcoming the obstacles that exclude older people.

6. FUNDING

The REMEDIS project is supported in Poland by the National Science Centre - NCN [021/03/Y/HS6/00275] within the CHANSE ERA-NET Co-fund, which has received funding from the European Union's Horizon 2020 Research and Innovation Programme [contract number 101004509].

7. REFERENCES

Abud, T., Kounidas, G., Martin, K. R., Werth, M., Cooper, K., & Myint, P. K. (2022). Determinants of healthy ageing: a systematic review of contemporary literature. *Aging Clinical and Experimental Research*, *34*(6), 1215-1223. https://doi.org/10.1007/s40520-021-02049-w

Adamczyk, M., & Betlej, A. (2021). Social determinants of digital exclusion in an ageing society. The case of Poland. *Entrepreneurship and Sustainability Issues*, *8*(3), 122-135. http://doi.org/10.9770/jesi.2021.8.3(7)

Alexopoulou, S., AAström, J., & Karlsson, M. (2022). The grey digital divide and welfare state regimes: a comparative study of European countries. *Information Technology & People, 35*(8), 273-291. https://doi.org/10.1108/ITP-11-2020-0803

Ball, W., & Holland, S. (2009). The Fear of New Technology: A Naturally Occurring Phenomenon. *The American Journal of Bioethics, 9*(1), 14-16. http://doi.org/10.1080/15265160802617977

Berkowsky, R. W., Rikard, R. V., & Cotten, S. R. (2015). Signing off: Predicting discontinued ICT usage among older adults in assisted and independent living. In J. Zhou, & G. Salvendy (Eds.), *Human aspects of IT for the aged population: Design for everyday life* (pp. 389–398). Springer, Cham. https://doi.org/10.1007/978-3-319-20913-5_36

Blažič, B. J., & Blažič, A. J. (2020). Overcoming the digital divide with a modern approach to learning digital skills for the elderly adults. *Education and Information Technologies*, *25*, 259-279. https://doi.org/10.1007/s10639-019-09961-9

Bonfiglio, N. S., Mascia, M. L., Cataudella, S., & Penna, M. P. (2022). Digital help for substance users (SU): A systematic review. *International journal of environmental research and public health*, *19*(18), 11309. https://doi.org/10.3390/ijerph191811309

Carlo, S., & Bonifacio, F. (2020). "You Don't Need Instagram, It's for Young People": Intergenerational Relationships and ICTs Learning Among Older Adults. In Q. Gao, & J. Zhou (eds.), *Human Aspects of IT for the Aged Population. Technology and Society. HCII 2020. Lecture Notes in Computer Science*, vol 12209 (pp. 29-41). Springer, Cham. https://doi.org/10.1007/978-3-030-50232-4_3

Chaouali, W., & Souiden, N. (2019). The role of cognitive age in explaining mobile banking resistance among elderly people. *Journal of Retailing and Consumer Services*, *50*, 342-350. https://doi.org/10.1016/j.jretconser.2018.07.009

Chen, E., Wood, D., & Ysseldyk, R. (2022). Online Social Networking and Mental Health among Older Adults: A Scoping Review. *Canadian Journal on Aging / La Revue Canadienne Du Vieillissement*, *41*(1), 26-39. https://doi.org/10.1017/S0714980821000040

Cheng, H., Keyi L., Jiacheng L., & Hoiyan S. (2022). Bridging the Digital Divide for Rural Older Adults by Family Intergenerational Learning: A Classroom Case in a Rural Primary School in China. *International Journal of Environmental Research and Public Health,* 19(1), 371. https://doi.org/10.3390/ijerph19010371

Cheshmehzangi, A., Zou, T., & Su, Z. (2022). The digital divide impacts on mental health during the COVID-19 pandemic. *Brain, Behavior, and Immunity*, *101*, 211-213. https://doi.org/10.1016/j.bbi.2022.01.009

Chiappe, A., Amado, N., & Leguizamón, L. (2020). Educommunication in digital environments: an interaction´s perspective inside and beyond the classroom. *Innoeduca. International Journal of Technology and Educational Innovation, 6*(1), 34–41. https://doi.org/10.24310/innoeduca.2020.v6i1.4959

Chiu, Ch-J, Tasi, W-Ch., Yang, W-L., & Guo, J-L. (2019). How to help older adults learn new technology? Results from a multiple

case research interviewing the internet technology instructors at the senior learning center. *Computers & Education*, *129*, 61-70. https://doi.org/10.1016/j.compedu.2018.10.020

Costa, C., Gilliland, G., & McWatt, J. (2019) 'I want to keep up with the younger generation' - older adults and the web: a generational divide or generational collide?, *International Journal of Lifelong Education*, *38*(5), 566-578, https://doi.org/10.1080/02601370.2019.1678689

Cruz-Jesús, F., Vicente, M. R., Bacao, F., & Oliveira, T. (2016). The education-related digital divide: An analysis for the EU-28. *Computers in Human Behavior*, *56*, 72-82, https://doi.org/10.1016/j.chb.2015.11.027

Connolly, L. Y., & Wall, D. S. (2019). The rise of crypto-ransomware in a changing cybercrime landscape: Taxonomising countermeasures. *Computers & Security*, *87*, 1-18, https://doi.org/10.1016/j.cose.2019.101568

Dąbrowska, A., Lubowiecki-Vikuk, A. (2020). Kraj sędziwych ludzi? Przegląd przemian demograficznych zachodzących w Polsce. In P. Machul, W. Kowalczyk (eds.), *Marketing generacji silver. Jak skutecznie komunikować się z pokoleniem 50+* (pp. 39-52). VFP Communications, Warszawa.

De Beni, R. (2009). *Psicologia dell'invecchiamento*. Il Mulino.

Demiris G., Rantz M., Aud M., Marek K., Tyrer H., & Skubic M., Hussam A. (2004). Older adults' attitudes towards and perceptions of "smart home" technologies: a pilot study. *Med Inform Internet Med*., *29*(2), 87-94. https://doi.org/10.1080/14639230410001684387

Dziuba, S., Cierniak-Emerych, A., Michalski, G., Poulova, P., Mohelská, H., & Klimova, B. (2021). The use of the internet by older adults in Poland. *Universal Access in the Information Society*, *20*, 171-178. https://doi.org/10.1007/s10209-019-00700-y

Esteban-Navarro, M.-Á., García-Madurga, M.-Á., Morte-Nadal, T., & Nogales-Bocio, A.-I. (2020). The Rural Digital Divide in the Face of the COVID-19 Pandemic in Europe—Recommendations from a Scoping Review. *Informatics*, *7*(4), 54. https://doi.org/10.3390/informatics7040054

Eurostat (2023). *EU digital skills divide: cities outpace rural areas*. https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230320-2

Fischer, S. H., David, D., Crotty, B. H., Dierks, M., & Safran, C. (2014). Acceptance and use of health information technology by community-dwelling elderly. *International journal of medical informatics*, *83*(9), 624–635. https://doi.org/10.1016/j.ijmedinf.2014.06.005

Gadomska-Lila, K. (2020). Effectiveness of reverse mentoring in creating intergenerational relationships. *Journal of Organizational Change Management*, *33*(7), 1313-1328. https://doi.org/10.1108/JOCM-10-2019-0326

Gierszewski, D., & Kluzowicz, J. (2021). The Role of the University of the Third Age in meeting the needs of older adult learners in Poland. *Gerontology & Geriatrics Education*, *42*(3). https://doi.org/10.1080/02701960.2021.1871904

Guillén-Gámez, F. D., Mayorga-Fernández, M. J., Bravo-Agapito, J., & Escribano-Ortiz, D. (2020). Analysis of Teachers' Pedagogical Digital Competence: Identification of Factors Predicting Their Acquisition. *Technology, Knowledge and Learning, 26*(3), 481–498. https://doi.org/10.1007/s10758-019-09432-7

GUS Główny Urząd Statystyczny (2022). *Emerytury i renty w 2021 r. Retirement and other pensions in 2021*. GUS.

Haight, M., Quan-Haase, A., & Corbett B. A. (2014). Revisiting the digital divide in Canada: the impact of demographic factors on access to the internet, level of online activity, and social networking site usage. *Information, Communication & Society, 17*(4), 503- 519, https://doi.org/10.1080/1369118X.2014.891633

Hanson, V.L. (2010). Influencing technology adoption by elderly people. *Interacting with Computers*, *22*(6), 502–509. https://doi.org/10.1016/j.intcom.2010.09.001

Hołda, M. (2008). Ludzie starzy w *świecie* wirtualnym. In B. Szmigielska (ed.), *Całe życie w sieci (pp. 281-313)*. WUJ.

Huxhold, O., Hees, E., & Webster, N. J. (2020). Towards bridging the grey digital divide: changes in internet access and its predictors from 2002 to 2014 in Germany. *European Journal of Ageing*, *17*, 271-280. https://doi.org/10.1007/s10433-020-00552-z

Jaeger, P. T., Bertot, J. C., Thompson, K. M., Katz, S. M., & DeCoster, E. J. (2012). The intersection of public policy and public access: Digital divides, digital literacy, digital inclusion, and public libraries. *Public library quarterly*, *31*(1), 1-20. https://doi.org/10.1080/01616846.2012.654728

Kourtesis, P., & MacPherson, S. E. (2021). An ecologically valid examination of event-based and time-based prospective memory using immersive virtual reality: The influence of attention, memory, and executive function processes on real-world prospective memory. *Neuropsychological Rehabilitation. Advance online publication*. https://doi.org/10.1080/09602011.2021.2008983

KIM (2022). *Badanie założycielskie. Danie skumulowane lipiec 2021-marzec 2022*. Warszawa.

Kuc-Czarnecka, M. (2020). COVID-19 and digital deprivation in Poland. *Oeconomia Copernicana*, *11*(3), 415-431. https://doi.org/10.24136/oc.2020.017

Lázaro, M.J.S., Lim, J., Kim, S.H., & Yun, M.H. (2020). Wearable Technologies: Acceptance Model for Smartwatch Adoption Among Older Adults. In Q. Gao, & J. Zhou (eds.), *Human Aspects of IT for the Aged Population. Technologies, Design and User Experience. HCII 2020. Lecture Notes in Computer Science* (vol 12207, pp. 303-315). Springer, Cham. https://doi.org/10.1007/978-3-030-50252-2_23

Lee, O. E.-K., & Kim, D.-H. (2019). Bridging the Digital Divide for Older Adults via Intergenerational Mentor-Up. *Research on Social Work Practice*, *29*(7), 786–795. https://doi.org/10.1177/1049731518810798

Leukfeldt, R., Veenstra, S., & Stol, W. (2013). High Volume Cyber Crime and the Organization of the Police: The results of two empirical studies in the Netherlands. *International Journal of Cyber Criminology*, *7*(1), 1-17.

Lewis, J. E., & Neider, M. B. (2017). Designing Wearable Technology for an Aging Population. *Ergonomics in Design*, *25*(3), 4–10. https://doi.org/10.1177/1064804616645488

López Seguí F., de San Pedro M., Aumatell Verges E., Simó Algado S., & Garcia Cuyàs F. (2019). An Intergenerational Information and Communications Technology Learning Project to Improve Digital Skills: User Satisfaction Evaluation. *JMIR Aging*, *2*(2), e13939. https://doi.org/10.2196/13939

Martinez-Pecino, R., Delerue Matos, A., & Silva, P. (2013). Portuguese older people and the Internet: Interaction, uses, motivations, and obstacles, *Communications*, *38*(4), 331-346. https://doi.org/10.1515/commun-2013-0020

McDonough, C. (2016). The Effect of Ageism on the Digital Divide Among Older Adults. *J. Gerontol. Geriatr. Med*., *2*, 1–7. https://doi.org/10.24966/GGM-8662/100008.

Mubarak, F., & Suomi, R. (2022). Elderly forgotten? Digital exclusion in the information age and the rising grey digital divide. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *59*, 00469580221096272. https://doi.org/10.1177/00469580221096272

Nayak, L.U.S., Priest, L., & White, A.P. (2010). An application of the technology acceptance model to the level of Internet use by elderly people. *Univ. Access Inf. Soc. 9*(4), 367–374. https://doi.org/10.1007/s10209-009-0178-8

Neves, B., & Amaro, F. (2012) Too Old For Technology? How The Elderly Of Lisbon Use And Perceive ICT. *Journal Community Informatics, 8*(1), 1-12. https://doi.org/10.15353/joci.v8i1.3061

Norris, P., & Inglehart, R. (2013). Digital divide. In R. Towse, & C. Handka (eds.), *Handbook on the digital creative economy* (pp. 90-102). Edward Elgar Publishing.

Nymberg, V. M., Borgström Bolmsjö, B., Wolff, M. Calling, S., Gerward, S., & Sandberg, M. (2019). 'Having to learn this so late in our lives…' Swedish elderly patients' beliefs, experiences, attitudes and expectations of e-health in primary health care. *Scandinavian Journal of Primary Health Care*, *37*(1), 41-52, https://doi.org/10.1080/02813432.2019.1570612

Parsons, C., & Hick, S. F. (2008). Moving from the digital divide to digital inclusion. *Currents: Scholarship in the Human Services*, *7*(2), 1-16.

Pedrós Barnils, N., & Schüz, B. (2022). The "grey" digital divide in older adults during COVID-19 in Germany: Who is most at risk? *European Journal of Public Health*, *32*(3), ckac130.059. https://doi.org/10.1093/eurpub/ckac130.059

Pihlainen, K., Korjonen-Kuusipuro, K., & Kärnä, E. (2021) Perceived benefits from non-formal digital training sessions in later life: views of older adult learners, peer tutors, and teachers. *International Journal of Lifelong Education*, *40*(2), 155-169. https://doi.org/10.1080/02601370.2021.1919768

Plebańska, M. (2021). *Kompetencje cyfrowe i ich cyfrowy rozwój*. Difin.

Poushter, J., & Stewart, R. (2016). *Smartphone ownership and internet usage continues to climb in emerging economies. But advanced economies still have higher rates of technology use*. https://www.diapoimansi.gr/PDF/pew_research %201.pdf

Raport (2021). *Wykluczenie społeczno-cyfrowe w Polsce. Stan zjawiska, trendy, rekomendacje*. Fundacja Orange, Orange Polska.

Raport EU DESI (2022). *The Digital Economy and Society Index*. file:///C:/Users/user/Downloads/DESI_2022__Poland__pl_UlopUwudTrPnJggMTs0l9cAo_88756.pdf

Ramia, I., & Voicu, M. (2022). Life satisfaction and happiness among older Europeans: The role of active ageing. *Social Indicators Research*, *160*(2-3), 667-687. https://doi.org/10.1007/s11205-020-02424-6

Rikard, R. V., Berkowsky, R. W., & Cotten, S. R. (2018). Discontinued information and communication technology usage among older adults in continuing care retirement communities in the United States. *Gerontology*, *64*(2), 188–200. https://doi.org/10.1159/000482017

Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hle, T.M., & Stern, M.J. (2015). Digital inequalities and why they matter Information, *Communication & Society*, *18*(5), 569-582 https://doi.org/10.1080/1369118X.2015.1012532

Sahin, M., Akbasli, S., Tugba Yanpar Yelken, T. Y. (2010). Key competences for lifelong learning: The case of prospective teachers. *Educational Research and Review*, *5*(10), 545-556.

Sastre Reyes, J. (2019). La brecha digital en las escuelas rurales: un estudio de caso. *Innoeduca. International Journal of Technology and Educational Innovation, 5*(2), 189–196. https://doi.org/10.24310/innoeduca.2019.v5i2.4995

Schulz, R., Wahl, H. W., Matthews, J. T., De Vito Dabbs, A., Beach, S. R., & Czaja, S. J. (2015). Advancing the aging and technology agenda in gerontology. *The Gerontologist*, *55*(5), 724–734. https://doi.org/10.1093/geront/gnu071

Shakina, E., Parshakov, P., & Alsufiev, A. (2021). Rethinking the corporate digital divide: The complementarity of technologies and the demand for digital skills. *Technological Forecasting and Social Change*, *162*, 120405. https://doi.org/10.1016/j.techfore.2020.120405

Sharifian, N., Kraal, A. Z., Zaheed, A. B., Sol, K., & Zahodne, L. B. (2020). The longitudinal association between social network composition and episodic memory in older adulthood: The importance of contact frequency with friends. *Aging & Mental Health*, *24*(11), 1789-1795. https://doi.org/10.1080/13607863.2019.1660850

Sparks, C. (2013). What is the "Digital Divide" and why is it important?. *Javnost-The Public*, *20*(2), 27-46. https://doi.org/10.1080/13183222.2013.11009113

Stara, V., Rampioni, M., Moşoi, A. A., Kristaly, D. M., Moraru, S. A., Paciaroni, L., Paolini, S., Raccichinni, A., Felici, E., Rossi, L., Vizitiu, C., Nistorescu, A., Marin, M., Tónay, G., Tóth, A., Pilissy, T., & Fazekas, G. (2022). A Technology-Based Intervention to Support Older Adults in Living Independently: Protocol for a Cross-National Feasibility Pilot. *International Journal of Environmental Research and Public Health*, *19*(24), 16604. https://doi.org/10.3390/ijerph192416604

Stosic, L. (2015). The importance of educational technology in teaching. *International Journal of Cognitive Research in Science, Engineering and Education*, *3*(1), 111-114. https://doi.org/10.23947/2334-8496-2015-3-1-111-114

Teater, B., & Chonody, J. M. (2020). How do older adults define successful aging? A scoping review. The *International Journal of Aging and Human Development*, *91*(4), 599-625. https://doi.org/10.1177/0091415019871

Tomczyk, Ł. (2015). *Edukacja osób starszych*. Seniorzy w przestrzeni nowych mediów. Difin.

Tomczyk, Ł. (2018). *Wolontariusze i seniorzy w programie Polski Cyfrowej Równych Szans: o siłach społecznych w procesie minimalizacji wykluczenia cyfrowego w Polsce*. Wydawnictwo Naukowe Uniwersytetu Pedagogicznego.

Tomczyk, L., Eliseo, M. A., Costas, V., Sanchez, G., Silveira, I. F., Barros, M.-J., Amado, H. R., Oyelere, S. S. (2019). Digital divide in Latin America and Europe: Main characteristics in selected countries. 2019 *14th Iberian Conference on Information Systems and Technologies (CISTI)*. https://doi.org/10.23919/cisti.2019.8760821

Valokivi, H., Carlo, S., Kvist, E., & Outila, M. (2021). Digital ageing in Europe: A comparative analysis of Italian, Finnish and Swe-

dish national policies on eHealth. *Ageing & Society*, *43*(4), 1-22. https://doi.org/10.1017/S0144686X21000945

Van Deursen, A. J., & Van Dijk, J. A. (2015). Toward a multifaceted model of internet access for understanding digital divides: An empirical investigation. *The Information Society*, *31*(5), 379-391. https://doi.org/10.1080/01972243.2015.1069770

Van Dijk, J. (2005). *The digital divide*. John Wiley & Sons.

Van Dijk, J. (2005). *The deepening divide: Inequality in the Information Society*. SAGE Publications. https://doi.org/10.4135/9781452229812

Van Dijk, J. (2017). Afterword: The state of digital divide theory. In M. Ragnedda, & G. Muschert (Eds.), *Theorizing digital divides* (pp. 199-206). Routledge.

Vargo, D., Zhu, L., Benwell, B., & Yan, Z. (2021). Digital technology use during COVID‐19 pandemic: A rapid review. *Human Behavior and Emerging Technologies*, *3*(1), 13-24. https://doi.org/10.1002/hbe2.242

Vásquez-Amézquita, M. (2016). Factores predictores de la reserva cognitiva en un grupo de adultos mayores. *Revista Chilena de Neuropsicología*, *11*(1), 5-11. https://doi.org/10.5839/rcnp.2016.11.01.02

Wątróbski, J., Ziemba, E., Karczmarczyk, A., & Jankowski, J. (2018). An index to measure the sustainable information society: the Polish households case. *Sustainability*, *10*(9), 3223. https://doi.org/10.3390/su10093223

Wagner F., Basran J., & Dal Bello-Haas V. (2012). A review of monitoring technology for use with older adults. *Journal of Geriatric Physical Therapy*, *35*(1), 28-34. https://doi.org/10.1519/JPT.0b013e318224aa23.

Ziemba, E. (2019). The contribution of ICT adoption to the sustainable information society. *Journal of Computer Information Systems*, *59*(2), 116-126.

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 27-38 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15503

Online Learning Attitude and Readiness of Students in Nigeria during the Covid-19 Pandemic: A Case of Undergraduate Accounting Students

Actitud de aprendizaje en línea y preparación de los estudiantes en Nigeria durante la pandemia de Covid-19: un caso de estudiantes de pregrado en contabilidad

RECIBIDO 30/09/2022 ACEPTADO 24/10/2022 PUBLICADO 01/06/2023

Chiedu Eseadi
University of Johannesburg, South Africa
chiediue@uj.ac.za

ABSTRACT

The occurrence of corona virus disease in 2019 (Covid-19) pandemic with its negative consequences on various sectors including education up till now has led to the increase in the necessity to use online learning resources and platforms for teaching and learning especially in higher education institutions (HEIs) in various countries. This research paper's major goal was to investigate the online learning attitude and online learning readiness of undergraduate accounting students in Nigerian public HEIs during the Covid-19 pandemic. The research participants consisted of 845 male and female undergraduate accounting students purposively selected from six HEIs. Study data was collected quantitatively with two online learning scales addressing students' online learning attitude and online learning readiness respectively. The study data were analysed with relevant statistical tests in the Statistical Package for the Social Sciences (SPSS, version 22) based on .05 level of significance criteria. The finding demonstrates significantly positive online learning attitude among the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic. Finding also showed that the undergraduate accounting students' online learning attitude significantly related to their online learning readiness during the Covid-19 pandemic. The male and female undergraduate accounting students did not differ in their online learning attitude and online learning readiness. There were no significant differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education). Nigerian HEIs and accounting departments should provide efficient online learning access and resources to these students and work towards bridging any existing institutional disparities in the availability and use of online learning facilities and resources.

KEYWORDS Covid-19 pandemic; Undergraduate Accounting Students; ICT; Online Learning; Online Learning Attitude; Online Learning Readiness.

RESUMEN

La aparición de la enfermedad del coronavirus en la pandemia de 2019 (Covid-19) con sus consecuencias negativas en varios sectores, incluida la educación, ha llevado al aumento de la necesidad de utilizar recursos y plataformas de aprendizaje en línea para la enseñanza y el aprendizaje, especialmente en Instituciones de Educación Superior (IES) en varios países.

El objetivo principal de este estudio fue investigar la actitud de aprendizaje en línea y la preparación para el aprendizaje en línea de los estudiantes de pregrado en contabilidad en las IES públicas de Nigeria durante la pandemia por Covid-19. Los participantes de la investigación fueron 845 estudiantes de licenciatura en contabilidad, hombres y mujeres, seleccionados intencionalmente de seis IES. Los datos del estudio se recopilaron cuantitativamente con dos escalas de aprendizaje en línea que abordan la actitud de aprendizaje en línea de los estudiantes y la preparación para el aprendizaje en línea, respectivamente. Los datos del estudio se analizaron con pruebas estadísticas relevantes en el Paquete Estadístico para las Ciencias Sociales (SPSS, versión 22) basado en criterios de nivel de significancia de .05. El hallazgo demuestra una actitud de aprendizaje en línea significativamente positiva entre los estudiantes de pregrado en contabilidad de las IES estudiadas durante la pandemia por Covid-19. Los hallazgos también mostraron que la actitud de aprendizaje en línea de los estudiantes de licenciatura en contabilidad se relacionó significativamente con su preparación para el aprendizaje en línea durante la pandemia por Covid-19. Los estudiantes universitarios de contabilidad masculinos y femeninos no difirieron en su actitud de aprendizaje en línea y preparación para el aprendizaje en línea. No hubo diferencias significativas en la actitud de aprendizaje en línea y la preparación para el aprendizaje en línea entre los estudiantes de licenciatura en contabilidad de las IES estudiadas según el tipo de institución (universidad, politécnica y facultad de educación). Las IES y los departamentos de contabilidad de Nigeria deben proporcionar acceso y recursos de aprendizaje en línea eficientes a estos estudiantes y trabajar para salvar las disparidades institucionales existentes en la disponibilidad y el uso de las instalaciones y los recursos de aprendizaje en línea.

PALABRAS CLAVE Pandemia Covid-19; Estudiantes de Grado en Contabilidad; TIC; Aprendizaje en línea; Actitud de aprendizaje en línea; Preparación para el aprendizaje en línea.

1. INTRODUCTION

The occurrence of corona virus disease in 2019 (Covid-19) pandemic with its negative consequences on various sectors including education up till now has led to the increase in the necessity to use online learning resources and platforms for teaching and learning especially in higher education institutions (HEIs) in various countries (González et al., 2020). In order for educational institutions, particularly HEIs to be successful in their application of online learning models to educate their students at this time of the pandemic, it is important they have evidence-based information about students' online learning attitude and online learning readiness (Eze et al., 2021). Such information can help both the school administration and course lecturers in recognizing students' need areas as well as equip them with information required for improving existing online teaching and learning models and curricular implementation techniques to become more motivating and relevant to students' learning needs at this time of the pandemic (Eze et al., 2021; Olayemi et al., 2021).

Online learning attitude of students has been conceptualized in terms of students' general acceptance of online learning mode, individual student awareness, perception of usefulness of online learning mode, and application effectiveness in online learning context (Usta et al., 2016). The students' attitude towards online learning can be influenced by both internal and external factors that determine if the online learning attitude of the students will be positive or negative. Different studies have shown that internal factors such as students' personality, computer anxiety, ability to control technology, quality of personal interaction, self-control, and goal influence students' online learning attitude (Gilbert et al., 2007; Holley, & Oliver, 2010; Lee et al., 2011; Osman, 2005; Smart, & Cappel, 2006; Sun et al., 2008). On the other hand, studies also showed that external factors such as technological experience, technological control, length of online

material, multimedia used and support perception influence the online learning attitude of the students either negatively or positively (Boling et al., 2012; Bolliger et al., 2010; Gilbert et al., 2007; Lee et al., 2011; Mockus et al., 2011; Smart, & Cappel, 2006). Positive online learning attitude enables the students to gain more value from their online classes while negative online learning attitude prevents the students from gaining knowledge from these online classes (Smidt et al., 2014).

Online learning readiness has been conceptualized in terms of students' computer/internet self-efficacy; self-directed learning, control in online learning, motivation for learning and online communication self-efficacy (Hung et al., 2010). Kayaoglu and Akbas (2016) showed that proficiency, subject, organizational structure, human and fiscal resources have an effect on online learning readiness. Factors that influence online learning readiness positively include: emotional intelligence, grades, internet access, internet literacy, aim of learning, learning features, technical base, combined teaching, measured pattern, rating and feedback, learning time, learning motive and knowledge of learners' features (Borotis et al., 2008; Cinkara, & Bagceci, 2013; Engin, 2017). In order to significantly contribute to the empirical discourse on students' online learning attitude and readiness, especially from a developing country sample, the researchers considered investigating the online learning attitude and online learning readiness of undergraduate accounting students in Nigerian HEIs during the Covid-19 pandemic as an important research that could positively impact the use of online learning and teaching model in the studied higher education institutions.

1.1. Statement of Problem

Many teachers use online learning for teaching, but some people say it makes them unable to understand the cultural perspective of their students and that their interactivity is unsatisfactory due to insufficient communication options offered by online learning mode (Anderson, 2008). However, the use of technology as a tool for teaching online has been described as a social inclusion strategy (Aguilera, & Cuenca, 2022). While Covid-19 restrictions increased the use of online learning, research points the increase in stress experienced by teachers (Téllez et al., 2022) and problematic use of the Internet and technological tools by teachers-in-trainee (Colomo Magaña et al., 2021) which might impact teaching and learning outcomes. Some other studies demonstrated that the Covid-19 pandemic negatively impacted workplace orientation of employees including the school workforce (e.g. Egara et al., 2021). Therefore, it is important to explore the online learning attitude and online learning readiness of students during the Covid-19 pandemic.

1.2. Theoretical Underpinning

The theory underpinning this research is the Online Collaborative Learning theory (OCLt) (Harasim, 2012). Aside from the fact that OCLt allows students to work as a team to create knowledge, this theoretical model also offers a learning approach that encourages and supports students to explore avenues through which they can innovate, invent, and engage in abstract thinking required for problem-solving instead of indulging in rote learning. Thus, the OCLt emphasizes the importance of active and engaged learners for the construction of knowledge. On the other hand, teachers, according to the OCL theoretical framework, play invaluable roles as conduits for the diffusion of knowledge in their particular subject area being studied. OCLt is mainly driven by the idea that, at least in some cases, some of the tasks typically carried out in classroom

learning can be performed through computers. Therefore, a significant proposition of OCLt is to utilize technology as a tool to improve the interaction between teachers and students. The OCLt may help to identify how knowledge can be developed and enhanced via social discourse in virtual learning environment between the teacher and students (Bates, 2014).

1.3. Research Objectives

This research paper's major goal was to investigate the online learning attitude and online learning readiness of undergraduate accounting students in Nigerian HEIs during the Covid-19 pandemic. Specific objectives of this research paper are to investigate:

a. The online learning attitude of the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic.
b. The relationship between undergraduate accounting students' online learning attitude and their online learning readiness during the Covid-19 pandemic.
c. The extent of difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness.
d. The extent of differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education)

1.4. Research Questions

a. What is the online learning attitude of the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic?
b. Is undergraduate accounting students' online learning attitude related to their online learning readiness during the Covid-19 pandemic?
c. What is the extent of difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness?
d. What is the extent of differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education)?

1.5. Research Hypotheses

– H01: There will be no significant relationship between undergraduate accounting students' online learning attitude and their online learning readiness during the Covid-19 pandemic.
– H02: There will be no significant difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness.
– H03: There will be no significant differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education).

2. MATERIAL AND METHOD

2.1. Ethics Statement

The researchers received ethics approval to carry out this online survey from the Research Ethics Committee at the University of Nigeria.

2.2. Design

For this research, the descriptive survey design was employed to answer four research questions and test three null hypotheses regarding online learning attitude and online learning readiness of undergraduate accounting students in selected Nigerian public higher education institutions (HEIs) in Southern Nigeria.

2.3. Sample

The research participants consisted of a purposive, random sample of 845 undergraduate accounting students selected from six public HEIs in Nigeria. In terms of institution category, the study sample consisted of undergraduate accounting students from two public universities, two public polytechnics, and two public colleges of education. The study respondents included 441 male (52.2 %) and 404 female (47.8 %) undergraduate accounting students. A total of 500 students (59.2 %) were from the university, 241 students (28.5 %) were the polytechnic while 104 (12.3) were college of education students. Out of the total sample, 489 students (57.9 %) were between 19-25years of age while 356 students (42.1 %) were between 26-30 years of age.

2.4. Instruments

The study data was collected quantitatively with two online learning scales addressing students' online learning attitude (Usta et al., 2016) and online learning readiness (Hung et al., 2010) respectively.

2.4.1. The Online Learning Attitude Scale (OLAS)

The Online Learning Attitude Scale (OLAS) (Usta et al., 2016) consist of 20 items in four dimensions (general acceptance – 7 items; individual awareness – 6 items; perceived usefulness – 3 items; and application effectiveness –4 items) on five-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5). Research report concerning the internal consistency of the OLAS show total Cronbach's alpha value of 0.90 (Usta et al., 2016).

2.4.2. The Online Learning Readiness Scale (OLRS)

The Online Learning Readiness Scale (OLRS) (Hung et al., 2010) consist of 18 items in five clusters (computer/internet self-efficacy –3 items; self-directed learning – 5 items; learner control – 3 items; motivation for learning – 4 items; and online communication self-efficacy – 3 items) on five-point Likert-type scale ranging from strongly disagree (1) to strongly agree(5). Research report concerning the internal consistency of the OLRS show total Cronbach's alpha value of 0.89 (Herguner et al., 2020).

2.5. Procedure

The two online learning scales were sent to the undergraduate accounting students as online survey in which they were required to provide online informed consent before proceeding to complete the demographic information section (age, gender, and institution type) and respond to the items in the scales. A total of 1050 online surveys were sent out whereas 845 completed surveys were received by the end of three months of data collection.

2.6. Analysis

The study data were analysed with relevant statistical tests (including mean, standard deviation, regression, and F-test statistics) in the Statistical Package for the Social Sciences (SPSS, version 22) based on .05 level of significance criteria.

3. RESULTS

TABLE 1. Descriptive statistics for the students' online learning attitude and readiness

	Gender	HEI type	Mean	Standard Deviation	N
OLAS	Male	University	28.45	4.57	264
		Polytechnic	27.54	2.38	123
		COE	28.12	4.53	54
		Total	28.16	4.09	441
	Female	University	27.96	3.93	236
		Polytechnic	28.82	5.68	118
		COE	27.34	1.84	50
		Total	28.14	4.36	404
	Total	University	28.22	4.29	500
		Polytechnic	28.17	4.36	241
		COE	27.75	3.51	104
		Total	**28.15**	**4.22**	**845**
OLRS	Male	University	38.65	9.85	264
		Polytechnic	39.10	10.01	123
		COE	38.69	10.03	54
		Total	38.78	9.89	441
	Female	University	38.25	9.87	236
		Polytechnic	38.18	9.87	118
		COE	38.50	10.02	50
		Total	38.26	9.86	404
	Total	University	38.46	9.85	500
		Polytechnic	38.65	9.93	241
		COE	38.60	9.98	104
		Total	**38.53**	**9.88**	**845**

OLAS=Online Learning Attitude Scale; OLRS=Online Learning Readiness Scale,
N=Number of respondents, COE=College of Education, HEI=Higher Education Institution

RQ1: What is the online learning attitude of the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic?

Table 1 show that the total OLAS mean responses of the students was 28.15 with standard deviation score of 4.22. This suggests a positive online learning attitude among the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic.

RQ2: Is undergraduate accounting students' online learning attitude related to their online learning readiness during the Covid-19 pandemic?

Table 2 show that students' online learning attitude was positively related to the students' online learning readiness (Pearson R=.32, R2=.10, Adjusted R2=.10, β=.32). [See Table 2]

TABLE 2. Relationship between the students' online learning attitude and readiness

Model	R	R2	Adj. R2	B	β	Sig	95 % CI
1	.32	.10	.10	.75	.32	.000	.596, .896

B=Unstandardized Cofficients, β=Standard Coefficient

RQ3: What is the extent of difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness?

In respect of online learning attitude, male students had OLAS mean score of 28.16 and standard deviation score of 4.09 while female students had OLAS mean score of 28.14 and standard deviation score of 4.36. Regarding the students' online learning readiness, male students had OLRS score of 38.78 and standard deviation score of 9.89 while female students had OLRS mean score of 38.26 and standard deviation score of 9.86. The closeness of the standard deviation scores of male and female students in both the OLAS and OLRS suggest a similarity of opinions about online learning attitude and online learning readiness [See Table 1].

RQ4: What is the extent of differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education)?

In respect of online learning attitude, university students had OLAS mean score of 28.22 and standard deviation score of 4.29; polytechnic students had OLAS mean score of 28.17 and standard deviation score of 4.36; while college of education students had OLAS mean score of 27.75 and standard deviation score of 3.51. For the students' online learning readiness, university students had OLRS mean score of 38.46 and standard deviation score of 9.85; polytechnic students had OLRS mean score of 38.65 and standard deviation score of 9.93; while college of education students had OLRS score of 38.60 with standard deviation score of 9.98. The closeness of the standard deviation scores of the university, polytechnic and college of education students in both the OLAS and OLRS suggest a similarity of opinions about online learning attitude and online learning readiness [See Table 2].

H01: There will be no significant relationship between undergraduate accounting students' online learning attitude and their online learning readiness during the Covid-19 pandemic.

Table 2 show the regression analysis testing the significant relationship between undergraduate accounting students' online learning attitude and their online learning readiness during the Covid-19 pandemic. The results showed a statistically significant relationship between students' online learning attitude and their online learning readiness during the Covid-19 pandemic (β=.32, p=.000, 95 %CI: .596, .896). Therefore, the null hypothesis of no significant relationship was rejected [See Table 2].

TABLE 3. F-test analysis of the students' online learning attitude and readiness

Source	Scales	df	*F*	Sig.
Gender	OLAS	1	.004	.948
	OLRS	1	.585	.445
Institution type	OLAS	2	.541	.582
	OLRS	2	.032	.968
Total	OLAS	845		
	OLRS	845		
Corrected Total	OLAS	844		
	OLRS	844		

OLAS=Online Learning Attitude Scale; OLRS=Online Learning Readiness Scale

H02: There will be no significant difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness.

Table 3 show the F-test analysis testing the significant difference between male and female undergraduate accounting students in their online learning attitude and online learning readiness. The results revealed that there is no significant difference between the male and female students in their online learning attitude [F(1, 844)= .004, p=.948] and online learning readiness [F(1, 844)= .585, p=.445]. Thus, the null hypothesis of no significant difference was accepted [See Table 3].

HO3: There will be no significant differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education).

Table 3 show the F-test analysis testing the significant differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education). The results revealed that there are no significant differences in online learning attitude [F(2, 844)= .541, p=.582] and online learning readiness [F(2, 844)= .032, p=.968] among the students from the studied HEIs based on institution type (university, polytechnic and college of education). Thus, the null hypothesis of no significant difference was accepted [See Table 3].

4. DISCUSSION

This research paper's major goal was to investigate the online learning attitude and online learning readiness of undergraduate accounting students in Nigerian higher education institutions (HEIs) during the

Covid-19 pandemic. The finding demonstrates significantly positive online learning attitude among the undergraduate accounting students from the studied HEIs during the Covid-19 pandemic. This result agrees with the points from the results of Britiller and Zaki (2020) who indicated the positive online learning attitude of students at a medical college in the kingdom of Saudi Arabia in their research. The result of this research also agrees with the findings of Mehra and Omidian (2011) and Egbo et al. (2011) who both indicated positive attitude from a high number of students towards e-learning in their study.

Finding also showed that the undergraduate accounting students' online learning attitude significantly related to their online learning readiness during the Covid-19 pandemic. Similar results were reported by Jiang et al. (2021) who indicated the interrelationship between online readiness and attitude. This finding also correlates with the findings of Herguner et al. (2020) who noted from their study that online attitude predicts online readiness significantly and online attitude has 42 % of the total variance in explaining online readiness. This finding also agrees with the findings of Olayemi et al. (2021) who investigated the perception and readiness of students towards online learning in Nigeria during the Covid-19 pandemic. According to these findings the effect of positive online learning attitude on online learning in the tertiary institution has been further revealed.

The male and female undergraduate accounting students did not differ in their online learning attitude and online learning readiness during the Covid-19 pandemic. The results of this research agrees with the findings of Suri and Sharma (2013) and Egbo et al (2011) which showed that there was no significant difference between the online learning attitude of male and female, but disagrees with the findings of Britiller and Zaki (2020) and Zabadi and Al-Alawi (2016) which shows a significant difference between readiness and attitude of male and female faculty members on the use of online learning.

There were no significant differences in online learning attitude and online learning readiness among the undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education). This finding agrees with the findings of Herguner et al. (2020) who revealed in their studies that online attitude and online readiness do not differ according to the faculty/ department studied. It is, thus, recommended to Nigerian public HEIs and accounting departments to provide efficient online learning access and resources to these students and work towards bridging any existing institutional disparities in the availability and use of online learning facilities and resources.

4.1. Research Contributions

This study appears to be the only research from Nigerian public HEIs examining online learning attitude and online learning readiness among undergraduate accounting students and particularly during the pandemic period. The study adds to the online learning literature to help researchers further recognize and explore undergraduate students' online learning attitude and online learning readiness in accountancy department especially in developing countries. The research brings to researchers' knowledge about the existing relationship of online learning attitude with online learning readiness in undergraduate student sample from Nigerian public HEIs setting. The research also adds to knowledge regarding accounting students' online learning attitude and online learning readiness across the various types of HEIs in Nigeria that were investigated.

5. CONCLUSIONS

Given the findings, the researchers conclude that undergraduate accounting students from the studied Nigerian HEIs possess significantly positive online learning attitude during the Covid-19 pandemic. Furthermore, there was a significant relationship between undergraduate accounting students' online learning attitude and readiness during the Covid-19 pandemic. The male and female undergraduate accounting students were similar in their mean ratings regarding online learning attitude and readiness. Finally, no significant differences exist in online learning attitude and readiness among undergraduate accounting students from the studied HEIs based on institution type (university, polytechnic and college of education). It is, thus, recommended to Nigerian public HEIs and accounting departments to provide efficient online learning access and resources to these students and work towards bridging any existing institutional disparities in the availability and use of online learning facilities and resources.

5.1. Limitations and future lines of research

This research is limited to the undergraduate sample investigated. It is suggested to investigate accounting students' ICT skills and usage in relation to how much these constructs influences their online learning attitude and readiness. It is further suggested to conduct a comparative research of online learning attitude and readiness between undergraduate accounting students and other undergraduates from other academic departments within their faculty as well students from other faculties. Another suggestion is for researchers to investigate whether undergraduate accounting students and postgraduate accounting students are similar in their online learning attitude and readiness during Covid-19 pandemic. It is also important to investigate enhancing factors for online learning attitude and readiness during Covid-19 pandemic among accounting students in both public and private HEIs. It is necessary to underline the main limitations of the research, as well as the future lines of work resulting from the study carried out.

6. REFERENCES

Aguilera, F.J.G., & Cuenca, D.A. (2022). ICT as a strategy for social inclusion. Analysis of an educational second chance itinerary. *Innoeduca. International Journal of Technology and Educational Innovation, 8*(1), 121-134. https://doi.org/10.24310/innoeduca.2022.v8i1.11467

Anderson, T. (2008). Toward a theory of online learning. In T. Anderson & F. Elloumi (Eds.) *Theory and Practice of Online Learning* (pp. 45-74). Athabasca University Press.

Bates, T. (July 29, 2014). *Learning theories and online learning*. https://www.tonybates.ca/2014/07/29/learning-theories-and-online-learning/

Boling, E. C., Hough, M., Krinsky, H., Saleem, H., & Stevens, M. (2012).Cutting the distance in distance education: Perspectives on what promotes positive, online learning experiences. *The Internet and Higher Education*, *15*(2), 118-126. https://doi.org/10.1016/j.iheduc.2011.11.006

Bolliger, D. U., Supanakorn, S., & Boggs, C. (2010). Impact of podcasting on student motivation in the online learning environment. *Computers & Education*, *55*(2), 714-722. https://doi.org/10.1016/j.compedu.2010.03.004

Borotis, S., Zaharias, P., & Poulymenakou, A (2008). Critical success factors for e-learning adoption. In: T. T. Kidd & H. Song

(Eds.), *Handbook of Research on Instructional Systems and Technology* (pp. 498-514). IGI Global.

Britiller, M., & Zaki, S.H (2020). Readiness and attitudes of primary users of e- learning at a medical college in the kingdom of Saudi Arabia. *International Journal of Novel Research in Healthcare and Nursing*, *7*(1) 849-864.

Cinkara, E., & Bagceci, B. (2013). Learners' Attitudes towards Online Language Learning; and Corresponding Success Rates. *The Turkish Online Journal of Distance Education*, *14*(2), 118-128.

Colomo Magaña, E., Cívico Ariza, A., Ruiz Palmero, J., & Sánchez Rivas, E. (2021). Problematic Use of ICTs in Trainee Teachers during COVID-19: A Sex-Based Analysis. *Contemporary Educational Technology*, *13*(4), ep314. https://doi.org/10.30935/cedtech/10988

Egara, F.O., Nzeadibe, A.C., & Eseadi, C. (2021). Coronavirus Disease-19 in Nigeria: Reshaping Workplace Orientation. *International Medical Journal*, *28*(3), 307-310.

Egbo, O. P., Okoyeuzu, C. R., Ifeanacho, I. C., & Onwumere, J. U. (2011). Gender perception and attitude towards e-learning: A case of business students, University of Nigeria. *International Journal of Computer Application*, *1*(2), 135-148.

Engin, M. (2017). Analysis of students' online learning readiness based on their emotional intelligence level. *Universal Journal of Educational Research*, *5*(12A), 32-40. http://doi.org/10.13189/ujer.2017.051306

Eze, U. N., Sefotho, M. M., Onyishi, C. N., & Eseadi, C. (2021). Impact of COVID-19 pandemic on Education in Nigeria: Implications for Policy and Practice of e-learning. *Library Philosophy and Practice*, 5651. https://digitalcommons.unl.edu/libphilprac/5651

Gilbert, J., Morton, S., & Rowley, J. (2007). E-learning: The student experience. *British Journal of Educational Technology*, *38*(4), 560-573. https://doi.org/10.1111/j.1467-8535.2007.00723.x

Gonzalez, T., De La Rubia, M. A., Hincz, K. P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students' performance in higher education. *PloS One*, *15*(10), e0239490. https://doi.org/10.1371/journal.pone.0239490

Harasim, L. (2012). *Learning Theory and Online Technologies*. Routledge

Herguner, G., Son, S. B., Herguner Son, S., & Donmez, A. (2020). The effect of online learning attitudes of university students on their online learning readiness. Turkish Online *Journal of Educational Technology-TOJET*, *19*(4), 102–110.

Holley, D., & Oliver, M. (2010). Student engagement and blended learning: Portraits of risk. *Computers & Education*, *54*(3), 693-700. https://doi.org/10.1016/j.compedu.2009.08.035

Hung, M.-L., Chou, C., Chen, C.-H., & Own, Z.-Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education*, *55*(3), 1080–1090. https://doi.org/10.1016/j.compedu.2010.05.004

Jiang, L., Meng, H., & Zhou, N. (2021). English learners' readiness for online flipped learning: Interrelationships with motivation and engagement, attitude, and support. *Language Teaching Research*, 13621688211027459. https://doi.org/10.1177/13621688211027459

Kayaoğlu, M.N., & Akbaş, R.D. (2016). Online Learning Readiness: A Case Study in the Field of English for Medical Purposes. *Participatory Educational Research (PER)*, *4*, 212-220.

Lee, S.J., Srinivasan, S., Trail, T., Lewis, D., & Lopez, S. (2011). Examining the relationship among student perception of support, course satisfaction, and learning outcomes in online learning. *The Internet and Higher Education*, *14*(3), 158-163. https://doi.org/10.1016/j.iheduc.2011.04.001

Mehra, V., & Omidian, F. (2011). Examining students attitudes towards e-learning: Acase from india. *Malaysian Journal of Educational Technology*, *11*(2), 13-18.

Mockus, L., Dawson, H., Edel-Malizia, S., Shaffer, D., An, J., & Swaggerty, A. (2011). The impact of mobile access on motivation: Distance education student perceptions. *World Campus Learning Design*. http://learningdesign.psu.edu/research/MLRT-WhitePaper.pdf

Olayemi, O. M., Adamu, H., & Olayemi, K. J. (2021). Perception and readiness of students towards online learning in Nigeria during Covid-19 pandemic. *Library Philosophy and Practice*, 5051. https://digitalcommons.unl.edu/libphilprac/5051

Osman, M. E. (2005). Students' reaction to WebCT: Implications for designing online learning environments. *International Journal of Instructional Media*, *32*(4), 353-362.

Smart, K. L., & Cappel, J. J. (2006). Students' perceptions of online learning: A comparative study. *Journal of Information Technology Education*, *5*(1), 201-219.

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008) What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, *50*(4), 1183-1202. https://doi.org/10.1016/j.compedu.2006.11.007

Suri, G., & Sharma, S. (2013). The impact of gender on attitude towards computer technology and e-learning: an exploratory study of Punjab university, India. *International Journal of Engineering Research*, *2*(2), 132-136.

Téllez, R.C., Galisteo, R.P.R., & Bailón, M.R. (2022). Personal and teaching factors related to the stress perceived by university teachers in the face of COVID-19. *Innoeduca. International Journal of Technology and Educational Innovation, 8*(1), 102-110. https://doi.org/10.24310/innoeduca.2022.v8i1.11920

Usta, İ., Uysal, Ö., & Okur, M. R. (2016). Çevrimiçiöğrenmetutumölçeği: Geliştirilmesi, geçerliği ve güvenirliği. *Journal of International Social Research*, *9*(43), 2215–2222.

Zabadi, A. M., & Al-Alawi, A. H. (2016). University students' attitudes towards e-learning: University of Business & Technology (UBT)-Saudi Arabia-Jeddah: A case study. *International Journal of Business and Management*, *11*(6), 286-295. http://dx.doi.org/10.5539/ijbm.v11n6p286

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 39-52 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15191

Formación en competencia digital docente: validación funcional del modelo TEP

Training in Teaching Digital Competence: Functional Validation of the TEP Model

RECIBIDO 29/07/2022 ACEPTADO 03/08/2022 PUBLICADO 01/06/2023

Alba Ruth Pinto Santos
Universidad de La Guajira, Colombia
arpinto@uniguajira.edu.co

Adolfina Pérez-Garcias
Universidad de las Islas Baleares, España
fina.perez@uib.es

Antonia Darder Mesquida
Universidad de las Islas Baleares, España
antonia.darder@uib.es

RESUMEN

Este artículo presenta los resultados del proceso de validación funcional del Modelo Tecnológico Empoderado y Pedagógico (TEP) para el desarrollo de la Competencia Digital Docente (CDD) en la Formación Inicial del Profesorado. El enfoque metodológico corresponde a la Investigación Basada en Diseño. Los participantes fueron 162 estudiantes, 131 docentes y 15 miembros de 4 comités curriculares en la Facultad de Ciencias de la Educación de la Universidad de La Guajira. Los instrumentos correspondieron al Cuestionario de satisfacción y la Matriz de análisis FODA. Los resultados evidenciaron niveles de satisfacción, de 4.26 en docentes y 4.99 en estudiantes frente a la implementación del modelo, sobre un máximo de 5 y 6 puntos de manera respectiva. A partir de los hallazgos se identificaron 20 fortalezas, 16 debilidades, 20 oportunidades y 8 amenazas al Modelo TEP. En síntesis, el Modelo TEP genera innovación educativa, pedagógica y de transformación curricular para apropiar la tecnología digital en la formación profesional del docente.

PALABRAS CLAVE Competencias; personal docente; formación inicial; construcción de modelos; tecnología de la educación.

ABTRACT

This article presents the results of the functional validation process of the Technological Empowered and Pedagogical Model (TEP) for the development of Digital Teaching Competence (DTC) in Initial Teacher Training. The methodological approach corresponds to Research Based on Design. The participants were 162 students, 131 teachers and 15 members of 4 curricular committees in the Faculty of Educational Sciences of the University of La Guajira. The instruments corresponded to the Satisfaction Questionnaire and the SWOT Analysis Matrix. The results showed satisfaction levels of 4.26 in teachers and 4.99 in students compared to the implementation of the model, over a maximum of 5 and 6 points respectively. Based on the findings, 20 strengths, 16 weaknesses, 20 opportunities and 8 threats of the TEP Model. In short, the TEP Model generates educational, pedagogical and curricular transformation innovation to appropriate digital technology in the professional training of teachers.

KEYWORDS Competencies; teaching staff; initial training; model building; education technology.

1. INTRODUCCIÓN

La Formación Inicial Docente (FID) debe permitirle al futuro profesor desarrollar múltiples habilidades dentro de las cuales se encuentra la Competencia Digital Docente (CDD) (Cabero, & Martínez, 2019; UNESCO, 2019). No obstante, el escenario educativo generado por la Pandemia Covid-19 ha evidenciado que las instituciones formadoras de maestros tienen muchos retos frente la incorporación, modelado y desarrollo de la CDD. En este sentido, es necesario desde la FID, generar espacios de formación avanzada que permitan incorporar de manera segura y ética las tecnologías de la información y comunicación (TIC) a nivel profesional (Álvarez et al., 2022; Falloon, 2020; Masoumi, 2021; Pinto, & Pérez, 2022) y complementariamente desarrollar procesos de prácticas profesionales eficientes y productivas en la preparación del profesorado (Balladares-Burgos, 2018; Lázaro et al., 2021; Roll, & Ifenthaler, 2021).

Existen diferentes estudios relacionados con procesos de inserción de las TIC en la FID, que analizan a nivel curricular la forma en que se están abordando los contenidos y la formación en CDD (Falcó, 2017; Ferrada, 2019; Lázaro, & Gisbert, 2015); brindan orientaciones sobre política institucional para integrar la CDD en el perfil de egreso del futuro docente (Cabero, & Martínez, 2019; Silva et al., 2018); presentan experiencias de formaciones dirigidas a transformar las prácticas educativas de los formadores de maestros (Silva, & Miranda, 2020), y reflexionan sobre los cambios que se deben generar para propiciar la transformación e innovación educativa en respuesta a las necesidades profesionales actuales (Gabarda et al., 2021; Pozas, & Letzel, 2021; Vaillant, 2019).

Así, aunque se ha ido avanzando en la incorporación de la tecnología digital en la educación (Cabero, & Palacios, 2020), a través del desarrollo de diversos procesos de apropiación de las TIC a nivel profesional, la generación de políticas, y ajustes en los planes de estudio en la FID; todavía la formación se limita a la adquisición básica de habilidades instrumentales frente al uso de un conjunto de herramientas tecnológicas (Masoumi, 2021; Silva et al., 2018). No obstante, los escenarios laborales demandan un profesional de la educación con capacidades para colaborar, resolver problemas, hacer uso crítico y reflexivo de la tecnología digital, y desarrollar estas habilidades articuladas con las competencias profesorales (Falloon, 2020; Padilla-Hernández et al., 2019; Rodríguez-Hoyos et al., 2021; Roll, & Ifenthaler, 2021).

Para el contexto de Latinoamérica, se considera que se requieren mayores esfuerzos en la FID para avanzar en el desarrollo de la CDD en el marco de las necesidades de la profesión docente (Ferrada, 2019; González et al., 2020; Morales et al., 2020; Silva, & Miranda, 2020; Vaillant, 2019). Específicamente en Colombia, el Ministerio de Educación Nacional (MEN, 2013), ha considerado dentro de los ejes estratégicos la formulación de políticas orientadas en los lineamientos curriculares de la Educación Superior, para atender los diferentes desafíos, en aspectos tales como la renovación pedagógica y apropiación de la tecnología digital en las prácticas profesionales de los docentes desde la FID. En este contexto, surge la oportunidad de diseñar, validar e implementar un modelo de innovación pedagógica aplicado para el desarrollo de la CDD.

Este estudio responde al análisis de pertinencia y relevancia de las problemáticas, necesidades y expectativas educativas asociadas con la formación en CDD desde la FID. En este orden de ideas, los procesos de innovación educativa que incorpora el Modelo TEP se articulan con el mejoramiento continuo y avances en la calidad educativa. En consecuencia, la FID debe ser un espacio de desarrollo profesional que cuente

con los recursos administrativos, pedagógicos y tecnológicos necesarios para responder efectivamente a la transformación y desarrollo de las diferentes dimensiones del rol docente (Cabero, & Valencia, 2020; Paredes et al., 2015; Vaillant, 2019).

A partir de los elementos anteriormente expuestos, el propósito central del estudio consistió en presentar los hallazgos de la validación funcional del Modelo TEP para el fortalecimiento de la CDD en los futuros profesionales de la Facultad de Ciencias de la Educación en la Universidad de La Guajira. En tal sentido, el Modelo TEP se ha diseñado como una alternativa para el desarrollo de la CDD en la FID y está conformado por tres dominios (tecnológico, pedagógico y empoderado), que se articulan para promover la utilización intencionada, crítica, y creativa de la tecnología en el contexto educativo; con miras a fortalecer el desarrollo de las capacidades y actitudes frente al uso eficaz de las TIC en el mejoramiento de la docencia, y el desarrollo de buenas prácticas docentes con la apropiación de la tecnología digital (Pinto et al., 2022).

Adicionalmente, el Modelo TEP posibilita desarrollar la CDD en la FID desde propuestas curriculares basadas en los principios transversal, integrador, situado, auténtico, y flexible, que se buscan promover conocimientos y habilidades integrales, adaptadas a las características de los usuarios y basadas en las necesidades del contexto laboral del docente. Esta propuesta contribuye a abordar los problemas, necesidades, retos y oportunidades que tiene la FID para fortalecer las competencias docentes desde el rol de actor, facilitador y gestor del cambio a nivel educativo, social y cultural, lo cual constituye el marco referencial para generar procesos de innovación educativa, donde la tecnología digital es una herramienta de apoyo al desarrollo de diferentes dimensiones del perfil profesional docente (Falloon, 2020; Pinto et al., 2022b).

2. MATERIAL Y MÉTODO

El presente estudio asume el enfoque de la Investigación Basada en Diseño (IBD), a partir de los aportes del modelo Reeves (de Benito, & Salinas, 2016). La IBD es una estrategia metodológica que permite delimitar la investigación con metas a diferentes plazos, las cuales orientan el desarrollo y evaluación sistemática de los procesos de innovación educativa, en función del reconocimiento de las problemáticas que se identifican en el contexto por parte de los profesionales en ejercicio, a partir del intercambio de saberes con los demás profesores e investigadores. En tal sentido, la IBD se relaciona con la integración entre teoría y práctica, hace parte de las investigaciones activas y participativas, contribuye a la mejora de la práctica educativa, y puede enriquecerse a partir de los métodos cualitativos y cuantitativos.

2.1. Ciclos de la Investigación Basada en Diseño

En coherencia con los lineamientos metodológicos de la IBD, el Modelo TEP está comprendido por tres ciclos de diseño: 1) diseño del modelo de formación (Pinto et al, 2021); 2) contextualización de la propuesta de formación para la FID (Pinto et al, 2022a); 3) implementación y evaluación del Modelo TEP para el desarrollo de la CDD en futuros docentes.

Durante el primer ciclo de diseño para la formulación del Modelo TEP, se realizó la revisión de los elementos constitutivos del modelo formativo, con el uso de una ficha analítica configuradas por 7 marcos institucionales, que surgen como referentes internacionales sobre apropiación profesional del docente de

la tecnología digital y 5 modelos de desarrollo de CDD que mayor impacto han tenido en términos de citación, los cuales fueron seleccionados como producto de una revisión sistemática de la literatura sobre CDD con una muestra de 102 artículos de investigación publicados entre los años 2009 a 2019 en revistas de alto impacto (Pinto et al, 2022a). Asimismo, el modelo TEP fue validado en este ciclo a través del Método Delphi Modificado con la participación de 11 expertos en tecnología educativa (Pinto et al, 2022b).

El segundo ciclo de diseño correspondió al desarrollo de la propuesta formativa del Modelo TEP para el contexto de la Universidad de La Guajira (Pinto et al, 2021). Para tal efecto, se realizaron 6 grupos focales, en el que participaron 20 docentes, 12 directivos, 4 estudiantes, y 4 representantes del sector empleador, con los cuales se analizaron los aspectos administrativos, pedagógicos y tecnológicos para la implementación del modelo. Se contempló dentro de los aspectos administrativos la organización y el marco institucional para la articulación del modelo TEP a la FID. En el componente de la gestión institucional, se realizó la caracterización de los perfiles de CDD de estudiantes y docentes. En el aspecto pedagógico, se consideraron los elementos para la transversalidad de la CDD en el currículo, relacionados con los objetivos de aprendizaje, contenidos de la formación, planeación y diseño, metodología, recursos, prácticas pedagógicas, y evaluación. Con relación al aspecto tecnológico, se ha considerado las condiciones de infraestructura, cobertura y acceso eficiente en el uso de los dispositivos y recursos digitales, para garantizar así la implementación del modelo, a través de los medios educativos, modalidad de la formación, y los ambientes virtuales de aprendizaje.

El presente estudio, corresponde específicamente al desarrollo del tercer ciclo de diseño, comprendido por la implementación piloto del modelo y la valoración funcional del mismo, a partir de la reflexión sobre su estado actual, retos y perspectivas desde una aproximación analítica de las fortalezas, oportunidades, debilidades y amenazas identificadas con la participación de representantes de los comités curriculares de los cuatro programas de pregrado en la Facultad de Ciencias de la Educación de la Universidad de La Guajira. Cabe resaltar que el tercer ciclo de la IBD se ha configurado con el desarrollo de tres estrategias a nivel transversal, relacionadas con: 1) implementación del modelo de formación; 2) evaluación de la satisfacción por estudiantes y docentes; 3) evaluación con enfoque FODA del Modelo TEP.

2.2. Muestra

Este estudio tiene tres muestras de la comunidad educativa de la Facultad Ciencias de la Educación de la Universidad de La Guajira. La primera está comprendida por 162 estudiantes de los últimos semestres. La segunda muestra corresponde a 131 docentes de que participaron en procesos de formación en Tecnología Educativa. La tercera muestra contó con la participación de 15 representantes de los comités curriculares (5 directivos, 4 docentes, 4 estudiantes, y 2 miembros del sector empleador) de los programas de licenciaturas en Educación Infantil, Educación Física, Música, y Etnoeducación.

2.3. Técnicas e instrumentos

Los instrumentos usados en el presente estudio fueron:

a. Cuestionario de satisfacción dirigido a estudiantes. Se usó el cuestionario de evaluación para procesos de formación diseñado por Pinto et al. (2018). Este tiene 10 indicadores de evaluación asociados a los objetivos, metodología, información oportuna, recursos educativos, encuentros sincrónicos,

ambientes virtuales, tiempos, acompañamiento, comunicación, y retroalimentación. El cuestionario presenta seis opciones de respuesta en una escala tipo Likert, siendo seis (6) la más alta valoración y uno (1) la menor. El cuestionario mostró una confiabilidad Alfa de Cronbach (α: .955) evidenciando la consistencia interna del instrumento.

b. Cuestionario de satisfacción dirigido a docentes. Se diseñó un formulario para valorar la satisfacción de los docentes basado en Turpo-Gebera et al. (2021), que cuenta con una escala ordinal con cinco grados de respuesta a saber: Insuficiente (1), Aceptable (2), Bueno (3), Sobresaliente (4) y Excelente (5). El cuestionario consta de 12 indicadores, agrupados en 4 dimensiones relacionadas con la evaluación del contenido, la metodología, la utilidad y aplicabilidad, y el facilitador o tutor. Este cuestionario arrojó confiabilidad Alfa de Cronbach (α: .973). El cuestionario se administró a los docentes que participaron del proceso de formación en CDD a través de un mensaje por correo institucional.

c. Matriz de Análisis FODA. Se realizó un análisis FODA para la valoración funcional del modelo TEP. El diseño de la matriz fue validado a través del juicio de 5 expertos con el propósito de identificar los factores fuertes y los débiles, junto con las oportunidades y las amenazas del modelo. En coherencia con Ponce (2006), este análisis permite evaluar los factores fuertes y débiles de procedencia interna, y los factores externos que son las oportunidades y amenazas. La matriz de análisis FODA incluye 3 aspectos de análisis del proceso de implementación del modelo (Administrativo, Pedagógico y Tecnológico), desde 15 componentes de evaluación derivados de la propuesta formativa realizada en el segundo ciclo de diseño del Modelo TEP. El análisis FODA fue realizado a través de un grupo focal que contó con la participación de 5 directivos, 4 docentes, 4 estudiantes, y 2 miembros del sector empleador.

2.4. Ciclos de la Investigación Basada en Diseño

La validación funcional del Modelo TEP, siguió las siguientes etapas:

1. Implementación del modelo de formación. La implementación del modelo contempló dos acciones formativas diseñadas en el ciclo dos de la IBD. La primera consistió en un diplomado en Competencia Digital Docente que contó con la participación de 131 docentes de la Facultad Ciencias de la Educación, con el propósito de incorporar el Modelo TEP dentro de la planeación curricular de las asignaturas a su cargo. La formación duró 125 horas, divididas en 6 seminarios relacionados con las diferentes dimensiones de la CDD, y el desarrollo de todo el proceso fue en modalidad virtual a través de la plataforma Moodle de la Universidad de La Guajira. El esquema de la formación, asumido como un itinerario flexible de aprendizaje, se encuentra disponible en: (https://cmapscloud.ihmc.us/viewer/cmap/1X9K1294Q-2B6Q6L8-29856V3).

   La segunda, correspondió a la formación dirigida a estudiantes próximos a egresar de la FID, la cual contó con la participación de 162 estudiantes, y se orientó hacia la apropiación del Modelo TEP en las prácticas pedagógicas de los estudiantes. La formación consistió en 4 seminarios sobre tecnología educativa, de 30 horas de duración cada uno, a saber: 1) Mediaciones pedagógicas basadas en el uso de TIC; 2) Tecnologías para el aprendizaje y el conocimiento; 3) Tecnologías para el empoderamiento y la participación; 4) Desafíos retos y oportunidades de las TIC en la educación. La formación fue implementada durante dos meses con el acompañamiento de los docentes orientadores de las

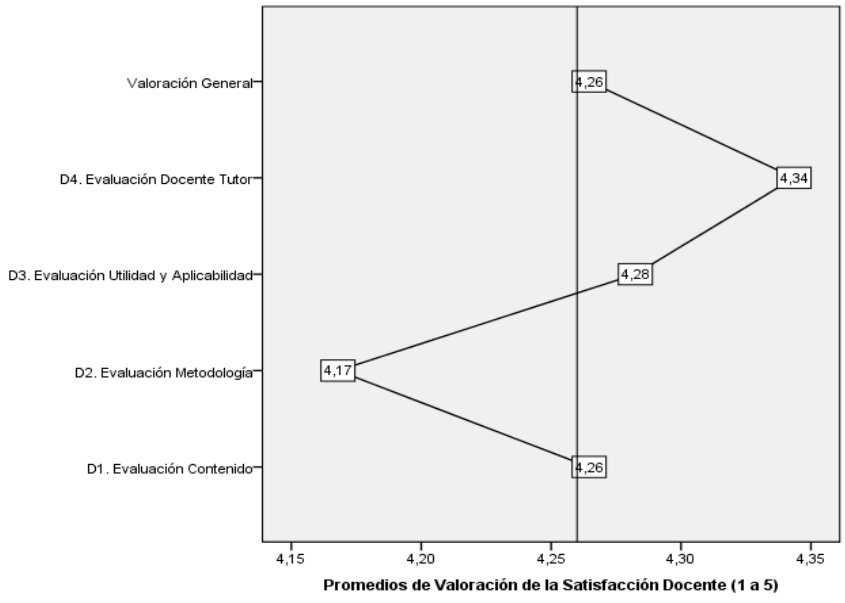
asignaturas asociadas a prácticas pedagógicas, con el soporte digital de las herramientas *Google Classroom*, *Google Meet*, y *WhatsApp*.

2. Evaluación de la satisfacción por estudiantes y docentes. Consistió en la administración de los dos cuestionarios de satisfacción frente a la implementación de la propuesta formativa basada en el Modelo TEP, uno dirigido a estudiantes y el otro a docentes. Cabe resaltar que la aplicación de los instrumentos se llevó a cabo al finalizar las etapas de formación correspondientes, siguiendo los lineamientos éticos con la administración de técnicas de la investigación en entornos mediados por TIC.
3. Evaluación con enfoque FODA del Modelo TEP. Para este ejercicio se realizó un análisis FODA a la implementación del Modelo TEP en la Universidad de la Guajira, para realizar la valoración y reconocimiento de las estrategias para aprovechar las fortalezas y oportunidades, y reducir las debilidades y amenazas identificadas en el Modelo TEP. La evaluación contó con la participación de 15 representantes del comité curricular de los programas de licenciaturas en Educación Infantil, Educación Física, Música, y Etnoeducación. El proceso se realizó a través de un grupo focal, usando la herramienta *Google Meet*, en un encuentro sincrónico en el que se presentaron los diferentes componentes de evaluación del Modelo TEP y se recolectó información de manera cualitativa de las opiniones y percepciones de los directivos, docentes, estudiantes, y miembros del sector empleador.

3. RESULTADOS

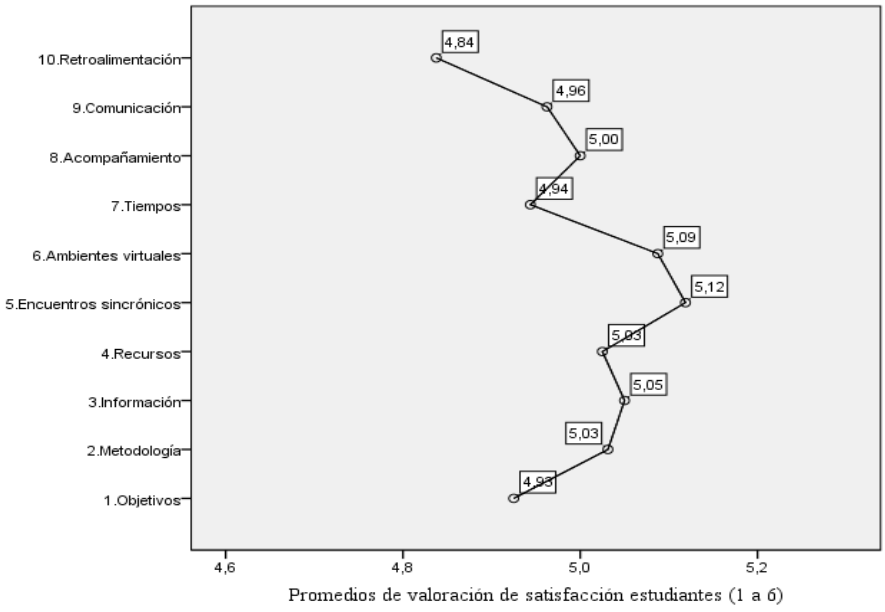
A continuación, se ilustra la valoración sobre el nivel de satisfacción que reportan los docentes, frente a las dimensiones de evaluación de contenido, metodología, utilidad y aplicabilidad, y docente tutor. Tal como se puede observar en la figura 1, en primera instancia se presentan los niveles globales de satisfacción de los docentes con el proceso de formación, con una media general de 4.26 sobre un máximo de 5 puntos, siendo superior la dimensión de evaluación docente 4.34, seguida por utilidad y aplicabilidad 4.28, los contenidos 4.26 y la metodología con menor de valoración 4.17.

FIGURA 1. Análisis general de la valoración de satisfacción de docentes



En la figura 2 se pueden observar las valoraciones realizadas por los estudiantes al finalizar el tercer ciclo de diseño. Todos los indicadores de evaluación recibieron valoraciones positivas superiores a (4.84) sobre un máximo de 6 puntos. Los indicadores con mayor valoración se clasificaron por encima de (5.0), a saber: Los encuentros sincrónicos como espacios de interacción (5.12), Los ambientes virtuales (5.09), La información presentada fue suficiente, adecuada y comprensible (5.05), La metodología y los recursos de aprendizaje (5.03) respectivamente. En términos generales la tendencia de acuerdo frente a los indicadores de evaluación fue de (4.99).

FIGURA 2. Análisis general de la valoración de satisfacción de estudiantes



De otra parte, se realizó el proceso de valoración de la implementación del modelo TEP teniendo presente los aspectos administrativos, pedagógicos y tecnológicos, de acuerdo con los componentes establecidos en el segundo ciclo de diseño (Pinto et al, 2021). Para la generación de las categorías finales asociadas a las fortalezas, oportunidades, debilidades y amenazas incorporadas en la tabla 1, 2 y 3, se llevó a cabo un análisis cualitativo de los contenidos del *verbatim* de cada componente de evaluación correspondiente a la sesión del grupo focal, que contó con la participación de representantes de los comités curriculares de los diferentes programas.

TABLA 1. Resultados análisis FODA al Aspecto Administrativo Modelo TEP

Componentes	Fortaleza	Oportunidad	Debilidad	Amenaza
Gestión institucional	**F1** - Existe compromiso real por parte de las directivas y docentes para fortalecer la CDD a nivel curricular. **F2** -Existe una propuesta clara para la articulación de modelo TEP a nivel curricular. **F3** - La comunidad educativa comprende la transformación del perfil profesional del futuro docente. **F4** - Existe autorización a nivel institucional para la implementación del modelo TEP. **F5** - Se cuenta con los recursos institucionales para la gestión administrativa del modelo TEP.	**O1** - El modelo TEP parte del análisis de necesidades y oportunidades de desarrollo institucional. **O2** - El modelo TEP permite adaptarse a las particularidades de cada programa. **O3** - El modelo TEP aporta un valor agregado a los procesos de articulación entre los campos de formación curricular. **O4** - Los dominios del modelo TEP fortalecen el PEP. **O5** - El modelo TEP surge como una oportunidad institucional para afrontar los retos educativos evidenciados en la pandemia.	**D1** - Existe un bajo nivel de capacidad de respuesta institucional oportuna para asumir los cambios permanentes formulados con el modelo.	**A1** - La inestabilidad administrativa a nivel departamental puede constituir una amenaza para la gestión institucional y el desarrollo efectivo del modelo TEP.
Caracterización de los niveles de la CDD	**F6** - Se dispone de instrumentos de evaluación para valorar los avances en el aprovechamiento profesional de las TIC. **F7** - Existe una caracterización diagnóstica inicial sobre los niveles de CDD de los estudiantes y docentes.	**O6** - La institución cuenta con mecanismos para certificar los niveles de CDD y para la cualificación estudiantil y docente. **O7** - El modelo TEP surge como una oportunidad para articular la CDD a los estándares internacionales.	**D2** - El compromiso de la comunidad educativa en metas a mediano y largo plazo para la continuidad del modelo.	**A2** - Circulan en el ámbito académico diferentes instrumentos para valorar la CDD en la FID de forma descontextualizada.
Perfil de Competencias de Egreso en los futuros docentes	**F8** - El modelo TEP establece el perfil de competencias en CDD que se deben desarrollar en la FID.	**O8** - El Modelo TEP ha propiciado en los comités curriculares el análisis sobre las oportunidades de mejoramiento que tiene el perfil de competencias de los futuros profesores.	**D3** - No se evidencian en los documentos tales como el PEP y guías propedéuticas los conocimientos y habilidades asociadas con la CDD.	**A3** - Resistencia sociocultural frente al cambio por efecto de los procesos de innovación y apropiación en la era digital.
Perfil de Competencias del Docente Universitario	**F9** - El docente universitario tiene actitudes positivas y compromiso con el desarrollo de la CDD.	**O9** - El diseño e implementación del diplomado en CDD contribuye a que el docente sea un referente para el desarrollo de buenas prácticas con uso de tecnología digital.	**D4** - Los docentes universitarios no cuentan con altos niveles de CDD. **D5** - El docente universitario no cuenta con amplia experiencia en el uso de pedagogías emergentes.	**A4** - Los procesos de contratación docente presentan algunos niveles de inestabilidad, lo que genera que algunos docentes no se comprometan con procesos de formación.

TABLA 2. Resultados análisis FODA al Aspecto Pedagógico Modelo TEP

Componentes	Fortaleza	Oportunidad	Debilidad	Amenaza
Objetivos de Aprendizaje	**F10** - Existen objetivos claros de aprendizaje en coherencia con los lineamientos del modelo TEP.	**O10** - Los 15 indicadores establecidos dentro de los dominios del modelo TEP, permiten la articulación entre las metas del aprendizaje y los lineamientos curriculares de los programas.	**D6** - Se identifica un bajo nivel de conocimiento sobre los 15 indicadores de CDD del modelo TEP por parte de los docentes y estudiantes.	
Contenidos de la formación	**F11** - Tanto en el PEI como en el PEP se reconoce la relevancia, pertinencia y compromiso permanente con el desarrollo de proceso de autorregulación y mejoramiento curricular.	**O11** - Existen posibilidades para avanzar en la transversalidad de la CDD y en los procesos de innovación y apropiación pedagógica de la tecnología educativa.	**D7** - Falta integrar curricularmente en los planes de asignatura de forma explícita la integralidad entre los dominios tecnológico, empoderado y pedagógico.	**A5** - Existen una oferta amplia a nivel externo de cursos, talleres, diplomados centrados en el manejo instrumental de las TIC.
Planeación y Diseño de la Formación	**F12** - La universidad dispone de guías para la planeación microcurrícular que contribuye a realizar seguimiento a las estrategias para el desarrollo de la CDD.	**O12** - La implementación del modelo TEP brinda la oportunidad de incluir dentro de la planeación de las asignaturas, diferentes actividades y recursos que fortalecen la CDD.	**D8** - Falta hacer explícito a nivel de los microcurrículos la articulación entre los dominios tecnológico, empoderado y pedagógico en la FID.	
Metodología	**F13** - Se promueven la interacción, personalización y flexibilidad en los procesos de aprendizaje.	**O13** - El modelo TEP brinda la oportunidad de pedagogías emergentes.	**D9** - La formación en CDD cuenta con pocas actividades y recursos de aprendizaje que permiten el aprendizaje autónomo.	
Materiales y Recursos	**F14** - Se cuenta con empatía y actitud positiva frente al desarrollo de materiales y recursos por parte de los docentes y estudiantes.	**O14** - Estudiantes y docentes pueden diseñar, utilizar, compartir e incrementar los niveles de apropiación social y las buenas prácticas relacionadas con el manejo de los recursos educativos abiertos.	**D10** - Actualmente existe una disponibilidad limitada en relación con los materiales y recursos educativos elaborados por el docente.	
Prácticas de innovación educativa	**F15** - A nivel institucional se gestionan y se establecen lineamientos para que en el desarrollo de las prácticas pedagógicas.	**O15** - Se cuenta con la oportunidad de empoderar las prácticas pedagógicas, para que el docente cooperante a su vez desarrolle altos niveles de CDD. **O16** - El modelo brinda la oportunidad al estudiante de vivenciar dentro de sus escenarios escolares el beneficio que brindan los procesos de uso y aprovechamiento educativo de la tecnología digital.	**D11** - Los estudiantes de manera paralela a la formación NO están desarrollando prácticas pedagógicas con un nivel de integración adecuada de la tecnología digital. **D12** - Los estudiantes NO diseñan e implementan un proyecto de aula en el que se integre adecuadamente la tecnología educativa.	**A6** - Los escenarios de prácticas profesionales presentan algunas dificultades en su infraestructura TIC y se evidencia la necesidad de fortalecer los niveles de CDD en los docentes cooperantes.

Evaluación y Seguimiento	**F16** - Se cuenta con el uso adecuado de diferentes estrategias y herramientas digitales, tales como la e-rúbrica, el e-portafolio, entre otros para evaluar los desempeños de los participantes.	**O17** - La incorporación del modelo TEP, abre un espacio de oportunidades para el acompañamiento, evaluación y seguimiento individual al desempeño de los participantes.	**D13** - Actualmente NO se cuentan con una normativa a nivel institucional en la cual se solicite formalmente la acreditación en el desarrollo de los niveles de la CDD.

TABLA 3. Resultados análisis FODA al Aspecto Tecnológico Modelo TEP

Componentes	Fortaleza	Oportunidad	Debilidad	Amenaza
Medios educativos	**F17** - La Universidad cuenta con laboratorios tecnológicos y plataformas digitales para apoyar los procesos de formación. **F18** - Los estudiantes tienen alto compromiso y resiliencia para optimizar el uso de sus dispositivos y condiciones de conectividad de la mejor manera posible.	**O18** - La implementación del modelo TEP brinda oportunidades para superar la tendencia al uso básico e instrumental de las herramientas TIC.	**D14** - Los estudiantes y docentes actualmente tienen un nivel de acceso limitado a los recursos tecnológicos institucionales por efecto de la pandemia.	**A7** - La brecha digital en el contexto regional es significativa tanto en la cobertura, conectividad, dispositivos tecnológicos y condiciones adecuadas para el uso de las TIC.
Modalidad de la formación	**F19** - Existe un proceso gradual y creciente de diseño, desarrollo y disponibilidad de asignaturas bajo la modalidad virtual.	**O19** - El modelo TEP tiene como oportunidad su alto nivel de compatibilidad con las diferentes modalidades de formación (presencial asistida por TIC, b-learning y virtual).	**D15** - Se requiere incrementar los niveles de experticia en la formulación de programas de formación que contemplen los escenarios emergentes de enseñanza y ecosistemas digitales para el aprendizaje.	**A8** - Existe riesgo latente de retroceder en los procesos de innovación, desarrollo y apropiación pedagógica y tecnológica mediada por las herramientas TIC cuando se retorne a la presencialidad.
Aula Virtual	**F20** - La Universidad dispone de ecosistemas digitales para para los procesos de formación en la FID.	**O20** - Con la incorporación del modelo TEP, los ambientes virtuales tienen la oportunidad de desarrollar y crecer con la integralidad.	**D16** - Falta un mayor nivel de aprovechamiento efectivo de los recursos disponibles por parte de los estudiantes y docentes.	

La valoración FODA permitió identificar que existen fortalezas relacionadas con la aceptación del modelo por la comunidad educativa, y que la principal debilidad corresponde a las dificultades en el desarrollo de procesos de articulación entre el Modelo TEP con las prácticas pedagógicas de los estudiantes. Asimismo, como amenaza se evidencian los niveles diferenciales de la brecha digital, y se resalta la oportunidad asociada al compromiso institucional para fortalecer el desarrollo de la CDD, con una perspectiva de innovación educativa y pedagógica que genera un alto potencial de transformación curricular, para responder a las necesidades y retos del contexto educativo en la FID.

4. DISCUSIÓN

A partir de los hallazgos identificados en el estudio se evidencia que existe disposición y compromiso por parte de los docentes y directivos docentes frente al desarrollo de la CDD, tal como se comprobó en la participación en el diplomado en competencia digital docente. En este sentido, se considera que el Modelo TEP promueve la transformación profesional del docente, así como la gestión e innovación pedagógica con aportes incorporados en los microcurrículos para el desarrollo de la CDD, tal como se evidencia en las valoraciones de los docentes frente al modelo de formación, identificando calificaciones con una tendencia positiva, principalmente en las categorías bueno, sobresaliente y excelente en cada una de las dimensiones de evaluación, con un promedio general de 4.26 sobre un máximo nivel de 5 puntos.

También se hacen explícitos los aportes del Modelo TEP al contemplar la necesidad de nivelar la CDD en los estudiantes que están terminando su formación. Aunque cabe resaltar que en los principios del modelo se establece el desarrollo de la CDD de manera transversal, integrada, situada, auténtica y flexible durante toda la formación profesional. Los resultados del estudio permiten identificar que los estudiantes que se encuentran finalizando la FID, valoran positivamente la formación basada en el Modelo TEP (4.99 en una escala de 1 a 6). Lo anterior evidencia el aporte significativo que tiene la implementación del modelo para enriquecer pedagógicamente las prácticas profesionales.

En este sentido la satisfacción percibida del modelo TEP por parte de estudiantes y docentes, es un indicador que sirve para mirar la proyección y usabilidad del modelo de formación de acuerdo con Turpo-Gebera et al. (2021). También el modelo permite contextualizar los procesos para incorporar de manera amplia y deliberada la CDD a las experiencias y expectativas de los participantes (Falloon, 2020). En particular, dentro de los aprendizajes derivados de la implementación del Modelo TEP, se coincide con Cabero y Martínez (2019) en que es prioritario: 1) la práctica docente para apropiar lo aprendido y recibir retroalimentación oportuna, y 2) el modelado a través de los referentes profesionales, tales como formadores de docentes y profesores de las instituciones educativas cooperantes.

Por otra parte, la valoración del Modelo TEP a nivel administrativo, pedagógico y tecnológico desde el enfoque FODA, posibilitó identificar 14 indicadores con 63 elementos, clasificados a su vez en 20 fortalezas, 16 debilidades, 20 oportunidades y 8 amenazas, los cuales permiten afirmar que se ha avanzado en la discusión y apropiación del modelo para generar los recursos, las condiciones y las oportunidades para el desarrollo de la CDD en la FID. Desde esta perspectiva, en la formación inicial del profesorado, promover la CDD centrada únicamente en lo tecnológico no es suficiente para hacer transformaciones educativas. Es imperante avanzar en la reflexión sobre la necesidad de transformar la enseñanza con TIC, promover una escuela participativa, generar cambios metodológicos y adaptarse a las demandas sociales (Morales et al., 2020; Paredes et al, 2015). También es necesario satisfacer las expectativas sobre apropiación profesional de la tecnología digital y apoyar las transformaciones en las prácticas docentes (Balladares-Burgos, 2018; González et al., 2020; Silva, & Miranda, 2020).

5. CONCLUSIONES

En conclusión, el Modelo TEP se convierte en una apuesta crítica frente a la adopción de modelos de formación centrados en el uso y apropiación profesional de la tecnología educativa. Se trata de una propuesta holística que busca impactar las diferentes dimensiones del rol profesional docente, y en este sentido implica mirar la tecnología digital siempre como mediaciones y herramientas que facilitan al docente actualizarse, interactuar, colaborar, mejorar la gestión del aprendizaje de los estudiantes, y propiciar innovaciones educativas.

Finalmente, se considera la importancia estratégica que tiene el desarrollo y fortalecimiento permanente de la CDD, facilitando al futuro docente la oportunidad de profundizar en su ejercicio profesoral con experiencias de apropiación social y construcción del conocimiento, trabajando de manera interdisciplinaria, identificando los problemas del contexto, administrando efectivamente las condiciones de recursos, espacio y tiempo, diversificando con el diseño innovador las actividades pedagógicas, potencializando el trabajo colaborativo, personalizando las experiencias significativas de aprendizaje y transformando así de forma multidimensional e integradora su rol profesional (Falloon, 2020; Lázaro et al., 2021; Paredes et al, 2015; Pozas, & Letzel, 2021).

Cabe resaltar que aún existen retos pendientes por asumir desde los principios transversal, integrador, situado, auténtico y flexible para el desarrollo de los dominios tecnológico, empoderado y pedagógico. La evaluación FODA del modelo con la participación de representantes de la comunidad educativa permite retroalimentar el Modelo TEP, genera lineamientos estratégicos para usar las fortalezas y las oportunidades para superar las debilidades y minimizar las amenazas, y da origen a nuevos ciclos de la IBD.

5.1. Limitaciones y prospectiva

Se recomienda la generación de proyectos, programas y experiencias de formación avanzada que estén situadas en el contexto desde la FID, para contribuir al desarrollo de la CDD y al fortalecimiento profesional de los futuros docentes; entendiendo que no hay fórmulas metodológicas y organizativas de formación del profesorado estandarizadas, y que los dispositivos tecnológicos no deben ser el centro de atención de la agenda de formación docente (Morales et al., 2020; Paredes et al., 2015; Pinto, & Pérez, 2022).

Complementariamente, este estudio es punto de referencia para generar nuevos procesos de investigación que contribuyan con el reto de promover el desarrollo de buenas prácticas docentes en la FID. Este reto surge a partir de la identificación de algunos aspectos críticos, relacionadas con los niveles de conocimiento dispares sobre TIC y su utilidad en educación por los docentes, fallas en los equipos y conectividad, y falta de prácticas pedagógicas que vinculen procesos de innovación educativa (Balladares-Burgos, 2018; González et al., 2020; Silva, & Miranda, 2020).

6. FINANCIACIÓN

Este trabajo se ha realizado dentro del proyecto de investigación Diseño de un modelo formativo para el desarrollo de la competencia digital docente en futuros maestros de La Universidad de La Guajira, el cual ha sido financiado por la Universidad de La Guajira.

7. REFERENCIAS

Álvarez, A., López-de-Arana, E., & Sáenz-del-Castillo, A. (2022). Una propuesta interdisciplinar para trabajar la competencia digital docente en el Grado de Educación Infantil (UPV/EHU). *Edutec. Revista Electrónica De Tecnología Educativa*, (79), 235-252. https://doi.org/10.21556/edutec.2022.79.2045

Balladares-Burgos, J. (2018). Diseño pedagógico de la educación digital para la formación del profesorado. *Revista Latinoamericana de Tecnología Educativa*, 17(1), 41-60. https://bit.ly/3OOGenI

de Benito, B., & Salinas Ibáñez, J. (2016). La Investigación Basada en Diseño en Tecnología Educativa. *Revista Interuniversitaria de Investigación en Tecnología Educativa*, (0), 44-59. https://doi.org/10.6018/riite2016/260631

Cabero, J., & Martínez, A. (2019). Las tecnologías de la información y comunicación y la formación inicial de los docentes: modelos y competencias digitales. *Profesorado, Revista de Currículum y Formación de Profesorado, 23*(3), 247-268. https://doi.org/10.30827/profesorado.v23i3.9421

Cabero, J., & Palacios, A. (2020). Marco Europeo de Competencia Digital Docente «DigCompEdu» y cuestionario «DigCompEdu Check-In». *EDMETIC. Revista de Educación Mediática y TIC, 9*(1), 213–234. https://doi.org/10.21071/edmetic.v9i1.12462

Cabero, J., & Valencia, R. (2020). Y COVID-19 transformó el sistema educativo: reflexiones y experiencias para aprender. *IJERI*: *Revista Internacional de Investigación e Innovación Educativa*, (15), 218–228. https://doi.org/10.46661/ijeri.5246

Falcó, J. M. (2017). Evaluación de la competencia digital docente en la comunidad autónoma de Aragón. *Revista Electrónica de Investigación Educativa*, *19*(4), 73-83. https://doi.org/10.24320/redie.2017.19.4.1359

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Education Tech Research Dev.*, 68, 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Ferrada, D. (2019). La sintonización en la formación inicial docente. Una mirada desde Chile. *Revista Electrónica de Investigación Educativa*, *21*, e39, 1-14. https://doi.org/10.24320/redie.2019.21.e39.2113

Gabarda, V., García, E., Ferrando, M.L., & Chiappe, A. (2021). El profesorado de Educación Infantil y Primaria: formación tecnológica y competencia digital. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(2), 19-31. https://doi.org/10.24310/innoeduca.2021.v7i2.12261

Lázaro, J. L., Sanromà, M., Molero, T., & Sanz, I. (2021). La formación en competencias digitales de los futuros docentes: una experiencia de Aprendizaje-Servicio en la universidad. *Edutec. Revista Electrónica De Tecnología Educativa,* (78), 54-70. https://doi.org/10.21556/edutec.2021.78.2243

Lázaro, J.L., & Gisbert, M. (2015). El desarrollo de la competencia digital docente a partir de una experiencia piloto de formación en alternancia en el Grado de Educación. *Educar*, 51, 2, 321-348. https://bit.ly/3bnYE0Q

Masoumi, D. (2021). Situating ICT in early childhood teacher education. *Educ Inf Technol*, 26, 3009–3026. https://doi.org/10.1007/s10639-020-10399-7

Ministerio de Educación de Colombia. (2013). *Competencias TIC para el desarrollo profesional docente*. https://bit.ly/2KEULlG

Morales. J. M., Rivoir, A., Lázaro, J. L., & Gisbert-Cervera, M. (2020). ¿Cuánto importa la competencia digital docente? Análisis de los programas de formación inicial docente en Uruguay. *Innoeduca. International Journal of Technology and Educational Innovation,* 6(2), 128-140. https://doi.org/10.24310/innoeduca.2020.v6i2.5601

Padilla-Hernández, A. L., Gámiz-Sánchez, V. M., & Romero-López, M. A. (2019). Niveles de desarrollo de la Competencia Digital Docente: una mirada a marcos recientes del ámbito internacional. *Innoeduca. International Journal of Technology and Educational Innovation, 5*(2), 140-150. https://doi.org/10.24310/innoeduca.2019.v5i2.5600

Paredes, J., Guitert, M., & Rubia, B. (2015). La innovación y la tecnología educativa como base de la formación inicial del profesorado para la renovación de la enseñanza. *RELATEC* , 14(1), 101114. https://bit.ly/3SjvrEG

Pinto, A.R., Cortés, O., & Alfaro, C. (2017). Hacia La Transformación De La Práctica Docente: Modelo Espiral De Competen-

cias TICTACTEP. *Píxel-Bit. Revista de Medios y Educación*, (51), 37–51. https://doi.org/10.12795/pixelbit.2017.i51.03

Pinto, A.R., Díaz, J., Rodríguez, B., Atrio, S.I., Alfaro, C.A., Cortés, I., Santos, Y., Morales, B., & Berrio, H. (2018). *Innovaciones y experiencias en escenarios de aprendizaje mediados por TIC*. Universidad de La Guajira. https://bit.ly/3C2dHG9

Pinto, A. R., & Pérez-Garcias, A. (2022). Gestión curricular y desarrollo de la competencia digital docente en la formación inicial del profesorado. *RED. Revista Educación a Distancia*, *22*(69), 1-21. https://doi.org/10.6018/red.493551

Pinto, A. R., Pérez, A., & Darder, A. (2021). Propuesta formativa basada en el modelo TEP para el desarrollo de la Competencia Digital Docente. *Espacios*, 42(3), 88-101. https://bit.ly/3Sk0UqD

Pinto, A., Pérez, A., & Darder, A. (2022a). Development of teaching digital competence in initial teacher training: A systematic review. *World Journal on Educational Technology: Current Issues*, *14*(1), 01-15. https://doi.org/10.18844/wjet.v14i1.6250

Pinto, A. R., Pérez Garcias, A., & Darder Mesquida, A (2022b). Formulación y validación del Modelo Tecnológico Empoderado y Pedagógico para promover la competencia digital docente en la formación inicial del profesorado. *Formación Universitaria*, 15(1). En prensa.

Ponce, H. (2006). La matriz FODA: una alternativa para realizar diagnósticos y determinar estrategias de intervención en las organizaciones productivas y sociales. *Contribuciones a la Economía*. https://bit.ly/3cVym6q

Pozas, M., & Letzel, V. (2021). "Do You Think You Have What it Takes?" – Exploring Predictors of Pre-Service Teachers' Prospective ICT Use. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-021-09551-0

Roll, M., & Ifenthaler, D. (2021). Multidisciplinary digital competencies of pre-service vocational teachers. *Empirical Res Voc Ed Train*, 13, 7. https://doi.org/10.1186/s40461-021-00112-4

Silva, J., Lázaro, J. L., Miranda, P., & Canales, R. (2018). El desarrollo de la competencia digital docente durante la formación del profesorado. *Opción*, 34(86), 423-449.

Silva, J., & Miranda, P. (2020). Presencia de la competencia digital docente en los programas de formación inicial en universidades públicas chilenas. *Revista de estudios y experiencias en educación*, 19(41), 149-165. http://doi.org/10.21703/rexe.20201941silva9

Turpo-Gebera, O., Hurtado-Mazeyra, A., Delgado-Sarmiento, Y., & Peréz-Postigo, G. (2021). Satisfacción del profesorado con la formación en servicio online: aproximaciones desde la usabilidad pedagógica. *Pixel-Bit. Revista de Medios y Educación*, (62), 39-70. https://doi.org/10.12795/pixelbit.79472

UNESCO (2019). *UNESCO ICT Competency Framework for Teachers*. https://bit.ly/3OPhSdp

Vaillant, D. E. (2019). Formación Inicial del Profesorado de Educación Secundaria en América Latina- Dilemas y Desafíos. *Profesorado*, 23(3), 35-52. https://doi.org/10.30827/profesorado.v23i3.9516

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 53-66 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15402

A Cross-sectional Study on Zoom Fatigue and Satisfaction with Online Learning among Filipino Nursing Students

Un estudio transversal sobre la fatiga y la satisfacción de Zoom en el aprendizaje en línea entre estudiantes de enfermería filipinos

RECIBIDO 23/09/2022 ACEPTADO 11/10/2022 PUBLICADO 01/06/2023

Mary Kristine Q. Amboy
West Visayas State University, College of Nursing, Philippines
mkamboy@wvsu.edu.ph

Maylin P. Habaña
West Visayas State University, College of Nursing, Philippines
mhabana@wvsu.edu.ph

Liza Marie M. Ramirez
West Visayas State University, College of Nursing, Philippines
lmramirez@wvsu.edu.ph

Marianne G. Sotelo
West Visayas State University, College of Nursing, Philippines
marianne.sotelo@wvsu.edu.ph

Ayesha C. Penuela
West Visayas State University, College of Nursing, Philippines
acpenuela@wvsu.edu.ph

Ryan Michael F. Oducado
West Visayas State University, College of Nursing, Philippines
rmoducado@wvsu.edu.ph

ABSTRACT

This study determined the associations between Zoom fatigue and satisfaction with online learning among nursing students in a higher institution of learning in the Philippines. A cross-sectional research design was employed and a web-based survey using two self-report measures was conducted in 2021. Descriptive statistics, Pearson's correlation, and linear regression were used to analyze the responses of 408 student respondents. The sample demonstrated high levels of Zoom fatigue and low to average online learning satisfaction. There was a significant difference in the Zoom fatigue levels between male and female students. Higher Zoom fatigue levels predicted reduced online learning satisfaction. This study underscores that online learning and virtual meetings have a likely negative impact on students' online learning experiences. Nursing schools may need to reconsider the existing learning and teaching strategies and start measures that will foster more meaningful and positive experiences in the virtual learning environment.

KEYWORDS Fatigue; nursing students; online learning; videoconferencing; Zoom.

RESUMEN

Este estudio determinó las asociaciones entre la fatiga al usar Zoom y la satisfacción en el aprendizaje en línea entre estudiantes de enfermería en una institución superior de aprendizaje en Filipinas. Se empleó un diseño de investigación transversal y se realizó una encuesta basada en la web con dos medidas de autoinforme en 2021. Se usaron estadísticas descriptivas, correlación de Pearson y regresión lineal para analizar las respuestas de 408 estudiantes encuestados. La muestra demostró altos niveles de fatiga al utilizar Zoom y una satisfacción de aprendizaje en línea de baja a media. Hubo una diferencia significativa en los niveles de fatiga al usar Zoom entre estudiantes masculinos y femeninos. Los niveles más altos de fatiga al utilizar Zoom predijeron una reducción de la satisfacción del aprendizaje en línea. Este estudio subraya que el aprendizaje en línea y las reuniones virtuales probablemente tengan un impacto negativo en las experiencias de aprendizaje en línea de los estudiantes. Es posible que las escuelas de enfermería deban reconsiderar las estrategias de aprendizaje y enseñanza existentes e iniciar medidas que fomenten experiencias más significativas y positivas en el entorno de aprendizaje virtual.

PALABRAS CLAVE Fatiga; estudiantes de enfermería; aprendizaje en línea; videoconferencia; Zoom.

1. INTRODUCTION

The coronavirus pandemic has wreaked havoc on educational systems and immensely impacted various aspects of students' lives around the globe (Cantero Téllez et al., 2022; Egcas et al., 2021). Information and Communication Technology (ICT) has transformed education and has been instrumental in the changes in the educational landscape during the global crisis and implementation of emergency remote teaching (Corell-Almuzara et al., 2021; Galván Orozco et al., 2022; Moreno-Guerrero et al., 2021, 2022; Torras Virgili, 2021). With the transition to online learning during the COVID-19 pandemic, nursing education has embraced videoconferencing tools and other technological advancements as the new trend in instructional delivery (Moralista et al., 2022; Oducado, 2021; Öztürk et al., 2020). With this abrupt change in teaching-learning landscapes, several studies have revealed varying levels of satisfaction among academic staff and learners, which has shown a substantial impact on student performance and the attainment of learning outcomes in blended learning modalities (Baber, 2020; Gopal et al., 2021; Ranadewa et al., 2021). According to a survey by Nambiar (2020), 68.4 % of students struggled to comprehend online lectures through platforms such as videoconferencing tools, while 67.5 % had difficulty articulating their doubts online compared to in-person lectures. Moreover, Peytcheva-Forsyth et al. (2018) observed that students with higher digital competence favored online learning, whereas Chogo (2020) reported that about 52 % of students were dissatisfied with remote learning. These findings highlight the possibility that the technical aspects of online learning platforms may influence student satisfaction. Aside from being multidimensional and complex, considerable evidence supports that student learner satisfaction is critical, encompassing various elements in the online learning environment such as technology tools and support, communication, engagement, workload, flexibility, instructor pedagogical skills, and feedback (Ranadewa et al., 2021; Wei, & Chou, 2020).

Empirical evidence has linked learner satisfaction to a range of variables in online learning, including stress and burnout (Atmaca et al., 2020; Oducado, & Estoque, 2021). During the pandemic, a new phenomenon known as "Zoom fatigue," which refers to feelings of worry, tiredness, or exhaustion triggered by excessive use of virtual communication platforms (Bowser et al., 2022; Döring et al., 2022; Fauville et al. 2021a;

Salhab, 2022; Williams, 2021) was noted. In nursing education, Vandenberg and Magnuson (2021) reported that only 12 % of student nurses enjoyed online practice courses. Nursing students were dissatisfied with the usage of Zoom conferencing for clinical or related learning experiences, claiming that "we are not learning anything" or that "clinicals cannot be done over Zoom" (Vandenberg, & Magnuson, 2021). Navigating online videoconferencing has led to technical concerns that did not exist during in-person lectures, including frozen screens, broken audio, and poor or nonexistent internet connectivity (Bailey, 2021). On the other hand, the study by Elshami et al. (2021) among Medical and Health Science schools reported that overall satisfaction with online learning was 41.3 % among students and 74.3 % for the faculty. The same study showed that student learners' highest satisfaction areas were flexibility and communication. Divergent viewpoints have been documented in related studies, with some claiming that videoconferencing and other synchronous or asynchronous activities promote flexibility while others find them time-consuming and rigorous, often leading to stress and burnout (Badia et al., 2019, Duke et al., 2020).

During the COVID-19 era, the rapid expansion of online learning and technology-enhanced tools in Philippine nursing schools led to a paradigm shift where both teachers and learners confronted unprecedented levels of challenges and stress (Guillasper et al., 2020; Guillasper et al., 2021; Oducado, & Soriano, 2021). In an undergraduate nursing school study conducted by Oducado and Estoque (2021), students reported low to moderate satisfaction as well as high levels of stress during the pandemic. High-stress levels are typically associated with a propensity to spiral into academic burnout syndrome (Nurhidayati et al., 2021; Wang et al., 2022). This trend also referred to as "school burnout" or "learning burnout," has been attributed to a confluence of academic inefficacy, emotional exhaustion, and cynicism as a consequence of an ongoing failure to manage schooling pressure effectively (Sveinsdóttir et al., 2021). This must be given attention as academic challenges in nursing school along with other pandemic-related and personal stressors make it difficult for students to stay motivated (Stevenson, 2022).

The outcomes of the literature review and the researchers' personal experiences as nurse educators enabled them to recognize the possible ramifications of excessive Zoom or videoconferencing fatigue on learners. These include feelings of being overwhelmed, exhaustion, decreased motivation, and mental health deviations or physical illnesses (Dhir et al., 2018; Fauville et al., 2021a; 2021b). Nurse educators and school administrators must investigate and respond to these palpable problems, backed by robust research. Primarily, this study was motivated by the lack of information on the relationships among the main variables, particularly among nursing students in a resource-limited setting. Furthermore, the knowledge gained from this study will be leveraged to promote feasible strategies and measures in virtual or blended learning platforms in the future.

Meanwhile, several studies have shown that issues related to videoconferencing or Zoom fatigue are mediated by the gender of the respondents (Bailenson, 2021; Bennett et al., 2021; Hacker et al., 2020). Notably, researchers from Stanford University indicated that one in seven women reported feeling highly worn out and exhausted after participating in Zoom sessions (Fauville, 2021b). These findings was attributed to the females' "self-consciousness" and "self-focused attention" (Dutta et al., 2021; Fauville, 2021b; Oducado et al., 2021; Oducado et al., 2022b; 2022c). Considering other demographic uses and personality attributes, women were significantly affected by Zoom fatigue compared to men, according to the above literature.

Understanding gender differences and how it affects students' performance can help in formulating and advancing effective policies to address equity and quality concerns in education (Organization for Economic Cooperation and Development, 2009).

This study is anchored on Daft and Lengel's (1986) Media Richness theory to explain the relationships between the primary variables. According to this model, media can be appraised along a rich-to-lean spectrum, encompassing feedback, message customization, linguistic variation, and several communication routes and indicators. The hypothesized association between Zoom fatigue and online learning satisfaction may be linked with the precepts of this theory, which asserts that improper or mismanaged media choices (i.e., in instructional delivery) may convey imprecise messages to the recipients (i.e., learners), resulting in uncertainty or equivocality (Daft, & Lengel, 1986) thus low satisfaction. The theory contends that when media is not utilized responsibly (e.g., excessive or inappropriate use of videoconferencing tools), this may lead to issues, such as poor learning satisfaction which was considerably prevalent among students during the new normal. Hence, systems such as educational institutions should closely examine, select, and manage media options in various contexts of remote learning (Tang, & Hew, 2019; Tanupabrungsun, & Hemsley, 2018). Fan-Chen et al. (2019) also claim that end-users who perceive higher or better-quality media richness in online interactions have higher satisfaction levels in virtual learning environments. According to Kobayashi (2017), students prefer recorded lectures with slides and audio over synchronous video lectures such as Zoom conferencing, which presents a number of technological issues. In the same study, learners favored collaborative and rich media platforms. Further, according to Kingsley-Westerman et al. (2015), proper media selection and practices, such as when using Zoom videoconferencing, can enable the transmission of media-rich channels that lead to "closer relationships," less ambiguity, and/or burnout, which may translate to higher levels of satisfaction among online environment participants. To understand Zoom fatigue experience, Shoshan and Wehrt (2022) argued that while videoconferences would be considered richer than other media, this is not as rich as face-to-face communication. Additionally, the authors argued that the subjective experiences of users in videoconferences might lead to increased exhaustion levels and determine how the characteristics of virtual meetings are perceived and appraised (Shoshan, & Wehrt, 2022).

The current evidence in the literature underscored the critical importance of the study's key variables on students' holistic wellness and the potential impact of these elements on nursing education and the profession at large. In addition, given the scarcity of data on the topic in local nursing schools, the researchers felt compelled to investigate the relationships between Zoom fatigue and satisfaction with online learning among nursing students at a higher education institution in the Philippines.

2. MATERIAL AND METHOD

2.1. Research design and participants

This cross-sectional research analyzed the responses of 408 students of a four-year baccalaureate nursing degree program in a higher institution of learning in the Philippines. Krejcie and Morgan's (1970) sampling table determined the required sample size. The minimum sample requirement for a total population of 1400 was 302.

2.2. Instrument

Two adopted scales were used in this study, namely, the Zoom Exhaustion and Fatigue Scale and the Online Learning Satisfaction Scale. The Zoom Exhaustion and Fatigue Scale by Fauville et al. (2021a) has 15 items with 5-point Likert options (1 = "not at all/never" to 5 = "extremely/always"). The Online Learning Satisfaction Scale from the research of Strong et al. (2012) has seven items with 5-point Likert response options ("1-strongly disagree" to "5-strongly agree"). Generally, higher scores obtained on the scales suggest higher Zoom fatigue and satisfaction levels. For this study, the following was used to interpret the mean scores: very low (1.00-1.50), low (1.51-2.50), moderate (2.51-3.50), high (3.51-4.50), very high (4.51-5.00). The two measures of this study had acceptable Cronbach's alpha reliability values of greater than .70. The reliability scores of the Zoom Exhaustion and Fatigue Scale and the Online Learning Satisfaction Scale were .91 and .94, respectively (Oducado et al., 2021; Oducado et al., 2022a). The demographic information (age, sex, and year level) and duration of online learning ("On a typical day, how many hours do you spend for online learning?") were also asked at the beginning of the survey after the information sheet and consent.

2.3. Data collection

This study is part of a bigger research study on online learning in nursing education. Data collection was done online in 2021 in June after administrative clearance of the sound and ethical conduct of academic research was obtained from the University where the study was conducted. Respondents were recruited broadly through a general announcement in the exclusive online social group (Facebook) where all students of the nursing program are members. The first page of the survey included the information sheet about the study, and respondents were asked to tick a box to indicate consent before accessing the actual survey. Participation in the study was voluntary and the participants' responses were kept anonymous and confidential.

2.4. Data analysis

The data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) 26. Both inferential (Pearson's and simple linear regression analysis) and descriptive (frequency, percentage, mean, and standard deviation) statistics were utilized for data analysis. The level of significance was set at .05 alpha.

3. RESULTS

Table 1 shows that of 408 respondents, 75.2 % were females, and 46.3 % were in their second year. The mean age was 19.95 (SD=2.20) years, and they spend an average of 8.08 (SD=8.18) hours on online learning.

TABLE 1. Profile of respondents

Profile	f	%
Age [M=19.95 (SD=2.20)]		
18-19 years old	206	50.5
20-21 years old	202	49.5

Gender		
Prefer not to say	9	2.2
Male	92	22.5
Female	307	75.2
Year level		
First Year	110	27.0
Second Year	189	46.3
Third and Fourth Year	109	26.7
Duration of online learning [M=8.08 (SD=8.18)]		
4 hours or less	42	10.3
5 to 8 hours	206	50.5
9 to 12 hours	130	31.9
13 hours or more	23	5.6

The levels of Zoom fatigue and satisfaction are shown in Table 2. About half (50.7 %) of the respondents experienced high levels of Zoom fatigue. In terms of satisfaction with online learning, 34.1 % had low, and 35.3 % had only an average level of satisfaction.

TABLE 2. Level of Zoom fatigue and online learning satisfaction

Level	Zoom Fatigue (M=3.84, SD=.76)		Satisfaction (M=2.52, SD=.99)	
	f	%	f	%
Very High	74	18.1	11	2.7
High	207	50.7	50	12.3
Average	113	27.7	144	35.3
Low	14	3.4	139	34.1
Very low	-		64	15.7

In analyzing the gender differences, we excluded the nine participants who preferred not to report their gender or sex. Statistical analysis using the t-test for independent samples revealed significant gender differences in students' Zoom fatigue (t=-3.208, *p*=.001). However, there was no significant gender differences in students' online learning satisfaction levels (t=1.685, *p*=.093).

TABLE 3. Gender differences in Zoom fatigue and satisfaction

Variables	Categories	M	SD	t	*p*-value
Zoom fatigue	Male	3.62	.69	-3.208*	.001
	Female	3.88	.67		
Satisfaction	Male	2.69	.96	1.685	.093
	Female	2.51	.93		

The bivariate analysis of the major variables using Pearson's correlation is shown in Table 4. Statistical analysis revealed a significantly low inverse correlation (r=-.204, *p*=.000) between Zoom fatigue and online learning satisfaction. The simple linear regression analysis in Table 4 indicates that Zoom fatigue significantly predicts (B=-.280, *p*=.000) online learning satisfaction explaining 4.2 % of the variance.

TABLE 4. Association between Zoom fatigue and satisfaction

	B	t	*p*	r	*p*	R2	F	*p*
Constant	3.619	13.985	.000	-.204	.000	.042	17.696	.000
Zoom fatigue	-.280	-4.207	.000					

4. DISCUSSION

This study looked into Zoom fatigue and learning satisfaction among nursing students. This study found a significant number of students reporting high levels of Zoom fatigue. The online phenomenon of videoconferencing fatigue also known as Zoom fatigue was described as exhaustion, overload frustration, and other forms of psychological or behavioral afflictions affecting online learners (Amponsah et al., 2021; de Oliveira Kubrusly Sobral et al., 2022; Oducado et al., 2021). Based on the thematic analysis of the study of Bennett et al. (2021), the participants reported experiencing "long periods" of "video fatigue" after numerous videoconference meetings due to the "extended periods" of "screen time length". Students also expressed various stressors during virtual streaming, which adds to the cognitive load and anxiety spurred by "Zooming". Moreover, it often drains energy to concentrate on different stimulations in the online virtual space. When Zooming or during virtual meetings, technical issues contribute to the stressors affecting students and elevating their stress levels. These issues include screen freezing, nervousness regarding virtual recording and data control, and a lack of data or connectivity when engaging in synchronous sessions (Jiang, 2020; Lawson, 2020; Oducado et al., 2021; Reisinger, 2020). There are also study findings linking Zoom fatigue with poor mental well-being (Deniz et al., 2022; Montag et al., 2022; Oducado et al., 2022d). Further, Massner (2021) proposed a multifactorial model of Zoom fatigue attributing the effects of fatigue and burnout to situational, environmental, communication, and individual factors.

Additionally, students in this study reported low to moderate online learning satisfaction. Prior studies conducted locally and abroad likewise reported almost similar findings. Only 12 % of student nurses enjoyed online practice courses in the study by Vandenberg and Magnuson (2021). The study by Elshami et al. (2021) reported 41.3 % overall satisfaction with online learning among students. Oducado and Estoque (2021) noted low to moderate satisfaction during the pandemic outbreak among Filipino nursing students.

Remedies for Zoom fatigue and improving online satisfaction must be made. Effective innovative strategies requiring technological tools and pedagogical design may be adopted to enhance students' engagement and motivation in online learning environments (Romero Andonegui et al., 2021; Sánchez et al., 2022) while trying to manage online fatigue. Scholars have explored strategies to lessen academic stress and burnout, including taking intermittent breaks and using the Zoom chat tool (Jiang, 2020; Halupa, & Bollinger, 2020; Pettersson, 2018). These strategies may be adopted in the local educational setting.

This study also discovered that females experienced more Zoom fatigue than males. According to newly published Stanford research by Fauville et al. (2021a; 2021b), the shift from face-to-face to virtual meetings has had a toll on women. In the first large-scale study examining the whole range of Zoom fatigue, Stanford University researchers discovered that women report feeling more worn out than men following video talks. According to the study findings, the exhaustion associated with a day of back-to-back online meetings is more severe for women. Moreover, the study reported that one in seven females (13.8 %) and one in twenty males (5.5 %) reported feeling very exhausted following Zoom calls. Additionally, the researchers discovered that the primary factor contributing to women's exhaustion was an increase in what social psychologists refer to as "self-focused attention" triggered by video conferencing's self-view. Self-focused attention refers to an increased awareness of one's appearance or how one comes across in a conversation. Further, the researchers explained that women are more likely than males to focus exclusively on themselves when in front of a mirror, a phenomenon known as "mirror anxiety." Women's perception of physical confinement due to the requirement to remain centered in the camera's range of vision is also related to increased Zoom fatigue. Unlike in-person meetings, where participants can move around, pace, and stretch, video conferencing inhibits movement. Furthermore, even when women attended the same number of meetings each day as men, their sessions were reported as longer. It was also found that women had fewer breaks in between sessions, which contributed to their tiredness. A gender difference in the problematic use of ICTs was also noted (Colomo Magaña et al., 2021). Moreover, the gender difference in Zoom fatigue was also found in other studies (Dutta et al., 2021; Oducado et al., 2021; Oducado et al., 2022c). This finding suggests being mindful of the impact of online fatigue particularly among female students.

This study found that Zoom fatigue was significantly correlated with and predicted online learning satisfaction. Congruent with the study findings, the literature has shown that Zoom fatigue can likely reduce online learning satisfaction among learners. Massner (2021), Oducado et al. (2021), and Oducado et al. (2022b) noted that using online video conferences such as Zoom is reported to negatively impact satisfaction with teaching and learning and may have an undesirable impact among higher education institution students and faculty. Additionally, studies also noted that online learning along with the use of videoconferencing applications for education purposes creates negative or indifferent attitudes and dissatisfaction among students in medicine, nursing, and other allied health courses during the pandemic (Abbasi et al., 2020; Oducado, & Estoque, 2021; Sasmal, & Roy, 2021). It was also noted that lesser online meetings were linked to the participants' satisfaction with the utility of videoconferences (Johnson, 2021). Moreover, Fauville et al. (2021b) and Darshana (2021) identified that the limited field of vision when utilizing Zoom and decreased mobility contribute to a feeling of being "contained" for the Zoom session duration. Along with not being able to see what is happening when the user is off-screen, some students may feel left out, which is believed to contribute to the overall online learning dissatisfaction in the intra- and extra-virtual experience of the students (Søraker, 2012). Also, off-camera students tend to shun other learners' real-time, extra-virtual experiences (Darshana, 2021), which may translate to reduced satisfaction levels.

The study extends the theoretical implications of Media Richness theory to online teaching-learning environments in nursing education. According to the study findings, the theory can be useful in explaining nurse educators' media choices in online courses, particularly how to use Zoom videoconferencing effectively. When evaluated for potential richness and merged with best practices such as timely feedback, mes-

sage personalization, language use and variety, and the balanced use of the online platform's communication channels and cues, videoconferencing tools such as Zoom can be considered rich media, as defined in the model (Daft, & Lengel, 1986). Although most of the theory's assumptions can be applied to online environments, its breadth in the context of the nursing education landscape may still be limited. Hence, the findings of the study may broaden the Media Richness theory in terms of its connections with multidimensional aspects and repercussions of media use (whether positive or negative), such as Zoom fatigue, which may influence satisfaction among message recipients (i.e., student nurses). Further, the results support the argument of Shoshan and Wehrt (2022) that the characteristics of videoconferences can be shaped by the experiences of its users. Individual factors such as gender may also be used as indicators in developing policy-related insights and consequences as an offshoot of this study. Overall, the identified correlation between Zoom fatigue and satisfaction has important implications for understanding the Media Richness hypothesis. Furthermore, the study findings advocate the mindful use of videoconferencing in the context of online nursing education.

5. CONCLUSIONS

This study is among the earliest to investigate the likely impact of Zoom fatigue on learning satisfaction with online education among nursing students. We conclude in this study that online learning and videoconferencing have a likely negative impact on students' learning experiences. Moreover, this study highlights that Zoom fatigue negatively contributes to students' satisfaction with online learning and that female students experience higher levels of fatigue.

It is recommended that nursing schools revisit the current teaching and learning approaches and look into the possible overuse of virtual communication platforms, particularly videoconferencing, that may negatively impact students' online learning experiences in virtual learning spaces amid the time of global health crisis. Nursing faculty members may focus on improving online academic learning environments and curricula to alleviate unnecessary stress and deliver more productive theoretical and clinical learning experiences. Emphasis may be given to female students who are likely to experience a greater impact of online fatigue.

Moreover, it may also be necessary to understand students' goals, motivations, and experiences and how to keep students engaged in learning and prevent negative effects in online learning environments. Additionally, universities may offer academic breaks within semesters and consider having rests between lengthy virtual meetings to support students in maintaining their mental health and well-being. This study underscores that measures that foster more positive and meaningful learning experiences for students may be initiated.

5.1. Limitations and future lines of research

Regardless of the valuable findings, several limitations apply to this study. The study used a sample of students from a single private university in the Philippines, limiting the generalizability of results to larger, more diverse populations. Also, the data were collected using an online approach, which likely included people interested in the subject. Those who did not participate may have different perspectives from the

study participants. Self-report bias in the use of questionnaires is also a limitation of this paper. Despite the limitations, our research expands the literature on virtual meeting fatigue in the field of education. Future researchers may conduct similar research and address the limitations presented in this study.

6. FUNDING

The authors received no financial support for the research, authorship, and publication of this article.

7. REFERENCES

Abbasi, S., Ayoob, T., Malik, A., & Memon, S. I. (2020). Perceptions of students regarding e-learning during Covid-19 at a private medical college. *Pakistan Journal of Medical Sciences*, *36*(COVID19-S4), S57-S61. http://dx.doi.org/10.12669/pjms.36.COVID19-S4.2766

Amponsah, S., van Wyk, M., Kolugu, M. (2021). Academic experiences of "Zoom Fatigue" as a virtual streaming phenomenon. *International Journal of Web-based Learning and Teaching Technologies, 17*(6), 1-16. http://dx.doi.org/10.4018/IJWLTT.287555

Atmaca, Ç., Rızaoğlu, F., Türkdoğan, T., & Yaylı, D. (2020). An emotion focused approach in predicting teacher burnout and job satisfaction. *Teaching and Teacher Education*, *90*, 103025. https://doi.org/10.1016/j.tate.2020.103025

Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID19. *Journal of Education and E-Learning Research*, *7*(3), 285-292. https://doi.org/10.20448/journal.509.2020.73.285.292

Badia, A., Garcia, C., & Meneses, J. (2019). Emotions in response to teaching online: Exploring the factors influencing teachers in a fully online university. *Innovations in Education and Teaching International*, *56*(4), 446-457. https://doi.org/10.1080/14703297.2018.1546608

Bailenson, J. (2021). Nonverbal overload: A theoretical argument for the causes of zoom fatigue. *Technology, Mind, and Behavior, 2*(1). https://doi.org/10.1037/tmb0000030

Bailey, D. (2021). Interactivity during Covid-19: mediation of learner interactions on social presence and expected learning outcome within videoconference EFL courses. *Journal of Computers in Education*, *9*, 291-313. https://doi.org/10.1007/s40692-021-00204-w

Bennett, A. A., Campion, E. D., Keeler, K. R., & Keener, S. K. (2021). Videoconference fatigue? Exploring changes in fatigue after videoconference meetings during COVID-19. *Journal of Applied Psychology*, *106*(3), 330-344. http://dx.doi.org/10.1037/apl0000906

Bowser, A. S., Kazakoff, M. A., Scott, P. W., & Dunbar-Jacob, J. (2022). Nursing students' dissatisfaction with course organization and student engagement in remote learning 1 year Post-COVID-19 restrictions. *Nurse Educator*, *47*(3), 68-72. https://doi.org/10.1097/NNE.0000000000001175

Cantero Téllez, R., Romero Galisteo, R. P., & Rodriguez Bailón, M. (2022). Personal and teaching factors related to university professors' stress levels in the face of COVID-19. *Innoeduca. International Journal of Technology and Educational Innovation*, *8*(1), 102-110. https://doi.org/10.24310/innoeduca.2022.v8i1.11920

Chogo, P. J. (2020). An evaluation of higher education students online learning experience. *International Journal of Scientific and Research Publications*, *10*(6), 926-933. https://doi.org/10.29322/IJSRP.10.06.2020.p102111

Colomo Magaña, E., Cívico Ariza, A., Ruiz Palmero, J., & Sánchez Rivas, E. (2021). Problematic use of ICTs in trainee teachers during COVID-19: A sex-based analysis. *Contemporary Educational Technology*, *13*(4), ep314. https://doi.org/10.30935/cedtech/10988

Corell-Almuzara, A., López-Belmonte, J., Marín-Marín, J. A., & Moreno-Guerrero, A. J. (2021). COVID-19 in the field of educa-

tion: State of the art. *Sustainability*, *13*(10), 5452. https://doi.org/10.3390/su13105452

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, *32*(5), 554-571. https://doi.org/10.1287/mnsc.32.5.554

Darshana, J. D. (2021). *Dissonance of the self: applying the philosophy of Patañjali's Yogasūtra to the effects of prolonged engagement in virtual synchronous platforms* (Master's thesis). Oregon State University. https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/8k71nq857

de Oliveira Kubrusly Sobral, J. B., Lima, D. L. F., Lima Rocha, H. A., de Brito, E. S., Duarte, L. H. G., Bento, L. B. B. B., & Kubrusly, M. (2022). Active methodologies association with online learning fatigue among medical students. *BMC Medical Education*, *22*, 74. https://doi.org/10.1186/s12909-022-03143-x

Deniz, M. E., Satici, S. A., Doenyas, C., & Griffiths, M. D. (2022). Zoom fatigue, psychological distress, life satisfaction, and academic well-Being. *Cyberpsychology, Behavior, and Social Networking*, *25*(5), 270-277. http://doi.org/10.1089/cyber.2021.0249

Dhir, A., Yossatorn, Y., Kaur, P., & Chen, S. (2018). Online social media fatigue and psychological wellbeing—a study of compulsive use, fear of missing out, fatigue, anxiety and depression. *International Journal of Information Management*, *40*, 141-152. https://doi.org/10.1016/j.ijinfomgt.2018.01.012

Döring, N., Moor, K. D., Fiedler, M., Schoenenberg, K., & Raake, A. (2022). Videoconference fatigue: A conceptual analysis. *International Journal of Environmental Research and Public Health*, *19*(4), 2061. https://doi.org/10.3390/ijerph19042061

Duke, N. N., Gross, A., Moran, A., Hodsdon, J., Demirel, N., Osterholm, E., Sunni, M., & Pitt, M. B. (2020). Institutional factors associated with burnout among assistant professors. *Teaching and Learning in Medicine*, *32*(1), 61-70. https://doi.org/10.1080/10401334.2019.1638263

Dutta, S., Ambwani, S., Lal, H., Ram, K., Mishra, G., Kumar, T., & Varthya, S. B. (2021). The satisfaction level of undergraduate medical and nursing students regarding distant preclinical and clinical teaching amidst COVID-19 across India. *Advances in Medical Education and Practice*, *2*(12), 113-122. https://doi.org/10.2147/AMEP.S290142

Egcas, R. A., Oducado, R. M. F., Visperas, J., Cleofas, J. S. R., & Lausa, S. M. (2021). After over a year of pandemic: Mental well-being and life satisfaction of Filipino college students. *Pertanika Journal of Social Sciences & Humanities*, *29*(4), 2401-2416. https://doi.org/10.47836/pjssh.29.4.17F

Elshami, W., Taha, M. H., Abuzaid, M., Saravanan, C., Al Kawas, S., & Abdalla, M. E. (2021). Satisfaction with online learning in the new normal: perspective of students and faculty at medical and health sciences colleges. *Medical Education Online*, *26*(1), 1920090. https://doi.org/10.1080/10872981.2021.1920090

Fan-Chen, T., Cheng, T., Pei-Ling, Y., Huang, T., & Teng, C. (2019). Media richness, social presence and loyalty to mobile instant messaging. *Industrial Management & Data Systems, 119*(6), 1357-1373. http://dx.doi.org.ezproxy.liberty.edu/10.1108/IMDS-09- 2018-0415

Fauville, G., Luo, M., Queiroz, A. C. M. and Bailenson, J. N., & Hancock, J. (2021a). Zoom exhaustion & fatigue scale. *Computers in Human Behavior Reports*, *4*, 100119. https://doi.org/10.1016/j.chbr.2021.100119

Fauville, G., Luo, M., Queiroz, A. C. M., Bailenson, J. N., & Hancock, J. (2021b). Nonverbal mechanisms predict zoom fatigue and explain why women experience higher levels than men. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3820035

Galván Orozco, A., López Pérez, O., Chávez López, J. K., & Contreras López, E. X. (2022). Virtual learning environments: Social networks for learning at university. *Innoeduca. International Journal of Technology and Educational Innovation*, *8*(1), 91-101. https://doi.org/10.24310/innoeduca.2022.v8i1.12340

Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19. *Education and Information Technologies, 26*(6), 6923-6947. https://doi.org/10.1007/s10639-021-10523-1

Guillasper, J. N., Soriano, G. P., & Oducado, R. M. F. (2020). Psychometric properties of 'attitude towards e-learning scale'among nursing students. *International Jour-*

nal of Educational Sciences, *30*(1-3), 1-5. https://doi.org/10.31901/24566322.2020/30.1-3.1135

Guillasper, J. N., Oducado, R. M. F., & Soriano, G. P. (2021). Protective role of resilience on COVID-19 impact on the quality of life of nursing students in the Philippines. *Belitung Nursing Journal*, *7*(1), 43-49. https://doi.org/10.33546/bnj.1297

Hacker, J., vom Brocke, J., Handali, J., Otto, M., & Schneider, J. (2020). Virtually in this together – how web-conferencing systems enabled a new virtual togetherness during the COVID-19 crisis. *European Journal of Information Systems*, *29*(5), 1-22. https://doi.org/10.1080/0960085x.2020.1814680

Halupa, C., & Bolliger, D. U. (2020). Technology fatigue of faculty in higher education. *Journal of Education and Practice*, *11*(18). https://doi.org/10.7176/JEP/11-18-02

Jiang, M. (2020). *The reason Zoom calls drain your energy.* https://www.bbc.com/worklife/article/20200421-why-zoom-video-chats-are-so-exhausting

Johnson, B. (2021). *Video meetings in a pandemic era: Emotional exhaustion, stressors, and coping* (Doctoral dissertation). Antioch University. https://aura.antioch.edu/cgi/viewcontent.cgi?article=1635&context=etds

Kingsley-Westerman, C. Y., Reno, K. M., & Heuett, K. B. (2015). Delivering Feedback: Supervisors' Source Credibility and Communication Competence. *International Journal of Business Communication*, *55*(4), 526-546. https://doi.org/10.1177/2329488415613338

Kobayashi, M. (2017). Students' media preferences in online learning. *Turkish Online Journal of Distance Education*, 18(3), 1. https://doi.org/10.17718/tojde.328925

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Lawson, S. (2020). *Are schools forcing students to install spyware that invades their privacy as a result of the Coronavirus lockdown?* https://www.forbes.com/sites/seanlawson/2020/04/24/are-schools-forcing-students-to-install-spyware-that-invades-their-privacy-as-a-result-of-the-coronavirus-lockdown/?sh=675a3662638d

Massner, C. K. (2021). The use of videoconferencing in higher education. In F. Pollák, J. Soviar & R. Vavrek (Eds.), *Communication Management*. IntechOpen. https://doi.org/10.5772/intechopen.99308

Montag, C., Rozgonjuk, D., Riedl, R., & Sindermann, C. (2022). On the associations between videoconference fatigue, burnout and depression including personality associations. *Journal of Affective Disorders Reports, 10*, 100409. https://doi.org/10.1016/j.jadr.2022.100409

Moralista, R. B., Oducado, R. M. F., Robles, B. R. G., & Rosano, D. A. (2022). Determinants of zoom fatigue among graduate students of teacher education program. *International Journal of Emerging Technologies in Learning*, *17*(13), 176-185. https://doi.org/10.3991/ijet.v17i13.31511

Moreno Guerrero, A. J., Marín Marín, J. A., Parra González, M. E., & López Belmonte, J. (2022). Computer in education in the 21st century. A scientific mapping on the literature in Web of Science. *Campus Virtuales: Revista Científica Iberoamericana De Tecnología Educativa*, *11*(1), 201-223. https://doi.org/10.54988/cv.2022.1.1019

Moreno-Guerrero, A. J., Soler-Costa, R., Marín-Marín, J. A., & López-Belmonte, J. (2021). Flipped learning and good teaching practices in secondary education. *Comunicar*, *29*(68), 107-117. https://doi.org/10.3916/C68-2021-09

Nambiar, D. (2020). The impact of online learning during COVID- 19: Students' and teachers' perspective. *The International Journal of Indian Psychology*, *8*(2), 783-793. https://doi.org/10.25215/0802.094

Nurhidayati, T., Rahayu, D., & Alfiyanti, D. (2021). Nursing students' coping for burnout and fatigue online learning during coronavirus disease 2019 pandemic. *Open Access Macedonian Journal of Medical Sciences*, *9*(T4), 92-96. https://doi.org/10.3889/oamjms.2021.5857

Oducado, R. M. F., Amboy, M. K. Q., Penuela, A. C., Dela Rosa, R. D., Fajardo, M. T. M., & Temelo, D. R. F. (2022a). Instructor's caring behaviors, burnout, satisfaction, and academic performance of nursing students in online education and pandemic era. *Frontiers of Nursing*.

Oducado, R. M. F., Dequilla, M. A. C. V., & Villaruz, J. F. (2022b). Factors predicting videoconferencing fatigue among higher

education Faculty. *Education and Information Technologies*, *27*, 9713-9724. https://doi.org/10.1007/s10639-022-11017-4

Oducado, R. M. F., Fajardo, M. T. R., Parreño-Lachica, G. M., Maniago, J. D., Villanueva, P. M. B., Dequilla, M. A. C. V., Montaño, H. C., & Robite, E. E. (2022c). Is videoconference "Zoom" fatigue real among nursing students? *Journal of Loss and Trauma*, *27*(5), 490-492. https://doi.org/10.1080/15325024.2021.1950987

Oducado, R. M. F., Villaruz, J. F., Dequilla, M. A. C. V., & Parreño-Lachica, G. M. (2022d). Zoom fatigue and mental well-being among school executives. *Journal of Loss and Trauma*, *27*(4), 393-394. https://doi.org/10.1080/15325024.2021.2002617

Oducado, R. M. (2021). New normal in nursing education: Sophomore students' expectations of and readiness for online learning in the era of COVID-19 pandemic. *International Journal of Caring Sciences*, *14*(2), 1170-1177. https://doi.org/10.31219/osf.io/uyda6

Oducado, R. M. F., & Estoque, H. (2021). Online learning in nursing education during the COVID-19 pandemic: Stress, satisfaction, and academic performance. *Journal of Nursing Practice*, *4*(2), 143-153. https://doi.org/10.30994/jnp.v4i2.128

Oducado, R. M. F., Fajardo, M. T. R., Parreño-Lachica, G. M., Maniago, J. D., Villanueva, P. M. B., Dequilla, Ma. A. C. V., Montaño, H. C., & Robite, E. E. (2021). Predictors of videoconference fatigue: Results from undergraduate nursing students in the Philippines. *Asian Journal for Public Opinion Research*, *9*(4), 310-330. https://doi.org/10.15206/ajpor.2021.9.4.310

Oducado, R. M. F., & Soriano, G. P. (2021). Shifting the education paradigm amid the COVID 19 pandemic: Nursing students' attitude to E learning. *Africa Journal of Nursing and Midwifery*, *23*(1). https://doi.org/10.25159/2520-5293/8090

Organization for Economic Cooperation and Development. (2009), "Gender matters?" in *Equally prepared for life?: How 15-year-old boys and girls perform in school*. OECD Publishing. https://doi.org/10.1787/9789264064072-2-en

Öztürk, G., Karamete, A., & Çetin, G. (2020). The relationship between pre-service teachers' cognitive flexibility levels and techno-pedagogical education competencies. *International Journal of Contemporary Educational Research, 7*, 40-53. https://doi.org/10.33200/ijcer.623668

Pettersson, F. (2018). On the issues of digital competence in educational contexts – a review of the literature. *Educational Informational Technology*, *23*, 1005-1021. https://doi.org/10.1007/s10639-017-9649-3

Peytcheva-Forsyth, R., Yovkova, B., & Aleksieva, L. (2018, December). Factors affecting students' attitudes towards online learning-The case of Sofia University. *AIP conference proceedings*, *2048*(1), 020025. AIP Publishing LLC. https://doi.org/10.1063/1.5082043

Ranadewa, D. U. N., Gregory, T. Y., Boralugoda, D. N., Silva, J. A. H. T., & Jayasuriya, N. A. (2021). Learners' satisfaction and commitment towards online learning during COVID-19: A concept paper. *Vision: The Journal of Business Perspective*, *0*(0), 097226292110567. https://doi.org/10.1177/09722629211056705

Reisinger, T. (2020). *Zoom security: I've researched problems with video conferencing for years – here's what you need to know.* https://theconversation.com/zoom-security-ive-researched-problems-with-video-conferencing- for-years-heres-what-you-need-to-know-136330

Romero Andonegui, A., Tejada Garitano, E., López de la Serna, A., & Bilbao Quintana, N. (2021). Diversity of technological use in university students; the academic vs. the personal. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(1), 19-30. https://doi.org/10.24310/innoeduca.2021.v7i1.7868

Salhab, R. (2022). Zoom or not to zoom: Students' attitudes towards using zoom at PTUK. *Journal of Southwest Jiaotong University*, *57*(1), 488-50. https://doi.org/10.35741/issn.0258-2724.57.1.45

Sasmal, S., & Roy, M. (2021). Perception of undergraduate nursing students regarding e-learning during COVID-19 pandemic in West Bengal. International *Journal of Community Medicine and Public Health, 8*(4), 1892-1898. http://dx.doi.org/10.18203/2394-6040.ijcmph20211251

Shoshan, H. N., & Wehrt, W. (2022). Understanding "Zoom fatigue": A mixed-method approach. *Applied Psychology*, *71*(3), 827-852. https://doi.org/10.1111/apps.12360

Stevenson, D. (2022). Academic burnout in nursing school. *Nursing*, *52*(3),60-61. https://doi.org/10.1097/01.nurse.0000820056.95100.26

Sveinsdóttir, H., Flygenring, B. G., Svavarsdóttir, M. H., Thorsteinsson, H. S., Kristófersson, G. K., Bernharðsdóttir, J., & Svavarsdóttir, E. K. (2021). Predictors of university nursing students burnout at the time of the COVID-19 pandemic: A cross-sectional study. *Nurse Education Today*, *106*, 105070. https://doi.org/10.1016/j.nedt.2021.105070

Sánchez, S. P., Lampropoulos, G., & López-Belmonte, J. (2022). Comparing gamification models in higher education using face-to-face and virtual escape rooms. *NAER: Journal of New Approaches in Educational Research*, *11*(2), 307-322. https://doi.org/10.7821/naer.2022.7.1025

Søraker, J. H. (2012). Virtual worlds and their challenge to philosophy: understanding the "intravirtual" and the "extravirtual". *Metaphilosophy*, *43*(4), 499-512. https://doi.org/10.1111/j.1467-9973.2012.01755.x

Strong, R., Irby, T. L., Wynn, J. T., & McClure, M. M. (2012). Investigating students' satisfaction with eLearning courses: The effect of learning environment and social presence. *Journal of Agricultural Education*, *53*(3), 98-110. https://doi.org/10.5032/jae.2012.03098

Tang, Y., & Hew, K. (2019). Emoticon, emoji, and sticker use in computer-mediated communication: A review of theories and research findings. *International Journal of Communication*, 13(2019), 1-27. https://doi.org/10.1007/978-981-10-8896-4_16

Tanupabrungsun, S., & Hemsley, J. (2018). Studying celebrity practices on Twitter using a framework for measuring media richness. *Social Media + Society*, *4*(1), 205630511876336. https://doi.org/10.1177/2056305118763365

Torras Virgili, M. E. (2021). Emergency Remote Teaching: ICT applied to education during confinement by COVID-19. *Innoeduca. International Journal of Technology and Educational Innovation*, *7*(1), 122-136. https://doi.org/10.24310/innoeduca.2021.v7i1.9079

Vandenberg, S., & Magnuson, M. (2021). A comparison of student and faculty attitudes on the use of Zoom, a video conferencing platform: A mixed-methods study. *Nurse Education in Practice*, *54*, 103138. https://doi.org/10.1016/j.nepr.2021.103138

Wang, Q., Sun, W., & Wu, H. (2022). Associations between academic burnout, resilience and life satisfaction among medical students: a three-wave longitudinal study. *BMC Medical Education*, *22*(1), e248. https://doi.org/10.1186/s12909-022-03326-6

Wei, H.-C., & Chou, C. (2020). Online learning performance and satisfaction: do perceptions and readiness matter? *Distance Education*, *41*(1), 48-69. https://doi.org/10.1080/01587919.2020.1724768

Williams, N. (2021). Working through COVID-19: "Zoom" gloom and "Zoom" fatigue. *Occupational Medicine*, *71*(3), 164. https://doi.org/10.1093/occmed/kqab041

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 67-80 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15396

The Effects of Activities Enriched with Game Elements in Mathematics Lessons

Los efectos de las actividades enriquecidas con elementos de juego en las lecciones de matemáticas

RECIBIDO 21/09/2022 ACEPTADO 17/10/2022 PUBLICADO 01/06/2023

Selen Galiç
Hacettepe University, Turkey
selengalic@gmail.com

Bahadır Yıldız
Hacettepe University, Turkey
bahadir@bahadiryildiz.net

ABSTRACT

Differentiated instruction is a form of teaching. The content, processes, products, or learning environment can be differentiated with respect to students' readiness to learn, interests, and learner profiles. Enrichment, one of the differentiation strategies, can be described as the student's intensive work on any subject or area. Using game elements can also impact students' achievement, mathematics attitude, and motivation. The aim of this study was to investigate the influence of activities enriched with game elements on students' learner profiles in mathematics lessons and their achievement, motivation, and attitudes. This current study used the quantitative quasi-experimental approach with 24 6th-grade students during two weeks. The Learner Profile Scale was used on the students and then mathematics activities with game elements were prepared for experimental group. An Academic Achievement Test and Attitude and Motivation Towards Mathematics Scales were used as data collection tools before and after the implementation of activities enriched with game elements. Mann Whitney U Test is used to analyse the differences between experimental and control group. Wilcoxon Signed Rank Test is used to analysed the difference pre- and post-test both experimental and control group. According the result significant point for students' academic achievement, motivation and attitude is found as .229, .002 and .043 respectively. Effect size is calculated for students' academic achievement, attitudes and motivation as .34, .58 and .58 respectively. As a result of this study, the use of enriching game elements had positive and larger effect on students' motivation, and attitude in mathematics lessons. Although the differences between experimental and control group is not found significantly for the student's achievement, there is a difference between pre- and post-test and the size of effects is calculated as medium. Hence, the educational gamify activities should be design by considering the students' types.

KEYWORDS Differentiated instruction; gamification; mathematics teaching; player type.

RESUMEN

La instrucción diferenciada es una forma de enseñanza. El contenido, los procesos, los productos o el entorno de aprendizaje se pueden diferenciar con respecto a la disposición para aprender, los intereses y los perfiles de aprendizaje de los estudiantes. El enriquecimiento, una de las estrategias de diferenciación, se puede describir como el trabajo intensivo del estudiante en cualquier materia o área. El uso de elementos del juego también puede afectar al rendimiento, la actitud matemática y la motivación de los estudiantes. El objetivo de este estudio fue investigar la influencia de las actividades enriquecidas con elementos de juego en los perfiles de aprendizaje de los estudiantes en lecciones de matemáticas y su rendimiento, motivación y actitudes. Este estudio utilizó el enfoque cuasi-experimental cuantitativo con

24 estudiantes de sexto grado durante dos semanas. Se utilizó la Escala de Perfil de Aprendiz en los estudiantes y luego se prepararon actividades matemáticas con elementos de juego para el grupo experimental. Se utilizó un Test de Rendimiento Académico y Escalas de Actitud y Motivación hacia las Matemáticas como instrumentos de recolección de datos antes y después de la implementación de actividades enriquecidas con elementos lúdicos. La prueba U de Mann Whitney se utiliza para analizar las diferencias entre el grupo experimental y el de control. La prueba de rango con signos de Wilcoxon se utiliza para analizar la diferencia antes y después de la prueba, tanto en el grupo experimental como en el de control. Según el resultado, el punto significativo para el rendimiento académico, la motivación y la actitud de los estudiantes se encuentra en .229, .002 y .043 respectivamente. El tamaño del efecto se calcula para el rendimiento académico, las actitudes y la motivación de los estudiantes como .34, .58 y .58 respectivamente. Como resultado de este estudio, el uso de elementos de juego enriquecedores tuvo un efecto positivo y mayor en la motivación y actitud de los estudiantes en las lecciones de matemáticas. Si bien las diferencias entre el grupo experimental y el de control no fue significativa para el rendimiento de los estudiantes, existe una diferencia entre el pre y post test con un tamaño de los efectos medio. Por lo tanto, las actividades educativas de gamificación deben diseñarse considerando los tipos de estudiantes.

PALABRAS CLAVE Enseñanza de las matemáticas; instrucción diferenciada; ludificación; tipo de jugador.

1. INTRODUCTION

Games may be older than culture and playing games in itself presuppose the existence of a society (Huzinga, 1955). A number of significant philosophers agree that games have been an important phenomenon in learning and teaching throughout human history (Sezgin, 2016). It can thus be claimed that game-playing is a very ancient aspect of society. According to Huzinga (1955), play is a voluntary activity, and universal. Suits (1967) defined a game as a voluntary activity designed to overcome inessential obstacles. Because games are voluntary activities, they may affect participants' happiness, motivation, and creativity, and also increase achievement in an academic context. It has been pointed out that gamification, which is using game elements in non-gaming contexts, can enhance an individual's experiences and sense of belonging (Deterding et al., 2011; Domínguez et al., 2013; Hanus, & Fox, 2015; Karataş, 2014; Kim, & Lee, 2015; Yıldırım, & Demir, 2014; Werbach, 2013). Challenges, rewards, levels, and point-scoring are examples of some "game elements" (Toda et al., 2019). It is important to make the learning process a journey; this can be done by using gamification to promote motivation and commitment in order to provide the conceptual understanding and ensure that learning experiences are deep and sustainable (Sezgin et al., 2018).

Previous studies of "gamification" in education focused on students' motivation and attention in lessons (Abramovich et al., 2013; Alsawaier, 2018; Bayram, & Çalışkan, 2019; Bell, 2014; Harrold, 2015; Meşe, & Dursun, 2018). Although gamification uses game elements, Buckley and Doyle (2016) stated that gamification has negative effects when it is considered solely as a process that motivates students by using "rewards". Similarly, some studies have shown that using "points" or "badges" has negative effects on students' motivation (Hakulinen et al., 2015; Hanus, & Fox, 2015). Gamification, on the other hand, tends to adapt the system to the users' desires, goals, and personalities (Bergmann et al., 2017). Players' interests, willingness to participate, and opinions cannot be ignored. Santos et al. (2021) argued that the gamification design should be considered as user types. This is why game elements should be selected with reference to the target audience. In this way, any gamification in education should be adapted to student's needs, goals, and characteristics because the target audience is students in a school environment. Since

the players are students in a classroom, the students' "player types" need to be determined in order to select appropriate game elements. However, the current player types scales are not able to fully represent the student's profile in the class. If a player type scale is used to determine a player's type with regard to game-playing, a learner profile scale should also be used to identify how students function in the school environment. The learning environment can thus be designed to meet the individual student's needs, interests, and specific learner profile.

Differentiation is one of the most effective methods to meet students' individual needs. Differentiated instruction is based on addressing students' readiness to learn, interests, and learning profiles using differentiated content, products, or learning environments (Tomlinson, 2001). Differentiation consists of several components. In this study, "enrichment" was used as a component of differentiation. Enrichment can be expressed as an optional practice that can be used to prevent students from losing attention to the content they already know (Cutts, & Moseley, 2001). Thus, it was expected that it would have a positive effect on students in this study. It was considered that identifying appropriate game elements according to students' needs and personalities and enriching lessons with these elements would have positive effects.

This study investigated the effect of mathematics activities enriched with game elements (MAEGEs) on middle-school students' mathematics achievement, motivation, and attitudes towards mathematics lessons. It was necessary to know the students' player types in order to select the appropriate game elements that would motivate them. However, since the player type scale (Andersen, & Downey, 2001) relate to online games and the questions are related to these kinds of games, the student's responses to the questions may not have reflected their profile. For this reason, using any player type scale for games in Education was not considered sufficient to determine the students' player types for each participant in education. For this reason, the Learner Profile Scale (Galiç, & Yıldız, 2020) was used to determine the students' player types in the school environment. Learner Profile Scale determines students' player types without using the player types scale in order to prepare gamification activities according to the target audience's player types. Learner Profile Scale can be used in gamification applications in education during the design of the activities. Also, it can be used to determine the students' profiles to identify them or follow their academic development. The Learner Profile Scale is associated with Bartle's player types:

1. *Achievers* are interested in acting in the world. The game is a stimulating environment for them to succeed in something.
2. *Explorers* are interested in interacting with the world. They want to keep following the sense of wonder during the game. Other players are not interested in the game unless there is a resource to discover.
3. *Socializers* are interested in interacting with other players. They usually want to communicate with others, meet people, and know more about them. The game is just a tool to interact with the players.
4. *Killers* are interested in acting with the players. They want to show their superiority over others to feel better. The game is not fun unless it affects a real person for them.

There are several game elements to motivate players according to their player type such as collecting, power, research, levels for achievers; imagination, learning, and completing for explorers; collaboration, communication, role-playing for socializers and competitions, challenges, and strategy for killers.

The purpose of the study was to investigate the effects of MAEGEs selected with respect to students' player types as identified by the Learner Profile Scale on the student's achievement, motivation, and attitudes toward mathematics lessons. The following three research questions were answered in the study:

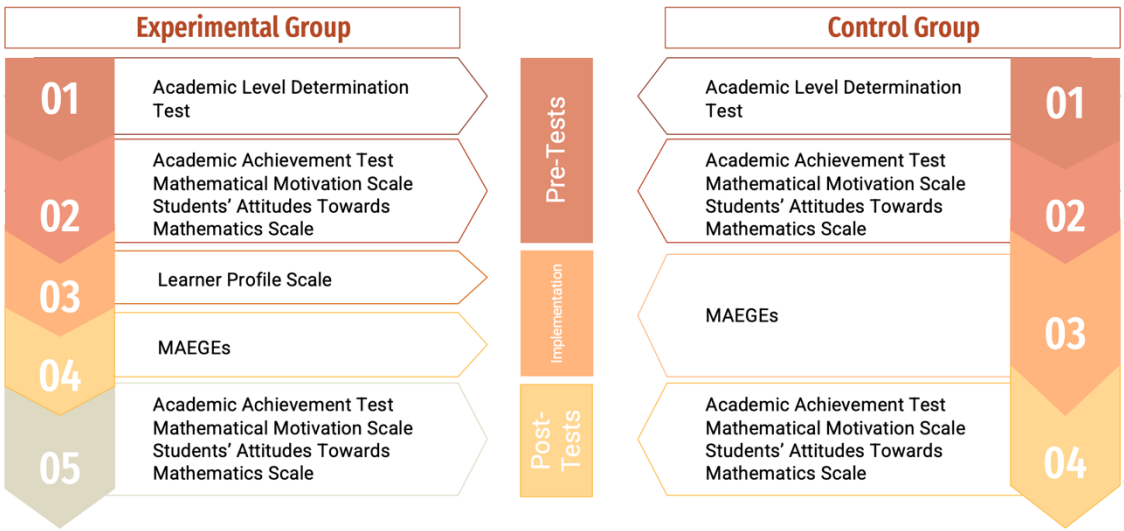
1. What is the effect of activities enriched with game elements on students' achievement in mathematics lessons?
2. What is the effect of activities enriched with game elements on students' motivation toward mathematics lessons?
3. What is the effect of activities enriched with game elements on students' attitudes towards mathematics lessons?

2. MATERIAL AND METHOD

2.1. Research Design

This current study used the quantitative quasi-experimental approach. The matching-only design group was used from among the quasi-experimental designs because of non-randomization. In this design "the researcher still matches the subjects in both groups on certain variables'' (Fraenkel, & Wallen, 2003). One of the researchers was the mathematics teacher of the experimental group. Another class from the same school was assigned as the control group because the students were at the same academic level as the experimental group. Each group was formed of 6th-grade students. The path of the study is given in Figure 1.

FIGURE 1. Path of the study



Although there was no randomization, the Academic Level Determination Test (ALDT) was performed with both groups to ensure that the mathematics academic level of the groups was equal. For this purpose, the ALDT was analyzed using the Mann-Whitney U Test. The result of the ALDT analysis is given in Table 1.

TABLE 1. Mann-Whitney U Test Analysis of Academic Level Determination Test

Groups	Measurement	N	X	U	z	p
Experimental Group	ALDT	12	14.08	53.000	-1.108	.268
Control Group		12	10.92			

As seen in Table 1, there was no significant difference between averages of the experimental (14.08) and control group (10.92) ($p(24) = .268$; $p > 0.05$). This result proved that there was no difference between groups before the implementation according to their academic level in mathematics. Thus, nonrandomization did not affect the implementation and the results of this study. To determine the appropriate game elements, the learner profiles of the students in the experimental group needed to be identified. The Learner Profile Scale was therefore applied to the students (Galiç, & Yıldız, 2020). The experimental group was found to be made up of students with the following player types: 40 % "Killers", 30 % "Achievers", 20 % "Socializers", and 10 % "Explorers". MAEGEs were designed according to the results of the scale. Two of these activities are given in Table 2.

TABLE 2. Two Examples of Mathematics Activities during Implementations

Activity	Learning Outcomes	Game Elements	Duration
Relay Race	Operations with Fractions	Collaboration Competition	20 min
Where is the Place?	Operations with Fractions	Challenges Mission	40 min

When the age of the students in this study was considered, it was felt that applying all pre-tests on the same day may affect the results. Therefore, the pre-tests were planned for different days, but the same tests were applied to both groups on the same day. The Mathematics Motivation Scale (Aktan, & Tezci, 2013) and the Students' Attitude Towards Mathematics Scale (Önal, 2013) was first applied on the same day to both groups, while the Academic Achievement Test was applied on the next day. After the pre-test, MAEGEs was implemented for two weeks in the experimental group. Each activity was about a fraction unit. The post-test was applied after the implementation.

Ethical approval for this study was obtained from Hacettepe University Ethics Committee (35853172-300 on 21.01.2020).

2.2. Participants

Twenty-four 6th-grade students participated in this study. The participants are shown in Table 3.

TABLE 3. Participants

Group / Gender	Female	Male	Total
Experimental Group	5	7	12
Control Group	9	3	12
Total	**14**	**10**	**24**

2.3. Instruments

The Learner Profile Scale (Galiç, & Yıldız, 2020), the Academic Achievement Test, the Academic Level Determination Test (ALDT), the Mathematics Motivation Scale (Aktan, & Tezci, 2013), and the Students' Attitudes Towards Mathematics Scale (Önal, 2013) were used to collect quantitative data. To determine whether there had been any change or not, these scales were applied before and after the implementation of MAEGEs.

2.3.1. Academic Level Determination Test

The ALDT was designed by the researchers to evaluate the academic level of the experimental and control group before implementation. Each question was selected as related to topics in the units. Students had previously taken in the semester before they began the unit on fractions. The test included 10 questions designed with reference to the related literature. These questions were chosen from sample questions in national and international exams in order to ensure reliability and validity. Each question scored 10 for the correct answer and 0 for the wrong answer. The highest obtainable score for the scale was 100, while the lowest was 0.

2.3.2. Learner Profile Scale

The aim of this scale, which was developed by Galiç and Yıldız (2020), is to identify the learner profile of any person or group. It has 35 items on a 5-point Likert-type scale. The Learner Profile Scale identifies seven specific profiles: reflector (six items), inquirer (five items), collaborator (three items), researcher (four items), problem-solver (four items), and self-confidence (two items). The score for each item is between 1 and 5. The Cronbach's alpha coefficient of the scale was .912.

2.3.3. Academic Achievement Test

To assess the student's academic achievement with regard to the "fractions'' unit, the Academic Achievement Test was developed by researchers. The Academic Achievement Test was applied to the control and experimental groups before and after the implementation of MAEGEs. The test included 10 questions designed with reference to the related literature. These questions were chosen from sample questions in national and international exams in order to ensure reliability and validity. Each question scored 10 for the correct answer and 0 for the wrong answer. The highest obtainable score for the scale was 100, while the lowest was 0.

2.3.4. Mathematical Motivation Scale

The aim of this scale, which was developed by Aktan and Tezci (2013), is to determine middle-school students' motivation toward mathematics. It has 27 items and is a 5-point Likert-type scale. The internal consistency of this scale is between .84 and .94 and the item-total correlation is between .62 and .89.

2.3.5. Students' Attitudes Towards Mathematics Scale

The aim of this scale, which was developed by Önal (2013), is to determine students' attitudes toward mathematics This scale consists of four factors such as interest, anxiety, study, and necessity. It has 22 items in a

form of a five-point Likert scale. The Cronbach's alpha coefficient was .90. Items are pointed between 1 and 5. Thus the score on this scale can get the highest 110 and the lowest 22 points.

2.4. Data Analysis

Since the number of participants is lower than 30, the assumptions of normal distribution was not provided. Therefore, Mann-Whitney U test is used to analyse the non-normal continuous data for the differences between two independent groups At the beginning of the implementation, the Mann-Whitney U test was applied to the ADLT to observe the differences between the groups. The Mann-Whitney U test is used when the researcher wishes to analyze ranked data for nonparametric tests (Fraenkel, & Wallen, 2003). The effect size shows the size of the differences between groups to comprehend the result (Cohen, 1992). Hence, the effect size is calculated for each problem question. According to Cohen (1992), the criteria for effect size is given as following. If effect size is:

- less than 0.3 then it has a small effect
- between 0.3 and 0.5 then it has a medium effect
- greater than 0.5 then it has a large effect

Before the implementation, the Academic Achievement Test, Mathematics Motivation Scale, and Students' Attitude Towards Mathematics Scale were applied to each group. The differences between pre- and post-test should be important to analyze in both experimental and control group. The Wilcoxon signed-rank test is used since the data for pre- and post-test was from dependent samples which is defined ranoomly and data are the non-normal continuous . The same process was repeated for the control group and experimental group individually. Data were tested at a .05 level of significance in this study.

3. RESULTS

This study investigated the effect of MAEGEs on students' achievement, attitudes, and motivation in mathematics lessons. In this section findings related to each research, and the problem is presented.

3.1. The Effects of MAEGEs on Students' Academic Achievement

To assess the students' prerequisite knowledge and readiness to learn, the Academic Achievement Test was applied. The Mann-Whitney U test was used to analyze data. No significant difference between the groups was observed in the ALDT. The results are given in Table 4.

TABLE 4. Mann-Whitney U Test Analysis of Pre-test of Academic Achievement

Groups	Measurement	N	X	U	z	p
Experimental Group	AAT Pre-test	12	12.00	78.000	.353	.724
Control Group		12	13.00			

As seen in Table 4, there was no significant difference between the average scores of the experimental group (X=12.00) and the control group (X=13.00) (p(24)=.724; p>0.05). According to this result, the student's academic achievement in both groups was equal. Therefore, it can be argued that any future differences between groups were likely to relate to the implementation.

The Academic Achievement Test was given to both groups after implementation to examine the effect of the MAEGEs on the student's achievement in mathematics. The result of the Wilcoxon signed-rank test for each group is given in Table 5.

TABLE 5. Wilcoxon Signed-rank Test Analysis of the Academic Achievement Test (AAT)

Groups	Measurement	N	X	Sd	p
Experimental	AAT Pre-Test	12	50.83	17,30	.004
	AAT Post-Test	12	81.67	16,42	
Control	AAT Pre-Test	12	54.17	20,66	.016
	AAT Post-Test	12	74.17	15,05	

In Table 5 the average scores for the Academic Achievement Test which was performed with both groups are given as both pre-and post-test. There was a significant difference between the pre-test (X=50.83) and the post-test (X=81.67) in the average scores of the experimental group (p(12)=.004; p<0.05). Similarly, there was a significant difference between the pre-test (X=54.17) and post-test (74.17) in the control group (p(12) = .016; p<0.05). This result shows that the MAEGEs and lecture-based mathematics lessons contributed significantly to the student's academic achievement. Therefore, to answer the first research question: MAEGEs positively affected the student's academic achievement in mathematics.

Table 6 shows the results of data analysis to examine the difference between both groups with regard to the student's academic achievement.

TABLE 6. Mann-Whitney U Test analysis of Post-test of Academic Achievement Test (AAT)

Groups	Measurement	N	X	U	Z	p
Experimental Group	AAT Post Test	12	14.21	51.500	-1.202	.229
Control Group		12	10.79			

Table 6 shows the results of students' academic achievement after the implementation of the MAEGEs and lecture-based mathematics lessons. According to Table 5, there was a difference between the average of the experimental group (X=14.21) and the control group (X=10.79) yet this difference was not significant (p(24)= .229; p>0.05). This result shows that the MAEGEs contributed to students' academic achievement at least in the lecture-based mathematics lessons. Since the effect size is calculated as 0.34, MAEGES can be interpreted as have a medium effect on student's academic success.

3.2. The Effects of MAEGEs on Students' Motivation

To determine students' motivation toward mathematics lessons in experimental and control groups, the Mathematical Motivation Scale was applied before the implementation. The results are given in Table 7.

TABLE 7. Mann-Whitney U Test analysis of the Pre-test of Mathematical Motivation Scale (MMS)

Groups	Measurement	N	X	U	z	p
Experimental Group	MMS Pre-test	12	14.12	52.500	-1.129	.259
Control Group		12	10.88			

As seen in Table 7, there was no significant difference between the averages of the experimental group (X=14.12) and the control group (X=10.88) (p(24)=.259; p>0.05). According to this result, the student's motivation in both groups was equal. Therefore, it can be argued that any possible differences between groups would be related to the implementation.

The Mathematical Motivation Scale was applied to the experimental and control group after implementation to examine the effect of the MAEGEs on the student's motivation toward mathematics lessons. The result of the Wilcoxon signed-rank test is given in Table 8.

TABLE 8. Wilcoxon Signed-rank Test Analysis of Mathematical Motivation Scale (MMS)

Groups	Measurement	N	X	Sd	p
Experimental Group	MMS Pre-test	12	55.67	8.24	.002
	MMS Post-test	12	107.92	11.26	
Control Group	MMS Pre-test	12	53.17	5.37	.002
	MMS Post-test	12	99.50	10.01	

Table 8 shows the averages for the Mathematical Motivation Scale both before and after implementation. There was a significant difference between the pre-test (X= 55.67) and post-test (X=107.92) in the averages of experimental group (p(12)= .002; p<0.05). Similarly, there was a significant difference between the pre-test (X=53.17) and post-test (X=99.50) in the control group (p(12)= .002; p<0.05). This result shows that MAEGEs and lecture-based mathematics lessons contributed significantly to students' motivation toward mathematics lessons.

Table 9 shows the result of data analysis to investigate the difference between groups in terms of students' motivation toward mathematics lessons after the implementation.

TABLE 9. Mann-Whitney U Test Analysis of Post-test of Mathematical Motivation Scale (MMS)

Groups	Measurement	N	X	U	z	p
Experimental Group	MMS Post-test	12	15.42	37.000	-2.026	.043
Control Group		12	9.58			

As seen in Table 9, there was a significant difference between the averages of the experimental group (X=15.42) and the control group (X=9.58) (p(24) = .043; p<0.05). This result shows that MAEGEs contributed to students' motivation toward mathematics lessons more than lecture-based mathematics lessons. Since the effect size is calculated as 0.58, MAEGES can be interpreted as have a large effect on student's motivation.

3.3. The Effects of MAEGEs on Students' Attitude

To determine the students' attitudes towards mathematics lessons, the Students' Attitudes Towards Mathematics Scale was applied to both groups before the implementation. The results are given in Table 10.

TABLE 10. Mann-Whitney U Test Analysis of Pre-test of Students' Attitudes Towards Mathematics Scale (SATMS)

Groups	Measurement	N	X	U	z	p
Experimental Group	SATMS Pre-test	12	13.42	61.000	-.635	.525
Control Group		12	11.58			

As seen in Table 10, there was no significant difference between the average of the experimental group (X=13.42) and the control group (X=11.58) (p(24)= .525; p> 0.05). According to this result, the experimental and control groups were equal with regard to the students' attitudes towards mathematics lessons. Thus, it can be argued that any possible differences between the groups after the application of MAEGEs would be related to the implementation.

The Students' Attitudes Towards Mathematics Scale has applied again to the experimental and control groups after the implementation to examine the effect of the MAEGEs on the students' attitudes towards mathematics lessons. Table 11 shows the results of the Wilcoxon signed-rank test for each group.

TABLE 11. Wilcoxon Signed-rank Test Analysis of Students' Attitudes Towards Mathematics Scale (SATMS)

Groups	Measurement	N	X	Sd	P
Experimental Group	SATMS Pre-test	12	48.33	12.42	.003
	SATMS Post-test	12	88.64	15.74	
Control Group	SATMS Pre-test	12	44.42	11.48	.002
	SATMS Post-test	12	78.23	14.28	

Table 11 presents the averages for the Students' Attitudes Towards Mathematics Scale both before and after the implementation. According to the results, there was a significant difference between the averages of the experimental group pre-test (X= 48.33) and post-test (X=88.64) (p(12)= .003; p<0.05). Similarly, there was a significant difference between the pre-test (X=44.42) and post-test (X=78.23) in the control group (p(12)=.002; p<0.05). This result shows that MAEGEs and lecture-based mathematics lessons contributed significantly to students' attitudes towards mathematics lessons.

Table 12 shows the difference between experimental and control groups in terms of the student's attitudes toward mathematics lessons after the implementation.

TABLE 12. Mann-Whitney U Test Analysis of Post-test of the Students' Attitudes Towards Mathematics Scale (SATMS)

Groups	Measurement	N	X	U	z	p
Experimental Group	SATMS Post-test	12	15.42	37.000	-2.026	.043
Control Group		12	9.58			

As seen in Table 12, there was a significant difference between the averages of the experimental group (X=15.42) and control group (X=9.58) (p(24) = .043; p>0.05). This result shows that MAEGEs contributed to students' attitudes towards mathematics lessons more than lecture-based mathematics lessons. Since the effect size is calculated as 0.58, MAEGES can be interpreted as have a large effect on student's attitudes.

4. DISCUSSION

This study investigated the effect of MAEGEs on students' academic achievement, motivation, and attitude towards mathematics lessons. Understanding the student's "player types" was necessary to determine the appropriate game elements for the experimental group. Since the game environment was the classroom, and the players were students in the school, it was necessary to determine the learner profiles of the students. After the player types had been determined using their Learner Profile Scale (Galiç, & Yıldız, 2020) without using any player type scale, the game elements required for the experimental group were then identified and the MAEGEs were designed. These activities were applied to the 6th-grade students as they studied fractions for a period of two weeks. Instruments were applied to both groups before and after the implementation in order to observe the effect of the MAEGEs on academic achievement, attitudes, and motivation.

The results of this study show that MAEGEs and lecture-based mathematics lessons contributed significantly to students' academic achievement significantly. MAEGEs had a positive effect on the students' mathematics academic achievement. This result is consistent with other studies on gamification (Bal, 2019; Chen et al., 2018; Harrold, 2015; Türkan, 2019; Welbers et al., 2019; Yürük, 2019). No difference was observed in the post-test Academic Achievement Tests for the experimental and control groups. This result shows that MAEGEs contributed to students' academic achievement at least in the lecture-based process. This result is consistent with the study by Samur (2015). According to the school's "Differentiation Policy", all lessons had to be differentiated. Nevertheless, the "Differentiation Policy" may have affected the results.

MAEGEs contribute to students' motivation towards mathematics lessons more than lecture-based mathematics lessons. This result is consistent with the literature (Bayram, & Çalışkan, 2019; Bell, 2014; Chen et al., 2018; Domínguez et al.; 2013; Harrold, 2015; Karamert, & Kuyumcu Vardar, 2021; Samur, 2015; Şahin et al; 2017; Türkan, 2019). On the other hand, this result is not consistent with some research (Meşe, & Dursun, 2018; Polat 2014). Unlike in other studies, determining the player types of the students in the experimental group and selecting appropriate game elements is thought to have had a positive effect in this study. While some researchers (Hakulinen et al., 2015; Hanus, & Fox, 2015) claimed the negative effects of gamification, the effect size is found as a larger effect for students' motivation and attitudes in this study. Hence, it can be claimed that if educator prepare the lesson according to the students' player types, the gamification has a positive effect during the learning process. As Buckle and Doyle (2016) mentioned that gamification means more than using badges in education. Since gamification path depends on the students' personalities (Bergmann et al., 2017), the students should be well-known before creating a gamification environment to select the appropriate game elements.

According the result of this study, the effect size of MAEGE's has medium on students' academic achievement. Marín Suelves et al. (2021) argued that video games provide students to develop their cognitive and creative aspects. Thus, the effect of MAEGE's may be expected to increase as the extension of implementation duration.

The results of this study showed that MAEGEs contributed to students' attitudes towards mathematics lessons more than lecture-based mathematics lessons. According to the results of studies by Bal (2019), Polat (2014), Türkan (2019), and Yürük (2019) gamification affects students' attitudes positively. Hence the result in this study is consistent with previous research.

5. CONCLUSIONS

This study investigated the effect of MAEGEs chosen according to middle-school students' learner profiles on their academic achievement in a "fractions unit", as well as their motivation and attitudes towards mathematics lessons. The study found that MAEGEs positively affected the student's academic achievement, motivation, and attitudes. Although the results indicated that students' motivation and attitudes towards mathematics were better in the experimental group, no differences were observed between the groups' academic achievements. It can be argued that these activities were more effective than lecture-based mathematics lessons in the student's motivation and attitudes toward mathematics lessons. The MAEGEs was implemented for a period of two weeks. Increasing the duration of implementation may also have a positive effect on students' academic achievement, motivation, or attitudes in mathematics lessons. It can be also stated that MAEGEs designed according to students' learner profiles positively affect students' academic achievement, attitudes, and motivation in mathematics lessons. Santos et al. (2021) recommended that the gamification design should be personalized to obtain better result since the differences between different studies about gamification is related to the gamification design. In this study, educational gamification environment adapted to the students and the result shows that gamification has positive effects on students. In addition, it can be argued that such enrichment activities can be used not only for gifted students but also for all students in a mixed-ability classroom.

5.1. Limitations and future lines of research

The following recommendations for future research can be made: the effects of using game elements with respect to students' player types could be researched for different topics, different disciplines, or students of different grades. Game elements could also be used in differentiation instructions.

6. REFERENCES

Abramovich, S., Schunn, C., & Higashi, R.M. (2013). Are badges useful in education?: It depends upon the type of badge and expertise of learner. *Educational Technology Research and Development, 61,* 217–232. https://doi.org/10.1007/s11423-013-9289-2

Aktan, S., & Tezci, E. (2013). The mathematical motivation scale (MMS) study of reliability and validity. *The Journal of Academic Social Science Studies, 6*(4), 57-77. https://doi.org/10.9761/JASSS1173

Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology, 35*(1), 56-79. https://doi.org/10.1108/IJILT-02-2017-0009

Andersen, E., & Downey, B. (2001). The MUD personality test. *The MUD Companion, 1,* 33–35. https://web.archive.org/web/20000818064001/http://www.andreasen.org/bartle/stats.cgi

Bal, M. (2019). Use of digital games in writing education: an action research on gamification. *Comtemporary Educational Technology, 10*(3), 246-271. https://doi.org/10.30935/cet.590005

Bayram, Y. T., & Çalışkan, H. (2019). Gamified creative activities used in social studies courses: action research. *Journal of Individual Differences in Education, 1*(1), 30-49. https://dergipark.org.tr/tr/download/article-file/724822

Bell, K. R. (2014). *Online 3.0-The rise of the gamer educator the potential role of gamification in online education* [Doctorate Thesis, University of Pennsylvania]. UPENN. https://repository.upenn.edu/dissertations/AAI3635727

Bergmann, N., Schacht, S., Gnewuch, U., & Maedche, A. (Eds.). (2017). *Proceedings of the 38th International Conference on Information Systems (ICIS)*. Karlsruhe Institute of Technology.

Buckley, P., & Doyle, E. (2016). Gamification and student motivation. *Interactive Learning Environments, 24*(6), 1162-1175. https://doi.org/10.1080/10494820.2014.964263

Chen, C.C., Huang, C., Gribbins, M., & Swan, K. (2018). Gamify online courses with tools built into your learning management system (LMS) to enhance self-determined and active learning. *Online Learning, 22*(3), 41-54. https://doi.org/10.24059/olj.v22i3.1466

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science, 1*(3), 98-101.

Cutts N. E., & Moseley, N. (2004). *Education of gifted and talented children* (İsmail Ersevim.). Özgür Publications.

Deterding, S., Sicart, M., Nacke, L.E., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. *Proceedings of 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA'11)*. ACM Digital Library. https://dl.acm.org/doi/10.1145/1979742.1979575

Domínguez, A., Saenz-de-Navarrete, J., De-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: practical implications and outcomes. *Computers & Education, 63*, 380-392. http://dx.doi.org/10.1016/j.compedu.2012.12.020

Fraenkel, J. R., & Wallen, N. E. (2003). *How to design and evaluate research in education*. McGraw-Hill.

Galiç, S., & Yıldız, B. (2020, Nov.22). Development of Learner Profile Scale To Be Used To Identify Students' Player Types. *2th International Conference on Science, Mathematics, Entrepreneurship and Technology Education*, Virtual, Turkey. http://2020.fmgtegitimikongresi.com/dosyalar/files/ozetler2.pdf

Hakulinen, L., Auvinen, T., & Korhonen, A. (2015). The effect of achievement on students' behavior: an empirical study in a university- level computer science course. *International Journal of Emerging Technologies in Learning (iJET), 10*(1), 18-29. https://doi.org/10.3991/ijet.v10i1.4221

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: a longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education, 80*, 152-161. https://doi.org/10.1016/j.compedu.2014.08.019

Harrold, D. J. (2015). *Game on: a qualitative case study on the effects of gamified curriculum design on student motivational learning habits* [Doctorate Thesis, Robert Morris University]. ProQuest Dissertations and Theses.

Huzinga, J. (1955). *Homo Ludens: A Study of the Play Element in Culture.* The Beacon Press.

Karamert, Ö., & Kuyumcu Vardar, A. (2021). The effect of gamification on young mathematics learners' achievements and attitudes. *Journal of Educational Technology & Online Learning, 4*(2), 96-114. https://files.eric.ed.gov/fulltext/EJ1307874.pdf

Karataş, E. (2014). Gamification in Education: Research Trends. *Ahi Evran University Journal of Education Faculty, 15*(2), 315-333. https://doi.org/10.24106/kefdergi.380982

Kim, J. T., & Lee, W. H. (2015). Dynamical model for gamification of learning (DMGL). *Multimedia Tools and Applications, 74*(19), 1-11. https://doi.org/10.1007/s11042-013-1612-8

Marín Suelves, D., Vidal Esteve, M. I., Donato, D., & Granados Saiz, J. (2021). Análisis del estado del arte sobre el uso de los videojuegos en Educación Infantil y Primaria. *Innoeduca: international journal of technology and educational innovation. 7*(2), 4-18. https://doi.org/10.24310/innoeduca.2021.v7i2.11541

Meşe, C., & Dursun, Ö. (2018). Effectiveness of gamification elements in blended learning environments. *Turkish Online Journal of Distance Education, 20*(3), 119-142. https://doi.org/10.17718/tojde.601914

Önal, N. (2013). Turkish adaptation study of attitudes towards

mathematics in secondary school students. İlköğretim Online, 12(4), 938-948. https://doi.org/10.20860/ijoses.486630.

Polat, Y. (2014). *A case study: Gamification and its effect on motivation of learners of English.* [Master Thesis, Çağ University]. Council of Higher Education Thesis Center. https://acikbilim.yok.gov.tr/handle/20.500.12812/71558

Şahin, Y., Karadağ, N., Bozkurt, A., Doğan, E., Kılınç, H., Uğur, S., Gümüş, S., Öztürk, A., & Güler, C., (2017). The use of gamification in distance education: A web-based gamified quiz application, *Turkish Online Journal of Qualitative Inquiry, 8*(4), 372-395. https://doi.org/10.17569/tojqi.329742

Santos, A.C.G., Oliveira, W., Hamari, J., Rodrigues, L., Toda, A. M., Palomino, P., & Isotani, S. (2021) The relationship between user types and gamification designs. *User Model User-Adap Inter, 31*, 907–940. https://doi.org/10.1007/s11257-021-09300-z

Samur, Y. (2015). *Gamifying a Hybrid Graduate Course* [Conference session]. In Global Learn Conference, FernUniversitat in Hagen, Berlin, Germany.

Sezgin, S. (2016, May). *İnsan ve Oyun: Oyunların Dünü, Bugünü, Yarını. VIII. International Congress of Educational Research*, Çanakkale Onsekiz Mart University, Çanakkale, Turkey. http://congress.eab.org.tr/2016/media/2016_ozet_kitap.pdf

Sezgin, S., Bozkurt, A., Yılmaz, E., & Van Der Linden, N. (2018). Gamification, education and theoretical approaches: Motivation, engagement and sustainability in learning process. *Mehmet Akif Ersoy Education Faculty, 0*(45), 169-189. https://doi.org/10.21764/maeuefd.339909

Suits, B. (1967). What Is a Game? *Philosophy of Science, 34*(2), 148-156. https://doi.org/10.1086/288138

Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. *Smart Learning Environments, 6*(1), 1-14. https://doi.org/10.1186/s40561-019-0106-1

Tomlinson, C. A. (2001). Differentiated instruction in the regular classroom. *Understanding Our Gifted, 14*(1), 3-6.

Türkan, A. (2019). *The effect of gamification method on the academic achievements, motivations and attitudes of secondary school students* [Master Thesis, Atatürk University]. Council of Higher Education Thesis Center.

Welbers, K., Konijn, E. A., Burgers, C., de Vaate, A. B., Eden, A., & Brugman, B. C. (2019). Gamification as a tool for engaging student learning: A field experiment with a gamified app. *E-Learning and Digital Media, 16*(2), 92-109. https://doi.org/10.1177/2042753018818342

Werbach, K. (2013). *Gamification: "Gamification Design Framework".* Coursera.

Yıldırım İ., & Demir S. (2014). Gamification and education. *International Journal of Human Sciences, 11*(1), 655-670. https://doi.org/10.14687/ijhs.v11i1.2765

Yürük N. (2019). Edutainment: Using Kahoot! as a Review Activity in Foreign Language Classrooms. *Journal of Educational Technology & Online Learning, 2*(2), 89-101. https://doi.org/10.31681/jetol.557518

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 81-96 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15419

Analysis of Teachers in the Use of Digital Resources in Online Teaching and Assessment in COVID Times

Análisis de los docentes en el uso de recursos digitales en la enseñanza y evaluación en línea en tiempos de COVID

RECIBIDO 23/09/2022 ACEPTADO 14/11/2022 PUBLICADO 01/06/2023

Basil C.E. Oguguo
University of Nigeria, Nigeria
basil.oguguo@unn.edu.ng

Roseline I. Ezechukwu
Federal College of Education (Technical), Omoku, Nigeria
ezechukwuifeoma445@yahoo.com

Fadip A. Nannim
University of Nigeria, Nigeria
Fadip.nannim@unn.edu.ng

Kelechi E. Offor
Imo State University, Nigeria
kelechioffor@yahoo.com

ABSTRACT

The study considered the use of online learning applications for instructional delivery and assessment purposes in higher institutions of learning that stimulates a new atmosphere where lecturers could utilize these facilities to promote learning. The study also determined the gender difference between lecturers use of online learning applications for instructional delivery and classroom assessment in a post-covid context. The digital applications analyzed in this study include Google classroom, Email, Moodle, Canvas, Google, Microsoft Team, Zoom, Google Meet, Cisco Webinar, Facebook groups, Open Educational Resources (OERs), Google docs, Google slide, WhatsApp and Telegram Channel. At present, however, opinions are divided over the extent to which lecturers utilize these online learning applications in instruction and assessment. A descriptive survey research design was adopted with 152 participants (n = 88 males and n = 64 females) for the study and the instrument used for data collection was Utilization of Online Leaning Applications in Classroom Instruction and Continuous Assessment Questionnaire (UOLACICAQ). On December 2021, the participants completed the Questionnaire. The internal consistency of the instrument was determined using Cronbach's Alpha and the reliability index of .93 was obtained. Results of the study show a low extent of utilization of online learning applications in classroom instruction and continuous assessment (Canvas, Microsoft Team, Google Meet, Cisco Webinar, OERs, Google slide, Telegram Channel, Facebook groups, Moodle, Google Classroom, learning management systems, Google forms and Google sheet). There was however, a significant difference between male and female lecturers' use of online learning applications for continuous assessment. Lecturers' utilization of online learning applications in instruction and assessment of learning will expose them to different online learning applications used in delivery instructions and assessing students' learning. The research supplies good idea of the instrument for

measuring those staked learning outcomes in higher institution. However, lecturers do not differ in terms of the extent to which they use online learning applications while delivering instructions in the classroom based on gender.

KEYWORDS Online education; teachers; technology; ICT; COVID.

RESUMEN

El estudio consideró el uso de aplicaciones de aprendizaje en línea con fines de enseñanza y evaluación en instituciones de aprendizaje superiores que estimulan una nueva atmósfera en la que los profesores pueden utilizar estas instalaciones para promover el aprendizaje. El estudio también determinó la diferencia de género entre los profesores que usan aplicaciones de aprendizaje en línea para la enseñanza y la evaluación en el aula en un contexto post-covid. Las aplicaciones digitales analizadas en este estudio incluyen el aula de Google, Correo electrónico, Moodle, Canvas, Google, Microsoft Team, Zoom, Google Meet, Seminario web de Cisco, grupos de Facebook, recursos educativos abiertos (REA), documentos de Google, diapositivas de Google, canal de WhatsApp y Telegram. En la actualidad, sin embargo, las opiniones están divididas sobre la medida en que los profesores utilizan estas aplicaciones de aprendizaje en línea en la instrucción y la evaluación. Se adoptó un diseño de investigación de encuesta descriptiva con 152 participantes (n = 88 hombres y n = 64 mujeres) para el estudio y el instrumento utilizado para la recolección de datos fue la Utilización de Aplicaciones de Aprendizaje en Línea en la Instrucción en el Aula y el Cuestionario de Evaluación Continua (UOLACICAQ). En diciembre de 2021, los participantes completaron el Cuestionario. La consistencia interna del instrumento se determinó mediante el Alfa de Cronbach y se obtuvo el índice de confiabilidad de .93.Los resultados del estudio muestran un bajo grado de utilización de las aplicaciones de aprendizaje en línea en la instrucción en el aula y la evaluación continua (Canvas, Microsoft Team, Google Meet, Cisco Webinar, OER, Google slide, Telegram Channel, grupos de Facebook, Moodle, Google Classroom, sistemas de gestión de aprendizaje, formularios de Google y hoja de Google). Sin embargo, hubo una diferencia significativa entre el uso de aplicaciones de aprendizaje en línea para la evaluación continua por parte de profesores masculinos y femeninos. La utilización de las aplicaciones de aprendizaje en línea por parte de los profesores en la instrucción y la evaluación del aprendizaje los expondrá a diferentes aplicaciones de aprendizaje en línea utilizadas para impartir docencia y evaluar el aprendizaje de los estudiantes. La investigación proporciona una buena idea del instrumento para medir los resultados de aprendizaje en juego en la institución superior. Sin embargo, los profesores no difieren en cuanto a la medida en que utilizan aplicaciones de aprendizaje en línea mientras imparten instrucciones en el aula según el género.

PALABRAS CLAVE Educación online; profesorado; tecnología; TIC; COVID.

1. INTRODUCTION

It is no longer news that the world has gone digital. The digital train moves so fast that its impact is felt in all spheres of human endeavours such as agriculture, financial services, transport and logistics, news media, health care and more importantly, education. A successful digital conversion for classrooms is not determined by the technology, but by how technology enables teaching and learning (McKnight, et al., 2016). The education sector as well is not left out of this advancement brought about by the digital technology also known as the Information and Communication Technology (ICT) in this study. ICT according to Liverpool as cited in Daramola and Omoyajowo (2016) is used to represent technologies requiring the collecting, storing, editing and transmitting of information using different forms. The term ICT has been considered an all-encompassing name for digital and electronic devices, applications, communication devices, hardware, software and related devices or application. The Organization of Economic Cooperation Development (OECD) as highlighted in Curtin (2002) viewed ICT as a series of activities such as storage, capturing, processing and

transmitting of information with the help of electronic devices. Thus, ICT could be said to mean information retrieval, processing, storing and transmitting using the computer and other technological-based devices. According to Liverpool as cited in Daramola and Omoyajowo (2016), the following are characteristics of ICT: it is a broad and fast-changing subject, communication of data by electronic means, storing, retrieving, manipulating, processing and distributing of information, involves digital sharing of information through internal or external networks, it is a technological tool for manipulating information or data. Information and Communication Technology has led to changes in the educational context; however, its incorporation in schools is not synonymous with nor a guarantee of its use as a didactic tool in the teaching and learning process (Orozco et al., 2022). Technological development in the past few decades has generated important changes in the educational field, which have resulted in new approaches that require the use of digital tools in arts education (Villares, & Sánchez, 2022).

Digital technology through facilitation of delayed-time discussion, directed instruction, and self-learning, among others, has been found to encourage learning (Yuen et al., 2003). The learning is facilitated by various digital learning platforms such as online and offline remote teaching technologies. Remote teaching occurs outside of the physical classroom. It is a situation where the teacher is separated from his/her learners by distance and sometimes by time. Learners are separated from their peers as well. Remote learning takes place online or offline (Federal Government of Nigeria [FGN], 2021). In online learning, learners can either learn at the same time (synchronously) or at a different time (asynchronously). It requires the use of internet connections. While offline digital learning is a system where information and knowledge are shared without the need to access the internet. The teachers and learners can share information and ask questions, but at different times, activities may not be simultaneous. Some major advantages of online digital learning over offline is that teaching and learning happen in real-time, it is more engaging and effective, and allows immediate feedback to learners.

Digital learning generally brings about improved learning outcomes, classroom instruction and assessment, administration as well as the development of essential skills among underprivileged groups (Palloff, & Pratt, 2013; Sharma, 2003). Yusuf (2005) also noted that digital learning impacts the process of research and educational instructions. Ali et al. (2013) noted that incorporating digital technology in the classroom offers the teacher and the students the opportunity to operate, control, store, and retrieve data as well as promoting self-regulated learning. This digital technology-facilitated learning according to Hussain et al. (2017) deals with an increased tendency and zeal toward learning that is collaborative among learners and instructors that is not dependent on specific classrooms. This learning pattern contrasts the traditional learning environment as it provides the opportunity for learning activities that are not dependent on face-to-face interaction, especially in the case of online digital learning technologies. In reference to students digital competence level, they have a high self-perception, especially in those skills related to communication and multimedia elements, which are the ones that they most commonly use in their everyday life (Sánchez-Caballé et al., 2019).

The rapid evolution in online digital technologies has also impacted positively the Post COVID-19 work environment, most especially in teaching and learning (Almazova et al., 2020; Charters, & Murphy, 2021; Crick et al., 2020; Mustapha et al., 2021). Now we have smart classrooms where smart/digital devices are applied to improve the learning outcome of traditional education. Smart education can be applied in a virtual or physical environment, or a blended scenario (Huang et al., 2013; Yang et al., 2022). A virtual environment

could include cloud servers, smartphones, emails, smart communication tools etc. Remote learning is another post-COVID-19 facilitated work environment. This is a situation where remote teaching takes place outside of a physical classroom (Dean, & Campbell, 2020; Rapanta et al., 2020). The teacher is separated from his/her learners by distance, time or both. The students are also separated from their peers. Online assessment, homeschooling and collaborations are other digital learning practices that became essential Post Covid-19 teaching and learning environment.

When digital technology is appropriately utilized in higher institutions of learning, students are usually equipped with the relevant knowledge and expertise to be efficient in the 21st century (Andoh, 2012). This can invariably boost access to educational resources, improve equality in the education system, promote quality teaching/learning and enhance the professional development of educators which will in the end improve the management of the educational system. Studies focusing on the utilization of online learning applications and tools in classroom instruction and continuous assessment have helped to determine which tools/applications are capable of accomplishing certain educational objectives (Mohmmed et al., 2020; Pererva et al., 2020; Saini, & Al-Mamri, 2019). The integration of online learning application and tools in the field of education provides lecturers with the opportunity to deliver their lectures anywhere and at any time, hence time and place is no longer barrier to education even amidst global disruptions such as the COVID-19 pandemic. It also enables lecturers to record and store information on students' intellectual development as well afford lecturers the time to focus on other activities since the process of assessment and feedback on students' progress will be monitored via the online learning platform anytime and anywhere. The use of online learning tools/platforms in education has made it easier for scholars to assemble information quickly, organize the information as well as use the information to pass across knowledge in different subjects or fields (Saini, & Al-Mamri, 2019).

The importance of adopting online digital learning in education cannot be overemphasized. Among the evolving trends in ICT, the online learning platforms such as Learning Management Systems (LMS) and electronic-based assessment and evaluation system has gained unprecedented attention in assessing complex competencies (Mohamed et al., 2019). The enormous contribution of digital learning tools to the field of education is evident all over the world (Cook, & Triola, 2014; Maity et al., 2021; Talebian et al., 2014). As pointed out by Pelgrum (2001), it is in line with the acknowledgement of the above that the education system witnessed the speedy integration of computers and networking. This according to Becker and Ravitz (2001) is perhaps just the beginning of what the future holds concerning online digital presence in the world of education.

The foregoing is an indication that the field of education has been empowered by the development of technology. However, it is important to note that integrating digital technology into the school curriculum has been a great challenge. This is because teachers and lecturers as well as educational stakeholders require some level of skills and competence for ease of integration (Mielikäinen, 2021). It is in the consideration of the points above that Cuban (2000) stressed the need to consider lecturers' knowledge and skills while adopting digital technologies within the classroom context. Thus, more efforts are expected from educational custodians such as teachers and lecturers in the field of education to be able to effectively integrate online digital technology in such aspects of education as assessment. Assessment deals with the process of gathering data to make informed educational decisions that have to do with the learners, curricula and educational policies (Nitko, & Brookhart, 2007; Suskie, 2018; Swaffield, 2011). Assessment could be seen to

be concerned with the process of gathering data from a variety of sources on the activities of teaching and learning for understanding, describing and improving learning. In essence, assessment targets pointing out students' strengths and areas requiring more attention. Assessment is viewed to be pivotal in the field of education (Ugodulunwa, 2008). Assessment helps to validate the effectiveness of the teaching and learning process. Through assessment, the instructor can determine students' areas of strength and weaknesses. Thus, through assessment, educational decisions or judgement can be made.

Through assessment, the level of teachers' instructional effectiveness can also be ascertained. The assessment provides feedback on the activities of teaching and learning. Through assessments, selections, instructional decisions, classification and certification, among others can be made regarding students. A common form of assessment employed by lecturers and instructors is continuous assessment. Continuous assessment as defined by Ugodulunwa (2008) deals with the systematic and periodic assessment that takes into account what an individual has been able to learn in terms of cognitive, affective and psychomotor domains at the end of a unit, a course or programme. This definition sees continuous assessment as a regular and systematic process that covers the three domains of learning. Thus, continuous assessment is cumulative, systematic, comprehensive and guidance oriented. The adoption of online digital technology is an essential tool and agent of change in continuous assessment in education as it enables delivery of continuous assessment to remote students and facilitates record-keeping and analysis of data relating to students learning process. Integration of online digital platforms can improve efficiency and support educational decision making through enabling lecturers to gather and analyse student responses and compare testing and non-testing techniques. Common online mechanisms for collecting data on assessment include the use of learning management systems such as Moodle, Canvas, Google classroom and Microsoft team, other includes google forms, google sheets, and Survey Monkey among others (Durak et al., 2022; Mpungose, 2020). To make data from such assessment mechanisms understandable, lecturers must be able to analyse and report results relating to the assessment. Hence, it is important to determine if lecturers are utilizing online learning applications in the process of assessment.

This study examined the use of online learning applications for instructional delivery and assessment purposes in higher institutions of learning in post Covid. The study highlighted the concept of digital technologies and their application in the education system in enhancing assessment and particularly continuous assessment. Pre-covid and mid-covid studies have shown the failure rate of integrating online learning platforms in the classroom (Al-Maroof, & Salloum, 2021; Mesfin et al., 2018). Studies have also indicated that the rate at which school teachers employ the use of online learning platforms is very low (Nawrot, & Doucet, 2014; Panigrahi, 2018; Wang et al., 2013). The study of Salman et al. (2013) showed that teachers and students are aware of the use of online learning in teaching some specific subjects. Equally, the study showed that private and public-school teachers are significantly different in terms of their level of awareness of digital technologies in teaching. The study of Yushau and Nannim (2020) showed that teachers possess a low level when it comes to utilizing ICT facilities. According to the authors, this is due to a lack of technical know-how by the teachers in instructional delivery with ICT facilities. Although Mesfin et al. (2018) show that teachers' and students' experience of using advanced digital technologies is fair, there is limited access to multimedia-rich e-learning resources and premature practice of adopting the technology into teaching and learning. Also, Oriji and Anikpo (2019) found that even though lecturers and students possess

internet-enabled mobile phones, they were not properly utilizing Whatsapp instant messaging for effective academic activities as only 15 (11.7 %) of lecturers and 243 (22.9 %) of the students were using it for academic purposes. The result further revealed that 100 % of both lecturers and students never received any form of training for the use of Whatsapp mobile technology. Bryan et al. (2018) found that students tends to engage more intensively in online classes when they frequently interact with peer students also using technology. Another study by Bawa et al. (2022) shows that undergraduate students had positive perceptions of the utilization of Moodle LMS. It was also found that some of the problems associated with the use of the platform for learning include inconsistency of power supply and technical and psychological issues. Octaberlina and Muslimin (2020) on their part carried out a study that investigates the online learning barriers to using Moodle and Google Classroom, results show that students experienced three barriers during online learning which include unfamiliarity with e-learning, slow internet connection, and physical condition e.g. eye strain.

Peytcheva-Forsyth and Aleksieva (2021) carried out a study on the forced introduction of e-assessment during the COVID-19 pandemic and the result shows that students were mostly summatively assessed through course works (artefacts) submissions and tests, and the use of different types of formative assessment was very limited. The technologies utilised for the assessments by academic staff were also very deficient. The results further show that most of the teachers transferred their experience and approaches to students' assessment from face-to-face to the online environment without adaptation and modification to details of the latter. This reduced to a certain extent the trust of students in e-assessment and reinforced their preference for a face-to-face assessment.

The above is an indication that lecturers in Nigerian tertiary institutions lack adequate access to digital learning such as online learning platforms. The lack of relevant digital learning resources and skills in some colleges of education affects the level at which lecturers use the digital platforms in the assessment of students. This situation is worrisome in our tertiary institutions that are in the South-South region of Nigeria. These worrisome situations made the researchers evaluate the extent lecturers use information technologies in classroom instruction and assessment. Therefore, the aim of this paper is to investigate the use of online applications for teaching and assessment in a post-covid context. The study also determined the mean difference between male and female lecturers on the use of online learning applications for instructional delivery and classroom assessment in a post-covid context. The following research questions were addressed in this current study:

1. To what extent do lecturers use online learning applications in classroom instruction in post-covid lockdown?
2. What is the extent to which lecturers utilize online learning applications in classroom assessment in post-covid lockdown?
3. What is the mean difference between lecturers on the use of online learning applications for instructional delivery in a post-covid context based on gender?
4. What is the mean difference between male and female lecturers on the use of online applications in classroom assessment in a post-covid context?

2. MATERIAL AND METHOD

2.1. Research Design

The researchers adopted a descriptive research design. This research design explains the characteristics, features or attributes of a given phenomenon, events, objects or groups of persons (Nworgu, 2015). This is because this study described the characteristics of lecturers in colleges of education on their level of utilization of online learning applications while assessing students. The study was conducted at Colleges of Education in Nigeria. The survey response data were retrieved in December 2021 and it lasted for one (1) week through questionnaire administered to each participants face-to-face.

2.2. Participants

The participants were Lecturers from two Colleges of Education in Nigeria. A total of 152 lecturers participated in the study which comprised 88 male lecturers and 64 female lecturers drawn from the Colleges. All the 152 participants invited for the study voluntarily agreed to participate in the study. The participants' biodata is presented in Table 1.

TABLE 1. Bio-data of the Participants

Demographic Information		N	Qualification			
			B.Sc.	Masters	Ph.D	
Gender	Male	88	19	40	29	176
	Female	64	21	16	27	128
Total		152				
Age	35-45	38	18	16	4	76
	46-55	53	15	27	11	106
	45-63	43		34	9	86
	≥64	18		13	5	36
TOTAL		**152**				

2.3. Research Instrument

The study made use of the "Utilization of Online Leaning Applications in Classroom Instruction and Continuous Assessment Questionnaire (UOLACICAQ)" instrument. The UOLACICAQ contained 27 items and was developed by the researchers. The instrument had sections, A, B and C. The demographic information of lecturers was captured in section A. Section B has 15 items on the extent of lecturers' use of online learning applications in classroom instruction while section C with 11 items covered lecturers' extent of use of online applications in classroom assessment. Sections B and C items were developed on a modified Likert type of 4-point scale ranging from Very High Extent, High Extent, Low Extent and Very Low Extent with numerical values of 4, 3, 2 and 1 accordingly. In making decisions, a mean value of 2.50 - 4.00 is accepted and below 2.50 is rejected.

2.4. Validity and Reliability

The instrument (UOLACICAQ) was validated by experts. To ensure the reliability of the instrument, 40 copies of the questionnaire were administered to 40 academic staff for trial testing. The subjects used in the trial testing were outside the study area and therefore were not included in the main study. Data collected were subjected to the Cronbach Alpha method. The internal consistency estimate for the instrument was calculated to be 0.93. The value was judged high enough to give confidence about the reliability of the instrument. The researchers and two research assistants administered the questionnaire to lecturers face-to-face.

2.5. Data Analysis

The data generated through the research instrument was analyzed using SPSS version 23.00 to conduct the statistical analysis. We first tested the normality of the data generated using Kolmogorov-Smirnov (K-S) test. The tests compared the scores in the sample to a normally distributed set of scores with the same mean and standard deviation; the null hypothesis is that sample distribution is normal. Since the p-value of the K-S test is greater than 0.05, this means that the frequency distribution corresponds to the normal distribution. The data is normally distributed (Table 2).

TABLE 2. Normality Test

Test Statistics	Statistics	p.Value
Kolmogorov-Smirnov test	0.08	0.782

This analysis involves the use of descriptive and inferential statistics [mean and standard deviation, t-test]. This analysis technique was chosen because this study evaluated the extent lecturers use information technologies in classroom instruction and assessment in post Covid-19 pandemic in Nigeria.

3. RESULTS

The result in Table 3 shows that the lecturers accepted using the identified online learning applications in items 1, 2, 3, 4, 7, 11 and 13 in their teaching since they have a mean greater than the criterion mean of 2.5. However, items 5, 6, 8, 9, 10, 12, 14, and 15 were not being used to a large extent by the lecturers in instructional delivery since they have means below the criterion mean of 2.5. The cluster mean of 2.46 shows that the lecturers use these online learning facilities to a low extent for instructional delivery in their institutions.

TABLE 3. Descriptive statistics of Lecturers' Use of Online Learning Applications in Classroom Instruction

S/N	Item Statement	Mean	SD
1.	I use Google to search for learning materials online	3.16	0.81
2.	I send/share information to students using email	2.89	0.87
3.	I use Moodle to teach/share instructional material with students	2.63	1.02
4.	I use Google classroom to teach/share instructional material with students	2.81	1.02
5.	I use Canvas to teach/share instructional material with students	2.20	1.05
6.	I use Microsoft Team to teach/share material with students	2.11	0.91
7.	I use Zoom in delivering lectures	3.11	1.12
8.	I use Google Meet in delivering lectures	2.01	0.88
9.	I use Cisco Webinar in delivering lectures	1.76	0.67
10.	I use Open Educational Resources (OERs) such as OER Common and Khan Academy to teach	1.89	1.08
11.	I use Google docs for collaborative learning	2.56	1.02
12.	I use Google slide for effective lesson delivery	1.93	0.97
13.	I use WhatsApp to teach/share instructional material with students	3.49	0.91
14.	I use Telegram Channel to teach/share material with students	2.26	0.97
15.	I use Facebook groups in teaching my students	2.11	1.07
	CLUSTER MEAN	**2.46**	

Note. N = 152

TABLE 4. Independent t-test analysis of lecturers' use of online learning application in classroom instruction

Gender	N	Mean	SD	df	t-cal	Sig. (2-tailed)
Male	88	2.53	0.69	150	1.071	0.286
Female	64	2.42	0.46			

The analysis in Table 4 shows that male lecturers had a slightly higher mean rating (2.53) as compared with their female counterparts (2.42). The result also shows that t(152-2) = 1.071, p = 0.286 was obtained in terms of lectures' use of online learning applications in classroom instruction based on gender. The p-value is greater than the level of significance of 0.05. The null hypothesis is retained, meaning that gender does not significantly influence lecturers' use of online learning applications in instructional delivery.

The result in Table 5 shows that the lecturers accepted item statements 19, 21 and 24; which means that they have been using those identified online learning applications for assessment purposes since they have means above 2.50. However, item statements 16, 17, 18, 20, 22, 23 25 and 26 were rejected since their mean ratings fall below the criterion mean of 2.50. This means that the lecturers were not using these identified online learning applications for assessment purposes in their colleges. The cluster means of 2.15 shows that overall, there is a low extent of lecturers' use of online learning applications for assessment purposes in their respective Colleges of education.

TABLE 5. Descriptive statistics of Lecturers' Use of Online Learning Applications in Classroom Assessment

S/N	Item Statement	Mean	SD
16	I use online learning management systems such as Moodle and Google Classroom to administer tests and assignments	2.01	0.75
17	I use online learning management systems such as Moodle and Google Classroom to mark/grade tests and assignments	1.95	1.07
18	I use Google forms in designing and administering quizzes/assignment	2.13	1.01
19	Most of my assignments are submitted via e-mail	2.84	0.88
20	I use Google sheet to process students' scores	1.55	1.15
21	My students' assessment records are stored in Google Drive	2.50	1.08
22	I use online learning management systems such as Moodle, Google Classroom, or Microsoft Teams to give feedback that improves students learning	2.15	1.24
23	Most of my assessments are scored automatically using the online learning applications	1.68	1.08
24	I use the WhatsApp application to share and receive assignments from student	2.63	1.09
25	I use Telegram Channel to share and receive assignments from students	1.95	0.89
26	I use Messaging applications such as WhatsApp, Telegram, Facebook, etcetera to publish students' results	2.21	0.95
	CLUSTER MEAN	**2.15**	

Note. N = 152

TABLE 6. Independent t-test Analysis of Lecturers' Uses of Online Learning Applications in Continuous Assessment by Gender

Gender	N	Mean	SD	df	t-cal	Sig. (2-tailed)
Male	88	2.91	0.67	150	4.239	.000
Female	64	2.48	0.56			

Table 6 shows that male lecturers had a higher mean rating (2.91) as compared with their female counterparts (2.48). The result also indicates that t(152-2) = 4.239, p = 0.000 (2-tailed) was obtained. The p-value is less than the 0.05 level of significance set for decision making. Thus, the null hypothesis is rejected, this means that gender significantly influenced lecturers' level of usage of online learning applications for continuous assessment.

4. DISCUSSION

The study considered the use of online learning applications for instructional delivery and assessment purposes in higher institutions of learning that stimulates a new atmosphere where lecturers could utilize these facilities to promote learning. The findings revealed that lecturers use WhatsApp to teach/share instructional material with students; use Google to search for learning materials online; use Zoom in delivering lectures; send/share information to students using email; use Moodle to teach/share instructional material with students; use Google classroom to teach/share instructional material with students, and use Google docs for collaborative learning. However, it was found that there was low extent of use of Canvas to teach/share instructional material with students; use of Microsoft Team to teach/share material with students; use of Google Meet in delivering lectures; use of Cisco Webinar in delivering lectures; use of Open Educational Resources (OERs) such as OER Common and Khan Academy to teach; use of Google slides for effective lesson delivery; use Telegram Channel to teach/share material with students, and use of Telegram Channel to teach/share material with students which all have their mean ratings below criterion benchmark of 2.5. Lecturers to a low extent use these online learning applications for classroom instructions. This result is surprising because these institutions are teachers' training institutions where these facilities should be used adequately for classroom instructions but it was not the case. Also, considering the global disruption as a result of COVID-19, which has pushed most institutions around the world to adopt the online learning platforms for their instructional delivery (Adedoyin, & Soykan, 2020; Agormedah et al., 2020), it was expected that Nigerian teachers training institutions (Colleges of Educations) should have been a leader in adoption and usage of these platforms among the Nigerian higher institutions of learning. The plausible reason for this could be institutional issues such as lack of motivation for lecturers who adopted this technology for classroom instruction; electricity or lack of adequate training for lecturers to use these platforms for classroom instructions. The report of (Sánchez-Caballé et al., 2019) collaborates with the present study finding. The authors states that students make limited use of technology in learning, they are very predisposed to integrate it in their work. The result of this study aligns with that of Yushau and Nannim (2020) who found out that lecturers' level of utilizing ICT resources for teaching purposes is low. This result also agreed with Aworanti (2016) who found that there was low utilization of ICT facilities for classroom instruction. However, it disagrees with Olokooba and Abdulsalam (2017) that found a higher extent of utilization of ICT in classroom instruction among teachers. The result also differs with the report of (Villares, & Sánchez, 2022) who discovered a high degree of acceptance of these media in arts education, a great variety of uses, and commitment towards lifelong learning.

Lecturers'gender does not significantly influence' use of online learning applications in instructional delivery. Male and female lecturers did not differ in their opinions on the use of online learning applica-

tions for instructional delivery in colleges of education. This result strengthens the report of Onwuagboke and Singh (2016) who revealed no significant gender influence in ICT usage in instructional delivery. Similarly, the result of Yushau and Nannim (2020) found no significant gender difference in the use of ICT in teaching. However, it disagrees with the report of Umar (2010) and Adekeye (2008) which shows that a significant difference existed. Male lecturers were found to use ICT facilities most as compared to their female counterparts (Mahdi, & Al-Dera, 2013). The present study findings contradict the study of Rodrigo et al. (2018) where women plan and get more out of study time, provide an intrinsic motivation for learning, have a marked preference for doing work and study with other colleagues, discuss doubts and ask for help from both peers and teachers.

Lecturers have been using online learning applications for submission of assignments via e-mail; storage of students' assessment records via the Google drive, and also use WhatsApp application to share and receive assignments from students. These items all have means above the benchmark. However, it was also found that the use of online learning management systems such as Moodle and Google Classroom to administer tests and assignments; use of online learning management systems such as Moodle and Google Classroom to mark/grade tests and assignments; use of Google forms in designing and administering quizzes/assignments; use of Google sheet in processing students' scores; use of online learning management systems such as Moodle, Google Classroom, or Microsoft Teams to give feedback that improves students learning; the automatic scoring of assessments; use Telegram channel/group to shared and receive assignments from students; use Messaging application such as WhatsApp, Telegram, Facebook, etcetera to publish students results were being used by the lecturers to a low extent. This finding is consistent with the result of Jotia and Matlale (2011) who found a low extent of utilization of ICT in classroom assessment. The study disagrees with Ojerinde (2009) who found that lecturers were using ICT for classroom assessment in their institutions.

The result further revealed that male and female lecturers are significantly different in terms of using online learning applications for classroom assessment. This result agrees with the findings of Umar (2010) and Adekeye (2008) however, it disagrees with Salman et al. (2013) who found that gender does not influence lecturers' use of digital technologies in classroom assessment. The authors attributed these findings to factors such as enabling environment for the usage of ICT in the institution or individual factors such as lack of will to use the ICT facilities for classroom instructions. The results obtained with the research could be useful to improve the training of lecturers in online learning applications utilization in instructional delivery and assessment purposes in high institutions of learning.

5. CONCLUSIONS

The result shows low utilization of online learning applications in the classroom for instructional delivery by lecturers in Nigeria. Male and female lecturers do not differ in terms of the extent to which they use online learning applications while delivering instructions in the classroom. The result of this study also revealed that lecturers utilize online learning applications in the process of classroom assessment to a high extent. Male lecturers significantly utilize online learning platforms in the process of assessment more than female lecturers. This result means that more effort is required by lecturers with respect to adopting online learning

platforms in the process of instructional delivery and assessment within the classroom environment since it is indispensable in the world of academics and considering the global disruption caused by the COVID-19 pandemic. Based on the findings, it was recommended amongst others that stakeholders in education should ensure adequate training for lecturers on how to use these platforms for instructions and assessment. This could be done quarterly. The online learning platforms should be made accessible to lecturers by providing them with all the required licenses.

5.1 Limitations and future lines of research

Lecturer characteristics may limit the result of the study. Some lecturers can be more effective and dedicated in the use of online learning applications than others. This could influence the outcome of this study, and as such a limitation to the findings of the study. Also, the study data relied on questionnaire which are self-report instruments, capable of generating subjective response. Thus, findings of this study may be further verified using interviews, open-ended questions and focused group discussions. We noted the inability to conduct a confirmatory validity of the two dimensions of the instrument (exploratory analysis and confirmatory analysis). On this note, other researchers should investigate further using exploratory and confirmatory factor analysis in exploring online learning applications in instructional delivery and classroom assessment among postgraduate lecturers and students. The generalizability of the findings of this study may be limited due to the sample size. Thus, the researchers suggested that future researchers can replicate the study and employ large sample size. With these limitations, the generalization of these findings should be done with caution. It was only moderating influence of gender of participants that was determined among several demographic variables. The moderating effects of demographic variables like age, qualifications, school type, ethnicity, and state of origin were not determined. Given these limitations, we encourage future studies to consider the demographic variables moderating the lecturers online learning applications in classroom instruction and assessment. A replication of this study on a wider geographical area to include students in Secondary schools and Universities.

6. REFERENCES

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive learning environments*, 1-13. https://doi.org/10.1080/10494820.2020.1813180

Adekeye, J. D. (2008). *Availability and utilization of resources for teaching junior secondary school social studies in Kwara State, Nigeria* [Doctoral Thesis, University of Ilorin].

Agormedah, E. K., Henaku, E. A., Ayite, D. M. K., & Ansah, E. A. (2020). Online learning in higher education during COVID-19 pandemic: A case of Ghana. *Journal of Educational Technology and Online Learning*, *3*(3), 183-210. https://doi.org/10.31681/jetol.726441

Ali, G. Haolader, F. A., & Muhammad, K. (2013). The role of ICT to make teaching-learning effective in higher institutions of learning in Uganda. *International Journal of Innovative Research in Science, Engineering and Technology, 2*(8), 61-73.

Al-Maroof, R.S., & Salloum, S.A. (2021). An Integrated Model of Continuous Intention to Use of Google Classroom. In M. Al-Emran, K. Shaalan, & A. Hassanien (Eds.) *Recent Advances in Intelligent Systems and Smart Applications. Studies in Systems, Decision and Control* (pp. 311-335). Springer. https://doi.org/10.1007/978-3-030-47411-9_18

Almazova, N., Krylova, E., Rubtsova, A., & Odinokaya, M. (2020). Challenges and opportunities for Russian higher education

amid COVID-19: Teachers' perspective. *Education Sciences*, *10*(12), e368. https://doi.org/10.3390/educsci10120368

Andoh, C. B. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology, 8*(1), 136-155. http://ijedict.dec.uwi.edu//viewarticle.php?id=1361

Aworanti, O. A. (2016). Information and communications technology (ICT) in Nigeria educational assessment system - emerging challenges. *Universal Journal of Educational Research,* 4(6), 1351-1356. https://doi.org/10.13189/ujer.2016.040612

Bawa, N., Imam, H. Y., & Bello, A. J. (2022). Undergraduate Students' Perceptions of the Use of

Moodle Learning Management System in Usmanu Danfodoyo University, Sokoto. *Journal of Artificial Intelligence, Machine Learning and Neural Network, 2*(03), 7-14. https://doi.org/10.55529/jaimlnn.23.1.8

Becker, H. J. & Ravitz, J. L. (2001, marzo). Computer use by teachers: Are Cuban's predictions correct? *2001 annual meeting of the American Educational Research Association*, Seattle, Washington. https://larrycuban.files.wordpress.com/2011/03/10-1-1-90-6742-1.pdf

Bryan, T. K., Lutte, R., Lee, J., O'Neil, P., Maher, C. S., & Hoflund, A. B. (2018). When do online education technologies enhance student engagement? A case of distance education at University of Nebraska at Omaha. *Journal of Public Affairs Education*, *24*(2), 255-273. https://doi.org/10.1080/15236803.2018.1429817

Charters, M., & Murphy, C. (2021). Taking art school online in response to COVID 19: From rapid response to realising potential. *International Journal of Art & Design Education*, *40*(4), 723-735. https://doi.org/10.1111/jade.12384

Cook, D. A., & Triola, M. M. (2014). What is the role of e-learning? Looking past the hype. *Medical education*, *48*(9), 930-937. https://doi.org/10.1111/medu.12484

Crick, T., Knight, C., Watermeyer, R., & Goodall, J. (2020, September). The impact of COVID-19 and "Emergency Remote Teaching" on the UK computer science education community. *United Kingdom & Ireland Computing Education Research conference.* (pp. 31-37). https://doi.org/10.1145/3416465.3416472

Cuban, L. (2000). So much high-tech money invested, so little use and change in practice: How come? *Chief State School Officers' Annual Technology Leadership Conference*, Washington DC.

Curtin, R. (2002). *Promoting youth employment through information and communication technology (ICT): Best practice example in Asia and the Pacific*. http://www.ybiz.com/aybizweb/ResourceCenter/ICT&youthemploymentRC. pdf.

Daramola, F. O., & Omoyajowo, B. S. (2016). Information communication technology as a tool for improving Nigerian education at all levels: A theoretical perceptive. *International Journal of Education and Evaluation, 2*(2), 79-84.

Dean, B. A., & Campbell, M. (2020). Reshaping work-integrated learning in a post-COVID-19 world of work. *International Journal of Work-Integrated Learning*, *21*(4), 355-364.

Durak, G., Cankaya, S., Demir, O. A., & Cevre, C. (2022). Integrated Systems in Distance Education: Comparison of Popular Systems. In G. Durak, & S. Çankaya (Ed.), *Handbook of Research on Managing and Designing Online Courses in Synchronous and Asynchronous Environments* (pp. 77-95). IGI Global. https://doi.org/10.4018/978-1-7998-8701-0.ch004

Federal Government of Nigeria (2021). *Remote Learning During COVID-19 Lockdown is Preventing Learning Loss in Nigeria.* https://www.worldbank.org/en/news/feature/2021/12/08/remote-learning-during-covid-19-lockdown-is-preventing-learning-loss-in-nigeria

Huang, R., Yang, J., & Zheng, L. (2013). The components and functions of smart learning environments for easy, engaged and effective learning. *International Journal for Educational Media and Technology*, *7*(1), 4-14. https://jaems.jp/contents/icomej/vol7/IJEMT7.4-14.pdf

Hussain, I. Suleman, Q. Din, M. N., & Shafique, F. (2017). Effects of information and communication technology (ICT) on students' academic achievement and retention in Chemistry at secondary level. *Journal of Education and Educational Development*. *4*(1), 73-93. http://dx.doi.org/10.22555/joeed.v4i1.1058

Jotia, A. L., & Matlale, O. J. (2011). Use of instructional materials in social studies: Impact on students' performance in primary school leaving certificate examinations in Botswana. *European Journal of Educational Studies, 3(1),* 111-122.

Mahdi, H.S., & Al-Dera, A.S. (2013). The Impact of Teachers' Age, Gender and Experience on the Use of Information and Communication Technology in EFL Teaching, *English Language Teaching*, 6(6), 57-67. https://doi.org/10.5539/elt.v6n6p57

Maity, S., Sahu, T. N., & Sen, N. (2021). Panoramic view of digital education in COVID-19: A new explored avenue. *Review of Education*, *9*(2), 405-423. https://doi.org/10.1002/rev3.3250

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M.K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: how educators use technology to improve student learning. *Journal of Research on Technology in Education*, *48*(3), 194-211. https://doi.org/10.1080/15391523.2016.1175856

Mesfin, G., Ghinea, G., Grønli, T. M., & Hwang, W. Y. (2018). Enhanced agility of e-learning adoption in high schools. *Journal of Educational Technology & Society*, *21*(4), 157-170.

Mielikäinen, M. (2021). Towards blended learning: Stakeholders' perspectives on a project-based integrated curriculum in ICT engineering education. *Industry and Higher Education*, 36(1), 0950422221994471. https://doi.org/10.1177 %2F0950422221994471

Mohamed, A.A.M., Hansson, B.S., & Sachse, S. (2019). Third-Order Neurons in the Lateral Horn Enhance Bilateral Contrast of Odor Inputs Through Contralateral Inhibition in Drosophila. *Frontiers in Physiol*igy, *10*, e851. https://doi.org/10.3389/fphys.2019.00851

Mohmmed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020). Emergency remote teaching during Coronavirus pandemic: the current trend and future directive at Middle East College Oman. *Innovative Infrastructure Solutions*, *5*(3), 1-11. https://doi.org/10.1007/s41062-020-00326-7

Mpungose, C. B. (2020). Emergent transition from face-to-face to online learning in a South African University in the context of the Coronavirus pandemic. *Humanities and Social Sciences Communications*, *7*(1), 1-9. https://doi.org/10.1057/s41599-020-00603-x

Mustapha, I., Van, N. T., Shahverdi, M., Qureshi, M. I., & Khan, N. (2021). Effectiveness of Digital Technology in Education During COVID-19 Pandemic. A Bibliometric Analysis. *International Journal of Interactive Mobile Technologies*, *15*(8), e136. https://doi.org/10.3991/ijim.v15i08.20415

Nawrot, I., & Doucet, A. (2014, April). Building engagement for MOOC students: introducing support for time management on online learning platforms. *Proceedings of the 23rd International Conference on world wide web* (pp. 1077-1082). https://doi.org/10.1145/2567948.2580054

Nitko, A., & Brookhart S. (2007). *Educational assessment of students*. (5th. ed) Upper Saddle River. Pearson Inc.

Nworgu, B. G. (2015). *Educational measurement and evaluation. Theory and Practice*. University Trust Publishers.

Octaberlina, L. R., & Muslimin, A. I. (2020). EFL Students Perspective towards Online Learning Barriers and Alternatives Using Moodle/Google Classroom during COVID-19 Pandemic. *International Journal of Higher Education*, *9*(6), 1-9. https://eric.ed.gov/?id=EJ1277897

Ojerinde, D. (2009, September 13-18). Using assessment for the improvement of tertiary education in Nigeria: The Joint Admissions and Matriculation Board (JAMB) role. *A paper presented at the 35thInternational Association for Educational Assessment conference*., Brisbane, Australia. https://iaea.info/documents/using-assessment-for-the-improvement-of-tertiary-education-in-nigeria-the-joint-admissions-and-matriculation-board-jamb-role/

Olokooba, I. N., & Abdulsalam, A.A. (2017). Teacher variables and use of computer assisted instructional materials (CAIM) in upper basic Social Studies. *Nigerian Journal of Educational Technology, 1*(2),108-116.

Onwuagboke, B. B. C., & Singh, T. K. R. (2016). Faculty attitude and use of ICT in instructional delivery in tertiary institutions in a developing nation. *International Journal of Research Studies in Educational Technology, 5*(1), 77-88. https://doi/10.5861/ijrset.2016.1428

Oriji, A., & Anikpo, F. (2019). Social media in teaching-learning process: Investigation of the use of Whatsapp in teaching and learning in University of Port Harcourt. *European Scien-*

tific Journal, *15*(4), 15-39. https://doi.org/10.19044/esj.2019.v15n4p15

Orozco, A.P., Pérez, O.L., López, O.L., Chávez, J.K., & López, E.X.C. (2022). Virtual learning environments: Social networks for learning at university. *Innoeduca. International Journal of Technology and Educational Innovation, 8*(1), 91-101. https://doi.org/10.24310/innoeduca.2022.v8i1.12340

Palloff, R. M., & Pratt, K. (2013). *Lessons from the virtual classroom: The realities of online teaching*. John Wiley & Sons.

Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online learning: Adoption, continuance, and learning outcome—A review of literature. *International Journal of Information Management*, *43*, 1-14. https://doi.org/10.1016/j.ijinfomgt.2018.05.005

Pelgrum, W. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37,* 163–178. https://doi.org/10.1016/S0360-1315(01)00045-8

Pererva, V., Lavrentieva, O., Lakomova, O., Zavalniuk, O., & Tolmachev, S. (2020). The technique of the use of Virtual Learning Environment in the process of organizing the future teachers' terminological work by specialty. *Proceedings of the 7th Workshop on Cloud Technologies in Education (CTE 2019),* Kryvyi Rih, Ukraine. http://ds.knu.edu.ua/jspui/handle/123456789/2646

Peytcheva-Forsyth, R., & Aleksieva, L. (2021, March). Forced introduction of e-assessment during COVID-19 pandemic: How did the students feel about that? (Sofia University case). *AIP Conference Proceedings*, *2333*(1), 050013. https://doi.org/10.1063/5.0041862

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. *Postdigital science and education*, *2*(3), 923-945. https://doi.org/10.1007/s42438-020-00155-y

Rodrigo, M.R., Chacón J.P., & Alonso, A.S.M. (2018). Sex differences in learning strategies of online students. *Innoeduca. International Journal of Technology and Educational Innovation*, *4*(2), 114-126. http://dx.doi.org/10.24310/innoeduca.2018.v4i2.4940

Saini, D. K., & Al-Mamri, M. R. S. (2019). Investigation of Technological Tools used in Education System in Oman. *Social Sciences & Humanities Open*, *1*(1), 100003. https://doi.org/10.1016/j.ssaho.2019.100003

Salman, M. F., Ogunlade, O. O. & Adegbami, O. A. (2013). Assessment of secondary school teachers' professional development in the use of information communication technology for teaching mathematics in Ejigbo, Nigeria. IOSR *Journal of Research and Method in Education, 2*(1), 48-55. https://doi.org/10.9790/7388-0214855

Sánchez-Caballé, A., Gisbert-Cervera, M., & Esteve-Mon, F. (2019). First-year College Students'

Digital Competence. *Innoeduca. International Journal of Technology and Educational Innovation*, *5*(2), 104-113. https://doi.org/10.24310/innoeduca.2019.v5i2.5598

Sharma, R. (2003). Barriers in using technology for education in developing countries. *Computers & Education, 41*(1), 49-63. https://doi.org/10.1109/ITRE.2003.1270670

Suskie, L. (2018). *Assessing student learning: A common sense guide*. John Wiley & Sons.

Swaffield, S. (2011). Getting to the heart of authentic assessment for learning. *Assessment in Education: Principles, Policy & Practice*, *18*(4), 433-449. https://doi.org/10.1080/0969594X.2011.582838

Talebian, S., Mohammadi, H. M., & Rezvanfar, A. (2014). Information and communication technology (ICT) in higher education: advantages, disadvantages, conveniences and limitations of applying e-learning to agricultural students in Iran. *Procedia-Social and Behavioral Sciences*, *152*, 300-305. https://doi.org/10.1016/j.sbspro.2014.09.199

Ugodolunwa, C. A. (2008). *Fundamentals of educational measurement and evaluation*. Fab Educational Books.

Umar, M. (2010). *Assessment of teachers' use of instructional media for teaching Islamic Studies in secondary schools in Kano State* [Doctoral Thesis, University of Ilorin].

Villares V.B., & Sánchez, M.J. (2022). Perceptions and use of digital media in arts education: A descriptive study. *Innoeduca. International Journal of Technology and Educational Innovation*, *8*(1), 75-90. https://doi.org/10.24310/innoeduca.2022.v8i1.12069

Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, *34*(3), 302-323. https://doi.org/10.1080/01587919.2013.835779

Yang, Y., Zhang, H., Chai, H., & Xu, W. (2022). Design and application of intelligent teaching space for blended teaching. *Interactive Learning Environments*, 1-18. https://doi.org/10.1080/10494820.2022.2028857

Yuen, A., Law, N., & Wong, K. (2003). ICT implementation and school leadership case studies of ICT integration in teaching and learning. *Journal of Educational Administration, 41*(2), 158-170. https://doi.org/10.1108/09578230310464666

Yushau, B., & Nannim, F. A. (2020). Investigation into the utilization of ICT facilities for teaching purposes among university lecturers: Influence of gender, age, qualification and years of teaching experience. *Pedagogical Research, 5*(2), em0054. https://doi.org/10.29333/pr/7845

Yusuf, M.O. (2005). Information and communication technology and education: Analyzing the Nigerian national policy for information Technology. *International Education Journal, 6*(3), 316-321.

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 97-111 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.14551

Innovación socioeducativa a través del modelo VESS y Socrative: validación de un cuestionario en contexto universitario

Socio-educational innovation using the VESS model and Socrative: validation of a questionnaire in an university context

RECIBIDO 30/03/2022 ACEPTADO 01/05/2022 PUBLICADO 01/06/2023

María Helena Romero Esquinas
Universidad de Córdoba, España
m32roesm@uco.es

Juan Manuel Muñoz González
Universidad de Córdoba, España
juan.manuel@uco.es

María Dolores Hidalgo Ariza
Universidad de Córdoba, España
lola.hidalgo@uco.es

RESUMEN

Saber utilizar con criterio las nuevas tecnologías es el principal reto que tenemos los docentes del siglo XXI para formar estudiantes comprometidos a nivel social. La base fundamental para conseguirlo radica en "enseñar a pensar bien". En este sentido, el modelo VESS – Vida Equilibrada con Sentido y Sabiduría", busca crear en el aula una cultura del pensamiento, basada en el uso de rutinas y lenguaje de pensamiento, que fomenten habilidades de pensamiento para así lograr un desarrollo íntegro entre los estudiantes. Este trabajo de investigación cuantitativa se basa en la validación de un cuestionario que pone en el foco de atención la metodología del modelo VESS, así como la implicación que tiene Socrative como herramienta de evaluación en el desarrollo de sociedades democráticas. A lo largo de este trabajo se muestran dos estudios —un análisis factorial exploratorio y otro confirmatorio—, que nos permiten validar el instrumento creado *ad-hoc*, mostrando como resultados unos índices de bondad de ajuste elevados y una validez y fiabilidad adecuada.

PALABRAS CLAVE Modelo VESS; Socrative; validación; pensamiento crítico.

ABSTRACT

Knowing how to use new technologies judiciously is the main challenge facing teachers in the 21st century in order to educate socially committed students. The fundamental basis for achieving this lies in "teaching how to think well". In this sense, the VESS model - Balanced Life with Sense and Wisdom", seeks to create a culture of thinking in the classroom, based on the use of routines and language of thought, which foster thinking skills in order to achieve an integral development among students. This quantitative research work is based on the validation of a questionnaire that focuses on the methodology of the VESS model, as well as the implication of Socrative as an evaluation tool in the development of democratic societies. Two studies —an exploratory and a confirmatory factor analysis— are shown throughout this work,

which allow us to validate the instrument created *ad-hoc*, showing as results high goodness-of-fit indexes and adequate validity and reliability.

KEYWORDS VESS model; Socrative; validation; critical thinking.

1. PLANTEAMIENTO DEL PROBLEMA

Actualmente vivimos en un mundo digitalizado, en el que, de hecho, las nuevas generaciones —Generación Z—, se denominan "nativos digitales". Sin embargo, hoy en día existe, irónicamente, una escasa alfabetización digital por parte tanto de los docentes como de los discentes, poniendo en entredicho el desarrollo de algunas habilidades relacionadas con el pensamiento.

Por este motivo, en este artículo se pone de manifiesto una metodología innovadora que aboga por el pensamiento divergente, creativo, crítico y visual, que tenga en cuenta desde un punto de vista neuroeducativo todos los aspectos influyentes en el proceso de enseñanza-aprendizaje de un estudiante del siglo XXI. Esas habilidades que alcanzar no solo tienen que ver con el uso de las Tecnologías de la Información y la Comunicación, sino con dotar al discente de habilidades genéricas para la vida. Enseñar al alumnado a saber ser, hacer y estar.

2. FUNDAMENTACIÓN TEÓRICA

2.1. La innovación para la inclusión educativa

Esta apuesta por la innovación metodológica, no se entiende si no va de la mano de la inclusión educativa. Así, atendiendo a la idea de Monge-López y Gómez-Hernández (2022), la innovación educativa, depende, en cierto modo, de la calidad del factor humano y de la manera con que se estimule y aprovechen las habilidades, destrezas y creatividad de los estudiantes.

Se entiende por innovación pedagógica una propuesta creativa, que tiene como propósito mejorar las competencias en materia educativa y desde la escuela, garantizando el acceso y la permanencia de todos los estudiantes en el sistema educativo a través de una enseñanza más proactiva, creativa, colaborativa, que implique el pensamiento para afrontar cualquier situación y, que suponga una transformación a nivel social (Okoye, et al., 2020; Palacios et al., 2021)

Esa garantía de acceso tiene que ver con la inclusión educativa. Para Ainscow et al. (2006), este concepto en el ámbito escolar debía tener tres ingredientes fundamentales:

- Presencia: todos los alumnos/as se desarrollan plenamente en su grupo de referencia y están contemplados desde un punto de vista educativo.
- Participación: todos los estudiantes, aunque no de la misma forma, participan de las actividades de clase de una forma adaptada y respetuosa.
- Progreso de los discentes en el aula: todo el alumnado desarrolla sus potencialidades al máximo.

En este sentido, se observa cómo innovación e inclusión beben la una de la otra. No se puede entender la innovación educativa sin que suponga inclusión y viceversa. Y es que esta inclusión, no solamente aglutina a la educativa, sino también a la social.

Asimismo, la innovación educativa y, en este caso el modelo VESS, cuyas siglas significan Vida Equilibrada con Sentido y Sabiduría, trata de dar una respuesta novedosa y coherente a la educación, que la defina desde los cimientos y traspase a la sociedad, para conseguir de ella, un contexto cada vez más rico, más tolerante y demócrata.

Para ello, aunar diferentes roles y generaciones en el aula, supone un enriquecimiento a nivel curricular y personal muy potente para tal fin. Por este motivo, el modelo VESS y, en concreto el "*Harvard Family Research Project*", ponen sobre la mesa los beneficios que supone la participación familiar en el ámbito escolar elaborando de forma conjunta una serie de objetivos relativos a las áreas de desarrollo de los niños. Esa participación la incluyen las nuevas propuestas pedagógicas como esenciales y es considerada como un aspecto que aporta calidad a la docencia. Además, supone una buena práctica docente y un acto democrático entre familia-escuela, en pro de la educación de los estudiantes. (Azpillaga et al., 2014; Jurado, 2009).

En este sentido, el modelo VESS y Edu1st (2022), que es una organización que promueve la cultura del pensamiento, apunta 5 beneficios de la participación familiar en la escuela. Estos son:

- Respuesta adaptada a las necesidades del alumnado. Apertura total del centro a toda la comunidad educativa para responder a las necesidades de cada alumno/a de forma individualizada y atendiendo a la evolución psicoevolutiva y psicopedagógica del estudiante.
- Inclusión de los últimos descubrimientos sobre mente y cerebro en la formación integral de los estudiantes. Desde el colegio se apuesta por implementar en la vida de los estudiantes hábitos de pensamiento y, se pretende que sean extrapolados en la cotidianidad de sus vidas. Los padres deben desde casa trabajar y guiar a sus hijos para conseguir crear en ellos una cultura del pensamiento en todos los ámbitos vitales.
- Ayudar a los niños a desarrollar su máximo potencial a través del desarrollo socioemocional. Para ello es necesario conocer al niño/a y formular objetivos que permitan el desarrollo integral del alumnado, teniendo en cuenta las fortalezas y habilidades del estudiante, entre padres y colegio. Es muy importante el aspecto emocional, pues será el factor desencadenante en el desarrollo de la capacidad de toma de decisiones en el transcurso de la vida de los estudiantes.
- Cambios poderosos más allá de las aulas de clases, involucrando a las familias tanto de forma virtual como presencial. En Edu1st se diferencian tres momentos de participación o colaboración familiar: fijación de objetivos, conferencia dirigida por los estudiantes e informes de progreso.
- Fortalecimiento de las escuelas y participación en el proyecto educativo para lograr una vida equilibrada en sus hijos en varios aspectos (físico, emocional, autonomía, seguridad, etc.).

En definitiva, lo que se busca es un desarrollo integral y una educación en el alumnado que se mantenga en el tiempo para vivir en el mundo cambiante en que nos situamos, donde intervengan los dos pilares fundamentales en la educación de un niño/a (familia-escuela).

Asimismo, la Educación para el Desarrollo Sostenible (EDS) juega un papel fundamental para impulsar acciones formativas para desarrollar competencias, actitudes y aptitudes suficientes que les permita encontrar soluciones a los desafíos del mañana, reconociendo y valorando de forma crítica las diferentes realidades del mundo (desigualdad, pobreza, contaminación, etc.). Esta Educación para el Desarrollo forma parte del objetivo 4 para el Desarrollo Sostenible, propuesto en la Agenda 2030 (Organización de las Naciones Unidas, 2015).

2.2. El modelo VESS

Esta agenda tiene, entre otros objetivos, alcanzar el mayor reto educativo relacionado con formar a seres humanos que sean "humanos". Hoy en día estamos rodeados de máquinas, tecnologías capaces de sustituir en numerosas ocasiones a las personas. No obstante, hay un aspecto fundamental que nos diferencian de las máquinas: las habilidades blandas. Desarrollar estas habilidades en los primeros años de vida es muy importante, pues no debemos quitar el foco de atención en que las personas somos seres sociales por naturaleza y, a lo largo de nuestra vida, vamos a conocer y tratar con muchas personas. Tan importante es comunicarnos, como empatizar, sentir, lograr habilidades socioemocionales (Zumba-Hidalgo et al., 2021).

Al hilo de esto, el modelo VESS se muestra muy comprometido con el aprendizaje integral de los alumnos, pues apuesta por un aprendizaje adaptado a la época tecnológica en la que vivimos, sin dejar de lado esas aptitudes que nos hacen ser en esencia, humanos.

Por ello, el modelo tiene como objetivo la implantación de la cultura del pensamiento en el aula, haciendo uso de lo que sabe al respecto la neurociencia en materia educativa: sin emoción, no es posible desarrollar las funciones ejecutivas que, a su vez, potencian la cognición (Mora, 2017).

Este modelo supone una innovación a nivel educativo que traspasa al panorama social a través de diferentes metodologías basadas en el uso del pensamiento visible, el pensamiento crítico y creativo.

En definitiva, el modelo trata de implementar la cultura del pensamiento en el aula, de tal forma que este siempre sea consciente y útil en el día a día de cualquier persona (Perkins, 2008). No obstante, este pensar no puede llevarse a cabo de cualquier forma, sino que debe ser visible, preferiblemente compartido y que potencie una serie de movimientos mentales: razonar con evidencias, construir explicaciones e interpretaciones, observar de cerca y describir lo que hay, preguntar y hacer preguntas, capturar el núcleo y crear conclusiones, hacer conexiones, considerar diferentes puntos de vista, descubrir la complejidad (Ritchhart, & Perkins, 2008).

De esta forma, el pensamiento crítico y creativo están servidos. En primer lugar, el pensamiento visible facilita el crítico porque mejora la comprensión y la organización de ideas, —además se puede hacer uso de las rutinas del pensamiento para ello— (Ritchhart et al., 2014). En segundo lugar, el pensamiento visual permite el pensamiento creativo porque la construcción del aprendizaje puede ser entendido y expresado a través del lenguaje del pensamiento —de forma verbal o artística— (Tishman, & Perkins, 1997).

2.3. Socrative y la metacognición

En este afán por innovar metodológicamente, entran en juego las nuevas tecnologías y la evaluación. Este nuevo estilo evaluativo puede ir de la mano de diferentes aplicaciones dedicadas a tal fin, que hacen uso de la imagen y el aprendizaje cooperativo para mejorar su función. Una función, cuya prioridad es la de

personalizar y adaptar el proceso de enseñanza-aprendizaje a través de un enfoque globalizador que fomenta la construcción de este. En definitiva, el objetivo que persiguen estas herramientas TIC de evaluación es mejorar la metacognición y el pensamiento crítico (Santos, & Bastos, 2021).

Entendemos por metacognición —cuya etimología proviene del latín *meta* y *cognoscere*—, la capacidad reflexiva de los conocimientos adquiridos por uno mismo a través de la cognición teniendo en consideración la "sensibilidad individual" o la emoción para lograr organizar y estructurar el pensamiento (Roque Herrera et al., 2018).

Esta definición nos sugiere la necesidad de establecer una serie de estrategias metacognitivas para regular la actuación educativa. En este sentido, García (2011) sostiene que existen tres pasos o procesos fundamentales para regular la metacognición:

- La planificación efectiva y eficaz.
- La adecuación de las metas a través de la motivación.
- La evaluación relativa a la adquisición de habilidades o competencias.

El primer y el segundo requisito, se puede desarrollar a través del modelo VESS y todas las herramientas que subyacen de él. Para planificar y organizar las ideas, así como adecuar o adaptar las distintas actividades, podemos hacerlo a través de las rutinas del pensamiento, los hábitos de mente o el lenguaje del pensamiento.

Para el último requisito, existen multitud de herramientas TIC evaluativas que permiten medir la adquisición de conocimiento en el alumnado de forma individualizada y también grupal, haciendo uso del juego, la imagen y, fomentando así la motivación y la inclusión.

Socrative es una herramienta que permite conocer *in situ* el resultado de la adquisición de conocimientos. Además, numerosos estudios sitúan esta herramienta como una de las aplicaciones que conlleva más motivación entre el alumnado, que fomenta el aprendizaje activo, participativo y la interacción en el aula, que permite la evaluación del alumnado y la autoevaluación del docente y que mejora el rendimiento de los estudiantes (Ferreira, 2020; Pettit et al., 2015; Seco, & Cardoso, 2015).

A lo largo de este artículo se muestra la validación de un instrumento junto con los resultados obtenidos de los análisis realizados. El instrumento busca conocer la percepción de los estudiantes del Grado de Educación Infantil, Primaria y Máster de Educación Inclusiva de la Universidad de Córdoba acerca de la influencia del modelo VESS y Socrative a nivel educativo y social.

3. DISEÑO Y METODOLOGÍA

3.1. Objetivos

La presente investigación tiene como objetivo principal validar la estructura factorial del denominado *Cuestionario sobre las expectativas de uso del modelo VESS en su futura labor docente y su aplicabilidad en la sociedad* para, posteriormente conocer la percepción del alumnado de los Grados de Educación Infantil, Primaria y Máster de Educación Inclusiva al respecto.

Así la hipótesis principal planteada para este estudio es:

– El instrumento formado por las dimensiones "Aportación del modelo VESS en los procesos de enseñanza-aprendizaje" y "El modelo VESS como estrategia de interacción social" presentan una estructura y consistencia interna adecuadas.

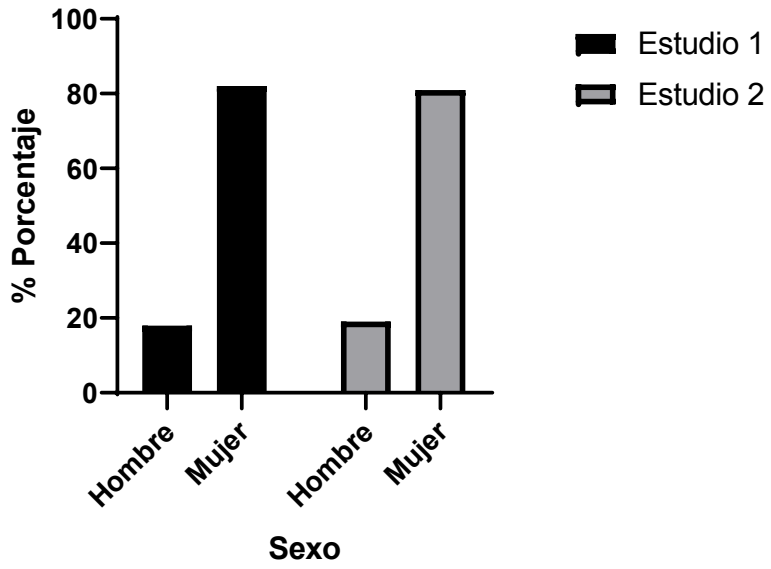
3.2. Participantes

La muestra total del estudio se compone de 231 participantes, seleccionados a través de un muestreo no probabilístico por conveniencia ya que estuvo limitada al alumnado de la Facultad de Ciencias de la Educación de la Universidad de Córdoba donde el director de este estudio impartía docencia en el curso académico 2018-2019.

Las características de la muestra se exponen a continuación, teniendo en cuenta las variables independientes que tomamos en consideración: sexo, edad, estudios que cursan los estudiantes y, el tipo de colegio donde estudiaron, tanto para el análisis factorial exploratorio (Estudio 1) como confirmatorio (estudio 2) –N= 128 Vs N=231-. Los porcentajes están calculados respecto al total de cada estudio.

En la figura 1, se muestra que el primer análisis (AFE), estuvo conformado por 23 hombres (17.97 %), y 105 mujeres (82.03 %). Sin embargo, el segundo análisis (AFC), se compuso de 44 hombres (19.05 %) y 187 mujeres (80.95 %).

FIGURA 1. Representación variable sexo en estudio 1 y 2



En la figura 2, se observa cómo en el estudio 1, existe un 32.81 % (n=42) que tienen entre 17-19 años. En ese rango de edad, además, un 5.47 % son hombres y un 27.34 % son mujeres. Las personas de entre 20-22 constituyen un 39.06 % (n=50) de los cuales un 8.6 % son hombres y un 30.47 % mujeres. Entre 23-25 años se contemplan un 17.19 % (n=22) de estudiantes, de los que 1.56 % corresponde al sexo masculino y, un

15.63 % al femenino. Las personas mayores de 26 años fueron 10.94 % (n=14), con un 2.34 % y 8.6 %, hombres y mujeres, respectivamente.

En el estudio 2, las personas entre 17-19 son un 32.9 % (n=76), siendo un 7.36 % hombres y un 25.54 % mujeres. En el rango de edad correspondiente a 20-22 años un 6.93 % son hombres y un 30.3 %, mujeres. Entre las personas de 23-25 años se encuentran 2.16 % hombres y 17.32 % mujeres. Por último, las personas mayores de 26 años ocupan un 10.39 % (n=24), de los que 2.6 % son hombres y 7.8 %, mujeres.

La figura 3 hace referencia a las características de los participantes en cuanto a la titulación que cursan. Asimismo, en el primer estudio existen 73 personas (57.03 %) que cursan el Grado de Educación Infantil, de los cuales 2.34 % son hombres y 54.69 % mujeres. No obstante, en el estudio dos el 3.02 % son hombres y el 52.82 % son mujeres respecto al 54.98 % (n=127) del total.

Los estudiantes del Grado de Educación Primaria en el estudio 1 corresponden al 39.84 % (n=51) –15.62 % hombres y 24.22 % mujeres-. En el estudio 2 hay un 39.39 % (n= 91) de estudiantes de este grado, de los que un 15.58 % y un 23.81 % son hombres y mujeres, respectivamente.

Por último, los alumnos que cursan el Máster de Educación Inclusiva son notablemente menos. En el primer estudio la totalidad de la muestra corresponde a mujeres (3.13 %). En el segundo estudio que está conformado por un total de 5.63 % (n=13), 1.3 % son hombres y 4.34 % mujeres.

Según el tipo de escuela donde estudiaron los participantes en el estudio 1 y 2 (figura 4), se observa que el 78.91 % (n=101), y 73.59 % (n=170), estudiaron en un centro público, respectivamente. Al colegio concertado fueron el 21.09 % (n=27) y el 25.11 % (n=58), respectivamente. Además, respecto a los centros privados, en la muestra relativa al estudio 1, no hay ninguna representación, pero sí hay un 1.3 % (n=3) de personas que estudiaron en un colegio privado en el segundo estudio.

FIGURA 2. Representación variables edad y sexo en estudio 1 y 2

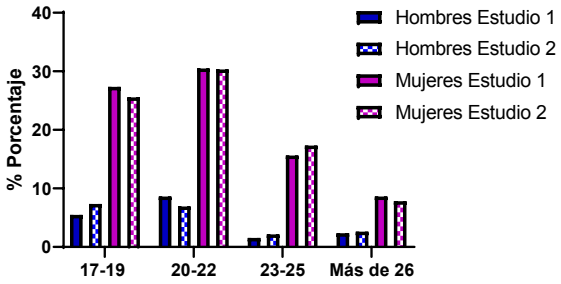


FIGURA 3. Representación de la variable "estudios que cursan los estudiantes" en estudio 1 y 2

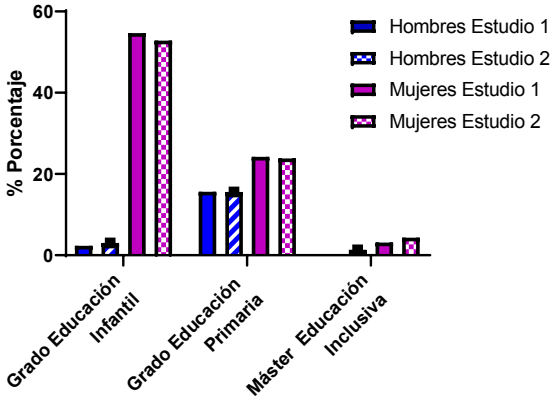
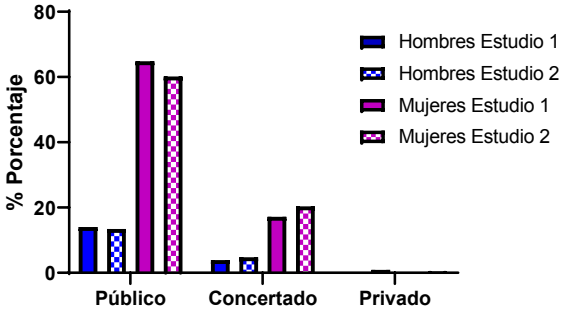


FIGURA 4. Representación variable "tipo de escuela" en estudio 1 y 2



3.3. Instrumento

El cuestionario estuvo compuesto por doce ítems distribuidos en dos dimensiones, que hacían referencia a los siguiente:

- Aportación del modelo VESS en los procesos de enseñanza-aprendizaje: conformada por siete ítems que hacen alusión al modelo VESS como método que permite la libertad personal y social, que fomenta los procesos mentales y establece relaciones con el contexto a través del pensamiento visible.
- El modelo VESS como estrategia de interacción social: sus ítems tienen que ver con la resolución de conflictos, la diversidad social, la autonomía, la intuición y las TIC.

En la tabla 1 se especifican los distintos ítems correspondientes a las dimensiones anteriormente expuestas.

TABLA 1. Factores del cuestionario con sus correspondientes ítems

Dimensión	Ítems	M (μ)	DT (σ)
Factor 1. Aportación del modelo VESS en los procesos de enseñanza-aprendizaje.	**1.** El modelo VESS responde a las necesidades que la sociedad demanda actualmente.	4.06	.769
	2. El modelo VESS permite el desarrollo personal de todos los niños/as.	4.32	.675
	4. El modelo VESS fomenta el aprendizaje significativo a través del entorno próximo.	4.45	.702
	5. El modelo VESS fomenta procesos mentales en el alumnado.	4.31	.695
	6. El pensamiento visible da sentido al aprendizaje.	4.49	.618
	7. El modelo VESS establece numerosas relaciones con el contexto del alumnado.	4.36	.670
Factor 2. El modelo VESS como estrategia de interacción social	**8.** El modelo VESS funciona como estrategia en la resolución de conflictos.	4.16	.794
	9. Tener una composición diversa en los miembros del grupo (edad, sexo, formación, experiencias, etc.) enriquece la actividad a realizar.	4.44	.731
	10. El trabajo cooperativo me ayuda a aprender de forma autónoma.	3.94	.974
	11. El uso de Socrative es intuitivo.	3.61	.997
	12. Socrative permite atender a la diversidad.	3.67	.968

3.4. Procedimiento

Para fabricar el instrumento y proceder a la recogida de datos, previamente se dedicó una parte del tiempo al aprendizaje del modelo. En los diferentes grupos de clases, referentes al Grado de Educación Infantil, Grado de Educación Primaria y Máster de Educación Inclusiva, se expuso los pilares básicos en los que se apoya el modelo, así como la demostración de cómo utilizar junto con el modelo un instrumento de

evaluación digital para mejorar la metacognición entre el alumnado. Tras esto, se le pasó a cada estudiante el cuestionario que, debieron cumplimentar de forma libre y anónima, valorando así la percepción que tenían del modelo VESS y su repercusión a nivel socioeducativo.

Una vez recogida la información derivada de las distintas respuestas obtenidas en los distintos ítems, se analizó el contenido de estos. Asimismo, no hubo que normalizar la muestra, pues se comprobó que era normal al presentar valores adecuados en la prueba de Kolmogorov-Smirnov (p>0.5) (Byrne, 2012; Stephens, & Spiegel , 2002).

Además, para conocer el constructo del instrumento se hizo a través del Análisis Factorial Exploratorio (AFE) (Ferrando, & Lorenzo-Seva, 2014), con el método de "Implementación Óptima del Análisis Paralelo" (Timmerman, &Lorenzo-Seva, 2011), junto con un proceso de extracción de factores comunes "Máxima Verosimilitud Robusto" (RML), teniendo en cuenta un criterio de rotación "Promaj". Después, se analizó la consistencia interna del instrumento haciendo uso del paquete estadístico SPSS 25 y el programa Factor Analysis (10.8.04).

Para confirmar la estructura obtenida en el AFE, se procedió a realizar el Análisis Factorial Confirmatorio (AFC). Con el objetivo de valorar el ajuste del modelo y, una vez comprobado que la muestra en esta ocasión seguía siendo normal (K-S, p> 0.5), con el programa AMOS 25, se realizaron diferentes estudios: prueba χ2/ grados de libertad, el índice de bondad de ajuste comparativo (CFI), el índice de ajuste incremental (IFI), el índice de ajuste normado (NFI), el índice de Tuker-Lewis (TLI), la raíz del residuo cuadrático promedio (RMR), la raíz del residuo cuadrático promedio de aproximación (RMSEA), menor a .08 y el índice de validación cruzada esperada (ECVI), siguiendo los criterios de (Hu, & Bentler, 1999).

4. RESULTADOS

Estudio 1: Análisis Factorial Exploratorio

TABLA 2. Matriz de factores rotados (AFE)

Variable	F1	F2
V 1	.509	
V 2	.382	
V 3	.444	
V 4		.790
V 5	.481	
V 6		.810
V 7		.798
V 8		.688.
V 9		.551
V 10	.984	
V 11	.354	
V12	.520	

Para este estudio se empleó la mitad de la muestra. Con el fin de conocer la conformación del instrumento, se llevó a cabo un Análisis Factorial Exploratorio (AFE), obteniendo un índice de Kaiser-Meyer-Olkin (KMO) de 0.94; test de esfericidad de Barllett con p=0.000; y análisis de residuales con RMSR= .0379, siendo adecuados para el modelo (Hefetz, & Liberman, 2017).

Los resultados obtenidos mostraron que la varianza total explicada es del 60.73 %. Las comunalidades, por su parte, se situaron entre el .354 en el ítem 11 y .984 en el ítem 10, superando todas el .3 (Martínez, & Sepúlveda,2012), (Ver tabla 2).

Estudio 2. Análisis Factorial Confirmatorio

Para confirmar la estructura obtenida en el AFE, se procedió a realizar un análisis confirmatorio (AFC). Los resultados obtenidos arrojaron que todos los ítems presentaban cargas factoriales estandarizadas con valores superiores a .4, lo que permitió mantener todas las variables integradas en el cuestionario (Figura 5) (Martínez, & Sepúlveda, 2012).

Valorando el ajuste se identificaron los distintos índices mencionados anteriormente, obteniendo los resultados que se muestran a continuación: X2=59.2; df=46; p=.091; X2/df=1.29; CFI=.985; IFI=.985; NFI=.938; TLI=.979; RMSEA=.035; ECVI=.640.

Además, se procedió a realizar el análisis de la consistencia interna del instrumento considerando tanto el cuestionario en su totalidad, como por dimensiones. En este sentido, se evidenció una fiabilidad moderada del instrumento, así como alta y baja en cada una de las dimensiones, respectivamente. (Ver tabla 3).

FIGURA 5. Modelo de 2 factores (AFC)

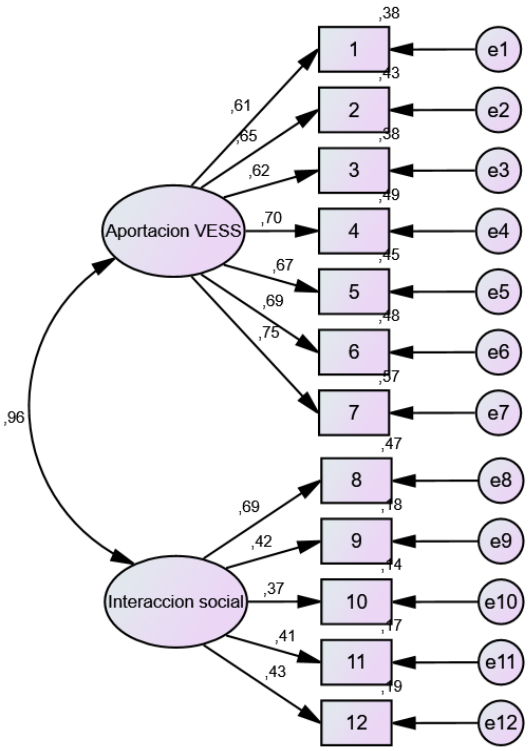


TABLA 3. Consistencia interna del instrumento entre dimensiones

Dimensión	Fiabilidad
Factor 1: Aportación del modelo VESS en los procesos de enseñanza-aprendizaje	α = .862 (*n*=7)
Factor 2: El modelo VESS como estrategia de interacción social	α = .632 (*n*=5)
Total	**α = .763 (n=12)**

También, se llevó a cabo un estudio correlacional de las dos dimensiones del instrumento, utilizando la prueba de correlación de Pearson y, obteniéndose los resultados que aparecen en la tabla 4.

TABLA 4. Correlaciones bivariadas entre dimensiones

		DIMENSION1	DIMENSION2
DIMENSION1	Correlación de Pearson	1	.621**
	Sig. (bilateral)		.000
	N	231	231
DIMENSION2	Correlación de Pearson	.621**	1
	Sig. (bilateral)	.000	
	N	231	231

**. La correlación es significativa en el nivel 0,01 (bilateral).

Con el propósito de comprobar las relaciones entre los distintos factores del instrumento. Los datos resultantes de la prueba de correlación de Pearson, mostraron una relación moderada entre la dimensión 1 y 2, referidas a la aportación que hace el modelo VESS en el proceso de E-A y, al modelo VESS como estrategia de interacción social, respectivamente (Pérez et al., 2009).

Por último, se llevó a cabo un análisis de regresiones lineales múltiples (Peláez, 2016), utilizando el método "por pasos", para conocer si existe una variable predictora y la relación que esta establece con la variable criterio.

TABLA 5. Coeficiente de la recta de regresión para la variable dependiente "El modelo VESS como estrategia de interacción social"

Coeficientes[a]							
	Coeficientes no estandarizados		Coeficientes estandarizados			Estadísticas de colinealidad	
Modelo	B	Error estándar	Beta	t	Sig.	Tolerancia	VIF
(Constante)	.973	.251		3.869	.000		
DIMENSION1	.692	.058	.621	11.984	.000	1.000	1.000

a. Variable dependiente: DIMENSION2

En la tabla 5 se muestra cómo la primera dimensión relativa a "Aportación del modelo VESS en los procesos de enseñanza-aprendizaje", constituye un factor predictor de la segunda dimensión "El modelo VESS como estrategia de interacción social" - β= .621, t (.621) = 11.984, p<.01-. Asimismo, la recta de regresión es estadísticamente significativa. En este sentido, el valor de R2 ajustado fue de .385, concluyendo que en un 38.5 %, la interacción social está explicada por la aportación que hace el modelo VESS a los procesos de enseñanza-aprendizaje.

5. DISCUSIÓN Y CONCLUSIONES

La validación de este instrumento ha puesto sobre la mesa la necesidad de innovar desde la transformación educativa, para conseguir un cambio social real desde la inclusión.

A lo largo de este artículo se pone en valor la importancia de usar el modelo VESS en el proceso de enseñanza-aprendizaje, por numerosos motivos: el principal de ellos es porque responde a las necesidades que se demandan en pleno siglo XXI, pues apuesta por el fomento del pensamiento en todas sus vertientes para la formación de estudiantes íntegros y comprometidos consigo mismo y con el entorno. Asimismo, este estudio muestra que el modelo VESS en el proceso de E-A tiene una gran repercusión tanto en la vida escolar, como en la social.

Este modelo se incluye dentro de las metodologías activas y participativas por hacer de los estudiantes personas autónomas que aprenden de la interacción social y la experiencia. Gracias a eso, y a la multitud de herramientas que proporciona para la adquisición de competencias para el pensamiento y la capacidad de resolver cualquier problema de la vida —social, laboral—, este modelo y los docentes innovadores que utilizan este tipo de metodologías pretenden transformar la sociedad, jugando así, en pro del mantenimiento democrático y, con ello, la justicia (Chand et al., 2021; Johnson, & Jonhson, 1999).

Y es que, este tipo de metodologías son muy necesarias en el mundo actual. Un mundo en que la emoción parece relegada a un segundo plano y la única razón que prima es la tecnológica. Razón condicionada por un consumo excesivo de información, que nos lleva a desembocar en una vida líquida, en que las bases éticas y la moral ya no conforman el sustento fundamental del individuo, repercutiendo de forma directa en la sociedad creada y en la propia democracia. (Han, 2014; Nussbaum, 2010).

En este sentido, se torna fundamental la libertad del pensamiento, haciendo hincapié desde las escuelas en la necesidad del fomento del pensamiento crítico y creativo. Ruíz et al. (2013) lo plasman así, posicionando a la creatividad, la imaginación y las artes, como un derecho fundamental que los estudiantes deben adquirir para ser libres.

Esta libertad actualmente está muy condicionada con las nuevas tecnologías (TIC). Estamos en un mundo globalizado donde la información está al alcance de todos. Por ello, lo que desde las escuelas tenemos que fomentar es un perfil de alumnado capaz de seleccionar toda la información que le llega siendo capaces de sacar sus propias conclusiones, porque "la libertad de la imaginación ilimitada no puede ser privilegio exclusivo de los artistas profesionales, sino que debe formar parte de todas las actividades docentes que se adentran en territorios desconocidos" (Martínez-Usarralde, & Álvarez Domínguez, 2021, p. 98).

Para ello, es fundamental implementar en el aula la cultura del pensar y, sobre todo, del pensar bien. Así, el modelo VESS se apoya en diferentes herramientas: rutinas del pensamiento, hábitos de mente, lenguaje del pensamiento, etcétera. Todo ello, respaldado en el pensamiento visible (Perkins, & Tishman, 2011; Ritchhart et al., 2014; Ryan, 2014).

Asimismo, en este estudio se corrobora la importancia de las Tecnologías de la Información y la Comunicación, como una herramienta muy útil para fomentar ese pensamiento y esa libertad individual en el aula desde lo colectivo. Socrative en este caso, supone una herramienta que permite la evaluación y autoevaluación de los contenidos del aula. Además, cuenta con la ayuda de imágenes que motivan, acercan, adaptan y facilitan el aprendizaje entre los estudiantes y, así lo perciben los estudiantes de la Universidad de Córdoba.

Y es que utilizar adecuadamente la imagen produce en el estudiantado mayor nivel de retención, con respecto a aquellos contenidos que solamente han sido verbalizados e, incluso, estimula la producción oral (Wiater, 2016). Haciendo alusión a Umberto Eco (1968), la imagen se ha convertido, y con la llegada de las nuevas tecnologías aún más, en un medio que debemos aprovechar para conducir la educación de una sociedad. Todo eso, no hace más que apoyar las evidencias neurocognitivas del aprendizaje que ya existen (Perry et al., 2018).

En este sentido, Usán-Supervía y Murillo-Lorente (2021), sostienen que las tecnologías emergentes suponen un impacto en la enseñanza y en la "investigación creativa" en materia educativa, siendo necesaria, por un lado, la creación de nuevas competencias profesionales y, por otro lado, que la innovación docente apueste por metodologías activas como el modelo VESS, basado en el pensamiento y el aprendizaje colaborativo, visual, crítico y creativo.

En este punto, cabe asumir que el panorama social y pedagógico ha cambiado sustancialmente y, eso hace que el currículum también lo haya hecho, no solo en las herramientas pedagógicas que se utilizan,

sino en la prioridad competencial y de habilidades que hay hoy en día en la sociedad y en las escuelas con respecto a años anteriores (Bautista-Vallejo, y Hernández-Carrera, 2020). Los futuros docentes, a la vista de los datos, también son conscientes de ello, y así se plasma en este estudio.

Así, tal y como dice Meirieu (2022), debemos como docentes, evitar caer en la "antipedagogía" y procurar ser "hiperpedagogos", es decir, personas que buscan espacios escolares de tranquilidad, dinámicos, "de resistencia", elaborando materiales y situaciones que jueguen en pro de la atención y la motivación del discente, donde el alumno construya su identidad y haga uso de su libertad, sin entorpecer la construcción del bien común.

Todo esto, no hace más que poner en relevancia la necesidad de formar a personas autónomas capaces de desenvolverse y tomar decisiones con sentido en la sociedad. Para ello, es necesario el desarrollo de diferentes procesos cognitivos (Ortega-Ruipérez, 2020).

No obstante, esa toma de decisiones no siempre se establece de forma unilateral, pues somos seres sociales y vivimos en una red social llamada mundo, donde los unos dependemos de los otros. De ahí la importancia de trabajar desde edades tempranas la cooperación y colaboración para ser capaces de solucionar cualquier conflicto que surja a nivel escolar y social desde una óptica asertiva.

Así, a través del modelo VESS, se trabaja en el alumnado multitud de factores basados en la neurociencia y, en concreto en la neuroeducación, que hoy en día son fundamentales para llevar una praxis educativa adecuada. Por un lado, se encuentra el desarrollo cognitivo y metacognitivo del estudiante desde un punto de vista inclusivo y atendiendo a la diversidad (Menéndez, & Gámez, 2019), a través de herramientas que guían y fomentan el pensamiento. Por otro lado, el uso de las nuevas tecnologías para la evaluación, autoevaluación y construcción del conocimiento de forma individual o grupal, promoviendo habilidades sociales y emocionales que a largo plazo transforman a la sociedad.

6. REFERENCIAS

Ainscow, M., Booth, T., & Dyson, A. (2006). Inclusion and the standards agenda: negotiating policy pressures in England. *International journal of inclusive education, 10*(4-5), 295-308. https://doi.org/10.1080/13603110500430633

Azpillaga, V., Nahia, I., & Joaristi, L. (2014). Implicación de las familias en los centros escolares de alta eficacia en la Comunidad Autónoma Vasca. *Bordón*, *66*(3), 27-33. https://doi.org/10.13042/bordon.2014.66302

Bautista-Vallejo, J. M., & Hernández-Carrera, R. M. (2020). Aprendizaje basado en el modelo STEM y la clave de la metacognición. *Innoeduca. International Journal of Technology and Educational Innovation*, *6*(1), 14-25. https://doi.org/10.24310/innoeduca.2020.v6i1.6719

Byrne, B.M. (2012). *Structural Equation Modeling with Mplus: Basic Concepts, Applications, and Programming.* Taylor y Francis Goup.

Chand, V.S., Kuril, S., Deshmukh, K.S., & Avadhanam, R.M. (2021). Assessing teacher innovations: Expert versus peer ratings. *International Journal of Educational Management, 35*(2), 467-482. https://doi.org/10.1108/IJEM-04-2020-0185

Dewey, J. (1916). *Democracia y educación*. Morata.

Eco, U. (1968). *Apocalípticos e integrados ante la cultura de masa.* Lumen.

Edu1st (14 de marzo de 2022). *5 beneficios de la alianza entre padres y escuelas, según el modelo educativo VESS.* VESS. https://edu1stvess.com/es/beneficios-de-la-alianza-entre-padres-y-escuelas/

Ferrando, P. J., & Lorenzo-Seva, U. (2014). El análisis factorial exploratorio de los ítems: Algunas consideraciones adicionales. *Anales de Psicología*, *30*(3), 1170–1175. https://doi.org/10.6018/analesps.30.3.199991

Ferreira, C. (2020). Socrative como herramienta tecnológica de aprendizaje y evaluación. En E. Colomo-Magaña, E. Sánchez-Rivas, J. Ruiz-Palmero, & J. Sánchez-Rodríguez (coord.), *La tecnología como eje del cambio metodológico* (pp. 1708-1711). *UMA Editorial.*

García, R. (2011) *Evaluación de las estrategias metacognitivas en el aprendizaje de contenidos musicales y su relación con el rendimiento académico musical*. [Tesis Doctoral, Universitat de València, España]. Roderic. http://hdl.handle.net/10803/62136

Han, B.-Ch. (2014). *En el enjambre.* Herder

Hefetz, A., & Liberman, G. (2017). The factor analysis procedure for exploration: a short guide with examples. *Culture and Education*, *29*(3), 526-562. https://doi.org/10.1080/11356405.2017.1365425

Henriquez-Peñailillo, J. A. (2021). Digital Hospitality: a Concept for the Education of the 21st Century. *EDU REVIEW. International Education and Learning Review*, *9*(1), 55–65. https://doi.org/10.37467/gka-revedu.v9.2839

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Johnson, D.W., & Johnson, R.T. (1999). *Aprender juntos y solos. Aprendizaje cooperativo, competitivo e individualista*. Aique

Jurado, C. (2009). La familia y su participación en la comunidad educativa. *Revista Digital de Innovación y Experiencias Educativas*, (23), 1-10.

Martínez Usarralde, M. J., & Álvarez Dominguez, P. (2021). Lections through Lecture Performance. Making forgotten conflicts visible through International and Comparative Education. *Revista Española De Educación Comparada*, (40), 91–111. https://doi.org/10.5944/reec.40.2022.31171

Martínez, C. M., & Sepúlveda, M.A.R. (2012). Introducción al análisis factorial exploratorio. *Revista Colombiana de Psiquiatría*, *41* (1), 197–207. https://doi.org/10.1016/s0034-7450(14)60077-9

Meirieu, Ph. (2022). El futuro de la Pedagogía. *Teoría de la Educación. Revista Interuniversitaria, 34*(1), 69-81. https://doi.org/10.14201/teri.27128

Menéndez, I. Y. C., & Gámez, M. R. (2019). Neuroeducación una tendencia pedagógica en el aprendizaje para la vida. *CIENCIAMATRIA*, *6*(10), 547-559. https://doi.org/10.35381/cm.v5i9.231

Monge-López, C., & Gómez-Hernández, P. (2022). Factores de personalidad e innovación docente en España: aproximación desde distintos enfoques. *Reista complutense de educación, 33*(1), 153-165. https://doi.org/10.5209/rced.73875

Mora, F. (2017). *Solo se puede aprender aquello que se ama*. Alianza Editorial.

Nussbaum, M. C. (2010). *Sin fines de lucro. Por qué la democracia necesita de las humanidades.* Katz editores.

Okoye, K., Arrona-Palacios, A., Camacho-Zuñiga, C., Hammout, N., Nakamura, E. L., Escamilla, J., & Hosseini, S. (2020). Impact of students evaluation of teaching: a text analysis of the teachers qualities by gender. *International Journal of Educational Technology in Higher Education, 17*(1), 1-27. https://doi.org/10.1186/s41239-020-00224-z

Organización de Naciones Unidas (2015). *La Agenda para el Desarrollo Sostenible*. https://bit.ly/3gHSzwr

Ortega-Ruipérez, B. (2020). Pedagogía del Pensamiento Computacional desde la Psicología: un Pensamiento para Resolver Problemas. Cuestiones Pedagógicas*. Revista De Ciencias De La Educación*, *2*(29), 130–144. https://doi.org/10.12795/CP.2020.i29.v2.10

Palacios Núñez, M., Toribio López, A., & Deroncele Acosta, A. (2021). Innovación educativa en el desarrollo de aprendizajes relevantes: una revisión sistemática de literatura. *Revista Universidad y Sociedad*, *13*(5), 134-145.

Peláez, I. M. (2016). Modelos de regresión: lineal simple y regresión logística. *Revista Seden*, *14*, 195-214.

Pérez, R., García, J. L., Gil, J. A., & Galán, A. (2009). *Estadística aplicada a la educación*. UNED-Pearson.

Perkins D. N. (2008). *La escuela inteligente. Del adiestramiento de la memoria a la educación de la mente*. Gedisa.

Perkins, D., & Tishman, S. (2011). El lenguaje del pensamiento. Educadores. *Revista de renovación pedagógica*, (236), 46-58.

Perry, J., Lundie, D., & Golder, G. (2018). Metacognition in schools: what does the literature suggest about the effectiveness of teaching metacognition in schools? *Educational Review 71*(2), 1-18. https://doi.org/10.1080/00131911.2018.1441127

Pettit, R. K., McCoy, L., Kinney, M., & Schwartz, F. N. (2015). Student perceptions of gamified audience response system interactions in large group lectures and via lecture capture technology. *BMC medical education*, *15*(1), 1-15. https://doi.org/10.1186/s12909-015-0373-7

Ritchhart R., Church M., & Morrison K. (2014). *Hacer visible el pensamiento. Cómo promover el compromiso, la comprensión y la autonomía de los estudiantes*. Paidós.

Ritchhart R., & Perkins D. N. (2008) Making thinking visible. *Educational Leadership*, *65*(5), 57-61.

Roque Herrera, Y., Valdivia Moral, P. Á., Alonso García, S., & Zagalaz Sánchez, M. L. (2018). Metacognición y aprendizaje autónomo en la Educación Superior. *Educación Médica Superior, 32*(4), 293-302.

Ruiz, R. G., Romero, Y. S., & de Cos Ahumada, C. (2013). La educación mediática en la formación profesional: Propuesta de inclusión. *Edmetic*, *2*(2), 37-55. https://doi.org/10.21071/edmetic.v2i2.2869

Ryan, T. (2014). *Thinkers keys: A powerful program for teaching children to become extraordinary thinkers*. eBook Publisher.

Santos, V., & Bastos, N.R.O. (2021). Critical Thinking on Mathematics in Higher Education: Two Experiences. En A. Reis, J. Barroso, J.B. Lopes, T. Mikropoulos, & C.W. Fan (eds) *Technology and Innovation in Learning, Teaching and Education. TECH-EDU 2020. Communications in Computer and Information Science* (pp. 156-167). Springer.

Seco, C., & Cardoso, T. (2015). Cuestionarios sistemáticos y smartphone: ¿herramientas de evaluación pedagógica? *Revista de estudios e investigación en Psicología y Educación*, *13*, 158-162. https://doi.org/10.17979/reipe.2015.0.13.489

Stephens, L. J., & Spiegel M. R. (2002). *Estadística.* McGraw-Hill.

Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychological Methods, 16*(2), 209-220. https://doi.org/10.1037/a0023353

Tishman, S., & Perkins, D. (1997). The language of thinking. *Phi Delta Kappan*, *78*(5), 368-374.

Usán-Supervía, P., & Murillo-Lorente, V. (2021). Aprendizaje constructivista y desarrollo de estrategias didácticas en el alumnado a través de Socrative. En O. Buzón-García, C. Romero-García, & A. Verdú-Vázquez (Eds.), *Innovaciones Metodológicas Con TIC En Educación* (pp. 2980-2990). Dykinson.

Wiater, A. (2016). ¿La enseñanza del arte o el arte nos enseña? El uso de la imagen en el aula de LE. *Decires*, *16*(20), 7-20. https://doi.org/10.22201/cepe.14059134e.2016.16.20.285

Zumba-Hidalgo, S.N., Quinde-Tenemea, J. L., Lata-Tigre, S. C., & Espinoza-Alvarez, C.A. (2021). La importancia del fomento de las habilidades blandas en la educación. *Revista Illari,* (9), 28-32.

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 112-125 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15403

Interactive and Social Reading Intervention in Design-based Research

Intervención de lectura interactiva y social en la investigación basada en el diseño

RECIBIDO 23/09/2022 ACEPTADO 14/11/2022 PUBLICADO 01/06/2023

Seda Özer Şanal
Fırat University, Turkey
sedaozer@firat.edu.tr

ABSTRACT

This study, carried out within the design-based research framework, aimed to create a digital environment for students with learning problems to read better. The social constructivist approach was used in this study, which generally focuses on the assumption that reading is an active, interactive, dynamic, and social language skill. The instructional content, built on a learning management system, was developed in line with this strategy. Focus on the problem, understand the problem, define the design goals, outline the solution, create the solution, and test the solution stages. This results in effective and efficient digital teaching material that students with learning problems can use in their reading processes. The study clearly showed the development process of digital material, as well as a deep theoretical discussion.

KEYWORDS Reading research; technology integration; constructivism; learning.

RESUMEN

Este estudio, llevado a cabo dentro del marco de investigación basado en el diseño, tuvo como objetivo crear un entorno digital para que los estudiantes con dificultades de aprendizaje lean mejor. En este estudio se utilizó el enfoque constructivista social, que generalmente se centra en la suposición de que la lectura es una habilidad lingüística activa, interactiva, dinámica y social. El contenido instructivo, basado en un sistema de gestión del aprendizaje, se desarrolló de acuerdo con esta estrategia. Concéntrese en el problema, comprenda el problema, defina los objetivos de diseño, describa la solución, cree la solución y pruebe las etapas de la solución. Esto da como resultado un material didáctico digital eficaz y eficiente que los estudiantes con dificultades de aprendizaje pueden utilizar en sus procesos de lectura. El estudio mostró claramente el proceso de elaboración del material digital, así como una profunda discusión teórica.

PALABRAS CLAVE Investigación en lectura; integración de tecnología; constructivismo; aprendizaje.

1. INTRODUCTION

Our urge to communicate gives the human being a very different dimension from other living things (Boyd, 2009). Communication is established through our excellent language skills. Reading, a language skill involves the conversion of symbols printed on a surface into words and the resulting understanding in simple terms. Reading is the most straightforward and least expensive approach to acquiring knowledge because it can assist in understanding the basics of more complex information (Hashemi, 2021). Reading

comprehension can be considered as the purpose of reading. Reading comprehension is a process that includes some complex processes such as word reading, vocabulary, and reading fluency and is affected by the reader's ability to perform reading tasks (Hasan et al., 2018; Reis et al., 2020; Soto et al., 2019). If we cannot understand what we are reading, the reading process is meaningless. By reading, we decipher the text's concepts, events, and relationships and try to reach the meaning. The reading process engages the reader with a complex thinking process (Rastegar et al., 2017). The primary purpose of reading is to create and derive meaning from written text, this meaning-making action should be interactive, strategic, and adaptive. Reading is a social process and should not be considered separate from society, people and interaction. According to the constructivist approach, which focuses on sociability, reading can be considered a dynamic, active, and constructive process. The reading process has different meanings for each reader, directly related to the reader's characteristics (e.g., prior knowledge, worldview, value, belief, attitude, motivation, language ability). In addition, factors such as the type of text and contextual factors affect the meaning created (Alton-Lee et al., 2012). In a constructivist approach, the reader associates their schemas with new information while producing meaning and developing their hypotheses (Bruner, 1966). Reciprocal Teaching Strategy (RTS), which is based on the social constructivist approach and focuses on understanding the text, was determined as the focus of this study. The development of knowledge through social interaction (Vygotsky, 1978) is the focus of RTS. If the reading processes of the readers are supported by interaction, an increase in reading performance is observed (Lim et al., 2021). RTS is a learning community whose participants share interactive roles that include learning interactions (Alemu, 2020). RTS is the social constructivist counterpart of the processes involved in taking and structuring meaning in the text. RTS, which overlaps with the social constructivist approach, has a structure supporting mental development (Esfendahad, 2010). In social constructivist understanding, peer support is a critical place in the learning process, and there is an effort to find meaning together with the peer (Ardiansyah, & Ujihanti, 2018). Peer support refers to helping each other in processes ranging from familiar tasks within an activity to the most difficult ones (Vygotsky, 1978). Vygotsky's idea of teaching emphasizes dialogue and the collective construction of knowledge done in a social group (Wells, 1999). The teacher or students can control learning in the context of RTS (Zendler, & Reile, 2018). The focus should be on the dialogue between the student leader and peers rather than on who is in control. RTS follows the constructivist philosophy that students should be encouraged and motivated to explore their ideas and seek explanations about complex concepts from friends or teachers without hesitation or embarrassment (Sumarmo, 2013). RTS has also been recognized for building student capacity in key competencies: thinking; use of language, symbols, and text; self-management; relating to and participating in, and contributing to others (Alton-Lee et al., 2012). In the case of RTS, the emphasis is on cooperative learning rather than independent learning. Students are taught to help each other. In this strategy, students work together as peer partners, each acting as a "doer" and a "guide" in completing the task. Peer feedback does not mean that students "grade" each other or score papers. Instead, the aim is for students to clarify what is right and wrong (Liu, & Bu, 2016). At the same time, the four stages (predicting, questioning, explaining, summarizing) collectively form a guided reading strategy that parallels Vygotsky's idea of scaffolding, defined as various teaching techniques, or learning activities used to progressively advance students towards more robust content (Erbil, 2020). RTS is an inquiry-based teaching strategy created by Palincsar and Brown (1984) to help students improve their reading comprehension skills (Pilonieta, & Medina, 2009). Teachers often administer RTS as a predetermined set of processes with little knowledge of why

strategies work (Barrett, 2003). Therefore, it is concluded that RTS is an outstanding role-playing learning strategy proven to improve reading and comprehension. RTS is best described as a conversation between teachers and students, in which each participant takes turns acting as the teacher (Munawir et al., 2022). The idea behind RTS is that the teacher instructs students on strategies until they are adept enough to shift the dialogue from student to student gradually (Clark, 2003). Through this strategy, students explain what they have learned to other students and act as a facilitator to become the teacher and help them clarify their ideas and activities. This process forces students to put their ideas into words, which helps organization and retention (Liu, & Bu, 2016). For the effective implementation of RTS, it is crucial to reveal the experiences, cultural knowledge, perspectives, and thinking strategies of the students participating in the process (Alton-Lee et al., 2012). Social dialogues about texts repeated and shared by students support students' reading comprehension performance (Dole et al., 2016). RTS is a scaffolded discussion technique built on four strategies that readers use to grasp the text: guessing, questioning, explaining, and summarizing (Yawisah et al., 2017). The more students experience analytical thinking skills for themselves, the more complex their learning skills repertoire becomes (Rattanavich, 2017). In addition, the reciprocal teaching strategy is a strategy for understanding a text that involves teachers and students working together to improve their interpretation of the text using four strategies (Oo et al., 2021; Tseng, & Yeh, 2018). RTS reduces students' position as students are fulfilled when they share their feelings, perspectives, and ideas through learning approaches in an interactive session. Learning spaces include opportunities to strengthen awareness, notice and observe misconceptions, and correct them along the way. The domain of proximal development is crucial for identifying appropriate content and device operations for enhanced learning and performance. These contents should be shared on an entirely different level, acceptable to students' learning ability and level of understanding. A framework should be available to encourage and implement feedback to end RTS practices (Oczkus, 2003). It is known that the interactions made while applying this strategy improve the students' thinking skills (Wadsworth, 2006). RTS was developed from research on tracking and structuring meaning from text. The basis of the strategy is the assumption that knowledge and understanding emerge as a result of creative socialization through conversations and negotiations between teachers and students or students and students (Pilten, 2016). Students work collaboratively on the text they are working on and try to give meaning to it. Based on the dialogue approach, this strategy makes facts and ideas feel comfortable in an open conversation process, and a collective learning process is emphasized (Ardiansyah, & Ujihanti, 2018). Learning to work is another perspective many see as a collaborative mode that focuses on discursive thinking and reasoning (Abu Hatab, 2017).

Many previous studies confirm that RTS is an effective reading strategy that significantly supports reading comprehension (Ahmadi, 2016; Cockerill et al., 2022; Dew et al., 2021; Hamdani, 2020; O'Hare et al., 2019; Pilten, 2016; Rojabi, 2021; Thurston et al., 2020). In addition, as in RTS, students read better in learning processes used by inquiry strategies (Ahmadi et al., 2021; Ariawan, & Winoto, 2021; Brown, & Pyle, 2021; Bui et al., 2021; Castells et al., 2021; Liu, 2021; Parjan, & Mohamad, 2021; Stuckelman et al., 2022). And peer support has been proven by convincing evidence as a strategy to support reading (Chairinkam, & Yawiloeng, 2021; Chun, & Cennamo, 2022; Ebrahimi, & Sadighi, 2022; Nguyen, 2022; Taheri, & Nazmi, 2021; Yawiloeng, 2021; Xu et al., 2022). In addition to peer support, expert/teacher support was also stated in the literature as an effective strategy for improving reading performance (Ebrahimi, & Sadighi, 2022; Li,

& Zhang, 2022; Taheri, & Nazmi, 2021; Xu et al., 2022). This study focused on the power of social constructivism to support reading and the social structure of language skills. In the context of this focus, the "Learning Disability (LD)" group, which frequently experiences inadequacy in reading skills and where this disability is formalized with a diagnosis, has been determined as the target audience. Reading skill is a prerequisite for being included in society and existing as an individual, not only in academic life but also in life. For this reason, the support of the LD group with social constructivism (based on RTS) and the digital environment adaptability of RTS are discussed together. The aim of the study; is the design an SCAFREAD (RTS-based e-learning environment) to support the reading performance of students with LD. The research questions are as follows:

1. What features of an SCAFREAD will support the reading performance of students with LD?
2. What is the experience of LD students using an SCAFREAD for their reading process?
3. Is there a change in the reading levels of students using SCAFREAD?

2. MATERIAL AND METHOD

2.1. Methodology

2.1.1 Design

Design-based research (DBR), which aims to develop research-based solutions for complex problems in educational applications or theories related to learning and teaching processes, is a multi-faceted and multi-cycle research process (Design-Based Research Collective, 2003; Dolmans, 2019). The most critical distinguishing feature of DBR is the iterative nature of its interventions. As iteration occurs, researchers examine and rework the intervention using various research methods best suited to the context. Based on collaboration between researchers and practitioners, iterative analysis design involves careful and continuous evaluation for an iteration to make these process improvements. DBR, which consists of cycles, includes continuous improvement in line with the findings obtained from product evaluations. DBR is carried out to meet local needs and advance a theoretical agenda to reveal, explore and validate theoretical relationships (Barab, & Squire, 2004). The purpose of DBR is to establish a strong link between educational research and the natural world (Amiel, & Reeves, 2008). Among the reasons for preferring DBR, it can be stated that contextual intervention is at the forefront and the necessity of an effective and collaborative communication environment between the researcher and the participants. In the study, Easterday et al. (2014) followed the stages of the DBR process: Focus on the problem, understand the problem, define the design goals, outline the solution, create the solution and test the solution. The researcher first made a detailed literature review on the reading problems of LD students. It was observed that reading skills could be supported by providing suitable environments for students with LD. She focused on the social dimension of reading as a result of intensive reflection on the best instructional technology intervention to the reading problem. She drew attention to the testability of a strategy in social constructivist identity. This strategy was RTS, based on the development of reading. The DBR process, therefore, involved developing an SCAFREAD to support LD students in their reading process.

2.1.2. Participants

The participants of this study are researchers (with a Ph.D. in instructional technologies and special education and technology studies), the evaluation committee (committee members have work and lectures on instructional design, special education, and DBR), and special education teachers and students with LD (n=11). Some criteria have been determined for students with LD:

1. The participant does not have any diagnosis other than LD,
2. The participant can touch the necessary place on a tablet or touch screen,
3. The participant can recognize and read the alphabet,
4. The age of 18 A "Family Consent Form" was prepared to be used both in the design-based research and in the experimental study, in order for the learning participants to be under the age of 18.

2.1.3. Data collection tool and analysis

The study's data consisted of video recordings of students' and teachers' experiences using the material, unstructured interviews with the evaluation committee, students' behavior in the e-learning environment (log data), and a research diary. The researcher kept a diary throughout the application process. DBR was completed in about eight months. All of the qualitative data obtained were analyzed by content analysis. First, the data was transcribed. An independent researcher controlled 60 % of the transcript data. The transcribed data were organized, classified, compared, and a theoretical report was made (Cohen et al., 2017). Error analysis inventory was used to determine the reading levels of the students. In this inventory, reading levels are determined by making use of reading comprehension and reading accuracy. According to the student's score, it is determined whether it is included in the free level, the teaching level or the anxiety level. The reading levels of the students were analyzed and reported with descriptive statistics and graphics.

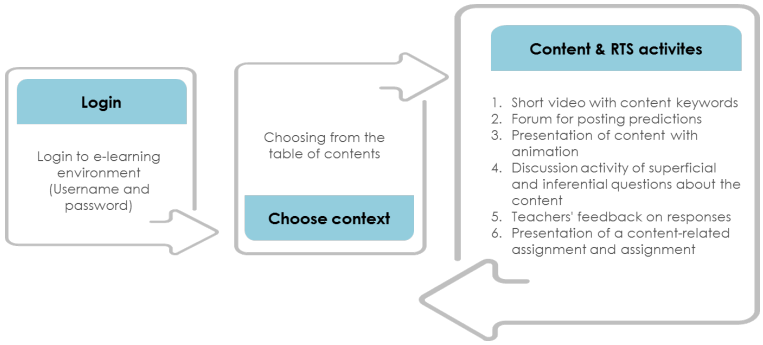
3. RESULTS

3.1. Features of an SCAFREAD

While developing the SCAFREAD, two separate stages were carried out design and improvement. During the design phase, design, development, control, application, correction, re-implementation, and evaluation processes took place over the content. Depending on the data obtained and the decisions of the evaluation committee, 29 contents were developed when the researcher decided that the design reached the best point. A module was produced for all letters of the alphabet. The flow diagram of the e-learning environment and SCAFREAD modules is shown in Figure 1 (see next page).

A total of 29 modules were produced for 29 letters in the Turkish alphabet in the e-learning environment. 1 module was added for the letter "a" for the new user to experiment, and an e-learning environment with a total of 30 modules was created. The researcher created the e-learning environment in the Articulate Storyline 360 program. The researcher wrote the stories and checked them with the evaluation committee and language experts. The texts to be used in the materials were written in the form of stories, and the length of the text and the new words used were discussed with the special education teachers. In order to have

FIGURE 1. Flowchart of SCAFREAD



standardization in the content and structure of the stories, value education is planned for each story, and it was decided that the text's readability level would be "independent reading." The readability formula developed by Çetinkaya (2010), depending on the Turkish language (Readability score = 118.823 – 25.987 x average word length–0.971x average sentence length), was used to calculate the text readability level. According to this formula, 0-34 points range means "problematic" reading, 35-50 points range means "educational," 51 and above points mean "independent" reading. All texts used in the content were arranged as "educational level" text. The contents of the stories were created from the values of love, respect, justice, benevolence, tolerance, empathy, honesty, patience, and hard work. Each module started with a short video introducing content keywords and included tips for the prediction activity. The prediction event took place in a forum. The original content was conveyed in the form of a presentation and voiced. After the presentation, students were directed to an online discussion with simple and inferential questions. The teacher gave feedback to the students and interacted actively with them students. After this process was over, students were given an assignment. Students presented their assignments by writing or recording their voices. Students were able to ask and answer questions to each other while making presentations.

3.2. Students' reading levels

When the pretest and posttest scores of 11 students from the error analysis inventory were examined, a positive change was observed in all but one student. In the pretest, all students had reading performance at the anxiety level.

TABLE 1. Reading scores

Student	Pre-test scores			Post-test scores		
	Word recognition	Comprehension	Reading level	Word recognition	Comprehension	Reading level
ST1	80 %	42 %	frustrational	100 %	92 %	independent
ST2	90 %	30 %	frustrational	99 %	82 %	independent
ST3	70 %	22 %	frustrational	99 %	87 %	independent
ST4	76 %	26 %	frustrational	98 %	86 %	instructional
ST5	72 %	32 %	frustrational	95 %	79 %	instructional
ST6	80 %	20 %	frustrational	97 %	80 %	instructional
ST7	82 %	40 %	frustrational	96 %	78 %	instructional
ST8	60 %	28 %	frustrational	98 %	88 %	instructional
ST9	70 %	38 %	frustrational	96 %	89 %	instructional
ST10	72 %	36 %	frustrational	96 %	80 %	instructional
ST11	64 %	18 %	frustrational	82 %	40 %	frustrational

After SCAFREAD, 7 of the students were at instructional level, 3 at independent level, and 1 at reading level at frustrational level. Comprehension score and word recognition scores were used while calculating the reading level. The scores of the students can be examined in the Table 1. The change in students' word recognition scores can be examined in Figure 2, and the change in comprehension scores in Figure 3.

FIGURE 2. Word recognition scores

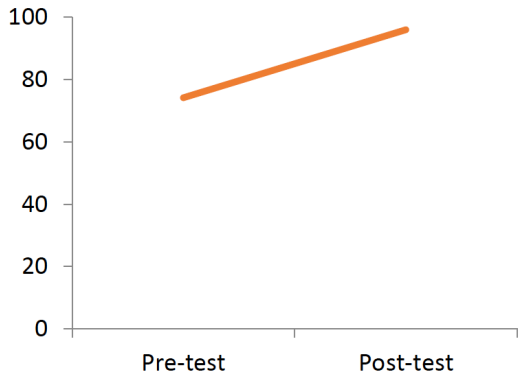
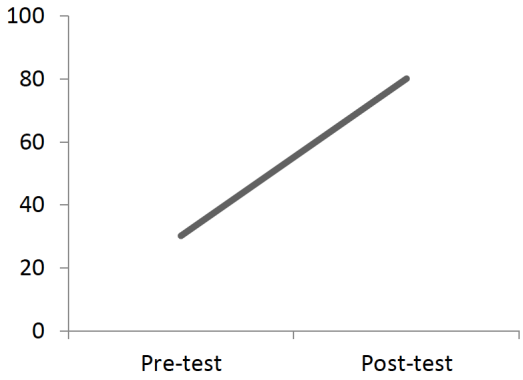


FIGURE 3. Comprehension scores



3.3. Students with LD experience using an SCAFREAD

During the design process, five primary school students with LD introduced the e-learning environment individually to the researcher students. When students could use the environment independently, they used the sample SCAFREAD module. A typical practice day and time was determined for each student. Each student used the tablet module with the same features in similar but separate classroom environments. The students made another application due to changes made to the first use of the module. Their experiences were recorded with both screen recording and video recording. While the students were using the trial module, the environment was active between 28 and 47 minutes. Each student entered the environment and study with trial module. Students progressed the activities sequentially. Students typed with the keyboard, recorded the sound, and uploaded it to the system in response. Students did not encounter any problems while using the e-learning environment. However, two students asked why they should choose only one item that appeared in the table of contents. Although two students completed the module, they wanted to listen to the lecture again. One student also listened and read his responses to the discussion and the feedback he received. Students asked questions, reinforced, confirmed, and criticized each other. It was noteworthy that there were comments explaining each other's answers in the correspondence, where the most smiley emoji were sent. They often reinforced each other's answers with expressions such as "Perfect answer" and "Great." They stated that they agreed with their friends' answers with expressions such as "I think too" and "Exactly." "No, actually not like that." They both criticized and shared their ideas. Students recorded and posted responses longer than ten words by speaking. They sent short replies either by voice or text. One student chose to write down each answer. In the predicting phase, the students made 85 % correct predictions. Students who made wrong predictions did not prefer to insist on their predictions. They explained why they made that prediction. All students watched the presentation, explaining the content

until the end. All of the students gave correct answers to the simple questions at the end of my end. Long and explanatory answers supported discussions that started with short answers to inferential questions. Students who answered five superficial and three inferential questions sent an average of six posts to each question. These posts were audio or textual. While evaluating the answers, the teacher took care to answer each answer. He directed the student again, explaining the wrong answers and giving hints. Reinforces correct answers. Students were given 30 minutes for the assignment given to them students. In the meantime, the students completed their homework, receiving support from the video and the responses to the discussions. Students who submitted their assignments gave feedback to each other and received feedback from their teachers. All students completed a module with 100 %. In summary, the student's behaviors in the RTS-based learning environment are as described in Table 2.

TABLE 2. Students' behavior in the trial module

Participant	Time investment	Posts on simple questions	Posts on inferential questions	Percentage of accuracy of simple questions' responses	Percentage of accuracy of inferential questions' responses
ST-1	27 min. 55 sec.	12	10	90 %	80 %
ST-2	39 min. 10 sec.	9	11	100 %	90 %
ST-3	45 min. 23 sec.	16	20	90 %	100 %
ST-4	38 min. 18 sec.	20	24	100 %	100 %
ST-5	43 min. 37 sec.	15	19	100 %	90 %
ST-6	40 min. 29 sec.	12	15	100 %	100 %
ST-7	41 min. 58 sec.	18	25	100 %	100 %
ST-8	23 min. 11 sec.	22	29	90 %	100 %
ST-9	39 min. 13 sec.	30	38	100 %	80 %
ST-10	46 min. 29 sec.	21	29	100 %	90 %
ST-11	40 min. 32 sec.	20	25	90 %	90 %

When Table 1 is examined, it is seen that; students in the trial module at least 27 min. 55 sec., maximum 46 min. 29 sec. They have had time. They sent a minimum of 9 and a maximum of 30 posts to simple questions. They sent a minimum of 10 and a maximum of 38 posts to inferential questions. While the accuracy rate in simple questions is calculated as a minimum of 90 % and a maximum of 100 %, it was calculated as a minimum of 80 % and 100 % in inferential questions.

4. DISCUSSION

The aim of the study; was the design an SCAFREAD to support the reading performance of students with LD. It was decided that this aim would be best accomplished within the scope of DBR, and a comprehensive participant group comprised of the researcher, the evaluation committee, special education teachers, and students with LD. DBR is conducted to advance a theoretical agenda, to uncover, explore and validate theoretical relationships (Barab, & Squire, 2004, p. 5), to provide an opportunity to establish a strong link

between educational research and the natural world (Amiel, & Reeves 2008), and to precede contextual intervention. It was chosen because DBR was completed in about eight months. The prediction stage was where interest and attention were drawn to the content. At this stage, we come across different models and strategies produced for learning processes. Arousing curiosity in the student about the learning content or process initiates learning by making the student activities. While it is seen that the pre-question process before reading the text supports the reading process (Ratmeilia, 2022; Riswanto, 2022; Thohidah et al., 2021), it was seen that the students' prediction strategies were not used in the reading process, except for RTS. However, it was seen that prediction systems were developed and used in reading processes with artificial intelligence applications. The questioning phase consisted of an evaluation phase. The content was repeated with both simple and inferential questions. This way, students could listen to the content again if they wanted. Alternatively, they corrected the wrong or incomplete information with the interactions of their peers. They even gave feedback to their peers. It was observed that the reading processes in which questioning strategies were used were more effective, and the readers achieved better reading scores (Ahmadi et al., 2021; Ariawan, & Winoto, 2021; Brown, & Pyle, 2021; Bui et al., 2021; Castells et al., 2021; Liu, 2021; Parjan, & Mohamad, 2021; Stuckelman et al., 2022). The explanation phase included teacher support. The teacher provided feedback on the student's responses and interactions. In this way, students had the opportunity to do it again and again. Enrichment of reading processes with peer support is already a frequently studied context that highly supports reading (Chairinkam, & Yawiloeng, 2021; Chun, & Cennamo, 2022; Ebrahimi, & Sadighi, 2022; Nguyen, 2022; Taheri, & Nazmi, 2021; Yawiloeng, 2021; Xu et al., 2022). Enriching reading processes with teacher support is also an approach that highly supports reading (Ebrahimi, & Sadighi, 2022; Li, & Zhang, 2022; Taheri, & Nazmi, 2021; Xu et al., 2022). In the summarizing phase, each student had the opportunity to share their meaning with their peers and their teacher and was in an interactive process. In some studies in the literature, it has been seen that summarizing strategies are a practical approach to reading processes and support reading skills (Solikhah, & Sari, 2022; Triana, 2021; Zahra et al., 2022). While the students were using the trial module, the environment was active between 28 and 47 minutes. Each student entered the environment and study with trial module. Students completed the activities sequentially. Students typed with the keyboard, recorded the sound, and uploaded it to the system in response. Students did not encounter any problems while using the e-learning environment. However, two students asked why they should choose only one item that appeared in the table of contents. Although two students completed the module, they wanted to listen to the lecture again. One student also listened and read his responses to the discussion and the feedback he received. Students asked questions, reinforced, confirmed, and criticized each other. It was noteworthy that there were comments explaining each other's answers in the correspondence, where the most smiley emoji were sent. They often reinforced each other's answers with expressions such as "Perfect answer" and "Great." They stated that they agreed with their friends' answers with expressions such as "I think too" and "Exactly." "No, actually not like that." They both criticized and shared their ideas. Students recorded and posted responses longer than ten words by speaking. They sent short replies either by voice or text. One student chose to write down each answer. When both the literature and the results of the current study were evaluated together, some suggestions were produced. It should include interaction with all dimensions of the learning process, which should be evaluated from a social constructivist perspective. The important thing is to choose the

most consistent approach with the content, the environment, and the target audience, rather than the most accurate, most popular, or most up-to-date strategy. It was seen that peer interaction in the reading process would support the reader's reading process. For this reason, the reader should be aware of interacting with their peers whenever they want in the classroom or in digital classrooms. Everyone in the learning process should know that he and others are trying to read. Considering the adaptability of social constructivist strategies to digital learning environments, we know that many technologies enable this. However, what should be considered is not to choose the newest, most expensive, most popular, most different technology but to design it with the right strategy and include it in the learning process. Although the study was conducted with LD students, it would not be difficult to say that RTS applies to every individual with reading difficulties.

5. CONCLUSION

As a result, this article started with the observation that while sociocultural learning has become more visible in recent years; it is still not of necessary importance. Especially after the acceptance of man as a social being, we must believe that everything humane can be built on a social basis. Constructivism should not be thought of as a middle-range learning theory. The constructivist approach offers the opportunity to approach education in a holistic, dynamic and as-is-how-it-like way. On the basis of constructivism, interaction, active learner, etc. It is very effective in designing and developing interactive teaching environments and materials, since concepts are included. It focuses on meaning, not product. For this reason, the design of the environment, interventions and processes in the identity is valuable. In this study, a learning environment supported by interaction was focused and the development of reading performance and user experiences were examined and reported to be effective.

5.1. Limitations and Recommendations

The study was carried out within the framework of some limitations. It is a limitation that the experimental results of the study were carried out with a limited number of participants. However, the main purpose of design-based research is not to reach empirical generalizable statistics. However, there is a need to examine the effectiveness of similar materials with more participants. More experimental studies can be conducted to increase the convincing data that especially the environment and materials in social constructivist identity are effective. The study was prepared for 29 letters in the Turkish alphabet and for Turkish texts. The realization of studies in different cultures in order to observe the differences arising from language differences will also enrich the literature. Collaborations between instructional designers and educators on social constructivist environments, materials and processes are very valuable. In this sense, multidisciplinary studies will also offer quite holistic perspectives.

6. ACKNOWLEDGEMENT

A part of this study was presented as an oral presentation at the International LET-IN 2022 Conference.

7. REFERENCES

Abu Hatab, S. (2017). Reciprocal Teaching for English and Arabic-Language Learners in Recent Studies. *International Journal of English Linguistics, 7*(6), 178-186. http://doi.org/10.5539/ijel.v7n6p178

Ahmadi, H., Behnam, B., & Seifoori, Z. (2021). The reciprocal questioning as a formative assessment strategy: EFL learners' reading comprehension and vocabulary learning. *Teaching English Language, 15*(2), 61-93. https://doi.org/10.22132/tel.2021.139843

Ahmadi, M.R. (2016). *The effects of reciprocal teaching strategy on reading comprehension, motivation and metacognition among iranian efl university learners* [Doctoral Thesis, Yniversiti Sains Malaysia]. http://eprints.usm.my/32033/1/MOHAMMAD_REZA_AHMADI_24%28NN%29.pdf

Alemu, M. (2020). Improving secondary school students' physics achievement using reciprocal peer tutoring: A multi-level quasi-experimental study. *EURASIA Journal of Mathematics, Science and Technology Education, 16*(4), 1-14. https://doi.org/10.29333/ejmste/115164

Alton-Lee, A., Westera, J., & Pulegatoa-Diggins, C. (2012). *BES exemplar 4: Reciprocal teaching*. Ministry of Education, NZ.

Amiel, T., & Reeves, T. C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Journal of educational technology & society*, *11*(4), 29-40.

Ardiansyah, W., & Ujihanti, M. (2018). Social constructivist learning theory and reciprocal teaching to teach reading comprehension. *International Journal of Learning and Teaching*, *10*(1), 70-77. https://doi.org/10.18844/ijlt.v10i1.3147

Ariawan, V. A. N., & Winoto, S. (2021). Total reading skills for elementary school students through the reading questioning answering model. *Jurnal Prima Edukasia, 9*(1), 44-54. https://doi.org/10.21831/jpe.v9i1.34534

Barab, S., & Squire, K. (2004). Design-based research: putting a stake in the ground. *Journal of the Learning Sciences, 13*(1), 1–14. https://doi.org/10.1207/s15327809jls1301_1

Barrett, R. A. (2003*). Reciprocal teaching as a Platform for communicative activities in the secondary foreign language classroom: A case study*. The University of Akron.

Boyd, B. (2009). *On the origin of stories: Evolution, cognition, and fiction*. Harvard University Press.

Brown, S. A., & Pyle, N. (2021). Self-questioning strategy routine to enhance reading comprehension among secondary students. *TEACHING Exceptional Children, 53*(6), 441-449. https://doi.org/10.1177/0040059920976677

Bruner, J. (1966). *The Process of Education*. Harvard University Press.

Bui, N. K., Nguyen, H. B., Ly, T. H., & Pham, A. L. (2021). Students' Perceptions of the Effects of Questioning At Pre-Reading Stage on Reading Comprehension: A Case at a Vietnamese University. *Multicultural Education, 7*(12), 377-385. https://doi.org/10.5281/zenodo.5792113

Castells, N., Minguela, M., Solé, I., Miras, M., Nadal, E., & Rijlaarsdam, G. (2021). Improving Questioning–Answering Strategies in Learning from Multiple Complementary Texts: An Intervention Study. *Reading Research Quarterly, 57*(3), 879–912. https://doi.org/10.1002/rrq.451

Chairinkam, J., & Yawiloeng, R. (2021). Peer Scaffolding Behaviors in English as a Foreign Language Writing Classroom. *Asian Journal of Education and Training, 7(*4), 226-234. https://doi.org/10.20448/journal.522.2021.74.226.234

Chun, J., & Cennamo, K. (2022). A Theoretical Model of Peer Learning Incorporating Scaffolding Strategies. *International Journal of Teaching and Learning in Higher Education, 33*(3), 385-397.

Clark, L. (2003). *Reciprocal-Teaching Strategy and Adult High-School Students*. M.A. Research Project, Kean University.

Cockerill, M., O'Keeffe, J., Thurston, A., & Taylor, A. (2022). Reciprocal reading for struggling readers: an exemplar of evidence implementation in schools. *Review of Education, 10*(1), 1-22. https://doi.org/10.1002/rev3.3332

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education*. Routledge

Çetinkaya, G. (2010). *Türkçe metinlerin okunabilirlik düzeylerinin tanımlanması ve sınıflandırılması* [Doctoral thesis, Ankara University]. Akademik Arşiv Sistemi. https://dspace.ankara.edu.tr/xmlui/handle/20.500.12575/33947

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32*(1), 5–8. https://doi.org/10.3102/0013189X032001005

Dew, T.P., Swanto, S., & Pang, V. (2021). The effectiveness of reciprocal teaching as reading comprehension intervention: a systematic review. *Journal of Nusantara Studies, 6*(2), 156-184. https://doi.org/10.24200/jonus.vol6iss2pp156-184

Dole, S., Bloom, L., & Kowalske, K. (2016). Transforming Pedagogy: Changing Perspectives from Teacher-Centered to Learner-Centered. *Interdisciplinary Journal of Problem-Based Learning, 10*(1), art.1. https://doi.org/10.7771/1541- 5015.1538

Dolmans, D.H.J.M. (2019). How theory and design-based research can mature PBL practice and research. *Advances in Health Science Education, 24*, 879–891. https://doi.org/10.1007/s10459-019-09940-2

Easterday, M. W., Lewis, D. R., & Gerber, E. M. (2014). *Design-based research process: Problems, phases, and applications*. International Society of the Learning Sciences.

Ebrahimi, Z., & Sadighi, F. (2022). Comparing the Effect of Online Teacher-Scaffolding vs. Peer-Scaffolding on Iranian EFL Learners' Grammatical Achievement. *Journal of Studies in Learning and Teaching English, 11*(1), 97-120.

Erbil, D. G. (2020). A review of flipped classroom and cooperative learning method within the context of Vygotsky theory. *Frontiers in Psychology*, *11*, 1157. https://doi.org/10.3389/fpsyg.2020.01157

Esfendahad, H. S. (2010). A comparative study of learning styles among monolingual(Persian) and bilingual (Turkish Persian) secondary school, student. *Procerdia-Social and Behavioral Sciences*, *5*, 2419-2422. https://doi.org/10.1016/j.sbspro.2010.07.474

Hamdani, B. (2020). Teaching reading through reciprocal teaching method. *Celtic: A Journal of Culture, English Language Teaching, Literature and Linguistics, 7*(1), 22-34. https://doi.org/10.22219/celtic.v7i1.11936

Hasan, A., Gushendra, R., & Yonantha, F. (2018). The influence of prior knowledge on students' listening and reading comprehension. *Indonesian Journal of English Education, 4*(1), 1-15. https://doi.org/10.15408/ijee.v4i1.4744

Hashemi, A. (2021). The effects of using games on teaching vocabulary in reading comprehension: a case of gifted students. *Journal for the Education of Gifted Young Scientists, 9*(2), 181-191. https://doi.org/10.17478/jegys.846480

Li, D., & Zhang, L. (2022). Exploring teacher scaffolding in a CLIL-framed EFL intensive reading class: A classroom discourse analysis approach. *Language Teaching Research, 26*(3), 333-360. https://doi.org/10.1177/1362168820903340

Lim, J., Whitehead, G. E., & Choi, Y. (2021). Interactive e-book reading vs. paper-based reading: Comparing the effects of different mediums on middle school students' reading comprehension. *System*, *97*, 102434. https://doi.org/10.1016/j.system.2020.102434

Liu, A., & Bu, Y. (2016). Reciprocal-Learning Strategy in CALL Environment: A Case Study of EFL Teaching at X University in Shanghai. *Universal Journal of Educational Research, 4*(5), 1059-1070. https://doi.org/10.13189/ujer.2016.040516

Liu, H. (2021). Does questioning strategy facilitate second language (L2) reading comprehension? The effects of comprehension measures and insights from reader perception. *Journal of Research in Reading, 44*(2), 339-359. https://doi.org/10.1111/1467-9817.12339

Munawir, A., Khair, U., & Putriani, N. (2022). The Impact of Using A Reciprocal Teaching Strategy on Reading Comprehension By Prospective Teachers. *ETDC: Indonesian Journal of Research and Educational Review*, *1*(2), 169-175. https://doi.org/10.51574/ijrer.v1i2.334

Nguyen, H. M. P. (2022). Using Scaffolding to Improve Online Group Presentation in English Literature Classes: An Action Study at Van Lang University. *International Journal of TESOL & Education, 2*(4), 21-31. https://doi.org/10.54855/ijte.22242

O'Hare, L., Stark, P., Cockerill, M., Lloyd, K., McConnellogue, S., Gildea, A., Biggart, A., Connolly, P., & Bower, C. (2019). *Reciprocal reading: Evaluation report*. Education Endowment Foundation.

Oczkus, L. (2003). *Introduction. Reciprocal teaching at work: strategies for improving reading comprehension*. International Reading Association.

Oo, T. Z., Magyar, A., & Habók, A. (2021). Effectiveness of the reflection-based reciprocal teaching approach for reading comprehension achievement in upper secondary school in Myanmar. *Asia Pacific Education Review, 22*(4), 675-698. https://doi.org/10.1007/s12564-021-09707-8

Palincsar, A.S., & Brown, A.L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1*(2), 117–175. https://doi.org/10.1207/s1532690xci0102_1

Parjan, H. W., & Mohamad, M. (2021). Year 5 Pupils' Perception on Guided Reciprocal Peer Questioning (GRPQ) Strategy in Reading Comprehension: A Conceptual Paper. *Creative Education, 12*(7), 1643-1654. https://doi.org/10.4236/ce.2021.127125

Pilonieta, P., & Medina, A. L. (2009). Reciprocal teaching for the primary grades:"We can do it, too!". *The reading teacher*, *63*(2), 120-129. https://doi.org/10.1598/RT.63.2.3

Pilten, G. (2016). The Evaluation of Effectiveness of Reciprocal-Teaching Strategies in Comprehension of Expository Texts. *Journal of Education and Training Studies, 4*(10), 232- 247. https://doi.org/10.11114/jets.v4i10.1791

Rastegar, M., Kermani, E. M., & Khabir, M. (2017). The relationship between metacognitive reading strategies use and reading comprehension achievement of EFL learners. *Open Journal of Modern Linguistics*, *7*(02), 65. https://doi.org/10.4236/ojml.2017.72006

Ratmeilia, N. R. (2022). The Use of Recount Text by Implementing Pre-Questioning Technique to Improve the Students Reading Comprehension at SMA Muhammadiyah Limbung. IDEAS: *Journal on English Language Teaching and Learning, Linguistics and Literature, 10*(1), 436-456. http://dx.doi.org/10.24256/ideas.v10i1.2692

Rattanavich, S. (2017). The Effects of an Experimental Training Programme for Teachers of Vocational English Using Concentrated Language Encounter Instructional Processes and Reciprocal PeerTeaching Strategies. *English-Language Teaching,10*(12), 58-71. https://doi.org/10.5539/elt.v10n12p58

Reis, A., Araújo, S., Morais, I. S., & Faísca, L. (2020). Reading and reading-related skills in adults with dyslexia from different orthographic systems: a review and meta-analysis. *Annals of dyslexia, 70*(3), 339-368. https://doi.org/10.1007/s11881-020-00205-x

Riswanto, R. (2022). The Impact of a Pre-Questioning Technique on Students' Reading Comprehension at a Bengkulu State Junior High School. *AL-ISHLAH: Jurnal Pendidikan, 14*(2), 2381-2386. https://doi.org/10.35445/alishlah.v14i2.1606

Rojabi, A. R. (2021). Exploring Reciprocal Teaching Method on EFL Learners' Reading Comprehension. *VELES: Voices of English Language Education Society*, *5*(2), 132-142. https://doi.org/10.29408/veles.v5i2.3860

Solikhah, N. A., & Sari, R. A. (2022). The Influence of Summarizing Short Stories Towards Students' Narrative Writing Ability. *Journal Corner of Education, Linguistics, and Literature, 1*(3), 176-190. https://doi.org/10.54012/jcell.v1i3.34

Soto, C., Gutiérrez de Blume, A. P., Jacovina, M., McNamara, D., Benson, N., & Riffo, B. (2019). Reading comprehension and metacognition: The importance of inferential skills. *Cogent Education, 6*(1), 1565067. https://doi.org/10.1080/2331186X.2019.1565067

Stuckelman, Z. D., Strouse, G. A., & Troseth, G. L. (2022). Value added: Digital modeling of dialogic questioning promotes positive parenting during shared reading. *Journal of Family Psychology, 36*(6), 1010-1020. https://doi.org/10.1037/fam0000932

Sumarmo, A. (2013). Improving MathematicalCommunication Ability and Self-regulation Learning of Junior High Students by Using Reciprocal Teaching. *IndoMS. J.M.E., 4*(1), 59-74. https://doi.org/10.22342/jme.4.1.562.59-74

Taheri, P., & Nazmi, R. (2021). Improving EFL Learners' Argumentative Writing Ability: Teacher vs. Peer Scaffolding. *Teaching English Language, 15(2), 299-333.* https://doi.org/10.22132/tel.2021.143348

Thohidah, H., Sagita, M., & Jamaliah, J. (2021). Improving Students Reading Comprehension By Applying Pre-Questioning Technique (An Experimental Study at the Second Grade of SMAN 1 Glumpang Tiga). *Education Enthusiast: Journal Pendidikan dan Keguruan, 1*(1), 1-11. https://doi.org/10.47647/.v1i1.268

Thurston, A., Cockerill, M., Chiang, T.H., Taylor, A., & O'Keeffe, J. (2020). An efficacy randomized controlled trial of reciprocal reading in secondary schools. *International Journal of Educational Research,104*, 1–27. https://doi.org/10.1016/j.ijer.2020.101626

Triana, N. (2021). Paired Reading and Paired Summarizing Strategy: Exploring Motivation and Effects Of EFL Students' Reading Comprehension. *Tamaddun, 20(2), 178-193.* https://doi.org/10.33096/tamaddun.v20i2.127

Tseng, S. S., & Yeh, H. C. (2018). Integrating reciprocal teaching in an online environment with an annotation feature to enhance low-achieving students' English reading comprehension. *Interactive Learning Environments, 26*(6), 789-802. https://doi.org/10.1080/10494820.2017.1412989

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wadsworth, B. J. (2006). *Piaget's theory of cognitive and affective development: foundations of constructivism*. Longman.

Wells, G. (1999) *Dialogic Inquiry: Towards a Sociocultural Practice and Theory of Education*. Cambridge University Press.

Xu, Y., Chen, C. C., Spence, C., Washington-Nortey, M., Zhang, F., & Brown, A. (2022). Supporting young Spanish speaking English learners through teacher scaffolding and reciprocal peer tutoring. *Early Child Development and Care, 192*(8), 1324-1336. https://doi.org/10.1080/03004430.2021.1874944

Yawiloeng, R. (2021). Peer Scaffolding During EFL Reading Activities: A Sociocultural Perspective. *English Language Teaching, 14*(12), 44-54. https://doi.org/10.5539/elt.v14n12p44

Yawisah, U. (2017). Reciprocal Teaching: One of the methods for poor comprehenders. *Pedagogy: Journal of English Language Teaching, 1*(1), 21-25.

Zahra, A., Mohammad, M., & Mehdi, S. (2022). Oral and Written Summarizing Strategy Training and Reading Comprehension: Peer-Mediated vs. Individualistic Task Performance. *Journal of Language and Education, 8*(1), 11-22. https://doi.org/10.17323/jle.2022.11157

Zendler, A., & Reile, S. (2018). The effect of reciprocal teaching and programmed instruction on learning outcome in computer science education. *Studies in Educational Evaluation, 58*, 132-144. https://doi.org/10.1016/j.stueduc.2018.05.008

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 126-142 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.15286

Relationship between Technological Change, Digitization, and Students' Attitudes toward Distance Learning in Lagos Higher Education Institutes

Relación entre el cambio tecnológico, la digitalización y las actitudes de los estudiantes hacia la educación a distancia en institutos de Educación Superior de Lagos

RECIBIDO 23/08/2022 ACEPTADO 10/11/2022 PUBLICADO 01/06/2023

Joy Chioma Onyekwere
University of Malaya, Malaysia
jjoe28690@gmail.com

Kazi Enamul Hoquei
University of Malaya, Malaysia
keh2009@um.edu.my

ABSTRACT

The focus of this research is to investigate the relationship between learning flexibility, support services, and students' attitudes toward remote learning programs in Nigeria. A correlational research methodology is used, and 385 individuals drawn from a multi-stage sampling technique form the study's sample. The data collecting tool is a three-section questionnaire devised by the researchers. Experts validated the questionnaire, which was then administered once on a randomly selected sample to assess the internal consistency. The Cronbach Alpha formula produced values of .74, .77, and .78 for the three separate questionnaire constructs. At the .05 level of significance, two research questions were posed, and two related null hypotheses were investigated. The collected data is analysed using the Mean, Standard Deviation, and Pearson Product Moment Correlation formulas. The findings show that there is a positive relationship between digital learning flexibility and students' attitudes toward distant learning programs (r =.439, Freq=476, p.05). There is also a favourable link between technology supports and students' attitudes toward distant learning programs (r =.339, Freq=476, p.05). It is thus recommended, among other things, that providers of distance learning programs guarantee high flexibility and quality learner support services to cater to the academic needs of learners with different characteristics, as this would improve students' positive attitudes and increase the enrolment of candidates in distance learning programs.

KEYWORDS Change; Higher Education; Organizational Culture; Technology; Digital; Distance Learning; Student Attitudes.

RESUMEN

El enfoque de este estudio es investigar la relación entre la flexibilidad de aprendizaje, los servicios de apoyo y las actitudes de los estudiantes hacia los programas de aprendizaje remoto en Nigeria. Se utiliza una metodología de investigación correlacional y se extraen 385 individuos con una técnica de muestreo de etapas múltiples para formar la muestra del estudio. La herramienta de recolección de datos es un cuestionario de tres secciones diseñado por los investigadores. Los

expertos validaron el cuestionario, que luego se administró una vez en una muestra seleccionada al azar para evaluar la consistencia interna. El alfa de Cronbach produjo valores de .74, .77 y .78 para las tres construcciones de cuestionario separadas. En el nivel de significación de .05, se plantean dos preguntas de investigación y se investigan dos hipótesis nulas relacionadas. Los datos recopilados se analizan utilizando las fórmulas de correlación de producto-momento de Pearson, desviación estándar y media. Los hallazgos muestran que existe una relación positiva entre la flexibilidad del aprendizaje digital y las actitudes de los estudiantes hacia los programas de aprendizaje a distancia (r =.439, Freq=476, p.05). También existe un vínculo favorable entre los apoyos tecnológicos y las actitudes de los estudiantes hacia los programas de aprendizaje a distancia (r =.339, Freq=476, p.05). Por lo tanto, se recomienda, entre otras cosas, que los proveedores de programas de educación a distancia garanticen servicios de apoyo al estudiante de alta flexibilidad y calidad para atender las necesidades académicas de los estudiantes con diferentes características, ya que esto mejoraría la actitud positiva de los estudiantes y aumentaría la inscripción de candidatos para programas de aprendizaje a distancia.

PALABRAS CLAVE Cambio; Educación Superior; Cultura Organizacional; Tecnología; Digital; Educación a Distancia; Actitudes de los estudiantes.

1. INTRODUCTION

Lagos is a cosmopolitan state with a population of approximately 17 million people (Wright et al., 2013). With practically all of Nigeria's telecommunication companies headquartered in Lagos, the state is the country's commercial nerve centre. The state has four universities and additional higher education schools, which are insufficient to meet the growing population's educational needs (Vermeulen et al., 2017)transformative leadership (TL. The use of digital technology in education has become a major topic (Okposio, 2021). There are several advantages to using digital technology in higher education institutions, including improved learning quality. It teaches students how to use technology and encourages them to be more involved. It also increases the performance and motivation of instructors and pupils. In the sphere of e-learning, many networks have emerged as the fourth generation (Samsudeen, & Mohamed, 2019).

A learning management system (LMS) is a web-based technology that aids in the development, distribution, and evaluation of a particular learning process. LMS is also known as a virtual learning environment or a course management system, and it provides more flexible options and benefits for both learners and teachers. This system includes software tools and capabilities that make it simple to access and manage learning content. LMS is made up of seven separate tools that combine diverse features to provide a wholly online approach with little or no need for face-to-face sessions. The Blackboard learning management system was used by higher education institutions in Lagos (Edebatu et al., 2019).

This tool is essentially a web-based server application with features such as course administration, customized open architecture, and scalable design. This research focused on the role of technological development and digitization in mediating the link between organizational culture and student attitudes in higher education institutions. A knowledge vacuum exists because the connection between organizational culture and student attitudes toward technological development

and digitization has not been addressed. Higher education institutions in Lagos have used digital technologies in the educational system to help the universities achieve the Millennium Development Goals and the Sustainable Development Goals. Students in Lagos encounter several hurdles in gaining access to good instruction via digital technologies. Due to a lack of knowledge and abilities, access to and usage of digital technology devices has been challenging (Çetin et al., 2021).

2. LITERATURE REVIEW

Universities in Africa have recently begun to integrate technology into their operations. University libraries, which hold the intellectual materials of the institutions, are completely involved in this evolution (Vermeulen et al., 2017). Digitization in Africa refers to the "conversion of non-digital material to digital form" (Okeke et al., 2015, p. 37). Digitization refers to the endeavour to digitize the institution's intellectual property. It is related to the e-services that most libraries are attempting to adopt in the digital world (Bourne & Bourne, 2017). Nigeria is the most populous black country, with an estimated 200 million inhabitants. As of 2020, Nigeria has 170 universities, 43 of which are owned by the federal government, 48 by state governments, and 79 by private persons or organizations. According to Okoroma (2018), the funding of six university librarian heads to attend a workshop by UNESCO spurred the institutions' early interest in digitalization. The digitization of resources is projected to boost a university's image in the long run. It also contributes to the webometric ranking of universities among the best in the world (Andreoni, & Anzolin, 2019).

The primary motivations for digitization are to increase access and preservation. It entails compiling a database of items such as theses and dissertations, as well as other resources worth preserving (Purwanti et al., 2021). Several initiatives have been undertaken to advance the digitization problem in Nigeria. Because digitization is still novel in Nigeria (Muhammad, & Johar, 2019), most digitization efforts in Africa have historically originated from outside Nigeria. However, in today's knowledge-driven economy, where nations are evaluated based on their information power, Nigeria cannot afford to neglect the digitization of its resources. What Nigeria may consider seriously is the establishment of a digitization project in Nigeria by Nigerians to protect its resources. The digitization effort is capital demanding, necessitating sophisticated software and hardware technologies, highly qualified employees, and other infrastructure such as appropriate power supply, which many African nations lack (Ojogiwa, & Qwabe, 2021). According to Asongu and Tchamyou (2020), a fundamental difficulty for African digitization initiatives is the availability of competent labour. Moreover, Samsudeen and Mohamed (2019) state that the challenges impeding digitization in Africa are a lack of competence, legal copyright laws, insufficient financing, and organizational infrastructure. Even though Ghavifekr and Rosdy (2015) as well as Jayanthi et al. (2007) have advocated for institutional repositories to manage digitization issues, this development is disappointing.

The Internet has profoundly transformed the technological and economic environments in such a way that quantum jumps in the use of technology for learning are now achievable (Mallya et

al., 2019). According to one study, students of any academic background, ethnicity, computer proficiency, gender, or academic aptitude might learn using the Internet in the same way they would through traditional contact (Mohammed et al., 2020). Some experts (Samsudeen, & Mohamed, 2019) argue that not all present students are digital natives because the majority of their activities include the usage of the Internet.

Many scholars such as Hassan et al. (2019), Li and Yu (2020), and Mutahar et al. (2017) have explored the aspects that impact students' academic use of the Internet from various theoretical perspectives. The Technology Acceptance Model (TAM) developed by Davis (1986), the Innovation Diffusion Theory developed by Rogers (1962), the Theory of Reasoned Action developed by Fishbein and Ajzen (1975), and the Social Influence Theory developed by (Kelman, 1958; 1961) are the most prominent theories used to understand users' acceptance of information systems (IS). To understand students' attitudes and behavioural intentions toward accepting Internet usage for academic activities in higher education institutions in Lagos, Nigeria, we need to re-examine Davis' previously developed model (1986) using the following factors: Ease of Use, Perceived Usefulness, Behavioural Intention, and Attitude and Facilitating Condition. Re-examining the paradigm will bring to the forefront important questions about the adoption of innovation for education among students.

In theory, this study has focused on what impacts students' views and behavioural intentions regarding using the Internet for learning. Surprisingly, the enabling condition had no statistically significant impact on students' attitudes on using the internet for education. According to the findings, the usefulness of the Internet was a strong predictor of students' attitudes and behavioural intention to learn.

2.1. Relevant Theories

The study adopted Unified Theory of Acceptance and Use of Technology (UTAUT) to explain the concepts of attitudinal expectancy, relationship expectancy, facilitating conditions, social influence, and behavioural intention toward adopting technological change and digitization (Samsudeen, & Mohamed, 2019). The Motivation Model – ARCS – is employed as a theoretical foundation for the motivation in this study. An attitude consists of three components: the affective component related to emotions, the behavioural component concerning an individual's response, and the cognitive component involving evaluation (Jain, 2014). The focus of a student's attitude is on their desire to react in a certain way to something. Naturally, a student's reaction might range from positive to negative, or from good to bad (Samsudeen, & Mohamed, 2019). Luhamya et al. (2017) aimed to explore organizational culture as it influences public higher education institutions, looking at it through the lens of transformational leadership. This will be beneficial since it fits with the dynamism of technological progress and digitization.

Understanding students' technology and gadget usage has been an important interest of scholars in education. Numerous theoretical models have been developed to investigate this, but their use has mainly declined since the 2003 launch of UTAUT, which investigates Performance

Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions to assess technology acceptance (behavioural intention) and utilization. Age, gender, experience, and voluntariness of usage all modify these notions (Nicholas-Omoregbe et al., 2017).

The Attention, Relevance, Confidence, and Satisfaction (ARCS) model has been developed to investigate and comprehend how to acquire and sustain learner attention during the learning process. The ARCS model is based on Tolman and Lewin's Expectancy-Value Theory, which also advocates that attention, relevance, confidence, and satisfaction be taken into account to keep learners engaged. The ARCS model provides a structure and tactics for retaining staff and students in business and education. The third variable, organizational culture, is based on the two theories of UTAUT and ARCS, as both include elements of individuality and collectivism.

2.2. Conceptual Framework

This study is founded on three theories: The Unified Theory of Acceptance and Usage of Technology (UTAUT); Attention, Relevance, Confidence, and Satisfaction (ARCS) theory of motivation; and item response theory of attitude and transformational leadership-organizational culture. These three theories will be combined to investigate and comprehend digital technology users' behavioural intents and digital technology utilization at higher education institutions in Lagos.

FIGURE. 1: Research Conceptual Framework

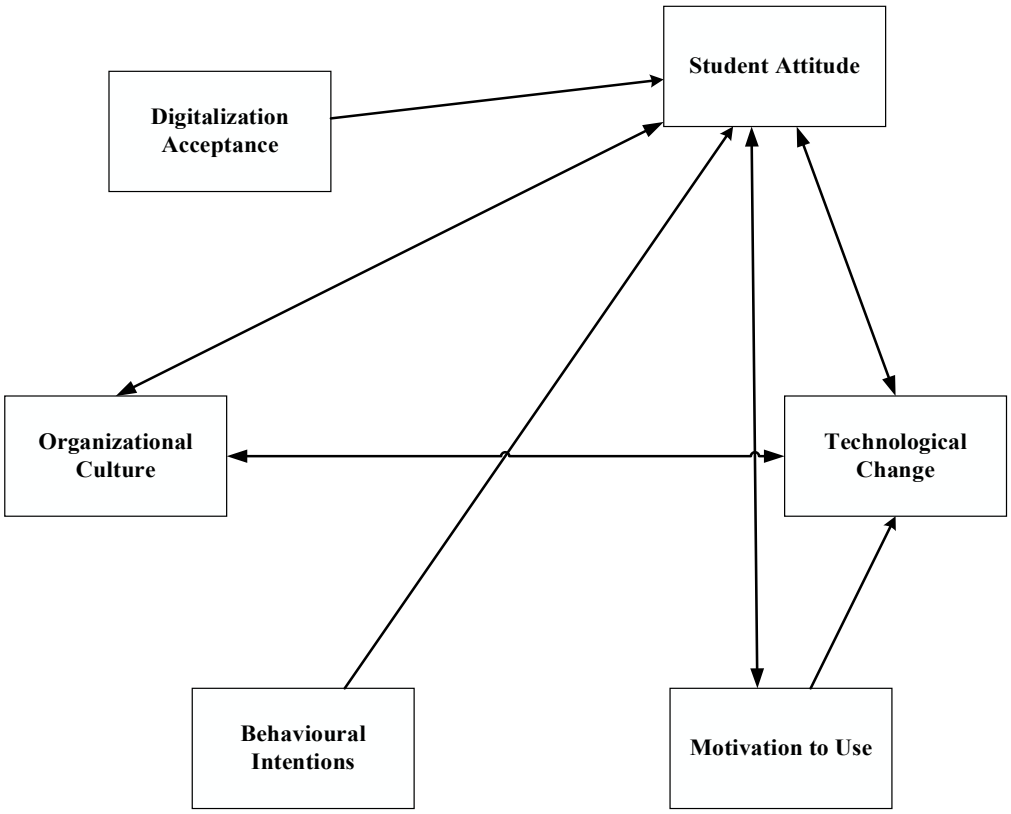
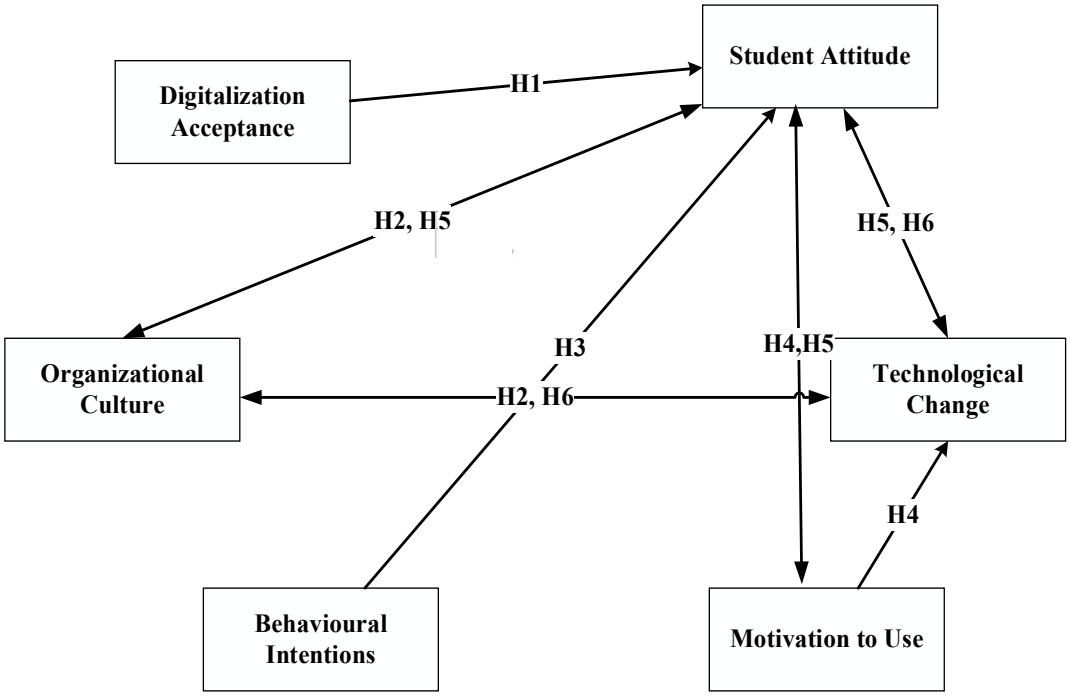


FIGURE. 2: Research Conceptual Framework Showing the Hypothesis and the Research Variables



The conceptual framework depicted in Figures 1 and 2 above demonstrates how attitude expectancy, effort expectancy (Digitization Acceptance), social influence (Organization Culture), facilitating conditions (Attitude to Change), and motivation to use digital technology influence higher education institution students' behavioural intentions and use of digital technology. However, according to the conceptual framework of this study, the respondents are students from higher education institutions in Lagos, ranging in age from 16 to 40 years old.

It is envisaged that the conceptual framework would aid in determining how the specified UTAUT variables and ARCS impact students' attitudinal intentions to utilize digital technology in higher education institutions. The study population's specific culture and setting add to the research body's distinctiveness. It is advantageous since, in general, there is still a lack of empirical study in which Behavioural Intention is examined as a mediator in the utilization of digital technology systems (Hussain et al., 2021; Parra et al., 2021; Samsudeen, & Mohamed, 2019).

3. RESEARCH METHODOLOGY

The study investigates the impact of technological development, namely digitization, on the link between organizational culture and students' attitudes regarding this change. This section discusses the research strategy, demographic, and sample methods, as well as the instruments used. It also discusses how data is prepared for structural equation modelling (SEM-AMOS) analysis.

3.1. Research Design

Correlational research examines the linkages between technological progress, digitization, corporate culture, and student attitudes in Lagos, Nigeria. Samples are obtained from the institutions that have agreed to participate. The approach is ideal for predicting and assessing the mediator effects of Path Analysis. Surveys are a superior form of primary data gathering in social and behavioural research in comparison with observation. As a result, a correlational research design is most suited to the current investigation. The correlational relationship between variables dictates the correlational design approach used to gather data via a structured questionnaire.

3.2. Location of the Study and Population Sampling

This research took place in higher education institutions in Lagos, Nigeria. It is Nigeria's most populous metropolis, with a population of around 17 million people. A critical part of survey research is selecting a representative sample. The features of the sample should represent the entire population, not just a subset of it. Because of its unique role as a country's representation, this research concentrated on higher education institutions in Lagos, Nigeria. Students from the University of Lagos, Lagos State University, Lagos State Polytechnique, Adeniran Ogunsanya College of Education, Federal College of Education Technical, Yaba College of Technology, Anchor University, Caleb University, and other institutions are the study's target audiences. Table 1 illustrates the proportions of sampling and the number of students in each stratum.

TABLE 1: Summary of the Proportional Sample Size

Institutions	Population	Percent	Sample size
University of Lagos	87	32.3	54
Lagos State University	94	34.9	58
Yaba college of technology	30	11.2	19
Lagos state polytechnic	29	10.8	18
Anchor University	29	10.8	18
TOTAL	**269**	**100**	**167**

Following the application of proportional stratified random sampling, the proportionate stratified sampling approach was utilized to choose respondents from pre-formed groupings or clusters. It should be noted that all groups had an equal opportunity to participate in this study. Finally, participants were picked at random from each of Lagos' higher education institutions; the researcher physically visited each school and delivered the questions after gaining consent from all participants.

3.3. Instrumentation

In this study, data was be collected using a questionnaire. The researcher perceived this tool as the appropriate tool for data collection because it can be distributed to a large number of respondents at the same and is relatively cheap and quick, which also allows the generalization of results to the larger population, according to Aldhafeeri and Khan (2016).

The questionnaire comprises five sections: A, B, C, D, and E. Section A consists of the respondents' demographic information such as age, specialization, region, the frequency of using the latest technology, and devices primarily used to access new technology. Section B comprised factors

influencing the utilization of digital technology; these factors consist of five sub-sections, namely (i) Technological Change (TC), (ii) Digitization Acceptance (DA), (iii) Organizational Culture (OC), (iv) Attitude to Change (AC), and (v) Mediating Variable in the use of new technology (MVNT) based on ARCS model. Section C is related to attitudes toward the usage of digital technological change as a mediator (DTC), while Section D is about the utilization of new technology. The latter consists of two sub-sections: Section 1 about level of further technology use (Volume) and Section 2 about level of new technology utilization (Frequency). Section (E) concerns the effect of organisational culture on students' attitudes. The composition of the questionnaire is presented in Table 2.

TABLE 2: Composition of the Questionnaire

Section	Aspect	Sources	No. Items
A	Demographic information		5
B	Factors influencing students' utilization of new technology	Venkatesh et al. (2003) Kim, & Keller (2010)	60
C	Attitude toward the use of digital technological change	Venkatesh et al. (2003)	5
D	The utilization of new technology	Asiri et al. (2012)	19
E	Effect of organisational culture on students' attitude	Alas, & Vadi (2006)	5
TOTAL			94

3.3.1. Demographic information

The first section (A) aims to collect background information about students in Higher education institutions in Lagos. This section consists of five items: age, specialization, name of institutions, new technology usage frequency, and devices used to access the latest technology.

3.3.2. Factors influencing students' utilization of digital technology

The second section (B) investigates the factors influencing digital technology utilization based on UTAUT theory and the ARCS model. This section consists of five Subsections, namely (1) Technology Change (TC), (2) Digitization Acceptance (DA), (3) Organizational Culture (OC), (4) Attitude to Change (AC), and (5) Mediating Variable in the use of new technology (MVNT). The total number of items in section B was 60 items adapted from instruments by Venkatesh et al. (2003) and Kim and Keller (2010).

TABLE 3: Components of Section B (Factors influencing students' utilization of digital technology)

Section	Factor	Sources	No. Items
1	Technology Change (TC)	Venkatesh et al. (2003)	5
2	Digitization Acceptance (DA)	Venkatesh et al. (2003)	6
3	Organizational Culture (OC)	Venkatesh et al. (2003)	8
4	Attitude to Change (AC)	Venkatesh et al. (2003)	5
5	Mediating Variable in the use of new technology (MVNT)	Kim & Keller (2010)	36
TOTAL			60

3.3.3. Attitude toward the use of digital technological change mediator

The purpose of the third section (C) of this questionnaire is to investigate participants' perception of behavioural intention in using digital technological change and see whether behaviour intention is a mediator between factors influencing digital technology use and the utilization of new technology. This section consists of five items adapted from Venkatesh et al. (2003).

3.3.4. The Utilization of New Technology

The purpose of the fourth section (D) of this questionnaire is conceived to be the frequency and volume of digital technology usage by students at the various higher education institutions in Lagos. This section consists of 19 items distributed into two subsections: Section 1 on Level of digital technology usage (Volume) and Section 2 on Level of digital technology utilization (Frequency). The description is shown in Table 4.

TABLE 4: Components of Section D (Utilization digital technology)

Section		Sources	No. Items
1	Level of digital technology usage (Volume)	Asiri et al. (2012)	5
2	Level of digital technology utilization (Frequency)	Asiri et al. (2012)	14
TOTAL			19

3.3.5. The Effects of Organisational Culture on Students' Attitude

The purpose of the last section (E) is to investigate the participants' perceptions of organizational culture's role and its direct and significant effect on students' attitudes toward technological change and digitization.

3.4. Validity and Reliability

Validity and reliability are two factors that must be properly verified in a study's employed instrument. The validity of an instrument relates to how well it measures the material that it was supposed to assess. When the content of an instrument matches the material covered in the subject area, it is considered legitimate. The capacity of an instrument to make consistent measurements from one set to another is referred to as its dependability. Instrument dependability is the capacity of an instrument to be consistently interpreted across a variety of scenarios in which a set of indications of the hidden construct is internal consistency. In a structural equation model, reliability is defined as the degree of measurement error in the variables that may be used to determine the correlation between the items and the construct. A widely accepted rule of thumb for describing internal consistency using Cronbach's alpha is depicted in Table 5.

TABLE 5: Recommended Alpha Range

Alpha range	Internal Consistency
Below 0.6	Unacceptable
Between 0.6 and 0.65	Undesirable
Between 0.65 and 0.7	Minimally Acceptable
Between 0.7 and 0.8	Respectable
Between 0.8 and 0.9	Very Good
Above 0.9	Excellent

Source: Cortina (1993)

Cronbach's Alpha is a reliability coefficient that was utilized in this study to assess the dependability of the obtained data. The internal consistency with unsatisfactory, undesirable, minimally acceptable, respectable, very good, and outstanding division has been carried out from below 0.6 to above 0.9 according to the alpha range. We examined dependability from two perspectives: accuracy (the degree of correctness) and unreliability (the degree of inaccuracy).

3.5. Data Collection

Data collection is an essential component of every research project since it allows the researcher to obtain first-hand knowledge for decision-making. The researchers collected data from each institution sampled using an observation checklist and a Semi-Structured Interview guide. Simultaneously, the respondents were given access to the semi-structured interview guide's questions, and their replies were recorded.

3.6. Data Analysis

The data in this study were analysed using descriptive and inferential statistics. The descriptive analysis was carried out with the help of the Statistical Package for Social Sciences (SPSS) version 22. In addition, for the inferential analysis, Analysis of Moment Structures (AMOS) version 22 was used.

3.7. Descriptive Statistics

In this study, descriptive statistical analysis was used to calculate percentages, frequencies, means, and standard deviations. To characterize the demographic data and research questions, descriptive analysis was used. The Analysis of Moment Structures (AMOS) version 22 was used to do Structural Equation Modeling (SEM).

3.8. Structural Equation Modelling

SEM is a statistical approach that combines factor and path analysis to study a sequence of correlations between variables. SEM has various characteristics that set it apart from other statistical analysis approaches, such as the ability to estimate a sequence of direct and indirect impacts

at the same time. Confirmatory Factor Analysis (CFA), Measurement Model (MM), and Structural Model (SM) were used to evaluate SEM. SEM was evaluated in this study using CFA.

3.9. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) is the initial phase in the SEM study and takes into account data preparation before the actual SEM analysis. The CFA was designed to specify distinct constructs and was used for three main purposes:

i. model fit testing,
ii. convergent validity testing, and
iii. construct reliability testing.

The model fit test may be used to assess how well the model matches the sample data.

3.9.1. Model fit indices

The fit indices that can be used to measure the model fit include three types.

i. Absolute fit indices directly evaluate how well the stated model reproduces the observed data and offer the requisite fitness theory assessment. It is accomplished by referring to various generally used index values in SEM, such as Root Mean Square Error Approximation (RMSEA), which shows a perfect match when the value of RMSEA is less than 0.08. The goodness of fit index (GFI) and the Chi-Square (Chi-sq) are both very sensitive to sample size and the number of variables in the model. As a result, its value alone does not adequately characterize the model's fit.
ii. Incremental fit indices quantify the degree of improvement when comparing the estimated model to the null model, assuming that all observed variables are uncorrelated. The Comparative Fit Index (CFI), which analyses the shift from the target model to the independent model and must be larger than 0.9, is widely employed. The Normed Fit Index (NFI), Incremental Fit Index (IFI), which may uncover inconsistency and must be more than 0.9, and Tucker-Lewis Index (TLI), are all useful.
iii. Parsimonious fit measures present Parsimony fit indices to estimate the best model among a set of computing models such as Relative Chi-sq (Chi-sq/df).

To increase model fit in this study, elements with factor loading less than 0.60 must be removed (Hooper et al., 2008; Awang, 2014).

i. Acceptance of technological change CFA. The initial model indicated poor match with one component, Actual Use (Volume). The component with factor loadings less than 0.60 was eliminated to enhance model fit. Then, the test was conducted again. The model fit showed a good fit (CFI ≥ 0.9, IFI ≥0.9, and RMSEA ≤ 0.08) with the retained items.

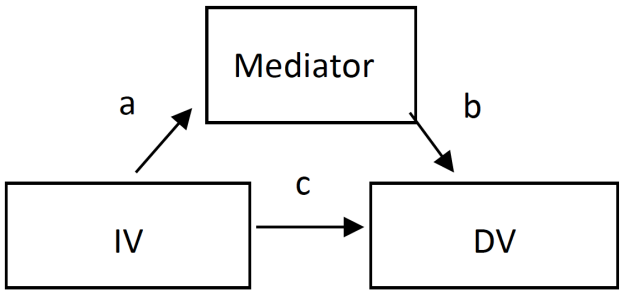
ii. Digital technology CFA. The original model, Actual Use (Frequency), with fourteen components, suggested a poor match. The two components with factor loadings of less than 0.60 were deleted to improve model fit. The test was carried out once again, and the model fit showed a good fit with the remaining items where all the indices followed the criteria (CFI ≥ 0.9, IFI ≥0.9, and RMSEA ≤ 0.08).

3.10. Mediator Variable

When one variable interposes between two variables that are connected to it, the mediating effect occurs. A substantial correlation between the mediator variable and the other factors is required.

In this study, technological transformation and digitization are viewed as model mediator factors. In route analysis, mediator roles were defined as an indirect prediction or a mediating impact, and all these paths estimate direct and indirect effects between the variables in the model. The description of mediating effects is shown in Figure 3.

FIGURE 3: Indirect and Direct Effects of Mediator



In this study, only a direct effect (c) between all independent variables and the factors affecting the utilization of new technology were estimated in an initial model. A second model was then calculated by adding the mediator variable to draw the additional paths (a & b) between IV's and DV in the mediating effect by behavioural intention.

This plays an important part in ensuring consistent internal measurement. In the current investigation, several factors were assessed to arrive at the same results as statistical analysis. For example, the third hypothesis testing sought to identify behavioural intents as a moderator of its connection with other key factors in technological development among students in higher education institutions. As a consequence of the regression findings, it was discovered that behavioural intention has a considerable influence on higher education institutions' use of digital technology. Moreover, it was consequently found to be one of the most prominent factors affecting technology change used as the value is estimated at 0.24. Therefore, the behavioural intention positively influences the utilization of digital technologies and the students' technicalities and the higher level of preferences such as using smartphones, laptops, and other communicative devices to facilitate the learning process.

4. RESULTS

Research question one: What is the relationship between both learning flexibility and students' attitudes regarding the online distance learning (ODL) program in Nigeria?

TABLE 6: Respondents' Mean and Standard Deviation on Learning Flexibility and Students' Attitudes Toward Open and Distance Learning

Variable	Freq.	Mean (X)	Standard Deviation (SD)	Regression	Significance
Digital Learning Flexibility	476	54.31	4.76	.439**	0000
Student's Attitude	476	52.37	5.65		

Table 6 displays the mean and standard deviation of respondents' responses to questions about learning flexibility and students' attitudes toward open and remote learning. For the two builds, the table shows X = 54.31, SD = 4.76 and X = 52.37, SD = 5.65. A similar null hypothesis was investigated using Pearson Product Moment Correlation analysis to assess whether the mean scores had any meaningful link. According to the hypothesis, there is no significant association between learning flexibility and students' attitudes regarding the ODL program in Lagos State, Nigeria. The table demonstrated a statistically significant positive relationship between learning flexibility and students' attitudes regarding open and distance learning (r =.439, Freq=476, p.05).

Research question two: What is the link between students' access to support services and their perceptions of the ODL program in Nigeria?

TABLE 7: Respondents' Mean and Standard Deviation on Student Support Services, as well as their Attitude Toward Open and Distance Learning

Variable	Freq.	Mean (X)	Standard Deviation (SD)	Regression	Significance
Technology Supports	476	51.83	4.62	.339**	0000
Student's Attitude	476	52.37	4.86		

Table 7 displays the mean and standard deviation of respondents' attitudes regarding student support services and open and remote learning. For the two builds, the table shows X = 51.83, SD = 4.62 and X = 52.37, SD = 4.86. A similar null hypothesis was investigated using Pearson Product Moment Correlation analysis to assess whether the mean scores had any meaningful link. According to the hypothesis, there is no statistically significant association between technology support and students' attitudes regarding the ODL program in Lagos State, Nigeria. The table demonstrated a statistically significant positive relationship between students' use of ongoing support and their attitudes regarding the ODL program (r =.339, Freq=476, p.05). The hypothesis was not validated, meaning that students' views on enrolling in the program would improve as long as student support services are present and functioning in ODL.

5. DISCUSSION OF FINDINGS

The findings of research question one, as well as the null hypothesis that is connected to it, demonstrated that there is a substantial positive relationship between learning flexibility and students' views about ODL programs in Lagos State. According to the findings, when stakeholders focus more on making the program more adaptable for learners, students' opinions toward enrolling in ODL programs increase. This may be because learning flexibility allows students to participate in online education at their own pace and in their location. This learning approach effectively helps a student with greater independence to engage in autonomous learning according to their background, talents, and interests. As learning progresses in this manner, students may develop a more positive attitude about ODL. The findings are consistent with the findings of Alhih et al. (2017), who discovered flexibility in student-content interaction in synchronous mediums such as material shared, multiple media tools utilized, and postings during the course. The conclusion is further reinforced by Cassidy et al. (2016), who discovered that learning flexibility allows educators to safely expose children to varied actors, activities, and situations using an established curriculum. The findings of research question two, as well as the null hypothesis that accompanied it, suggested that there is a substantial positive relationship between student support services and students' views about ODL programs in Lagos State.

This finding might be explained by the fact that if the ODL program focuses more on developing student support services, the institution's overall image will likely improve, and students' willingness to enrol in the program will also improve. Increased student support services potentially result in current ODL students being retained and a greater completion rate. Mayanja et al. (2019) found that by introducing learning management systems, web-based apps, registration, and results viewing, Lagos State University has improved student learning and assistance, ensuring students' happiness and retention in the ODL system. Afify (2018) discovered statistically significant differences in the mean scores of the experimental groups, which were supported by timely feedback in developing blogging design and production abilities and satisfaction with the distance e-learning environment. However, Ain et al. (2016) discovered that the majority of the students were unsatisfied with the support system provided to them at institutions of higher learning, resulting in a negative attitude about ODL.

6. CONCLUSION

Based on the findings reported, we can infer that there is a direct relationship between the flexibility of learning in the ODL program and students' views on enrolling in the program at Lagos State, Nigeria. Students' opinions about the ODL program are likely to be positive as long as the program stays adaptive through student-content interaction in synchronous and asynchronous mediums, the use of multiple media tools, and rapid response through postings during the course. It was also demonstrated in Lagos State, Nigeria, that there is a linear relationship between student

support services and their attitude toward ODL. This conclusion is based on the fact that support services like help and prompt feedback make the ODL program more enjoyable for learners, resulting in a positive attitude toward the program.

7. RECOMMENDATIONS

The study recommendations based on the results are as follows:

1. To enhance students' attitudes toward accepting enrolment in ODL, program management, in collaboration with program coordinators, should endeavour to make the program more flexible to attract more students' enrolment.
2. To develop a positive attitude toward ODL, program organizers should expand learner support services to meet varied learner characteristics and to assist prospective students with their inquiries.
3. Further research into students' attitudes and perceptions of management in higher education institutions should be carried out.

8. REFERENCES

Afify, M. K. (2018). The Effect of the Difference Between Infographic Designing Types (Static vs Animated) on Developing Visual Learning Designing Skills and Recognition of its Elements and Principles. *International Journal of Emerging Technologies in Learning*, *13*(9). https://doi.org/10.3991/ijet.v13i09.8541

Ain, N., Kaur, K., & Waheed, M. (2016). The influence of learning value on learning management system use: An extension of UTAUT2. *Information Development*, *32*(5), 1306-1321. https://doi.org/10.1177/0266666915597546

Alas, R., & Vadi, M. (2006). The impact of organisational culture on organisational learning and attitudes concerning change from an institutional perspective. *International Journal of Strategic Change Management, 1*(1-2), 155-170. https://doi.org/10.1504/IJSCM.2006.011109.

Aldhafeeri, F. M., & Khan, B. H. (2016). Teachers' and students' views on e-learning readiness in kuwait's secondary public schools. *Journal of Educational Technology Systems*, *45*(2), 202–235. https://doi.org/10.1177/0047239516646747

Alhih, M., Ossiannilsson, E., & Berigel, M. (2017). Levels of interaction provided by online distance education models. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(6), 2733-2748. https://doi.org10.12973/eurasia.2017.01250a

Andreoni, A., & Anzolin, G. (2019). *A revolution in the making? Challenges and opportunities of digital production Technologies for developing countries* (Inclusive and Sustainable Industrial Development Working Paper Series No. 7). UNIDO.

Asiri, M. J. S., Mahmud, R. B., Bakar, K. A., & Ayub, A. F. B. M. (2012). Factors influencing the use of learning management system in Saudi Arabian higher education: A theoretical framework. *Higher Education Studies*, *2*(2), 125-137.

Asongu, S. A., & Tchamyou, V. S. (2020). Human capital , knowledge creation , knowledge diffusion , institutions and economic incentives : South Korea versus Africa. *Contemporary Social Science*, *15*(1), 26–47. https://doi.org/10.1080/21582041.2018.1457170

Awang, Z. (2014). A Handbook on SEM for Academicians and Practitioners: the step by step practical guides for the beginners. *Bandar Baru Bangi: MPWS Rich Resources, 10*(3), 32-45.

Bourne, D. T. T., & Bourne, D. T. T. (2017). An investigation of senior secondary school teachers' experiences of integrating information and communication technologies into teaching

and learning in the era of Australia' s Digital Education Revolution. *University of Wollongong Research Online*. https://ro.uow.edu.au/theses1/76/

Cassidy, A., Fu, G., Valley, W., Lomas, C., Jovel, E., & Riseman, A. (2016). Flexible learning strategies in first through fourth-year courses. *Collected Essays on Learning and Teaching*, *9*, 83-94. https://doi.org/10.22329/celt.v9i0.4438

Çetin, S., De Wolf, C., & Bocken, N. (2021). Circular digital built environment: An emerging framework. *Sustainability (Switzerland)*, *13*(11), 1–34. https://doi.org/10.3390/su13116348

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of applied psychology*, *78*(1), 98-104. https://doi.org/10.1037/0021-9010.78.1.98

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [Doctoral dissertation, Massachusetts Institute of Technology].

Edebatu, D. C., Ekwonwune, E. N., & Ezeobi, C. (2019). Learning Management System for improved service delivery in tertiary institution. *International Journal of Communications, Network and System Sciences*, *12*(3), 37-48. https://doi.org/10.4236/ijcns.2019.123004

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and Learning with Technology: Effectiveness of ICT Integration in Schools. *International Journal of Research in Education and Science*, *1*(2), 175. https://doi.org/10.21890/ijres.23596

Hassan, M., Sibtain, S., Shah, A., & Padlee, S. F. (2019). Technology Acceptance Model (TAM) and Dynamics of Online Purchase Adaptability. *International Journal of Recent Technology and Engineering, 8*(1), 1-13.

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). *Evaluating Model Fit: a Synthesis of the Structural Equation Modelling Literature* [Conference paper]. 7th European Conference on Research Methodology for Business and Management Studies, Regent's College, London, United Kingdom. https://doi.org/10.21427/D79B73

Hussain, S., Mustafa, M. W., Jumani, T. A., Baloch, S. K., Alotaibi, H., Khan, I., & Khan, A. (2021). A novel feature engineered-CatBoost-based supervised machine learning framework for electricity theft detection. *Energy Reports*, *7*(3), 4425–4436. https://doi.org/10.1016/j.egyr.2021.07.008

Jain, V. (2014). 3D Model of Attitude. *International Journal of Advanced Research in Management and Social Sciences, 3*(3), 1-12. https://garph.co.uk/ijarmss/mar2014/1.pdf

Jayanthi, M. K., Srivatsa, S. K., & Ramesh, T. (2007). Object oriented analysis and design of e-Learning system. *Information Technology Journal*, *6*(6), 818-826. https://doi.org/10.3923/itj.2007.818.826

Kelman, H. C. (1958). Compliance, Identification, and Internalization: Three Processes of Attitude Change. *Journal of Conflict Resolution, 2*(1), 51-60. https://doi.org/10.1177/002200275800200106

Kelman, H. C. (1961). Processes of Opinion Change. *Public Opinion Quarterly 25*(1), 57-78.

Kim, C., & Keller, J. M. (2010). Motivation, Volition and Belief Change Strategies to Improve Mathematics Learning. *Journal of Computer Assisted Learning*, *26*(5), 407-420. https://doi.org/10.1111/j.1365-2729.2010.00356.x

Li, H., & Yu, J. (2020). Learners' continuance participation intention of collaborative group project in virtual learning environment: an extended TAM perspective. *Journal of Data, Information and Management*, *2*(1), 39–53. https://doi.org/10.1007/s42488-019-00017-8

Luhamya, A., Bakkabulindi, F. E. K., & Muyinda, P. B. (2017). Integration of ICT in teaching and learning: a review of theories. *Makerere Journal of Higher Education*, *9*(1), 21-36. https://doi.org/10.4314/majohe.v9i1.2

Mallya, J., Lakshminarayanan, S., & Payini, V. (2019). Self-efficacy as an antecedent to students ' behavioral intention to use the Internet for academic purposes : A structural equation modeling approach. *Library philosophy and practice.* https://core.ac.uk/download/pdf/228203799.pdf

Mayanja, J., Tibaingana, A., & Birevu, P. M. (2019). Promoting Student Support in Open and Distance Learning Using Information and Communication Technologies. *Journal of Learning for Development*, *6*(2), 177-186. https://doi.org/10.56059/jl4d.v6i2.360

Mohammed, B. H., Safie, N., Sallehuddin, H., & Hussain, A. H. Bin. (2020). Building Information Modelling (BIM) and the Internet-of-Things (IoT): A Systematic Mapping Study. *IEEE Access*,

8, 155171–155183. https://doi.org/10.1109/ACCESS.2020.3016919

Muhammad, Z., & Johar, F. (2019). Critical success factors of public–private partnership projects: a comparative analysis of the housing sector between Malaysia and Nigeria. *International Journal of Construction Management*, *19*(3), 257–269. https://doi.org/10.1080/15623599.2017.1423163

Mutahar, A. M., Norzaidi, M. D., Ramayah, T., & Isaac, O. (2017). Integration of Innovation Diffusion Theory (IDT) and Technology Acceptance Model (TAM) to Understand Mobile Banking Acceptance in Yemen : The Moderating Effect of Income. *June*. I*nternational Journal of Soft Computing, 12*(3), 164-177.

Nicholas-Omoregbe, O. S., Azeta, A. A., Chiazor, I. A., & Omoregbe, N. (2017). Prediting the adoption of e-learning management system : A case of selected private universities in Nigeria. *Turkish Online Journal of Distance Education*, *18*(2), 106–121. https://doi.org/10.17718/tojde.306563

Ojogiwa, O. T., & Qwabe, B. R. (2021). Leveraging on the management of organisational cultural change for an improved change outcome in the Nigerian public health sector. *African Journal of Governance and Development*, *10*(1), 61–79.

Okeke, I. E., Udem, O. K., & Onwurah, B. (2015). Digitization of Library Resources in University Libraries: A Practical Approach, Challenges and Prospects. *Madonna University Journal of Research in Library and Information Science, 3*(2), 36-47.

Okoroma, F. N. (2018). Technological and Infrastructural Issues of Institutional Repositories in University Libraries in Nigeria: And the Way Forward. *International Information & Library Review*, *50*(3), 251-262. https://doi.org/10.1080/10572317.2018.1491710

Okposio O. Collins. (2011). The use of ict in teaching and learning of physical education. *Continental Journal of Education Research*, *4*(2), 29–32.

Parra, C. M., Gupta, M., & Mikalef, P. (2021). Information and communication technologies (ICT)-enabled severe moral communities and how the (Covid19) pandemic might bring new ones. *International Journal of Information Management*, *57*, 1-16. https://doi.org/10.1016/j.ijinfomgt.2020.102271

Purwanti, Y., Erlangga, H., Kurniasih, D., Pratama, A., Sunarsi, D., Manan, A., Imam Duta Waskita, N., Ilham, D., Aditya Dwiwarman, D., & Purwanto, A. (2021). The Influence Of Digital Marketing & Innovasion On The School Performance. *Turkish Journal of Computer and Mathematics Education*, *12*(7), 118–127.

Rogers, E. M. (1962). *Diffusion of innovations.* Free Press of Glencoe.

Samsudeen, S. N., & Mohamed, R. (2019). University students' intention to use e-learning systems: A study of higher educational institutions in Sri Lanka. *Interactive Technology and Smart Education*, *16*(3), 219–238. https://doi.org/10.1108/ITSE-11-2018-0092

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

Vermeulen, M., Kreijns, K., van Buuren, H., & Van Acker, F. (2017). The role of transformative leadership, ICT-infrastructure and learning climate in teachers' use of digital learning materials during their classes. *British Journal of Educational Technology*, *48*(6), 1427–1440. https://doi.org/10.1111/bjet.12478

Wright, K. O., Tayo, F., Odusanya, O. O., Kuyinu, Y. A., Odugbemi, B., Arowolo, T., & Bakare, O. (2013). Perception and practices of Lagos state residents on the prevention and control of malaria in Lagos, Nigeria. *Annals of Tropical Medicine & Public Health*, *6*(5), 503. ttps://doi.org/10.4103/1755-6783.133698

Innoeduca. International Journal of Technology and Educational Innovation
Vol. 9. No. 1. Junio 2023 - pp. 143-156 - ISSN: 2444-2925 DOI: https://doi.org/10.24310/innoeduca.2023.v9i1.14237

Diseño, construcción y validación de rúbrica para medir la motivación en Educación Infantil con el uso de Realidad Aumentada

Design, Construction and Validation of a Rubric to Measure Motivation in Early Childhood Education with the Use of Augmented Reality

RECIBIDO 09/02/2022 ACEPTADO 10/06/2022 PUBLICADO 01/06/2023

Catalina Aroca-Reyes
Universidad de Sevilla, España
catalinaarocareyes@gmail.com

Carmen Llorente-Cejudo
Universidad de Sevilla, España
karen@us.es

RESUMEN

La Realidad Aumentada (RA) está cada vez más presente en todos los niveles de nuestro sistema educativo, desde Educación Infantil hasta la Universidad. Este trabajo analiza la validez y fiabilidad del Cuestionario sobre la influencia de la Realidad Aumentada en la motivación infantil "CIRAMI", adaptado del "Instructional Materials Motivation Survey IMMS" (Keller, 2010). Se analiza la atención, la relevancia, la confianza y la satisfacción en los niños de 3 a 6 años tras la utilización en el aula de un recurso tecnológico bajo RA. Se emplea la técnica del juicio de expertos, valorando la pertinencia y claridad de los diferentes ítems. El análisis de los resultados obtenidos en el proceso de validación del CIRAMI indican que cuenta con una adecuada validez de contenido, confiabilidad y validez de constructo. La fiabilidad del cuestionario muestra un índice alfa de Cronbach de .77. Debido a la falta de instrumentos que ayuden a medir la motivación del alumnado de educación infantil con TIC, se presenta como recurso a emplear en investigaciones de características similares.

PALABRAS CLAVE Realidad aumentada; Tecnología Educativa; Educación Infantil; Motivación; Juicio de expertos; Cuestionario.

ABSTRACT

Augmented Reality (AR) is increasingly present at all levels of our educational system, from Early Childhood Education to University. This work analyzes the validity and reliability of the Questionnaire on the influence of Augmented Reality on child motivation "CIRAMI", adapted from the "Instructional Materials Motivation Survey IMMS" (Keller, 2010). Attention, relevance, trust, and satisfaction in children aged 3 to 6 years after using a technological resource under AR in the classroom are analyzed. The technique of expert judgment is used, assessing the relevance and clarity of the different items. The analysis of the results obtained in the CIRAMI validation process indicates that it has adequate content validity, reliability and construct validity. The reliability of the questionnaire shows a Cronbach's alpha index of .77. Due to the lack of instruments that help to measure the motivation of the child education student with ICT, it is presented as a resource to be used in research with similar characteristics.

KEYWORDS Augmented reality; Educational technology; Early Childhood Education; Motivation; Expert judgment; Questionnaires.

1. INTRODUCCIÓN

La Realidad Aumentada (RA) es una tecnología que se está incorporando a la práctica educativa de una forma habitual. En la actualidad, se empieza a contemplar su uso en la normativa actual y son muchos los docentes interesados en el tema que están incorporando esta tecnología en su práctica educativa, debido a que es un recurso educativo que aporta numerosos beneficios al proceso de enseñanza aprendizaje. Aguaded y Cabero (2014) defienden que hay avances tecnológicos que nos ofrecen una enorme diversidad de posibilidades para crear nuevas escenografías comunicativas para la enseñanza. Para Barroso y Gallego (2017), la realidad aumentada facilita una combinación de información digital e información física en tiempo real por medio de diferentes soportes tecnológicos, creando con ello una nueva realidad.

Este uso de RA en la educación infantil puede verse en las numerosas publicaciones sobre esta tecnología en nuestro país (España), Latinoamérica, y en el resto del mundo. Hay varios estudios que demuestran que los alumnos de educación infantil consiguen resultados positivos en habilidades transversales como la colaboración, la comunicación, la atención y la participación activa tras utilizar la RA.

La mayoría de los estudios publicados defienden el efecto de esta tecnología en la motivación de los alumnos, afirman que el uso de la RA mejora la motivación de los niños, sin dejar constancia de ello. Por lo tanto, y centrándose en el campo específico de las Tecnologías de la Información y la Comunicación (TIC) en educación infantil, se han realizado revisiones sistemáticas sobre el uso de la RA en la educación infantil.

De acuerdo con Bethencourt-Aguilar et al. (2021), la integración de la tecnología en el currículo pasa por políticas educativas que respalden el desarrollo de la competencia digital del alumnado, así como un uso crítico de las TIC. Yelland (2007) afirmó que las formas digitales multimodales de expresión y comunicación ofrecen un cambio significativo en nuestra cultura y, por lo tanto, desafíos para los educadores. Los cambios en torno al uso de las TIC tienen un profundo impacto en el trabajo de los docentes, como los métodos de instrucción, el contenido de la enseñanza y la relación con los niños pequeños, lo que ha generado nuevas expectativas sobre su trabajo y sus roles para afrontar y enfrentar los desafíos digitales que conlleva su incorporación a la práctica docente.

Actualmente, nos encontramos en una sociedad cada vez más digital y la escuela tiene una responsabilidad fundamental en el desarrollo de la competencia tecnológica de los estudiantes de todas las etapas educativas (Gabarda Méndez et al., 2021).

Los estudios realizados indican que los factores que influyen en la integración de las TIC en las aulas pueden ser múltiples y complejos. Algunos de ellos señalan que el uso efectivo de las TIC en la educación depende, en gran medida, de la manera en que los docentes lo integran en la enseñanza y el aprendizaje (Nikolopoulou, & Gialamas, 2015). De hecho, el papel central de los docentes en el uso de las tecnologías apunta a que una razón fundamental por la que éstas no se utilizan y se encuentran poco integradas en las aulas está directamente relacionada con las intenciones y capacidades de los docentes para integrarlas, más que con la falta o poca dotación tecnológica que posean (Nikolopoulou, & Gialamas, 2010).

Numerosos estudios destacan los beneficios de la RA con fines educativos, debido a su capacidad para captar la atención de los alumnos creando sistemas de aprendizaje en nuevos entornos virtuales tridimensionales e interactivos que permiten a los estudiantes experimentar modelos tangibles de lugares y objetos

(García et al., 2010), reforzando el aprendizaje y aumentando la motivación para aprender (Reinoso, 2012). Algunas de las ventajas del uso de la realidad aumentada en educación según Terán (2012) son: desarrollo de habilidades cognitivas, espaciales, perceptivo motoras y temporales en los estudiantes, indistintamente de su edad y nivel académico; reforzamiento de la atención, concentración, memoria inmediata (corto plazo) y memoria mediata (largo plazo) en sus formas visuales y auditivas, así como del razonamiento; activación de procesos cognitivos de aprendizaje.

La RA trabaja de forma activa y consciente sobre estos procesos, porque permite confirmar, refutar o ampliar el conocimiento, generar nuevas ideas, sentimientos u opiniones acerca del mundo; formación de actitudes de reflexión al explicar los fenómenos observados o brindar soluciones a problemas específicos; suministra un entorno eficaz de comunicación para el trabajo educativo, porque reduce la incertidumbre del conocimiento acerca de un objeto; aumenta la actitud positiva de los estudiantes ante el aprendizaje, así como su motivación o interés en el tema que se esté abordando, reforzando capacidades y competencias (independencia, iniciativa y principio de la autoactividad o trabajo independiente).

Para De la Horra (2017), la RA es una herramienta que tiene unas características muy especiales y ofrece grandes oportunidades de integración en el ámbito de la educación y la formación. Su flexibilidad, portabilidad y manejo hacen que el usuario se sienta cómodo durante el proceso de aprendizaje.

Según el estudio realizado por la European Commission (2015) denominado "Young children (0-8) and digital technology: a qualitative exploratory study across seven countries", se indica que el dispositivo preferido por los menores son las tabletas, debido a la multifuncionalidad que ofrecen (citado en Gallardo Fernández et al., 2021).

Gracias a la llegada de los dispositivos móviles, la realidad aumentada está más cerca que nunca de los usuarios. Sin duda, la RA no es una moda pasajera, sino una herramienta para construir importantes pilares educativos.

Con la intención de elaborar un instrumento que sirva para evaluar la motivación de los niños de 3 a 6 años, se elabora el cuestionario sobre la influencia de la RA en la motivación infantil (CIRAMI), realizando una adaptación del instrumento *Reduced Instructional Materials Motivation Survey* (RIMM) (Loorbach et al., 2015), que a su vez es una adaptación del *Instructional Materials Motivation Survey* (IMMS) (Keller, 2010)

El propósito fundamental del estudio consiste en la creación de un instrumento para medir la motivación tras el uso de Realidad Aumentada, pero que se pueda aplicar tras el uso de cualquier recurso tecnológico. En esta investigación, el objetivo que se persigue es describir el proceso de diseño y validación de un cuestionario *ad hoc* capaz de analizar la influencia de la Realidad Aumentada en la motivación infantil. Por ello, los objetivos específicos planteados para este trabajo pretenden:

O1: Analizar la validez de contenido del instrumento "Cuestionario sobre la influencia de la RA en la motivación infantil".

O2: Examinar la validez de constructo del "Cuestionario sobre la influencia de la RA en la motivación infantil".

03: Estudiar la fiabilidad del "Cuestionario sobre la influencia de la RA en la motivación infantil".

2. MATERIAL Y MÉTODO

2.1. Procedimiento

La construcción del cuestionario CIRAMI se basó en la revisión bibliográfica de las investigaciones referentes a la RA relacionada con cuestionarios para medir la motivación infantil.

Para la construcción del instrumento de evaluación se ha realizado una minuciosa y extensa búsqueda bibliográfica, aunque cabe destacar la escasez de información encontrada, puesto que existen muy pocos estudios sobre esta temática y más aún, en relación con la etapa objeto de estudio. Una de las posibles razones de esta escasez, podría ser la incapacidad de los niños de esta etapa para cumplimentar los instrumentos validados por la comunidad científica puesto que la mayoría de ellos, aún no tienen adquirido el dominio de las destrezas de lectoescritura (Blanco, 2017).

Para la redacción de los ítems que componen el cuestionario, se ha seguido un proceso de revisión bibliográfica:

1. Revisión de la bibliografía referente a los estudios sobre motivación infantil con sujetos de edades comprendidas entre los 3 y los 6 años.
2. Revisión de la bibliografía referente a estudios sobre la influencia de la realidad aumentada en la motivación de los estudiantes.
3. Estudio del cuestionario *Instructional Materials Motivation Survey* (Cuestionario sobre la motivación en materiales didácticos) (IMMS), basado en el Diseño Motivacional ARCS (Atención, Relevancia, Confianza y Satisfacción) de Keller (1987) como ejemplo de instrumento para medir la motivación.

   El cuestionario *Instructional Materials Motivation Survey* (IMMS), basado en el modelo ARCS de Keller (1987) consta de 35 preguntas, divididas en cuatro dimensiones: Atención, Confianza, Relevancia y Satisfacción.

   El modelo de diseño motivacional de ARCS se ha utilizado innumerables veces para diseñar instrucciones internacionales que se centran en la atención, relevancia, confianza y satisfacción. (Che, 2012; Di Serio et al., 2013; Gallego, 2018; Lu, & Ying-Chieh, 2014; Proske et al., 2014; Wei et al., 2015).
4. Estudio del Instrumento Reduced Instructional Materials Motivation Survey (RIMMS), adaptación del Instructional Materials Motivation Survey (IMMS), creado en 2015 por los doctores Nicole Loorbach, Oscar Peters, Joyce Karreman y Michaël Steehouder (Loorbach et al., 2015).

En 2015, Loorbach, Peters, Karreman y Steehouder, crearon el Instrumento *Reduced Instructional Materials Motivation Survey* (RIMMS), adaptación del instrumento IMMS, pero que cuenta con 12 preguntas.

Tras el análisis de dichos instrumentos, se llegó a la conclusión de que la mejor opción era la realización de un nuevo instrumento de evaluación adaptado a nuestra investigación. En primer lugar, se han tenido

presentes las características del desarrollo de los niños de 3 a 6 años, y eso implica ciertas características definitorias a la hora de elaborar el instrumento. Siguiendo a Blanco (2017), las premisas que se utilizarán para la construcción del cuestionario serán:

- Brevedad, puesto que la edad de los destinatarios hace necesario utilizar pocos ítems para no provocar cansancio.
- Sencillez, sobre todo en la aplicación del cuestionario.
- Vocabulario cercano al alumno, que sea fácil de comprender y adaptado a la edad y características sociales de los participantes.
- Preguntas claras y directas, sin negaciones.
- Motivador.

2.2. Instrumento

Los ítems del cuestionario responden a las 4 dimensiones de la motivación, siguiendo el Modelo ARCS de Keller:

TABLA 1. Ítems del cuestionario y dimensiones Modelo ARCS

Dimensión	Ítem	Descriptor
A. Atención	A1	Opinión personal sobre la actividad
	A2	Sentimientos tras la actividad
	A3	Disposición a repetir la actividad
B. Relevancia	B4	Utilización previa de la tecnología utilizada
	B5	Opinión personal sobre la tecnología utilizada
	B6	Importancia dada a la actividad
C. Confianza	C7	Opinión personal sobre su aprendizaje
	C8	Opinión personal sobre la influencia de la tecnología en su aprendizaje
	C9	Creencia personal sobre su propia capacidad
D. Satisfacción	D10	Opinión personal sobre la influencia del material en su atención
	D11	Opinión personal sobre la presentación del material en su atención
	D12	Opinión personal sobre el material audiovisual utilizado

Fuente: elaboración propia

Para analizar la validez de contenido del instrumento se ha seguido la técnica de juicio de expertos. Está técnica consiste en solicitar a una serie de personas la demanda de un juicio hacia un objeto, un instrumento, un material de enseñanza, o su opinión respecto a un aspecto concreto (Cabero et al., 2019).

El juicio de expertos, según Cabero y Llorente (2013) tiene una serie de ventajas, tales como: la calidad teórica de las respuestas que obtenemos de las personas, la profundidad de las evaluaciones que nos brindan, la facilidad de implementación y la utilización de diferentes estrategias. Así como, reunir información para determinar conocimiento sobre contenidos y temas difíciles, complejos y novedosos o poco investigados.

2.3 Participantes

Los especialistas que han valorado el cuestionario han sido elegidos utilizando un muestreo no probabilístico intencionado, partiendo de que la finalidad no es la representatividad estadística en sí, sino la información y la captación de variedad de opiniones sobre el tema en cuestión (Gallego, 2018).

En el presente estudio se tuvieron en cuenta una serie de criterios para la selección de expertos, y se seleccionaron aquellos que cumplieran dos o más criterios de los que se exponen a continuación:

1. Tener experiencia en la impartición de asignaturas relacionadas con la utilización educativa de diferentes tecnologías en la docencia universitaria.
2. Tener experiencia en la formación del profesorado, relacionada con las TIC.
3. Tener varias publicaciones relacionadas con tecnología educativa, en revistas nacionales e internacionales, en los últimos cinco años.
4. Haber colaborado o asistido a alguno de los congresos "Congreso Internacional de Innovación y Tecnología en Educación Infantil (CITEI)".

El número de correos electrónicos que se mandaron, teniendo en cuenta los criterios referidos anteriormente, fueron 20.

De los 20 expertos pre-seleccionados para la realización de este juicio de expertos, han sido finalmente seleccionados 8 expertos en el tema, como profesores de tecnología educativa y nuevas tecnologías de diferentes universidades de España: Universidad de Sevilla, Universidad de Cataluña, Universidad de Málaga.

FIGURA 1. Universidades a las que pertenecen los expertos

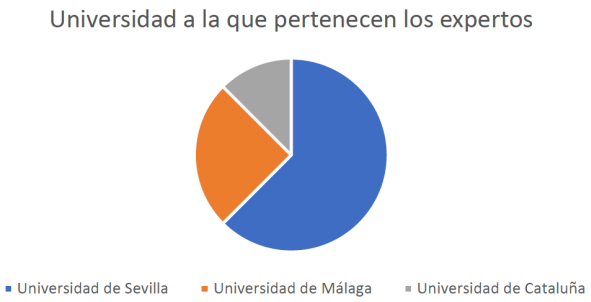


TABLA 2. Características demográficas de los jueces

		Porcentaje
Titulación	Doctorado	100
	Máster	100
	Grado o Licenciatura	100
	Diplomatura	60
Trabaja en un centro universitario	SÍ	100
	NO	0
Docente de tecnología educativa	SÍ	80
	NO	20
Investigación de tecnología educativa	SÍ	100
	NO	0
Publicación de tecnología educativa	SÍ	100
	NO	0

3. RESULTADOS

Estos expertos han sido contactados mediante vía telemática y se les envió un formulario *online* de la plataforma de *Google Drive*, donde a los jueces seleccionados se les solicitó que valoraran la pertinencia y claridad de las preguntas, así como una valoración global del cuestionario. Se requirió su opinión en dos apartados: uno específico para cada ítem o pregunta, y otro global para el instrumento en su conjunto.

La parte específica se centraba en valorar cada uno de los ítems del cuestionario. Para ello, se le solicitó que indicaran su grado de acuerdo o desacuerdo en una escala con 5 alternativas de respuesta, respecto a las siguientes afirmaciones:

El ítem o pregunta es pertinente (valoración de la pertinencia del ítem o pregunta para dar respuesta a la pregunta de investigación enunciada en la introducción). El ítem o pregunta es claro (valoración de la claridad del lenguaje empleado). La valoración de las respuestas es: 1- Totalmente en desacuerdo/ 2- Desacuerdo/ 3- Ni de acuerdo ni en desacuerdo/ 4- De acuerdo/ 5- Totalmente de acuerdo.

La parte sintética se centraba en la valoración de aspectos globales del cuestionario: facilidad para contestar, orden y extensión.

A continuación, presentamos el cuestionario elaborado para la realización del juicio de expertos, con el objetivo de validar el cuestionario CIRAMI, que pretende evaluar la influencia de la RA en la motivación Infantil.

VALIDACIÓN: PARTE ESPECÍFICA

Atendiendo a cada ítem del cuestionario, se señala su grado de acuerdo o desacuerdo respecto a su pertinencia y claridad. En la columna de la derecha, se añade cualquier observación o sugerencia que se considere oportuna.

TABLA 3. Validación parte específica cuestionario CIRAMI

	El ítem es pertinente					El ítem es claro					Observaciones y sugerencias
ÍTEMS	1	2	3	4	5	1	2	3	4	5	
Me ha gustado realizar esta actividad											
Me siento satisfecho por el esfuerzo que he hecho en esta actividad											
He disfrutado esta actividad tanto que me gustaría volver a hacerla											
El contenido de este material está relacionado con cosas que ya sé											
El contenido y el material audiovisual en esta lección dan la impresión de que su contenido vale la pena conocer											
El contenido de esta lección será útil para mí en el futuro											
La buena organización del material me ayudó a estar seguro de que iba a aprender el contenido.											
Mientras trabajaba en esta lección, yo estaba seguro de que podía aprender el contenido											
Yo estoy seguro de que voy a ser capaz de volver a realizarla.											
La calidad del material en RA me ayudó a mantener la atención											
La forma de organizar la información usando esta tecnología me ayudó a mantener la atención											
La variedad de material audiovisual ayudó a mantener mi atención en la lección											

VALIDACIÓN: PARTE SINTÉTICA. Aspectos globales del cuestionario

TABLA 4. Validación parte sintética del cuestionario CIRAMI

1. Contestar al cuestionario resulta:	2. El orden de las preguntas es:	3. La extensión del cuestionario es:
Muy fácil	Muy adecuado	Demasiado larga
Fácil	Adecuado	Larga
De dificultad media	Ni adecuado ni inadecuado	Ni larga ni corta
Difícil	Inadecuado	Corta
Muy difícil	Muy inadecuado	Demasiado corta

A continuación, se presenta el resultado de las medias obtenidas tanto en el total como en cada uno de los ítems del cuestionario.

TABLA 5. Medias obtenidas por cada ítem.

ÍTEM		MEDIA	DT
1. ¿Te ha gustado realizar esta actividad?	Pertinencia	4.78	0.44
	Claridad	4.56	1.33
2. ¿Estás contento/a por haber realizado la actividad?	Pertinencia	4.44	1.33
	Claridad	4.56	1.33
3. ¿Quieres volver a realizar la actividad?	Pertinencia	4.67	0.50
	Claridad	5.00	0.00
4. ¿Habías utilizado antes esta tecnología?	Pertinencia	4.89	0.33
	Claridad	4.22	1.30
5. ¿Te ha gustado usarla?	Pertinencia	4.89	0.33
	Claridad	4.67	0.71
6. ¿Crees que la actividad que hemos realizado es importante?	Pertinencia	4.44	0.88
	Claridad	4.11	1.17
7. ¿Has aprendido?	Pertinencia	4.89	0.33
	Claridad	4.29	2.06
8. ¿Utilizar este material te ha ayudado a aprender?	Pertinencia	4.67	0.50
	Claridad	4.33	1.12
9. ¿Te sientes capaz de volver a realizar la actividad?	Pertinencia	4.67	0.71
	Claridad	4.44	1.13
10. ¿El material ha atraído tu atención?	Pertinencia	4.44	0.73
	Claridad	3.89	1.27
11. ¿La presentación de la información te ha llamado la atención?	Pertinencia	4.78	0.44
	Claridad	4.33	1.12
12. ¿Te ha gustado el material audiovisual?	Pertinencia	4.89	0.33
	Claridad	4.11	1.36
General	Pertinencia	4.70	0.57
	Claridad	4.38	1.16

En relación con los datos aportados por los expertos, podemos afirmar que los resultados son abrumadores, que los ítems 1 y 5, se consideran totalmente pertinentes y claros. Los ítems 8 y 9 son menos pertinentes, pero siguen siendo claros y el ítem 4 es el menos claro.

En general, el cuestionario es más pertinente que claro.

A continuación, se presenta una selección de sugerencias y mejoras realizadas por el grupo de expertos respecto al instrumento:

Experto 1: "Se utilizan palabras o frases como "te sientes capaz", "tecnología" o "material audiovisual" que pueden interferir en la comprensión de la pregunta."

Experto 2: "Preguntas claras y sencillas, adecuado para los/las alumnas de educación infantil. Seguro que serán sorprendentes las respuestas de los niños cuando puedan expresarse verbalmente."

Experto 3: "El vocabulario ha de ser más cercano y concreto a los niños de 3-6 años."

Experto 4: "El instrumento que presentas, me parece interesante, aunque teniendo en cuenta la población a la que va dirigido, habría que cambiar la forma de presentar esas preguntas a alumnos de infantil."

Experto 5: "Adecuado tratándose de educación infantil."

Experto 6: "El cuestionario es muy concreto pero la claridad de las preguntas hay que contextualizarlas en las actividades que se hagan y no creo que sepan responder "si han aprendido"... habrá que preguntarle de una forma más directa."

Experto 7: "Algunos ítems son complicados de entender para niños de infantil, al menos como están formulados."

Podemos comprobar las valoraciones realizadas por los expertos para la parte sintética del cuestionario:

FIGURA 2. Respuestas para la pregunta 1 de la parte sintética del cuestionario

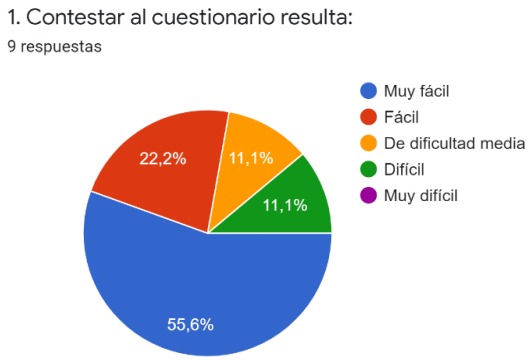


FIGURA 3. Respuestas para la pregunta 2 de la parte sintética del cuestionario

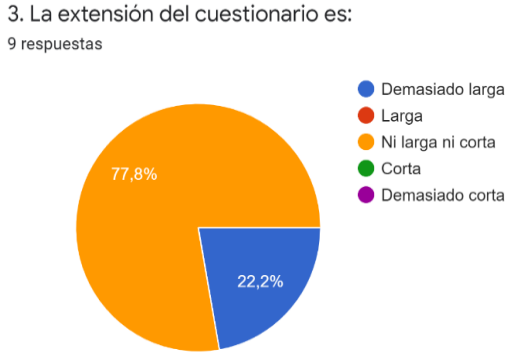
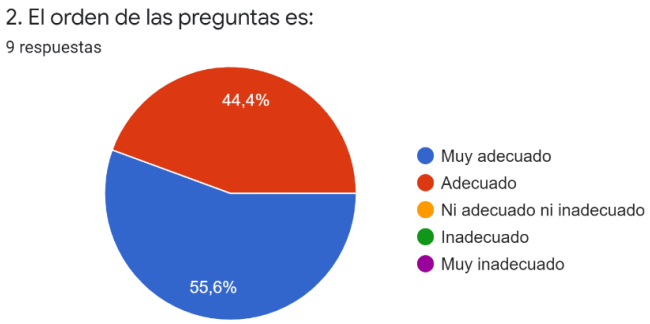


FIGURA 4. **Respuestas para la pregunta 3 de la parte sintética del cuestionario**



Aunque las puntuaciones del cuestionario han sido buenas, siguiendo la recomendación de los expertos, se han realizado los siguientes cambios:

a. Revisión de la redacción de todo el cuestionario.
b. Modificación en la formulación de algunos ítems para hacerlos más comprensibles al alumnado del segundo ciclo de Educación Infantil.
c. Organización de las preguntas agrupándolas en las diferentes variables de la motivación infantil.

A continuación, presentamos la versión inicial del cuestionario sobre la influencia de la Realidad Aumentada en la motivación infantil (CIRAMI), en la tabla.

TABLA 6. **Versión inicial del cuestionario (CIRAMI)**

	Sí	No sabe/ No contesta	No
Me ha gustado realizar esta actividad			
Me siento satisfecho por el esfuerzo que he hecho en esta actividad			
He disfrutado esta actividad tanto que me gustaría volver a hacerla			
El contenido de este material está relacionado con cosas que ya sé			
El contenido y el material audiovisual en esta lección dan la impresión de que su contenido vale la pena conocer			
El contenido de esta lección será útil para mí en el futuro			
La buena organización del material me ayudó a estar seguro de que iba a aprender el contenido.			
Mientras trabajaba en esta lección, yo estaba seguro de que podía aprender el contenido			
Yo estoy seguro de que voy a ser capaz de volver a realizarla.			
La calidad del material en RA me ayudó a mantener la atención			
La forma de organizar la información usando esta tecnología me ayudó a mantener la atención			
La variedad de material audiovisual ayudó a mantener mi atención en la lección			

A continuación, se presenta la versión final del cuestionario CIRAMI, tras el análisis y valoración del juicio de expertos. El análisis de las respuestas de los expertos condicionó la modificación de algunos ítems, pues estaban redactados de manera negativa o su lectura no permitía una fácil comprensión para los estudiantes de 3 a 6 años. Se han realizado modificaciones en la versión inicial del cuestionario cuando la valoración de varios expertos coincidía en el mismo inconveniente. Aun así, la mayoría de los ítems han resultado adecuados en comprensión para los destinatarios del cuestionario y partiendo del objeto de estudio.

TABLA 7. Versión final cuestionario CIRAMI

	Sí	No sabe/ No contesta	No
Me ha gustado realizar esta actividad			
Estoy contento por el esfuerzo que he hecho			
Me gustaría volver a hacer la actividad			
El contenido de esta actividad ya lo conocía			
El material audiovisual me ha gustado			
Utilizaré lo que he aprendido en el futuro			
Me he sentido seguro durante la actividad			
He aprendido a utilizar la herramienta			
Estoy seguro de que voy a ser capaz de volver a realizarla.			
Mantuve la atención durante la actividad			
La tecnología me ayudó a mantener la atención			
La variedad de material audiovisual me ayudó a mantener mi atención			

4. DISCUSIÓN

El objetivo de este trabajo se enfoca en la adaptación y validación de un instrumento para evaluar la motivación infantil en el alumnado de segundo ciclo de Educación Infantil, con edades comprendidas entre los 3 y 6 años, tras el uso de una herramienta tecnológica, como es la Realidad Aumentada.

Al analizar los ítems de los que consta el instrumento, podemos afirmar que todos los elementos del instrumento contribuyen adecuadamente al conjunto del cuestionario. Tras la intervención del juicio de expertos y su análisis, tanto cuantitativo como cualitativo, podemos afirmar la validez del contenido.

Para llevar a cabo la validación del instrumento, se ha calculado la fiabilidad a través del coeficiente Alfa de Cronbach, utilizando el programa IBM SPSS Statistics.

En definitiva, este instrumento permite analizar la motivación infantil siguiendo el Modelo ARCS de Keller y analizar su atención, relevancia, confianza y satisfacción. Dando respuesta a varias de las cuestiones que nos planteamos al principio de la investigación:

– Existe poca investigación sobre el estudio de la motivación en edad infantil, y la que existe se analiza de forma muy deficitaria (Blanco, 2017).

- No se han encontrado instrumentos que permitan la evaluación de la motivación en el alumnado del segundo ciclo de educación infantil. (Reinoso, 2012; Terán, 2012)
- Aunque son muchas las investigaciones que exponen que el uso de RA aumenta o mejora la motivación, no existen evidencias empíricas de ello.

5. CONCLUSIONES

Los resultados de este estudio aportan datos para poder evaluar la motivación en el alumnado del segundo ciclo de Educación Infantil. La fiabilidad del Cuestionario sobre la influencia de la Realidad Aumentada en la motivación infantil se ha calculado mediante el coeficiente alfa de Cronbach de forma global. Los resultados muestran un índice alfa de Cronbach de .77. Se establece que este índice es alto, indicando un alto grado de fiabilidad del cuestionario (O' Dwyer, & Bernauer, 2014).

El análisis de los resultados obtenidos en el proceso de validación del CIRAMI destinado a estudiantes de 3 a 6 años, indican que cuenta con una adecuada validez de contenido, confiabilidad y validez de constructo.

El análisis comparativo-descriptivo de las valoraciones de los expertos ha permitido constatar que los ítems asociados a cada una de las dimensiones del cuestionario son adecuados, pertinentes y relevantes para el estudio. No obstante, los resultados individuales de los ítems llevaron a una revisión cualitativa profunda que permitió realizar mejoras en algunas de las preguntas.

Teniendo en cuenta la escasez de instrumentos validados para estudiar las TIC en la etapa de educación infantil, consideramos relevante este estudio ya que presenta un instrumento capaz de aportar información que dé respuesta al propósito para el que fue diseñado, esto es, conocer la influencia del uso de la Realidad Aumentada en la motivación infantil.

Procederemos a mostrar la ficha técnica del cuestionario CIRAMI que describe sus características principales:

- Población a la que va dirigida: alumnado del segundo ciclo de Educación Infantil.
- Instrumento adaptado del cuestionario *Instructional Materials Motivation Survey* (IMMS), basado en el modelo ARCS de Keller (1987) y del Instrumento RIMMS, adaptación del instrumento IMMS de Loorbach et al. (2015)
- Utilidad: Valorar la motivación infantil, analizando las dimensiones: atención, relevancia, confianza y satisfacción.
- Implementadores: Educadores de Educación Infantil o investigadores.
- Contenido: 12 ítems agrupados según las dimensiones del modelo ARCS.
- Ventajas: posible aplicación a diferentes estudios empíricos cuantitativos, tratamiento estadístico del resultado de los ítems.

5.1. Limitaciones y prospectiva

Algunas de las principales limitaciones de la investigación realizada, han sido que la muestra estudiada es reducida y no permite generalizar las afirmaciones que se dan en las conclusiones; ni realizar una validación

psicométrica (análisis factorial exploratorio y análisis factorial confirmatorio), la cual se propone como ámbito a desarrollar en futuros estudios.

En síntesis, este trabajo proporciona información que puede ser de interés para profesores, profesorado en activo y los formadores del profesorado en relación con la influencia de la tecnología en la motivación infantil. En futuros trabajos, se podrá utilizar este instrumento con el uso de otras tecnologías como robótica o realidad virtual.

6. REFERENCIAS

Aguaded, I., & Cabero, J. (2014). Avances y retos en la promoción de la innovación didáctica con las tecnologías emergentes e interactivas. *Educar*, 67-83. http://dx.doi.org/10.5565/rev/educar.691

Barroso, J., & Gallego, O. (2017). Producción de recursos de aprendizaje apoyados en Realidad Aumentada por parte de estudiantes de magisterio. *Revista Edmetic*, *6*(1), 23-38. https://doi.org/10.21071/edmetic.v6i1.5806

Bethencourt-Aguilar, A., Fernández Esteban, M. I., González Ruiz, C. J., & Martín-Gómez, S. (2021). Recursos Educativos en Abierto (REA) en Educación Infantil: características tecnológicas, didácticas y socio-comunicativas. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(2), 32-45. https://doi.org/10.24310/innoeduca.2021.v7i2.12273

Blanco, J. (2017). *Evaluación de la motivación académica en niños de primer ciclo de educación infantil*. [Tesis de doctorado, Universidad de León]. Archivo digital. http://hdl.handle.net/11162/162887

Cabero, J., & Llorente, M.C. (2013), La aplicación del juicio de experto como técnica de evaluación de las tecnologías de la información (TIC). *Eduweb. Revista de Tecnología de Información y Comunicación en Educación, 7*(2), 11-22. http://tecnologiaedu.us.es/tecnoedu/images/stories/jca107.pdf

Cabero, J., Barroso, J., & Llorente, M.C. (2019). La realidad aumentada en la enseñanza universitaria. *REDU. Revista de docencia universitaria. 17*(1), 105-118. https://doi.org/10.4995/redu.2019.11256

Che, Y. (2012). A study of learning effects on e-learning with interactive thematic video. *Journal Educational Computing Research, 47*(3), 279-292. http://dx.doi.org/10.2190/EC.47.3.c

De la Horra, G. I. (2017). Realidad Aumentada: Una revolución educativa. *EDMETIC, Revista de Educación Mediática y TIC, 6*(1), 9-22. https://doi.org/10.21071/edmetic.v6i1.5762

Di Serio, A., Ibáñez, M.B., & Delgado, C. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computer & Education, 68*, 586-596. https://doi.org/10.1016/j.compedu.2012.03.002.

Gabarda Méndez, V., García Tort, E., Ferrando Rodríguez, M. de L., & Chiappe Laverde, A. (2021). El profesorado de Educación Infantil y Primaria: formación tecnológica y competencia digital. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(2), 19-31. https://doi.org/10.24310/innoeduca.2021.v7i2.12261

Gallardo Fernández, I. M., Saiz Fernández, H., Aguasanta Regalado, M. E., & López Iglesias, M. (2021). Educar en la escuela infantil del siglo XXI: diálogo, inclusión y tecnología. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(2), 75-88. https://doi.org/10.24310/innoeduca.2021.v7i2.12112

Gallego, O.M. (2018). *Estudio y análisis sobre las posibilidades educativas de la RA como herramienta de producción de experiencias formativas por parte del alumnado universitario* [Tesis de doctorado, Universidad de Córdoba] Archivo digital. http://hdl.handle.net/10396/17064

García, I., Peña-López, I., Johnson, L., Smith, R., Levine, A., & Haywood, K. (2010). *Informe Horizon: Edición Iberoamericana 2010.* The New Media Consortium.

Hernwall, P. (2016). We have to be profesional- Swedish preschool teachers' conceptualisation of digital media. *Nordic Journal of Digital Literacy, 11*(1), 5–23. https://doi.org/10.18261/issn.1891-943x-2016-01-01.

Keller, J. (1987). Development and use of the ARCS model of motivational design. *Journal of Instructional Development, 10*(3), 2–10. https://doi.org/10.1007 / BF02905780

Keller, J. (2008). An integrative theory of motivation, volition, and performance. *Technology Instruction Cognition and Learning, 6*(2), 79–104. https://doi.org/ 10.1007/978-1-4419-1428-6_218

Keller, J. (2010). Motivational design for learning and performance. *Science þ Business Media*, 227–286, Springer. https://doi.org/10.1007 / 978-1-4419-1250-3

Lu, J., & Ying-Chieh, L. (2014). Integrating augmented reality technology to enhance children's learning in marine education. *Environmental Education Research, 21*(4), 525-541. https://doi.org/10.1080/13504622.2014.911247

Loorbach, N., Peters, O., Karrema, J., & Steehoude, M. (2015). Validation of the Instructional Materials Motivation Survey (IMMS) in a self-directed instructional setting aimed at working with technology. *British Journal of Educational Technology, 46*(1), 204-218. https://doi.org/10.1111/bjet.12138

Nikolopoulou, K., & Gialamas, V. (2010). In-service and pre-service early childhood teachers' views and intentions about ICT use in early childhood settings: A comparative study. *Computers & Education, 55*, 333–341. http://dx.doi.org/10.1016/j.compedu.2010.01.019

Nikolopoulou, K., & Gialamas, V. (2015). ICT and play in preschool: early childhood teachers' beliefs and confidence. *International Journal of Early Years Education, 23*(4), 409-425. https://doi.org/10.1080/09669760.2015.1078727

O´Dwyer, L., & Bernauer, J. (2014). *Quantitative research for the qualitative researcher*. Sage.

Proske, A., Roscoe, R., & McNamara, D. (2014). Game-based practice versus traditional practice in computer-based writing strategy training: effects on motivation and achievement. *Education Technology Research Development, 62*, 481-505. https://doi.org/10.1007/s11423-014-9349-2.

Reinoso, R. (2012). Posibilidades de la realidad aumentada en educación. En J. Hernández, M. Pennesi, D. Sobrino & A. Vázquez (Coords), *Tendencias emergentes en educación con TIC* (pp. 175-197). Editorial Espiral.

Terán, K. (2012). Realidad Aumentada sus desafíos y aplicaciones para el E-Learning. *XIII Encuentro internacional Virtual Educa Panamá 2012*. http://www.virtualeduca.info/fveduca/es/tematica-2012/87--dispositivos-tecnologicospara-el-trabajo-en/371-realidad-aumentada-sus-desafios-y-aplicaciones-para-el-elearning.

Wei, X., Weng, D., Liu, Y., & Wang, Y. (2015). Teaching based on augmented reality for a technical creative design course. *Computers & Education, 81*, 221-234. https://doi.org/10.1016/j.compedu.2014.10.017

Yelland, N. (2007). *Shift to the future: Rethinking learning with new technologies in education*. Routledge.