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Self-directed learning and assessment in a crisis context: the COVID-19 pandemic as a case study

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Abstract

The COVID-19 pandemic has forced schools to close and shift to remote education. However, this might create new challenges, as students might have poor self-directed learning skills to keep up with the learning process from home. Although many studies have focused on remote education during said pandemic, there is limited information on the strategies implemented to support and encourage self-directed learning and assessment. Therefore, in this study – focusing on a case in China – focus group interviews were conducted to collect data from different stakeholders on the implemented self-directed learning strategies during the COVID-19 pandemic. The results might help different education stakeholders in future to effectively maintain education in crises, leading to better learning outcomes.

KEYWORDS: Self-Directed Learning, Assessment, Crisis, COVID-19, Online Learning.

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1. Introduction

The spread of COVID-19 has had a significant impact on teaching and learning worldwide, as classes had to be halted and, in some cases, have moved online (Carter Jr et al., 2020; Singh, 2020; Zhu & Liu, 2020; Zuo et al., 2020). This led to challenges with regard to students working autonomously and how assessments should be approached. The importance of self-directed learning (SDL) is expressed in the literature on how teaching and learning have been approached during this time of the pandemic (Singh, 2020). This article's unique contribution to the scholarship of SDL is exploring aspects of self-directedness in terms of assessment within the context of school-level education in China during the COVID-19 pandemic.

It is essential to define SDL to conceptualize assessment in this context. Knowles (1975, p. 18) defines SDL as follows:

> "*a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes*".

From the definition above, the importance of student agency is clear in terms of determining how their learning and assessment should take place and what resources are necessary. Furthermore, the role of others in this process is also noted. To this end, the role of peers, parents and teachers relates to SDL and is highly relevant for this research. SDL can be considered a process within the education context but also a learner

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characteristic (Brockett & Hiemstra, 2019). From this description, learner agency, but also actively taking responsibility for learners, are evident. Other specific characteristics include self-discipline, curiosity, motivation to learn and self-confidence. Furthermore, self-management aspects are highlighted. Learner agency is central to SDL, and it is evident that learner-centeredness is also pertinent to the COVID-19 context (Singh, 2020). Appropriate infrastructure and support are needed to foster SDL in online environments (Zhu & Liu, 2020). Furthermore, it is evident that lack of self-direction can have a negative effect on readiness for online learning (Chung et al., 2020).

Assessment is also an important part of the process in the SDL context. In this regard, Gibbons (2002, p. 12) says the following:

> "*In SDL, assessment is an essential means of learning and learning how to learn: improvement flows from students' critical assessment of their own activities*."

Importantly, for SDL, learners must be involved in different aspects of assessment, including planning and structuring, in addition to actually doing the assessment (ibidem). Self-assessment is also considered an integral step (ibidem).

Especially in online settings, learners can self-assess and self-monitor their progress (Zhu et al., 2020). Costa and Kallick (2004) provide an overview of how self-assessment capacity can be developed among learners. In our research, the issue of self-assessment was also briefly explored. As with SDL generally, the focus is on learners; therefore, assessment should also reflect the shift from a teacher-centered to a learner-centered approach.

Within this theoretical context, the nature of SDL and self-assessment was explored, focusing on a case in China. The following research question was the impetus for this research:

How can self-directed learning and self-assessment be supported and encouraged in times of crisis?

2. Related Work

Online assessment is proven to be a difficult link in the educational chain (Appiah & Van Tonder, 2018). For years, online settings have evolved quietly, with significant progress since early 2020. For instance, Moodle and Sakai – two major learning management systems – follow the same educational approach and basic framework as in their beginnings (Asamoah, 2020; Yassine et al., 2016). Despite the need for a revolutionary breakthrough in online learning and teaching methodology, many tools have been developed to provide additional services in an add-on scheme that does not change but rather complements the frameworks. Furthermore, since a year ago (2019/2020), along with the pandemic, the situation has changed, as many universities found the need for a transition to an online setting. This need has collaterally forced an adaptation of face-to-face methodologies to online learning and teaching deployments (Owolabi, 2020). However, the key open issues concerning e-learning remain unaltered, namely: student engagement; student performance estimate; drop-out prevention; teacher motivation; prevention of teacher burnout; teacher expertise in digital competences (Carver-Thomas & Darling-Hammond, 2019; eds. Christenson et al., 2012; Reschly, 2020), to name but a few.

In addition, e-assessment and online feedback remain two of the challenging, unresolved issues in this context (Alruwais et al., 2018; Moscinska & Rutkowski, 2018). Online feedback in a structured, sensible and effective way is not an easy task. When it comes to feedback, there is a cause-and-effect relationship. For instance, immediate feedback yields a good result when providing a positive report of user performance (Kaur, 2020). Also, significant progress has been made on isolated actions along learning flow. Some systems allow for the design and implementation of such feedback (Burgos & Van Nimwegen, 2009). Tutoring a student also means giving timely feedback; schoolteachers and university professors are usually good at such feedback and have shown to be quick learners (Pan & Shao, 2020; Van Nimwegen et al., 2006).

However, online assessment, although closely related to online feedback, is a completely different matter: it deals with a full framework of core competences, functional-specific competences, learning objectives, learning results, metrics and rubrics, orchestrated in a sensible way to attest that original expectations and thresholds have been satisfactorily met and are accreditable in online settings (Guerrero-Roldán & Noguera, 2018). E-assessment – whether summative or formative, or both – must be fully integrated with the learning flow to provide not only fair measurement and user tracking but also an organized and efficient system to improve performance (Mohamadi, 2018). In this context, assessment means another resource to support learners, not just to evaluate their progress (Mora et al., 2016). In online settings, assessment becomes the cornerstone to achieve the expected competences or to develop the designated skills, as students deem comments and scores a crucial part of the dialogue with teachers/professors. Furthermore, assessment helps to conclude the learning cycle and to understand more about one's performance and how to do better (Cakiroglu et al., 2017; Liu et al., 2018; Seifert & Feliks, 2019).

A further aspect of importance for this research is self-assessment. Self-assessment involves various different possible activities pertaining to assessing functioning of students by themselves and this can be considered as

a formative assessment process and a form of feedback (Andrade, 2019). Boud (2013) highlights the importance of self-assessment for the learning process. While Yan (2020) establishes the importance of self-assessment for self-regulated learning which by implication also confirms its relevance for SDL.

SDL seems to be a timely approach to face situations of isolation (wanted or unwanted, like the COVID-19 pandemic lockdowns), as it deals with common features like user authentication (Okada et al., 2019). According to Du Toit-Brits (2021) SDL requires embracing an SDL culture, addressing students' needs, creating a feeling of security and sense of belonging, employing active instructional procedures and using appropriate learning resources. SDL also implies a focus on learning-oriented assessment emphasizing assessment as being integral to the learning process and hence moving from assessment of learning to assessment for and as learning (Lubbe & Mentz, 2021). Furthermore, within the context of SDL-oriented assessment, aspects around metacognition, motivation, and, self-regulation are also relevant (Lubbe & Mentz, 2021).

As is noted above, motivation is important for SDL and for the assessment context relevant to this article. In this regard, it is imperative to distinguish between intrinsic and extrinsic motivation. As SDL is underpinned by self-determination theory (Van der Walt, 2016), the approach to motivation is also framed by this theory in this article. Within this view, Ryan and Deci (2020) describe intrinsic motivation as relating to something being done due to inherent interest or enjoyment while extrinsic motivation pertains to other often external reasons other than a person's inherent satisfaction.

SDL also deals with psychological features, like feeling lonely, or social relationship challenges. Both students and teachers find it hard to overcome the feeling of isolation along with the lack of an estimate deadline. As the rest of the population, uncertainty plays a significant role when any member of the educational community must schedule their daily life and still meet the expected performance (Irawan et al., 2020). Nonetheless, SDL requires a fine e-assessment strategy to become more effective and reinforced. Moreover, the pandemic has brought SDL into the spotlight, as SDL brings an excellent approach to the imposed problem of isolation worldwide. However, assessment in online, isolated environments is still a problem, as it requires a combination of normalization to become effective and fair and contextualization to be become sensitive to particular situations (García-Peñalvo et al., 2020; Khan & Jawaid, 2019). Regular mechanisms do not seem to work completely when adapted to specific needs, and there is a growing interest in and demand for a clear solution to be satisfactorily implemented.

3. Method

This study – in which it was aimed to qualitatively explore how self-directed learning and assessment can be supported and encouraged in times of crisis – was conducted within the interpretivist paradigm (Bakkabulindi, 2015).

Data were collected by means of focus group interviews, which is a type of group interviewing that focuses on communication between the different identified research participants for data generation (Kitzinger, 1995). Focus group interviews use group interaction in conjunction with researcher prompts rather than just turn-taking for questions. In such interviews, participants are expected engage with one another by asking questions and discussing different views (ibidem). Given the emergency, focus group interviews were the best way to generate data and find possible solutions. In view of the COVID-19 pandemic, focus group interviews were conducted by means of a group video-conferencing system (Zoom) and obtained the raw data through webinars.

Fifty-two participants (37 males and 15 females) from public schools, where 37 are teachers and 15 are parents, were sampled by means of convenience sampling and were invited to participate in the focus group interviews. Considering the differences of ICT infrastructure between different schools and regions of China, all the participants were invited from both cities and rural areas. Particularly, 75% of the participants were from the cities, and only 25% of the participants were from rural areas. This unbalanced distribution could be explained by the technical difficulties that people in rural areas might face to join online activities (e.g., courses, meetings, etc.). The goal was to collect data from stakeholders with different perspectives on the strategies implemented to support SDL during the COVID-19 pandemic.

Two questions were used to stimulate the discussion and collect data, namely: (1) What self-directed learning and assessment strategies were used online (for teachers) or at home (for parents) to maintain the learning process? and, (2) Have you used any tools or software to facilitate the process, if yes, please mention them?

The researchers adhered to the *Ethical Guidelines for Educational Research* of the British Educational Research Association (2011). Ethical approval for this study was obtained from the Smart Learning Institute of the Beijing Normal University (BNU), and permission was granted by the participants' institutions before data collection commenced. Moreover, participation in this research was voluntary, and the participants were informed that they could withdraw from the research process at any stage. The participants granted informed consent so that the Zoom discussion could be recorded, analyzed and reported. Additionally, the authors explicitly mentioned that all data and results

would be anonymized and used for research purposes only.

4. Results

This section provides an overview of the general strategies for SDL and assessment, as well as self-assessment strategies specifically.

4.1 Strategies for Self-directed Learning and Assessment

The general strategies that emerged from the data were grouped according to the different types of research participants. Therefore, the first part of the sub-section comprises inputs from teachers, while the second part of the sub-section covers the perspective of parents.

TEACHER PERSPECTIVE

Recommendation 1: Linking the learning and assessment process with the inner needs of students

According to one teacher, to keep learners self-directed, especially during crises, teachers should not rely on technology only. However, they should always link the learning and assessment process with students' inner motivation. For instance, teachers can suggest that obtaining a diploma would be helpful to be a successful person in the future and may support others in a crisis like the COVID-19 pandemic. This would give learners the inner motivation to study hard and to do their best. One teacher supported this, saying,

> *"it is not only about technology for an (sic) effective self-regulated learning … teachers should also pay attention to the psychological and inner needs of learners".*

Several teachers recommended that students be called by phone to check on them and to keep encouraging them to learn, as this could be motivational.

One teacher also shared a story about a female college student from the Sichuan Province in China. After the snow had damaged the phone cables, the student had to sit stiffly in the snow for at least two hours, looking for a 4G signal to attend an online course from a 3 800-meter-high mountain just to keep up with the course. According to this teacher, the student was motivated to keep up with the course despite the challenges she faced.

This finding ties in with the importance of motivation for SDL (Regan, 2003). Each student's context is different; this emphasizes the need for student agency and the fact that students should take charge of their own learning. This recommendation also ties in with the next recommendation.

Recommendation 2: Parents should be the motivators of the learning process

Teachers believed parents are a core element in maintaining education from home and they have more influence than technology to keep their children self-directed. Therefore, they encouraged parents to keep an eye on their children's schedule, remind them of their assessments and to encourage them to learn every day. Several teachers mentioned that moral support and encouragement are needed for students to maintain education, especially in times of crisis, where the student's mind is occupied with other things, such as health and safety. Several teachers further mentioned that parents helped students learn by, for instance, solving some problems they encountered while finishing their homework.

Moreover, motivation is such an essential aspect of SDL, it is included in Garrison's (1992) comprehensive model of SDL. According to Garrison,

> "*[m]otivation plays a very significant role in the initiation and maintenance of effort toward learning and the achievement of cognitive goals*" (p. 26).

Hence, efforts by teachers and parents, as described above, can be advantageous in said context. In addition, the role and affordance of parents as "human resource" (Knowles, 1975), especially in the context of a pandemic, are evident.

Recommendation 3: Use of smart and flexible technologies

Several teachers mentioned that, since the learning process often occurs online during crises, online tools could be used to facilitate learning from home. One teacher mentioned that several tools, such as timers, could be used to help students control learning time, for instance. In addition, other teachers mentioned that they used some learning tools, such as ClassIn, which send automatic reminders to students of their learning schedule and assessment deadlines. This can help students to keep up with the learning process. In addition to traditional course materials – which included videos, readings, and assessments – the teachers relied on Massive Open Online Courses (MOOCs), which provided interactive user forums that helped to build a community for them and their students. MOOCs allow for engagement between self-organized students by means of participation, which, in turn, relates to their set learning goals, their prior knowledge and skills, and common interests. Other teachers, on the other hand, mentioned that including tools in the learning process should be done carefully to not make students tired of using different tools for different subjects, especially during crises.

It is evident from the participants' feedback that several tools can contribute to creating an environment where

learning time as well as the content and process can be monitored. However, from the responses, it was clear that, in many cases, with a monitoring emphasis by teachers, the learning process might not always be as learner-centered as it could be. Yet, through the introduction of said tools, students can be empowered to make use of the tools themselves to support their own learning process.

Recommendation 4: Creating learning groups

Teachers mentioned that designing collaborative learning and assessment activities in using social networks and creating learning groups could help students to be self-directed. In groups, students could start reminding each other of homework or ask some questions about the course, according to one teacher. This type of interaction can encourage students to learn more and to start asking questions if they have something that they need to learn about. Other teachers also mentioned that learning groups in crises are particularly important to help avoid online isolation and maintain social interaction between students. For instance, several teachers reported that they used WeChat, which can be used as a simple and easy learning platform to support fostering collaborative learning.

The suggested learning groups prove to be an ideal means towards supporting collaborative learning. The importance of SDL and collaborative learning as 21st-century skills and their mutually supportive role are evident (Lee et al., 2014). Only by creating opportunities for students to interact – and in the COVID-19 context, this would be through online platforms – can students use peers as resources in the learning process.

Recommendation 5: Selecting an individual strategy based on the subjects to learn

The teachers mentioned that students can learn different subjects, such as language and mathematics, where each subject has its own approach. Consequently, students need to make their own individual learning plans per subject. For example, as regards language learning, one needs to read extracurricular books for at least one hour a day. Similarly, mathematics would involve other skills and tasks related to computing ability. From the feedback by the participants, it was evident that students had unique and subject-specific approaches to how they handled learning and assessment.

To select relevant strategies for different subjects and skills to be acquired, students need to take charge, set their own goals, and identify relevant strategies.

PARENTAL PERSPECTIVE

Recommendation 6: Create weekly plans and put them up in visible places

Parents mentioned that good planning can reduce learning stress for both them and their children. They recommended creating a written weekly schedule, where students outline what-to-learn goals, tasks and deadlines. Hence, there is parental support, but clear student agency determines the process. Said schedule could be put up in several visible places at home, such as on the fridge, or on students' bedroom wall. In this way, students can always remember their schedule. Parents also mentioned that it was their responsibility to create good daily habits at home, including ensuring enough sleeping hours, exercises to stay healthy, leisure and learning. This can help students to stay healthy and motivated to learn. Furthermore, parents mentioned that a notebook is the simplest tool that can be used to create a learning plan. It is evident that, regardless of the level and subjects, students can determine their own short-term and medium-term learning plans and can adapt their learning and assessment accordingly. This is highly relevant in this context, as sub-discipline teaching is quite prominent in Chinese education. In conclusion, the creation of learning plans was shown to be an effective tool to drive assessment as learning in a context in which SDL could be fostered.

Recommendation 7: Creating an encouraging environment and rewarding students

Parents also highlighted the importance of creating a quiet and encouraging environment at home in which students can feel safe and motivated to learn. The parents mentioned that, without motivation, students would not have the "will" to learn even with their teachers. Other parents also suggested that students should be rewarded to keep them self-motivated to learn from home and to do their best. One parent mentioned that rewards and encouragements have a significant impact on the mental state of students, especially during crises. It was found that interaction between parents and their children alleviated anxiety among students while staying at and learning from home for long periods. Despite some literature advising against the emphasis of rewards towards supporting learning (Ryan & Deci 2020), the data in this research clearly showed how incentives can be supportive in encouraging students in these specific circumstances. The affordances of rewards found in this research, is in line with other discourses on rewards and engagement in the educational context (McKernan et al. 2015).

Recommendation 8: Developing "leadership" and "positive" attitudes in students

According to the parents, one of the successful elements of SDL is developing a "leadership" attitude in their children. In this case, they encourage their

children to take the lead and be responsible for their learning process instead of waiting for the teacher. Such an attitude is crucial in order for students to always take initiative to learn and seek solutions whenever they face challenges or difficulties. Parents also stated that a "positive" attitude should be further developed in students by, for instance, explaining to them that facing difficulties is part of life, even when learning, and that giving up is not a choice and we should always keep on working to find a solution.

Through fostering a sense of student agency, students can be supported in becoming self-directed learners. In addition, the participants' views also echoed some of the self-directed learner characteristics noted by Guglielmino (1977).

4.2 Self-assessment Strategies

The importance of self-assessment for SDL is clear from the literature (Gibbons, 2002), and the issue of self-assessment was also raised by the parents. Teachers mentioned that they and/or parents should guide students to set new goals and allow them to formulate realistic action plans to support motivation and ultimately self-assessment.

The teachers further mentioned that, through self-assessment, students can: (1) identify their own learning gaps, hence, know what they should improve; (2) set learning goals to achieve; (3) revise homework or assignments; and (4) track their own learning progress. Furthermore, teachers mentioned different types of strategies that could be used to easily conduct self-assessment (see Table 1).

Another teacher said:

> "*learning doesn't just happen because we get an A. We learn when we reflect on why we were or weren't successful, and how we can make changes going forward to reach a different outcome*".

The teachers further mentioned that different subjects have various cognitive goals.

Importantly, students at different levels and in different contexts should be supported to assume different approaches to learning and assessment. For younger students, parental support should be more extensive and should actively create opportunities for self-reflection. In the case of students with higher levels of self-monitoring, it might be easier for them to conduct self-reflection by themselves by means of different mediums such as diaries or mind maps. For older students in junior and senior middle schools, self-reflection might be more related to subject knowledge, and they can deepen their knowledge through this reflective practice. In addition, teachers mentioned that several tools could be used for self-assessment that parents and students should consider (see Table 2).

5. Discussion

In times of crisis, as in the case of the COVID-19 pandemic, learning might be shifted to be remotely from home. However, students might lack the needed skills to be self-directed learners. This can affect the learning experience and learning outcomes. Therefore, in this paper, strategies and tools that can be used to foster self-directedness and assessment in crises were highlighted. These strategies were suggested by different stakeholders, namely teachers and parents.

It is clear from the results that, while technology can facilitate SDL and assessment, teachers and parents still need to pay attention to the mental state of students, especially during crises, to keep them motivated and eager to learn from home. Despite technological advancements, human-to-human interaction is still crucial to maintain education from home. The research findings can help the educational community provide better learning experiences, especially in times of crisis during which face-to-face learning may be difficult. Additionally, to develop SDL, self-monitoring and self-assessment (see Table 3 for the difference between these concepts) should be considered.

Additionally, digital citizenship is a set of values that must be reflected in students' behavior. Teachers and parents should help them understand those values, but students must embrace them and act upon them, even when they are not being monitored by anyone. When students take the lead in teaching these values to each other and support each other in implementing good digital citizenship practices, they take on an active SDL role that creates personal ownership and investment in those values. They become intrinsically motivated rather than extrinsically motivated, which is more likely to lead to long-term retention and change when it comes to ways of learning. Digital citizenship can be defined as the use of technology that is safe, is conducted ethically, responsibly and informed (Sheykhjan, 2017). Under this concept, many different skills and literacies are relevant and would also have implications for online assessment. In this regard, ethical behavior in terms of safety, privacy, security and conduct are relevant in conjunction with relevant communicative and information literacy skills.

6. Conclusion

This article explored SDL and assessment within the crisis context of the COVID-19 pandemic in China. Importantly, this research found that while technology can be supportive of SDL and assessment, teachers and parents have to pay attention to the mental state of students in order to keep the students motivated and eager to learn from home.

An important advantage of supporting SDL, is the fact that students are supported to take the lead and develop agency in terms of their learning. Furthermore, in this

]

	Rubrics	Test	Concept map
Descriptions	"Rubrics are a valuable tool for self-assessment. Because rubrics not only list the success criteria but also provide descriptions of levels of performance, students can use them to monitor and evaluate their progress during an assessment task or activity." (Assessment for Learning, n.d.)	A test will help students to conduct self-evaluation. For students in lower grades, the recommended types of questions include multiple options and fill-in-the-blank quizzes, and free-response questions should be designed to allow students to upload photos of their answers.	"A concept map organises facts, concepts, ideas or terms in a visual or diagrammatic way so that the relationship between the individual items is made clearer." (Assessment for Learning, n.d.)
Target user	Middle school and senior grade primary school students	All	Middle school and senior grade primary school students
Learning scenario	Multi-situations; Parents could work with kids to create the rubric, or it could be provided by the teacher	Knowledge mastering assessment	Sum up the learning in a period; organize knowledge

Table 1 - Typical self-assessment strategies.

Tools for self-evaluation			
Category	**Name**	**Form**	**Introduction**
Test	Yuantiku http://www.yuantiku.com/	APP	Yuantiku provides the examinations over the years of nationwide junior and senior middle schools
	Uda https://cn.udacity.co+m/	APP	A question-centered, personalized English learning application
	Xueba100 http://www.xueba100.com/	APP	A question bank with search engine
	17zuoye https://ucenter.17zuoye.com	APP	17zuoye provides online assignments and thematic exercises
	Liulishuo https://www.liulishuo.com/	APP	An English learning application combined with advanced auto-scoring engine of spoken English
	The exercises/papers purchased by students themselves	Paper products	Exercises/papers provide thematic training
	ALEKS https://www.aleks.com/	Website	An evaluation system for learning process, covering various subjects
Rubrics	Learning Contract	Document	A plan of learning activities negotiated/designed jointly by learners and instructors
	CSI Graphic	Graphic	"C" represents Color (student may choose a color representing the essence of their idea); "S" represents Symbol (student may choose a symbol representing the essence of their idea); "I" represents Image (student may choose an image representing the essence of their idea)
	KWL	Form	K-W-L – what I already know; what I want to know; and what I learned
Concept map	XMind https://www.xmind.cn/	PC App	A mind mapping tool
	MindManager https://www.mindmanager.cn/	PC App	A mind mapping tool
	Inspiration	PC App	A mind mapping tool suitable for brainstorming
	Mubu https://mubu.com/	Website	A tool to organize thoughts by outlines and mind maps
	Coggle https://coggle.it/	Website	An online collaborative mind mapping tool
	ProcessOn https://www.processon.com/	Website	An online collaborative drawing platform

Table 2 - Examples of self-assessment tools.

	Self-monitoring	In common	Self-evaluation
What	Checking and adjusting one's ongoing performance. Metacognitive strategy	Performance Metacognitive strategy	Judging how well one has learned and performed so far. Metacognitive strategy
Why	To measure effectiveness during a task. To change, adjust, and improve learning practices in order to succeed.	To improve	Identify strengths and weaknesses to improve next time.
When	Ongoing during a learning sequence	NA	In the end of a learning sequence

Table 3 - Differences between self-monitoring and self-assessment.

evident from this research. It is also relevant to note that the development of the skills supporting learning together with self-direction could have application value in students' further studies and work life.

Despite the important contribution that this study provides pertaining to the strategies that should be applied to foster SDL and assessment, there were several limitations that should be acknowledged and further investigated. For instance, this study was purely qualitative, and no quantitative results were presented. Also, we did not investigate the impact of applied SDL strategies on learning outcomes. Future research could focus on the following: (1) investigating the impact of the reported SDL strategies on learning motivation and outcomes; (2) the most appropriate SDL strategies or tools that could be implemented with different learning subjects (e.g., Mathematics, English, etc.) and modes (e.g., synchronous, asynchronous, etc.); and (3) developing an SDL competency framework where a systematic review is conducted first to determine the necessary competencies for SDL – such a framework may then be validated by experts using the Delphi method (at least two rounds).

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Teachers' perception of online teaching and its effects on learning outcome during Covid-19: an India based mixed method study

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Abstract

The purpose of this study was to explore the perceptions of teachers regarding online teaching whether they are comfortable and confident while delivering online content to students during this tough time of pandemic? Online teaching is not new in India, but many teachers are experiencing this first time due to emergency and sudden closure of institutions of higher education due to COVID 19. Teachers and students all are engaged in online teaching/learning and combat with several challenges i.e. lack of resources, expertise, anxiety, etc. This study is an attempt to determine the problems and issues pertained to teachers during online teaching. Efforts have been also made to find out teachers' perceptions about students' learning outcomes. This study explored advantages/disadvantages as well as barriers of online instructions as perceived by teachers of various colleges affiliated to Guru Nanak Dev University (GNDU), Amritsar, Punjab, India. There is the significant importance of the type of online teaching experiences i.e. faculty members who were having positive online teaching experiences significantly differ from their colleagues who experienced the negative or no online teaching experiences. Results obtained from this study indicate those faculty members who were trained and having sufficient exposure towards the technology are more comfortable as well as successful while implementing online teaching, therefore, it is strongly recommended that sufficient training must be provided to the teaching fraternity. Our "New Education Policy 2020 also support this view and recognize the importance of online/blended/digital education.

KEYWORDS: Online Teaching, Covid-19, Perceptions, Learning, ICT, Quantitative, Qualitative.

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1. Introduction

The Indian education system is based upon traditional chalk and talk methodology; although in the metro and capital cities of India there is the presence of ICT in the institution of higher education still more than 70% of Indian institutions are using traditional methods and pedagogy to teach students. In this time of the pandemic, institutions of higher education are struggling with several issues faced by teachers as well as by students. Many studies took place to study the different features of the online teaching-learning environment (Kim & Bonk, 2006) Online teaching requires certain expertise on both ends (teachers as well as for students).

The impact of this pandemic was so severe that it has shaken the world to its core. In most of the countries, Governments have temporarily closed educational institutions (Bds & Ojcius, 2020) According to UNESCO, this closure impacted 91% of the students. This report of UNESCO estimated that the coronavirus adversely impacted the 320 million students in India. Very few studies have been done so far to know the impact of COVID 19 on education (Toquero, 2020). Most of the studies are related to China and other countries, there is a lack of studies in India. Online teaching supports the concept of any time/anywhere learning, it provides the flexibility of time and location. Li and Akins (2003), Gagne and Walters (2009) suggested in their studies that there is a great need to develop tools for online teaching and such tools must be

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more effective when compared with face to face learning.

One quantitative study based upon Constructivist Online Learning Environment Survey (COLLES) studied the observed and expected experiences of students and teachers. This study was based upon quantitative data collected from teachers and students which concluded that there is a need for more research on the quality of teaching/learning realized with online support (Taylor & Maor, 2000). China, the originator of this disease implemented a policy of "Suspending Classes without Stopping Learning". This was launched by the Ministry of Education to switch into large scale online teaching. While studying the implications of this policy, it has been recommended that preparing teachers with relevant skills through professional development is the need of the hour. Furthermore, they argued that there is a need for financial, legal, and administrative support to the teachers (Zhang et al., 2020). This study targeted a wide research gap that must be filled by successive studies to know more about the effectiveness of online teaching.

The present study is an attempt to fill the research gap which was identified in earlier studies and the most important aspect of this study is to analyze the problem from the Indian perspective (Stošic & Stošic, 2015). The past studies didn't explain the disadvantages of the implementation of the internet in education. It has been argued that there is a need to explore the issue more extensively. So, in the current study, an attempt has been made to identify advantages as well as disadvantages along with challenges prevailing to online teaching. Online classes are going on but there is a need to analyze the learning outcomes. Do faculty members are at ease to use the different online platforms?

2. Literature review

There are very few studies to determine the effectiveness of online learning in Indian perspectives. New Education Policy generated the numerous dimensions to outdated education system in India. A comprehensive set of recommendations is provided for the promotion of online education, which also includes the establishment of an autonomous body National Education Technology Forum (NETF). There are numerous challenges for the implementation of NEP 2020, the major ones are capacity building and infrastructure (Soy, 2021). The recent outburst of epidemics clearly shows the importance of alternatives modes of quality education whenever and wherever traditional and in-house modes of education are not possible (Naveen, 2021). New education policy provided stress on digital India and this campaign will be helpful to convert entire nation into digitally empowered society as well as a knowledge economy. Extensive use of technology in higher education is the mission of NEP 2020. The whole word is affected by the COVID 19 and it's after effects are going to there for a long time. To implement the NEP 2020 there is need of huge investment for which Indian government is ready to enhance the budgetary expenditure from 3% to 6% (Kalyani, 2020). It is essential to identify scientific methods to observe and monitor the activities of teachers/learners during online teaching (Sahu, 2020). Limited research is available to study the comfort level of teachers, learning behaviour, and learning outcomes of students in the online environment (Hung & Zhang, 2008). A purely qualitative study was conducted in Canada in 2003 with a sample size of ten and used the Interview method to collect data (Conrad, 2004). In this study, teachers mentioned that online teaching is more time-consuming. Views of teachers have been collected before as well as after the online teaching. One of them mentioned that "although computer made him nervous it's not as bad as I thought maybe because of user-friendly online teaching software (in this case it was webCT)". Aydin (2005) conducted a quantitative study with a sample size of 53 mentors in Turkey. Descriptive statistics (means and standard deviation) were used to analyze the perceptions of teachers related to online teaching. Teachers perceived that access to resources is very crucial for the success of online teaching.

Similar two studies were conducted in the United States (2009), for the first study qualitative as well as quantitative data accessed to know the perceptions of teachers about online instructions. Fish et al. (2009) study is considered a base study for the current paper. While discussing challenges to online teaching some common barriers perceived by all faculty members were more time consuming, faculty training and support as well as faculty acceptance towards the paradigm of online instructions. In the second paper Gagne & Walters (2009), only qualitative data was collected for the Qualitative Meta-synthesis Study (QMS) design, generating new interpretive findings from existing qualitative studies. In this study, the authors selected nine studies to understand the changing role of the teacher in the case of online teaching and mentioned that further studies may be done to determine the robustness and efficacy of the findings or for generalizations of the findings. The instrument designed in the present study is based upon one which was used in the first study.

Teachers' perceptions were also studied by Gonzalez (2009) with the help of qualitative data. Seven lecturers were interviewed by the Faculty of Health Sciences. Teachers who were interviewed in this study conceived that online teaching is having some unique features like transmitting structured knowledge, more based upon interactions between students and teachers, teaching as a facilitating understanding, etc. Stošic & Stošic (2015) conducted a quantitative study with a sample of 143 teachers from Serbia. The scale consisted of 45 claims and is intended for determining teachers' attitudes regarding the implementation of the Internet in education. This study didn't explore the limitation of the use of online teaching. The study is also not able to explain the comfort level of teachers while teaching online. In the latest study (Park & Kim, 2020) collected

data from a sophomore-level online business statistics course between spring 2018 and summer 2018, taught by the same instructor. Mentors in this study assumed that the internet adds new dimensions in the teaching process and works as a facilitator. According to this study, a replication study with different communication tools in various courses would be good future research to support the generalizability of the findings. Bao (2020) in her case study also presented the same viewpoint and concluded that there is a need for adequate support for teachers to improve the breadth and depth of the teaching/learning process.

Based on the above literature review a comprehensive instrument is reviewed for the current study to collect data about teacher's perceptions. To support the viewpoint of teachers' quantitative as well as qualitative research is also required so data has been collected to evaluate both the aspect.

3. Research problem

Online teaching, which emerged as savior of education during the rise of pandemic becomes issue of concern for policy makers also. For the implementation of futuristic plan in any nation it is essential to know the expectations/perceptions of first pillar i.e. teachers. This study is an attempt to determine the problems and issues pertained to teachers during online teaching.

4. Methodology

For this study, a sample of 82 teachers was selected. These faculty members have been working in different colleges under the flagship of one Government University. To conduct this study an online survey tool was created with the help of Google forms. This survey was divided into five parts to collect data and faculty members were requested to provide their inputs as regards their perception and beliefs related to online teaching. These five different aspects were as follow: (i) Demographic profile of faculty members, (ii) Comfort level and training, (iii) Students learning outcomes, (iv) Delivery of academic tasks, and (v) Advantages/ disadvantages as well as barriers to online teaching. This survey was created after an extensive literature review. The scale used in this paper has been developed by Fish (2009).

Quantitative data was analyzed with the help of non-parametric tests. To compare differences in the mean ranking of the Likert scale of responses between university faculties with their experience of online teaching as a previous positive experience, previously negative experience, and no experiences of teaching, the computation of the Kruskal Wallis test was used at .05 level of significance.

4. Results

In this study, data was organized based on the experiences of teachers concerning online teaching. As per Table 2, 85.4% (70) of teachers were having positive experiences and only 4.8% (4) are having negative experiences as regards to online teaching whereas 9.8% (8) were not having any experience of online teaching. All of these teachers were teaching undergraduate as well as post-graduate classes. To check the difference between positive experiences, negative experiences, and no online teaching experiences and to compare means of these parameters, the Kruskal Wallis test has been performed. According to this test, there are significant means that rank the difference between the three different groups of faculties. All the results are given as appendices. Table 3 included the mean and Standard Deviations of responses given by faculty members. This table clearly explains the experiences of faculty members as regard to online teaching. Those who were having positive experiences are having higher value of mean 4.1(.78), 4.1(.94), 3.9(.90), 3.9(1.00) and 3.4(.94) as regard to, comfortable implementation, consider self-qualified, sufficient training, desire to teach online and future plan to teach online with a low slandered deviation. At the same time those who were having negative experiences comparatively have low mean value and high SD for 5 variables.

As regard to Students Learning Outcomes, again those who were having positive experiences are showing high value of mean as compare to those who were having negative experiences or having no experiences. These values are 3.4(1.26), 2.4 (2.0), 3.2(1.05), 3.4(.94), 3.0(1.75, 3.3 (.93) for advocate for online teaching, equivalent to traditional, beneficial to most students, complement adult learning, most students prefer online and enhances student services respectively. As compare to this, faculty with negative experiences shows a lower value of mean 3.0(.816), 2.0(1.15), 2.0(.81), 2.5(1.2), 1.7(.5), 2.2(.95) for six variables.

The third criteria was delivery of academic task, data in the Table 3 clearly shows that positive experiences lead to high value of mean whereas negative experiences lead to low value of mean for the five variables. These values are 3.7(.99), 3.5(.87), 3.3(1.21), 3.08(1.15) and 3.47(1.09) for faculties who were having positive experiences for

lecture, case studies, group discussion, group studies and research. In case of teachers having negative experience values are 2.2 (.95), 2.5(.57) 2.2(.50), 2.2(.95) and 3.5(1.29). These values are quite low for mean and high for SD.

Cronbach's alpha	*No. of items*
.936	16

Table 1 - Reliability Statistics.

	Frequency	*Per cent*	*Cumulative Percent*
Negative online teaching experience	4	4.9	4.9
No online teaching experience	8	9.8	14.6
Positive online teaching experience	70	85.4	100.0
Total	82	100.0	

Table 2 - Distribution of data according to the type of perceptions. Descriptive statistics were used to further analyze the data in terms of mean, SD.

5.1 Qualitative Data Analysis

5.1.1 The comfort level and Implantation

Participants were asked to rate their perceptions related to online teaching on a Likert scale of 1 to 5. For the first part i.e. comfort level and training, they were asked to answer these five statements Comfortable Implementing, Consider Self Qualified, Sufficient Training, and Desire to Teach Some Online as well as Future Plans to Teach Online. Those who were having 4(4.8%) negative online teaching and those who were having 8(9.8%) no online teaching out of these only 2 teachers agreed that it was difficult for them to implement online teaching. Those who were having 70 (85.4%) positive online teaching experience, out of these only two-faced problems while implementing online teaching, 56 agreed that they were quite comfortable while implementing online teaching. This perceived conception of comfort level may be enhanced in the no online teaching group due to the reason that 25% of participants within the group consider themselves as self qualified even in case of negative online teaching experience 25% agreed that they were self qualified. In the case of positive online teaching experiences, 40% (28) out of 70 consider themselves as self qualified. Among the faculty members who were perceived negative and no online teaching experience, only 1(25%), 1(12.5%) respectively were having formal and informal training, whereas those

who were having positive online teaching experiences 51(72.8%) agreed that they were having training in one or another form. Those who were having negative and no online teaching experiences only 4 (33%) were having any desire to teach an online course. At the same time, those who have positive online teaching experiences 48(68.5) were having a desire to teach online programs. Those members who were having positive experiences 48(68.5%) came forward with the plan to teach online whereas negative or no online teaching experience squeezed this ratio 25% only. Responses of faculty regarding comfort level and training of faculty while implementing online teaching has been given in Table 4.

5.1.2 Students' Learning and Outcome

To access perceptions regarding the outcome of teaching as regard to students, faculty members have been asked to rank six statements. These statements were Advocate for OnlineTeaching, Equivalent to Traditional, Beneficial to Most Students, Complements Adult Learning, Most Students Prefer Online, and Enhances Student Service.

Surprisingly when they were asked about the comparison of online and traditional teaching, most of them prefer traditional teaching and declared that online teaching is not equivalent to traditional teaching. Faculty members with no online teaching and negative online teaching experiences, only 1(8.3%) agreed that both are equal. Those who were having positive experiences only 12(17%) agreed upon the equality of both. This may be due to poor resources and institutional support because while answering open-ended questions most of them mentioned about lack of resources and technical issues. Not even a single faculty member with negative and no online teaching experiences agreed that students prefer online teaching as compared to classroom teaching where. Those who were having negative and no online teaching experiences only 4(33%) responded favorably, whereas 36(51%) advocate online teaching. as those with positive believes 23(32.8%) said that students prefer online teaching. In the first subgroup, only 1(8.3%) said that online teaching enhanced students' services while 32(45.7%) in the subgroup with positive perceptions agreed that online teaching enhanced students' services. The relevant data related to Students' learning and Outcome has been mentioned in Table 5.

5.1.3 Delivery of Academic task

Most of the Faculty members were in favour of online teaching while discussing the success of lecture and case study method. Those who were having positive experiences considered the lecture method as the best one. Out of these 43(61.4%) considered the lecture method most effective while teaching online. In this group 36(51%) considered a case study an effective method. The same faculty members were not in favour of group activities while teaching online. Teachers having no teaching/negative experiences only 3(25%) consider lecture and case study methods are effective while teaching online.

For research purposes, 42(60%) agreed that online teaching is effective. The detailed data related to the perceptions of teachers regarding the delivery of Academic tasks have been given in Table 6.

Items	Faculty with Positive Experiences M (SD)	Faculty with Negative Experiences M (SD)	Faculty with No Experiences M (SD)
The comfort level and Training			
Comfortable Implementing	4.1 (.78)	2.5 (1.29)	3.2 (1.38)
Consider Self Qualified	4.1 (.84)	3.2 (1.25)	3.5 (1.06)
Sufficient Training	3.9 (.90)	3.0 (1.63)	2.6 (1.18)
Desire to Teach Some Online	3.9 (1.00)	3.25 (.50)	3.2 (1.38)
Future Plans to Teach Online	3.9 (.94)	2.7 (.50)	2.6 (1.4)
Student' learning outcomes			
Advocate for Online Teaching	3.4 (.126)	3.0 (.816)	2.6 (.56)
Equivalent to Traditional	2.4 (2.0)	2.0 (1.15)	2.1 (1.45)
Beneficial to Most Students	3.2 (1.05)	2.0 (.81)	2.0 (1.06)
Complements Adult Learning	3.4 (.94)	2.5 (1.2)	2.37 (1.06)
Most Students Prefer Online	3.0 (1.75)	1.7 (.5)	1.8 (.83)
Enhances Student Service	3.3 (.93)	2.2 (.95)	1.8 (1.12)
Delivery of Academic Tasks			
Lecture	3.7 (.99)	2.2 (.95)	2.8 (1.35)
Case Studies	3.5 (.87)	2.5 (.57)	2.6 (1.06)
Group Discussion	3.3 (1.21)	2.2 (.50)	2.3 (1.5)
Group Activities	3.08 (1.15)	2.2 (.95)	2.5 (1.3)
Research	3.47 (1.09)	3.5 (1.29)	2.2 (1.38)

Table 3 - Descriptive statistics.

5.2 Qualitative Data Analysis

For the sake of open discussion, some open-ended questions were included in the survey instrument, which was related to advantages, disadvantages, and barriers to online teaching.

There are certain limitations of the quantitative analysis, which are beyond the control of researcher (Simon, 2011). To overcome such issues

a mixed approach has been used. Under this content analysis is performed with the help of two techniques i.e. with the help of themes (manual method) and with the help of the second technique used for the same is Word Frequency Analysis.

5.2.1 Content Analysis: Themes

(Advantages of online teaching)

Manual content analysis was performed as the examination mechanism. For this analysis advantages, listed by teachers are considered a unit of analysis. In this process, the following main themes emerge as advantages of online teaching: (a) Flexibility of time and location. (b) Safe and convenient during this time of Covid-19. (c) Helpful to keep the social distance. The majority of teachers agreed that online teaching is quite flexible as regards to time and place. Anytime, anywhere learning is possible due to online teaching. Teachers cited that "Students can learn from anywhere", "Covers the barriers of time and distance regardless of place, you can get to learn wherever you are". When they wrote about the advantages major concern in their mind is the safety of students during this time of pandemic and the said, "Easy and safe", "It keeps you safe and saves time" "Provide a safer environment, cut commuting cost, can be conducted from any place of your comfort" one of the faculty members very beautifully express views while describing the advantage of it.

"It is the need of the hour to fill in the void created due to Covid-19. This has highlighted the positive side of technology to all who were against it. Since social distancing is the foremost concern to be safe from the corona. Online teaching came as a boon for both teacher and taught. Moreover, the teachers have played a crucial role in creating a positive mindset for all (students and their parents). They have made it evident to all that we the teachers are always there for our students, to make them sail smoothly through every storm in life be it directly (as in the present situation) or indirectly later on in their life (by making them confident and strong)".

5.2.2 Disadvantages of Online Teaching

Faculty members were also asked to write disadvantages of online teaching, major cons which were emerged are (a) network problem, (b) lack of face to face interaction (c) difficult to teach practical subjects. Teachers expressed disadvantages as "Network problem is the biggest issue. Second thing is that students have less

Comfortable Implementation	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0 %	1 25.0 %	1 25.0 %	1 25.0 %	0 0.0%	4 100.0%
No Online Teaching Experience	1 12.5 %	1 12.5 %	3 37.5 %	1 12.5 %	2 25.5%	8 100.0%
Positive Online Teaching Experience	0 0.0%	2 2.9%	12 17.9%	33 47.1%	23 32.8%	70 100.0%
Total	2 2.4%	4 4.9%	16 19.5%	35 42.7%	25 30.4%	82 100.0%
Consider Self Qualified	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	1 25.0%	2 50.0%	0 0,0%	1 25.0%	4 100.0%
No Online Teaching Experience	0 0.0%	1 12.5%	4 50.0%	1 12.5%	2 25.0%	8 100.0%
Positive Online Teaching Experience	0 0.0%	3 4.3%	11 15.7%	28 40.0%	28 40.0%	70 100.0%
Total	0 0.0%	5 6.1%	17 20.7%	25 35.4%	31 37.8%	82 100.0%
Sufficient Training	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	0 0.0%	2 50.0%	0 0.0%	1 25.0%	4 100.0%
No Online Teaching Experience	1 12.5%	3 37.5%	3 37.5%	0 0.0%	1 12.5%	8 100.0%
Positive Online Teaching Experience	1 1.4%	4 5.7%	14 20.0%	33 47.1%	18 25.7%	70 100.0%
Total	3 3.7%	7 8.5%	19 23.2%	33 40.2%	20 24.3%	82 100.0%
Desire to Teach Some Online	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	0 0.0%	3 75.0%	1 25.0%	0 0.0%	4 100.0%
No Online Teaching Experience	1 12.5%	1 12.5%	3 37.5%	1 12.5%	2 25.0%	8 100.0%
Positive Online Teaching Experience	0 0.0%	8 11.4%	14 20.0%	24 34.3%	24 34.3%	70 100.0%
Total	1 1.2%	9 11.0%	20 24.4%	26 31.7%	26 31.7%	82 100.0%
Future Plan to Teach Online	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	1 25.0%	3 75.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	2 25.0%	2 25.0%	2 25.0%	1 12.5%	1 12.5%	8 100.0%
Positive Online Teaching Experience	0 0.0%	6 8.6%	16 22.9%	26 37.1%	22 31.4%	70 100.0%
Total	2 2.4%	9 11.0%	21 25.6%	27 32.9%	23 28.0%	82.0% 100.0%

Table 4 - Comfortable Implementation and training.

Advocate for Online Teaching	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	1 25.0%	2 50.0%	1 25.0%	0 0.0%	4 100.0%
No Online Teaching Experience	3 37.5%	1 12.5%	1 12.5%	2 25.0%	1 12.5%	8 100.0%
Positive Online Teaching Experience	3 4.3%	9 12.9%	22 31.4%	24 34.3%	12 17.1%	70 100.0%
Total	6 7.3%	11 13.4%	25 30.5%	27 32.9%	13 15.9%	82 100.0%
Equivalent to Traditional Teaching	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	2 50.0%	0 0.0%	2 50.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	4 50.0%	1 12.5%	2 25.0%	0 0.0%	1 12.5%	8 100.0%
Positive Online Teaching Experience	19 27.1%	17 24.3%	22 31.4%	9 12.9%	3 4.3%	70 100.0%
Total	25 30.5%	18 22.0%	26 31.7%	9 11.0%	4 4.9%	82 100.0%
Beneficial to Most Students	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	2 50.0%	1 25.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	3 37.5%	3 37.5%	1 12.5%	1 12.5%	0 0.0%	8 100.0%
Positive Online Teaching Experience	5 7.1%	10 14.3%	25 35.7%	23 32.9%	7 10.0%	70 100.0%
Total	9 11.0%	15 18.3%	27 32.9%	24 29.3%	7 8.5%	82 100.0%
Complement Adult Learning	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	1 25.0%	1 25.0%	1 25.0%	0 0.0%	4 100.0%
No Online Teaching Experience	2 25.0%	2 25.0%	3 37.5%	1 12.5%	0 0.0%	8 100.0%
Positive Online Teaching Experience	4 5.7%	3 4.3%	26 37.1%	30 42.9%	7 8.5%	70 100.0%
Total	7 8.5%	6 4.3%	30 42.9%	32 39.0%	7 8.5%	82 100.0%
Most Students Prefer Online	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	3 75.0%	0 0.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	3 37.5%	3 37.5%	2 25.0%	0 0.0%	0 0.0%	8 100.0%
Positive Online Teaching Experience	5 7.1%	16 22.9%	26 37.1%	19 23.2%	4 5.7%	70 100.0%
Total	9 11.0%	22 26.8%	28 34.1%	19 23.2%	5 4.9%	82 100.0%
Enhances Students Services	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	1 25.0%	2 50.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	4 50.0%	2 25.0%	1 12.5%	1 12.5%	0 0.0%	8 100.0%
Positive Online Teaching Experience	1 1.4%	12 17.1%	25 35.7%	25 35.7%	7 11.36%	70 100.0%
Total	6 7.3%	15 18.3%	28 34.1%	26 31.7%	7 8.5%	82 100.0%

Table 5 – Students' learning and outcome.

Lecture	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	2 50.0%	2 50.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	1 12.5%	3 37.5%	1 12.5%	2 25.0%	1 12.5%	8 100.0%
Positive Online Teaching Experience	0 0.0%	8 11.4%	19 27.1%	23 32.9%	20 28.5%	70 100.0%
Total	2 2.4%	12 14.6%	22 26.8%	25 30.5%	21 25.6%	82 100.0%
Case Studies	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	2 50.0%	2 50.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	1 12.5%	3 37.5%	2 25.0%	2 25.0%	0 0.0%	8 100.0%
Positive Online Teaching Experience	0 0.0%	8 11.4%	26 37.1%	26 37.1%	10 14.2%	70 100.0%
Total	1 1.2%	13 15.9%	30 36.6%	28 34.1%	10 12.1%	82 100.0%
Group Discussion	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	3 75.0%	1 25.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	3 37.5%	2 25.0%	1 12.5%	1 12.5%	1 12.5%	8 100.0%
Positive Online Teaching Experience	6 8.6%	12 17.1%	16 22.9%	23 32.9%	13 18.5%	70 100.0%
Total	0 0.0%	3 75.0%	1 25.0%	0 0.0%	0 0.0%	4 100.0%
Group Activities	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	1 25.0%	1 25.0%	2 50.0%	0 0.0%	0 0.0%	4 100.0%
No Online Teaching Experience	2 25.0%	2 25.0%	3 37.5%	0 0.0%	1 12.5%	8 100.0%
Positive Online Teaching Experience	8 11.4%	11 15.7%	26 37.15	17 24.3%	8 11.4%	70 100.0%
Total	11 13.4%	14 17.1%	31 37.8%	17 20.7%	9 6.5%	82 100.0%
Research	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*	*Total*
Negative Online Teaching Experience	0 0.0%	1 25.0%	1 25.0%	1 25.0%	1 25.0%	4 100.0%
No Online Teaching Experience	3 37.5%	2 25.0%	2 25.0%	0 0.0%	1 12,5%	8 100.0%
Positive Online Teaching Experience	3 4.3%	12 17.1%	16 22,9%	27 38.6%	12 17.15	70 100.0%
Total	6 7.3%	15 18.3%	19 23.2%	28 34.1%	14 17.0%	82 100.0%

Table 6 - Delivery of Academic task.

interest in online classes as compared to offline. The physical interaction between a teacher and student is getting reduced which will result in a fall in discipline and honesty levels from students' sides", "Basically technical& network problems." "Lack of interaction and lack of focus of students", Interaction with students is limited, can miss on reactions of students while teaching so wouldn't be able to know whether they understand the topic or not". Further, they also talk about the health issues of online teaching, discipline, and honesty of students while attending online classes.

5.2.3 Barriers to online teaching: Word Cloud

While mentioning barriers to online teaching, faculty members strongly discussed the following points (a) lack of infrastructure; (b) dependence on technology; (c) Poor connectivity and screen timing etc.

While writing about some common barriers they wrote,

"Lack of techno experience, lack of full access to advanced technology, lack of sufficient resources in the institutions for the implementation of online learning". The majority of the teachers who were having negative online teaching experience said that "technology; poor network and lack of expertise are the major hindrances in the implementation of online teaching. One teacher from the language department mentioned that, "Lack of techno experience, lack of full access to advanced technology, lack of sufficient resources in the institutions for the implementation of online learning".

5.2.4 Word Frequency Analysis (WFA)

A textual analysis of words has been performed with the help of the online portal www.wordart.com. WFA provides the number of times a word is used in the sample's unstructured data. This has been done to support manual thematic analysis. The output of WFA was also represented in the form of a cloud. Some words which are obvious in the list of advantages/ disadvantages as well as to depict barriers have been removed because these words are treated as stop words. These words are teaching, online, students, and time. Word convenient used 9 times, flexible 8 times, need 6 times better, and access 5 times, COVID, and technology 4 times. Word cloud gives a pictorial representation of the different words used and also helpful to identify prominently used words. Words which are used more frequently will be showed as bigger in size as compared to those words which were used as a smaller number of times. The most frequently used words in advantages are: convenient, flexible, COVID, need (which may represent the need of the hour). Figure 1 represents the word cloud of the advantages of online teaching as stated by teaching fraternity.

The same process was adopted to check the WFA of disadvantages and barriers to online teaching. Figure 2 represents the word cloud of the disadvantages of online teaching. This was also framed after removing stop words which were the same as in case of advantages of online teaching, most frequently used words in disadvantages were: network, health issue, lack of social/face to face interactions, etc.

In case of barriers to online teaching, Figure 3 represents the word cloud of the same. Words that were used most frequently were Internet and network (17 times), issue and connection (13 times), lack, and technology was used as 12 and 8 times respectively.

6. Discussion

In any form of teaching either face to face or online, faculty will remain the most important pillar. For the success of any practice in the teaching/learning process, the involvement of faculty is the most important aspect (M. Hung, 2015). Training of the faculty was not possible due to the sudden closure of colleges due to Covid-19 still who were having positive online teaching experiences 51(72.8%) agreed that they were having training in one or another form.

Figure 1 - Advantages of Online Teaching.

Figure 2 - Disadvantages of Online Teaching.

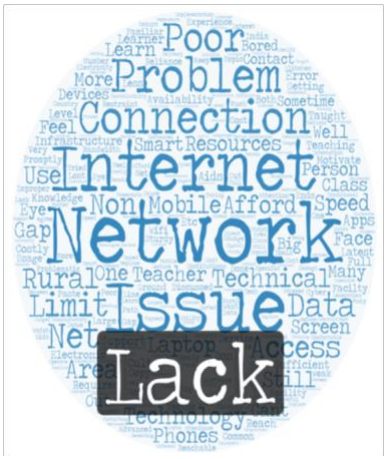

Figure 3 - Barriers to Online Teaching.

Among the faculty members who were perceived as negative and no online teaching experience, only 1(25%), 1(12.5%) respectively were having formal and informal training. This depicts the importance of training.

Learning is a continuous or never-ending process as teachers who were having negative online teaching experiences 25% of them consider themselves as self qualified. This result showed that faculties are learning with informal methods.

Type of the teaching experience (positive, negative) is a major deciding factor either faculty liked online teaching or not as those who were having negative and no online teaching experiences only 4 (33%) responded favorably, whereas 36 (51%) advocate the online teaching. At the same time either they will teach online in near future also depends upon their teaching experiences because those members who were having positive experiences 48(68.5%) came forward with the plan to teach online whereas negative or no online teaching experience squeezed this ratio (25%) only.

The majority of the teachers agreed that there is no alternative to classroom teaching, teachers who were having positive online teaching experiences, only 12 (17%) agreed that both (online as well as traditional) are equal. Faculty members also agreed that in the time of crisis like Covid-19, online teaching acts as a blessing and there is a need to develop more and more infrastructure for the implementation of online teaching.

Online teaching support delivery of academic task but the success of delivery depends upon the nature of the task, as it's easy to deliver the lecture and discuss case studies in case of online teaching whereas it is difficult to perform group activates.

7. Limitation of the study

The present study also suffered from certain limitations, such as size of sample, limited number of variables, scope of the study etc. There is a scope of future studies for the other developing and underdeveloped countries where means and resources are scare. There is scope to study the other dimensions of the higher education. There is also a need to test the questionnaire psychometrically for validity and sensitivity.

8. Conclusion

This study was performed to examine the perceptions of faculty regarding online teaching. For many of the teachers, it's a new experience. As India is a developing country and most of the educational institutions are in transition face, it's not only the institutes rather faculty members were also in dilemma as regards to online teaching. Although many of them agreed that online and traditional modes of teaching are not equal still there is a split between teachers, this split is visible as regard to positive online teaching experiences and negative or no online teaching experiences. Respondents who were successful in the implementation of online teaching highly advocate it and consider it more flexible, need of the hour, and highly advocate online teaching. Training and learning by doing are also important for the successful implementation of online teaching. There is a need to train the faculty as those who were trained were more comfortable while implementing online teaching.

In a country like India, there is a lack of infrastructure as most of the faculty members complaints about infrastructure, network problem, lack of recourses on both ends (for teachers as well as students. Results also revealed that 100% rely on online teaching is not safe and possible due to lack of recourses but it may acts as a supplement along with traditional classroom teaching.

There is need of huge investment in higher education for the success of online/blended teaching/learning process. Implementation of New Education Policy 2020 is ray of hope in this regard.

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Security as an emerging dimension of Digital Literacy for education: a systematic literature review

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Abstract

The mass use of the Internet, networks and digital devices has intensified the training processes in digital literacy; however, the risks related to the safety of users have also increased. The objective of this article is to analyze the scientific production related to digital security literacy, as well as to identify consolidated and emerging lines of research. To achieve this, a systematic literature review was carried out during the 2010-2020 period, taking as sources of information the Scopus and Web of Science databases. We used the systematic literature review method which has been adjusted for its application in the area of social sciences. The results indicate that most of the scientific texts have been produced in English, and that the treatment of the subject has been developed from perspectives related to criteria for the protection of personal data. Therefore, it is concluded that there is a need to develop a more solid body of scientific work that considers aspects such as safety in social networks, skills for digital security and digital intelligence.

KEYWORDS: Digital literacy, Security, Systematic Literature Review, Technology.

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1. Introduction

The mass use of technologies in society has had a great influence determining the modifications in the way of accessing and sharing information, and the digital literacy as a set of skills to interpret information and generate knowledge has accompanied these changes (Cabero & Fernández, 2018). However, overcrowding has also increased dependence on technology to carry out socialization processes such as establishing synchronous/asynchronous communication, exchanging data of various types, which has made users of computer networks vulnerable to suffering threats that violate their personal and professional identity security in cyberspace (Ibarra Rius et al., 2018).

1.1 The concept of digital literacy

The conceptual development of digital literacy originates with the proposal of Gilster (1997), who stated that a digitally literate person was who had sufficient skills to understand and use information from different digital sources, as well as to solve problems related to access and selection of information. This concept has evolved due to the demands of the interconnected world, where it is not enough to have the knowledge for reading, writing and understanding messages, but in which it is also necessary to learn new cognitive mechanisms, and to search, filter, categorize and use pertinent information (Gértrudix et al., 2016), as well as to establish effective communication using various technological means (Bhatt & Mackenzie, 2019), and even develop computational logical thinking (Gutiérrez et al., 2016).

It has also been argued that it is a set of skills to know how to communicate and obtain information through electronic tools (Shafirova, 2018), which has a close

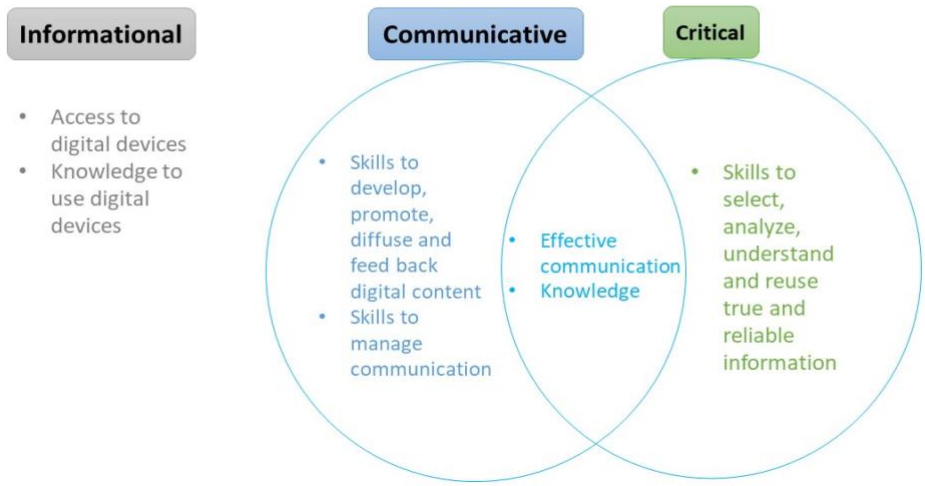

Figure 1 - Dimensions of digital literacy.

relationship with the ability to use digital media to evaluate the quality of information (Shin, 2015), and that is expressed as the knowledge and skills shown by individuals in digital environments effectively (Harati et al., 2018). Therefore, digital literacy is a complex skill that encompasses a diversity of awareness related to the knowledge of digital ecosystems, the critical use of technological devices, and the analysis of the information that can be obtained and produced through them (Terreni et al., 2019).

The issue has also provoked multiple reconceptualizations and research interests in recent years (Leaning, 2019), some of which aimed at developing proposals to identify the dimensions that compose digital literacy. In this sense, Nichols and Stornaiuolo (2019) mention computing, informational and media as main dimensions, while other authors include critical/cognitive skills, informational and communicative as their main components (Area Moreira, 2015; Demoiny & Ferraras-Stone, 2018; Holladay, 2018; Moreno Rodríguez et al., 2018; Rodríguez de Dios & Igartua, 2016) (see Figure 1).

In the academic field, digital literacy has gained relevance due to the increasingly intense incorporation of technologies in daily teaching and learning practices, which require the use of interactive tools based on the Internet, mobile devices, administration platforms of knowledge, and other digital resources (Tomczyk, 2019). Faced with this situation, educational institutions have invested considerable budget to increase the technological infrastructure to promote activities related to management, research and teaching.

In addition to the above, in recent years emphasis has been placed on aspects related to the safety of subjects who interact in educational settings with technologies and digital environments. Digital literacy not only implies using agile computer programs and information from digital networks, but also having the ability to guarantee students own security to prevent practices such as identity theft and unauthorized access to personal data. In this sense, Sonck et al. (2011) affirmed that if the digital literacy processes include components related to the prevention of risk behaviors associated with the use of digital tools, users will have the ability to better cope with the dangers present in a computerized society.

1.2 An emerging dimension: Digital security

Although the access and use of digital technologies in education offers disruptive opportunities to achieve better learning and socialize knowledge, it is also associated with risks and the development of potentially dangerous attitudes (Rodríguez de Dios & Igartua, 2015). It is not enough to handle computer devices and programs properly, but the ability to guarantee one's own security when using them is also required (Tomczyk, 2019). For this reason, an emerging dimension of digital literacy is related to the prevention of these risks and the ability to respond correctly to critical situations in the inappropriate handling of security (Rodríguez de Dios & Igartua, 2016; Kopecky & Szotkowski, 2017).

Digital security is the discipline that allows the protection of information, through the treatment of threats that put at risk the data that is processed, stored and transported on the Internet, it is oriented both to information systems and to users (Ghafir et al, 2018). Therefore, knowledge about how to deal with online dangers has become one of the key literacies, to ensure that people use the Internet in a safe way it becomes increasingly important to acquire the ability to recognize and deal with the dangers that appear in virtual spaces (Kopecky & Szotkowski, 2017).

In the educational field, well-founded fears have been expressed about the security conflicts that may exist in digital networks accessed by students (Pulak &

Wieczorek-Tomaszewska, 2015), such as cyberbullying, the invasion of privacy due to the unethical use of personal data (Ibarra Rius et al., 2018; Shin, 2015), weaknesses in the construction of digital identity (Moreno Rodríguez et al., 2018). Moreover, the emerging cyberwellness culture involves understanding the risks of harmful online behaviors, such as knowing how to protect oneself and others from actions that can put the welfare of Internet users at risk (Onumo et al., 2017).

For this reason, it is necessary to expand the study dimensions of digital literacy to know and establish training strategies that allow people to have sufficient skills to identify latent threats in digital interaction scenarios. In this study, the concepts of literacy and digital security were analyzed to establish parameters to perform a systematic literature review that would allow us to investigate the characteristics of scientific production on the subject, and with this to know the contemporary and emerging research trends.

2. Materials and Methods

To inquire about the relationship between digital literacy and security in digital environments, a systematic literature review was carried out with the purpose of knowing the characteristics of scientific production on the subject during the period 2010-2020, and thus identify research trends, as well as emerging exploration areas (García-Peñalvo, 2017a; Sánchez-Mena & Martí-Parreño, 2017). The review considered the methodology designed by Petersen et al. (2008), which has been applied as a bibliometric-descriptive study by various authors in the area of social sciences (Cantú González et al., 2019; López-Meneses et al., 2015; Ramírez Montoya & García-Peñalvo, 2018). Figure 2 illustrates the phases through which the study was developed.

2.1 Definition of research questions

In the first phase, the questions that guided the research were defined, since the intention of this paper was to know the scientific production related to literacy and digital security in education. The following questions were proposed:

Q1 - How many scientific articles related to digital literacy and security have been published between 2010 and 2020?
Q2 - How is research on digital literacy and security produced geographically and in what languages?
Q3 - What kinds of scientific products have been published, and how is their accessibility to readers?
Q4 - What are the documents with the greatest international impact according to the number of citations?
Q5 - What lines of research have been developed around digital literacy and security?
Q6 - What are the lines of research that have set trends?
Q7 - What are the lines of research that can be considered as emerging?

2.2 Location of scientific production

The second phase consisted of searching the scientific production in the Scopus and Web of Science (WoS) databases, since they are the main sources of peer-reviewed academic information (Delgado & Repiso, 2013). The terms used were digital literacy as the main search element and digital safety or digital security as contextual elements. To delimit the search, the first filter was applied, and the results were located in the disciplinary area of the social sciences (social sciences in Scopus; education scientific disciplines & social sciences interdisciplinary in WoS). Table 1 shows the general search string for Scopus and WoS.

2.3 Depuration of scientific production

Having defined the searching criteria, the first results were refined. Initially, 28 documents that appeared in both databases were excluded. The rejected documents were the following: articles in the preprint publication stage, without the author's name, with a corporate author, without an abstract available, and with misprints. Finally, a detailed reading of the summaries of the documents was made to eliminate false positives; that is, documents that did not address the subject of study of this research. Table 2 shows the progression to debug the documents.

2.4 Elaboration of the database for the SLR

Once the debugging was done, the next phase involved analyzing 106 documents. To do this, a database was developed in Microsoft Excel software considering the following fields: 1) author, 2) title of the publication, 3) abstract, 4) keywords, 5) year, 6) source data (name of the journal/book, volume, year, article number, pages, DOI, references, publisher), 7) country, 8), language, 9) type of document, and 10) access. Finally, each document was assigned a sequential numerical identifier.

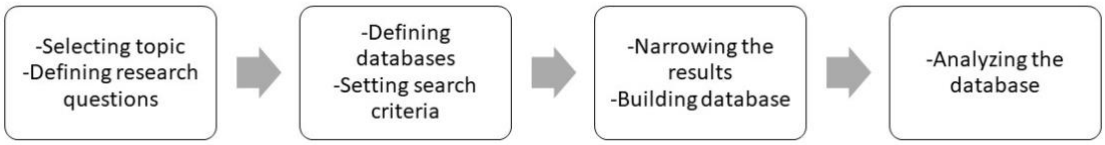

Figure 2 - Phases to perform the systematic review.

2.5 Database analysis

The information analysis was carried out in two stages. In the first stage, scientific production was quantified using as criteria the number of publications per year, language, country, type of document, access, and impact by number of citations. To carry out the second stage, the database was imported into the VOSViewer software, a tool that has been used in various investigations (Bornmann et al., 2016; Rodríguez-García et al., 2019) to extract the summaries of the selected documents, and with them create semantic maps to delimit the research trends.

Scopus
(TITLE-ABS-KEY (digital AND literacy) AND TITLE-ABS-KEY (digital AND security) OR TITLE-ABS-KEY (digital AND safety)) AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010)) AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (EXCLUDE (SUBJAREA, "MEDI") OR EXCLUDE (SUBJAREA, "NURS"))
Web of Science
((digital literacy AND (Digital security OR Digital safety)) Refined by: WEB OF SCIENCE CATEGORIES: (EDUCATION EDUCATIONAL RESEARCH OR COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS OR COMMUNICATION OR SOCIOLOGY OR PSYCHOLOGY EDUCATIONAL OR EDUCATION SCIENTIFIC DISCIPLINES OR SCIENCE INFORMATION SCIENCE LIBRARY OR SCIENCE INFORMATION SCIENCE LIBRARY OR COMPUTER SCIENCE THEORY METHODS OR SOCIAL SCIENCES INTERDISCIPLINARY OR COMPUTER SCIENCE INFORMATION SYSTEMS) AND [excluding] TYPES OF DOCUMENTS: (EARLY ACCESS) Time period: 2010-2020 Indices: SCI-EXPANDED, SSCI, A & HCI, CPCI-S, CPCI -SSH, BKCI-S, BKCI-SSH, ESCI.

Table 1 - Original search string.

Exclusion criteria	Scopus	WoS	Total
Original string	184	109	293
Duplicates	184	81	265
Preprints	29	11	225
No Author Name/Corporate Author	12	5	208
No summary	6	2	200
Editorials/misprints	3	1	196
False positives	49	41	106
Total	85	21	106

Table 2 - Depuration of scientific production.

3. Results

Q1 - Scientific production between 2010 and 2020

The evolution of scientific publications has increased in recent years. In particular, in 2016, there were thirteen published papers (12.26%); while in 2017 twelve (11.32%); in 2018 seventeen (16.04%), and in 2019 twenty-three (21.70%). Figure 3 shows the diachronic trend in Scopus and WoS. It is necessary to mention that although the research considered publications from 2020, at the end of this project, the year had not yet concluded, so the number of documents that addressed the subject cannot be specified with precision.

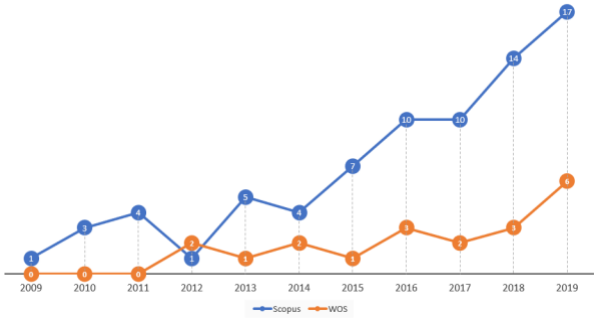

Figure 3 - Growth of scientific production in WoS and Scopus.

Q2 - Geographical distribution and languages in which research is produced

Figure 4 shows the geographical distribution of scientific production, which comes largely from the United States of America with 20 publications (18.87%), followed by the United Kingdom with 8 (7.55%), and Canada and Russia with 7 (6.60%). This means that these four countries have produced more than a quarter (39.62%) of world publications. Spain is the Iberoamerican country that has produced the most papers with 6 (5.66%).

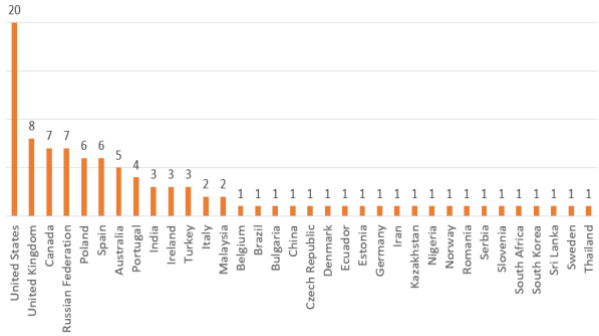

Figure 4 - Scientific production by country.

Table 3 lists the number of documents by language, in which English is the most widely used idiom with a predominance of 96 publications (90.57%), followed by Spanish with 5 (4.72%). There are two documents in

Russian, and one in Bosnian, Portuguese and Ukrainian. Regarding the impact of citations by country, the United States of America tops the list with 218 citations followed by the United Kingdom that counts 199, Canada 82, Norway 40, Australia 38, and Spain with 33. Table 4 shows the distribution by country, as well as the quotes between publications.

Language	*Total*	*Percentage*	*Publication No.*
English	96	90.57%	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20. 21, 22, 23, 24, 25, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 78, 79, 80, 82, 83, 84, 85, 86, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106.
Spanish	5	4.72%	26, 28, 77, 81
Russian	2	1.89%	5, 87
Bosnian	1	0.95%	60
Portuguese	1	0.95%	27
Ukrainian	1	0.95%	4

Table 3 - Documents by language.

Q3 - Types of scientific product and access

The documents were organized as follows: journal articles, book chapters, books, editorials, reviews, and conference papers (international papers). In Table 5, the distribution can be observed highlighting that the articles in magazines have a greater diffusion with 62 publications (58.49%).

The open access and restricted journals with the highest number of publications were identified. The balance regarding the type of access favors publications of the closed or paid type with 82 (77.34%), while those in open format are 24 (22.64%). In Table 6, the archives are categorized according to the restrictions for their full text consultation.

Q4 - Documents with the greatest international impact according to the number of citations

Table 7 shows the journals with the higher international impact in relation to the topic of literacy and digital security. The journal with the greatest impact is *Children and Society* with 191 citations corresponding to the article *On the rapid rise of social networking sites: New findings and policy implications,* followed by *New Media & Society* with 82 citations (22 in Scopus and 60 in WoS) linked with the publication *"Personal data literacies": A critical literacies approach to enhancing understandings of personal digital data*. The journal *Learning, Media and Technology* counts 72 citations grouped in the articles *Listening to excluded young people's experiences of e-safety and risk* (16) and *Digital literacy and informal learning environments: An introduction* (56). The best-placed Iberoamerican magazine in the ranking is *RED Revista de Educación a Distancia*, having 60 citations for the document *Assessing the digital-safety competences of students in Basic Education*. The data in Table 8 indicate the impact by the author.

Country	*Documents*	*Quotes*
United States	20	218
United Kingdom	8	199
Canada	7	80
Russian Federation	7	14
Poland	6	4
Spain	6	33
Australia	5	38
Portugal	4	6
India	3	4
Ireland	3	18
Turkey	3	0
Italy	2	7
Malaysia	2	2
Belgium	1	9
Brazil	1	0
Bulgaria	1	0
China	1	0
Czech Republic	1	0
Denmark	1	0
Ecuador	1	6
Estonia	1	7
Germany	1	2
Iran	1	2
Kazakhstan	1	0
Nigeria	1	0
Norway	1	40
Romania	1	0
Serbia	1	0
Slovenia	1	0
South Africa	1	0
South Korea	1	8
Sri Lanka	1	0
Sweden	1	0
Thailand	1	0

Table 4 - Number of citations per country/total documents.

Document	*Total*	*Percentage*	*Publications*
Articles	62	58.49%	3, 4, 5, 6, 7, 9, 10, 11, 15, 16, 17, 20, 22, 23, 24, 25, 26, 28, 32, 33, 34, 36, 39, 42, 46, 48, 49, 54, 56, 57, 60, 63, 64, 65, 67, 68, 69, 70, 71, 72, 73, 75, 76, 79, 80, 81, 83, 84, 85, 87, 89, 92, 93, 94, 95, 97, 98, 99, 100, 102, 104, 106.
Chapters of the book	9	8.49%	21, 35, 45, 55, 74, 82, 86, 91, 103.
Editorial	1	0.95%	62
Reviews	25	23.58%	12,13, 14, 27, 29, 31, 37, 40, 41, 43, 44, 47, 51, 52, 53, 58, 59, 61, 66, 77, 78, 88, 90, 96, 105.
Conference documents	9	8.49%	1, 2, 8, 18, 19, 30, 38, 50, 101.

Table 5 - Documents by type of publication.

Access	*Total*	*Percentage*	*Publications*
Closed	82	78.30%	1, 2, 3, 4, 7, 8, 10, 12, 13, 14, 15, 16, 18, 19, 20. 21, 22, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 40, 41, 43, 44, 45, 47, 49, 50, 51, 52, 53, 54, 55, 59, 61, 62, 63, 64, 65, 66, 67, 68, 70, 72, 74, 76, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 99, 101, 102, 103, 104, 105, 106.
Open	24	21.70%	5, 6, 9, 11, 17, 23, 24, 33, 39, 42, 46, 48, 56, 57, 58, 60, 69, 71, 73, 75, 77, 81, 98, 100.

Table 6 - Documents by type of access.

Rank	*Source title*	*Number of quotes*	*Source*	*Impact index*	*H index*
1	Children and Society	191	Scopus	Q1	54
2	New Media & Society	82	Scopus & WoS	Q1	99
3	Learning, Media and Technology	72	Scopus	Q1	42
4	RED Revista de Educación a Distancia	60	WoS	-	19
5	Discourse Context & Media	58	Scopus & WoS	Q1	16
6	Egitim Ve Bilim-Education and Science	50	Scopus & WoS	Q3	18
7	Journal of Information Technology Research	47	Scopus & WoS	Q3	10
8	International Journal of Game-Based Learning	40	WoS	Q2	15
9	Computers in the Schools	39	Scopus & WoS	Q2	23
10	IJERI-International Journal of Educational Research and Innovation	37	WoS	-	14
11	Social Media & Society	35	Scopus & WoS	Q1	2. 3
12	IEEE Access	21	Scopus	Q1	86
13	IEEE Computer	17	Scopus	Q1	161
14	Education Sciences	16	Scopus	Q3	7
15	Information Technologies and Learning Tools	15	WoS	-	9
16	International Communication Gazette	13	Scopus	Q1	34
17	Education and Information Technologies	12	Scopus & WoS	Q1	36
18	Cyberpsychology	9	Scopus	Q1	19
19	Language, Learning and Technology	8	Scopus	Q1	69
20	Italian Journal of Sociology of Education	7	Scopus	Q3	3

Table 7 - Magazines with the greatest international impact about digital literacy and security.

The person with the highest number of citations is Sonia Livingstone who brings together a total of 198 citations grouped in the articles *On the rapid rise of social networking sites: New findings and policy implications* (191) and *Girls 'and boys' experiences of online risk and safety* (7). The Italian Luci Pangrazio has 117 quotes for the documents *"It's Not Like It's Life or Death or Whatever": Young People's Understandings of Social Media Data* (6), *'Personal data literacies': A critical literacies approach to enhancing understandings of personal digital data* (22), *Beyond cybersafety: The need to develop social media literacies in pre-teens* (29), and *Towards a school-based "critical data education"* (60). The best ranked Spanish-speaking author is Ana García-Valcárcel with 60 citations obtained by the publication of the document *Evaluación de las competencias digitales sobre seguridad de los estudiantes de Educación Básica,* followed by Mario Grande de Prado with 37 quotes for *Seguridad digital, ¿cómo se perciben los docentes en formación?* On the other hand, Tomczyk has written the largest number of documents on the subject (5) with a total of 25 citations.

Rank	*First author*	*Documents*	*Citations*	*Language*
1	Livingstone, S.	2	198	English
2	Pangrazio, L.	4	117	English
3	Meyers, E.	1	72	English
4	Garcia, A.	1	60	Spanish
5	Velghe, F.	1	58	English
6	Çebi, A.	2	50	English
7	Rodríguez de Dios, I.	2	48	English
8	Costa, C.	4	46	English
9	Siddiq, F.	1	40	English
10	Grande de Prado, M.	1	37	Spanish
11	McNicol, S.	1	37	English
12	Chatzipetrou, N.	1	32	English
13	Sincar, M.	1	25	English
14	Tomczyk, Ł.	5	25	English
15	Andersson, D.	2	24	English
16	Heartfield, R.	1	21	English
17	Jagalur, P.	2	19	English
18	Hemerly, J.	1	17	English
19	Fraile, M.	1	16	English
20	Bondarenko, I.	2	16	Ukrainian

Table 8 - Authors with the highest number of citations.

Figure 5 illustrates that most of the co-citation between authors favors Sonia Livingston; that is, the two documents that she has published on the subject have been cited 198 times by other authors, and co-cited 93 times, with a binding strength of 100.

Q5 - Research lines on digital literacy and security

The analysis of the lines of research was done in two stages, first the keywords of the 106 selected documents were examined, with this information it was possible to infer what are the current trends in the study of the subject. Table 9 shows the keywords with the most co-occurrences (number of times a term is repeated): digital literacy (36), security (10), education and social media (9), Internet (8) and media literacy (7). Regarding the total link strength, Figure 6 graphically shows that digital literacy leads the relationship of proximity of two or more terms in the keywords.

Keyword	*Occurrences*	*Total link strength*
digital literacy	36	44
security	10	20
education	9	18
social media	9	18
Internet	8	21
media literacy	7	8
digital competence	6	3
digital citizenship	6	7
cybersecurity	6	14
information technology	5	7
Internet safety	5	8
literacy	5	9
teaching	5	9
students	5	10
digital storage	5	13
privacy	5	14
children	5	20
online safety	5	20
digital skills	4	4
personal data	4	6
e-learning	4	7
information literacy	4	7
youth	4	11

Table 9 - Keyword occurrences and total link strength.

In the second stage, the abstracts and in some cases complete documents were reviewed. It was observed that there are two lines of research: the first counts 83 documents (78.30%), and represents the most developed research trends, and the second one, an emerging line

with 23 documents (21.70 %). Table 10 specifies the set of lines of research identified.

Type	*Line*	*Documents*	*Total*
Trends in research	Protection of information	1, 2, 4, 5, 8, 10, 16, 17, 20, 21, 22, 24, 26, 27, 28, 31, 33, 37, 38, 40, 41, 43, 46, 47, 48, 50, 52, 53, 54, 55, 60, 61, 62, 63, 65, 66, 67, 71, 73, 74, 76, 81, 83, 85, 88, 89, 90, 92, 94, 95, 96, 99, 101, 102, 105, 106.	56
	Digital citizenship	6, 7, 25, 30, 35, 36, 39, 51, 56, 77, 84, 91	12
	Media culture	9, 29, 57, 59, 69, 75, 80, 82	8
	Cyberbullying	3, 79, 86, 87, 97, 100, 104	7
	Safety in social networks and gender studies	18, 42, 44, 45, 70. 98	6
	Skills for digital security	32, 49, 58, 78, 93, 103	6
Emerging lines	Digital identity	12, 13, 14, 15, 23	5
	Frameworks	11, 34, 68, 72	4
	Digital emotional intelligence	19, 64	2

Table 10 - Research in consolidation and emerging lines.

Figure 7 shows the strength of the link among the words identified in the abstracts. In other words, is the number of times that the words appear in the articles regarding the total of all documents. The most common terms are technology (73), risk (43), communication (34), parent (27), and privacy (24).

Q6 - Research trends

Research trends refer mainly to studies related to people's abilities to protect their personal information in different virtual interaction scenarios, such as the use of email, password management on computer platforms, as well as the development of strategies to maintain secure Internet connections during the development of training activities (56 documents; 52.83%). To a lesser degree, research has been carried out that analyzes the scope of strategies to promote digital citizenship (12 documents; 11.32%), sociocultural approaches regarding the media in different contexts (8 documents; 7.55%), and school practices related to cyberbullying (7 documents; 6.60%).

Q7 - Emerging lines of research

Among the emerging lines, the following trends can be identified: the security metrics in social networks from the perspective of gender studies (6 documents; 5.66%), the observation of skills to maintain digital security (6 documents; 5.66%), the analysis of digital identity and the appropriation of digital rights (five documents; 4.72%), the development of public policies regarding digital security and ethical attitudes in virtual cooperation environments from the approach of various frames of reference (four documents; 3.77%), and finally digital intelligence manifesting itself as the sum of social, emotional and cognitive skills to confidently face new school challenges (two documents; 1.89%).

4. Discussion

In this research, 106 documents published in the period between 2010 and 2020 were recovered regarding the link between digital literacy and digital security. The most prolific year was 2019 with 23 papers and recently there is a rising trend in academic production on the subject. The study of literacy and digital security in the educational field has been constant, especially due to the growing appearance of new technological tools that use the Internet and are integrated into educational practice (Tomczyk, 2019).

The production by country is led by the United States of America, followed by the United Kingdom, Canada and Russia, also, their works are constantly quoted. On the other hand, Spain has the most scientific production in Iberoamerica, however, their articles are rarely cited. The above constitutes an invitation to work on lines of research in other languages that address the issue of digital literacy from the perspective of the construction of strategies, methods and models that analyze the different aspects of security in virtual spaces, especially for non English speaking countries.

In addition, journal articles and reviews represent the main types of documents related to the topic. Although most of the publications are characterized as paid type, there is a trend towards open access. This is consistent with the information opening movements that are being developed in recent years (García-Peñalvo, 2017b).

By analyzing the keywords, abstracts, and in some cases the full text it was possible to identify variables related to the study trends, which can guide the researchers about what are the niches of inquiry for future articles. Also, the use of VOSviewer software allows to build semantic maps to visually identify the prevailing ideas on which the analysis of digital literacy and security is based. By applying grouping techniques, it was possible to identify groups of publications, authors or documents (van Eck & Waltman, 2017), to know the trends in the study of digital security.

Five lines of research appeared, the first was oriented to various literacies such as digital, media and information. The second line was focused on the educational context

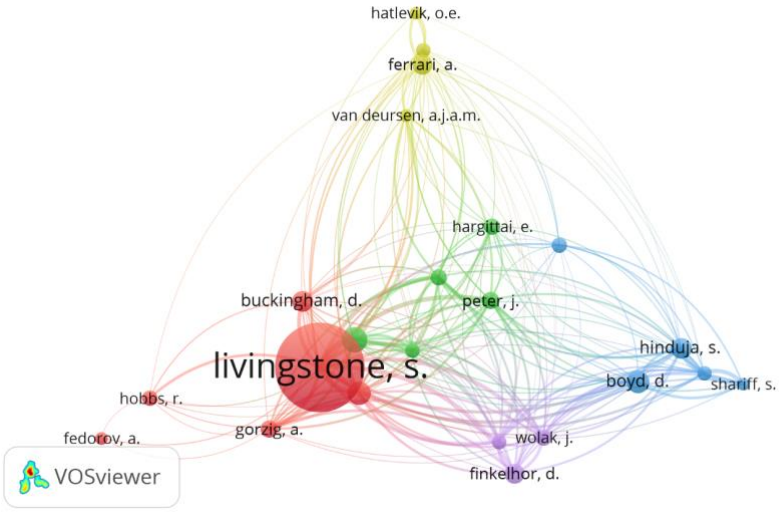

Figure 5 - Co-citation by the first author.

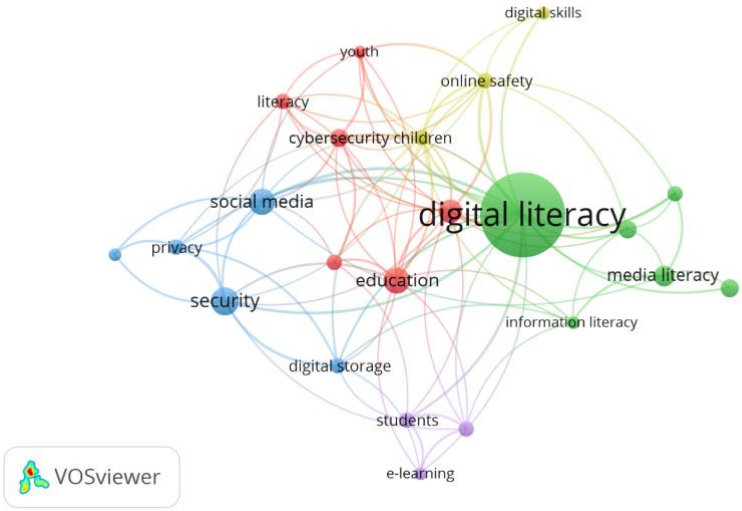

Figure 6 - Keyword analysis.

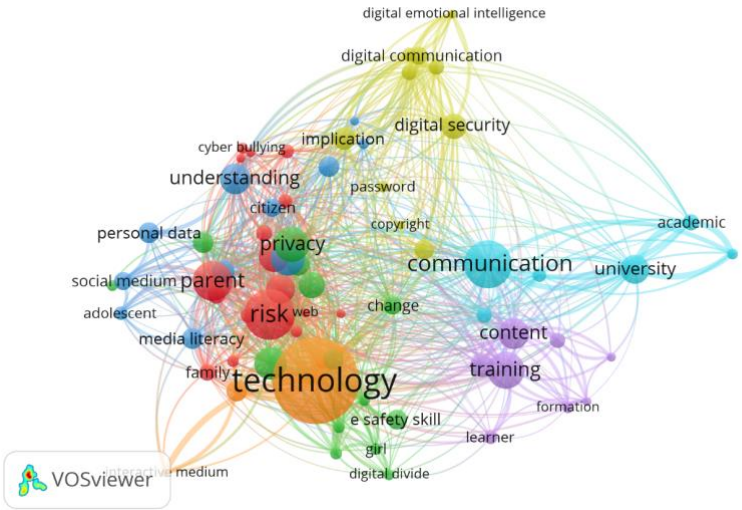

Figure 7 - Words with the highest strength link in the abstracts.

was aimed at children, seeking to promote digital skills and online safety. The fourth was oriented on security in social networks, digital storage and privacy. The last line was focused on online learning for students. The foregoing coincides with the integrative nature of digital literacy (Leaning, 2019), but at the same time, demonstrates how digital security issues are being incorporated in various areas in the last years.

In the research trends show up the related to protection of information, digital citizenship, media culture and cyberbullying. While the emerging lines of research were safety in social networks and gender studies, skills for digital security, digital identity, frameworks and digital emotional intelligence.

5. Conclusions

Since 2010, publications referring to digital literacy and security have remained constant, and they have increased in recent years. Research is taking place around the world, where more than half are from English-speaking countries, and publications are predominantly distributed in English-language journals. From the analysis of the documents, it can be deduced that lately, threats related to the use of the Internet increasingly challenge people's digital security; therefore, those who use the technologies must be able to recognize and address potential risks (Vitak et al., 2018). People should be educated about the dangers of digital threats, and ethical behaviors and responsibility when accessing the Internet should be encouraged and supported (Na-Nan et al., 2019).

It is necessary to be aware that any activity done in cyberspace must reduce the risks present in the network (Ibarra Rius et al., 2018). Knowledge about online threats is one of the key competences in the modern world, and that is why it is very important to develop digital security literacy, focused on the prevention of risky behaviors and the acquisition of skills to respond to critical situations (Kopecky & Szotkowski, 2017).

The practical implications of this study may be relevant for researchers who wish to delve into the subject. In matters of literature review, future research could include other databases and focus on studies outside the academic field to have a broader panorama of this phenomenon, since the issue of digital security has not received enough attention in the literature (Tomczyk, 2019).

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Factors affecting adoption of MOOC by hospitality students: a moderating role of Internet self-efficacy

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Abstract

The present study examines the moderating role of internet self-efficacy on the relationship between the perceived usefulness, perceived ease of use, and organisational support and behavioural intention of hospitality students in adopting the MOOC courses. This empirical study is based on the responses from hospitality students studying in one of the premier hospitality institutes in Karnataka, India. Structural equation modeling and process macro are used to test the proposed hypotheses in the study. The finding suggests that internet self-efficacy had a moderating effect only between organisational support and behavioural intention. In other words, study findings indicate that improved self-efficacy and organisational support lead to hospitality students' greater behavioural intention to adopt MOOCs for their academic accomplishments. The study outcomes are helpful for the universities' higher authorities formulate organizational support in technical and internet self-efficacy to achieve more success in adopting the MOOC.

KEYWORDS: MOOC, Hospitality Students, Internet Self-Efficacy, Organisational Support, Behavioral Intention.

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1. Introduction

MOOC, an acronym for a massive open online course, is a platform that provides unlimited open access to numerous courses via the web. Introduced in 2008 by Dave Cormier, this platform emerged as a popular learning mode with several benefits. It also provides an opportunity to educate the intellectual capacities of an individual at the mass level. Additionally, MOOCs can be used as a blended learning program allowing students access to a wealth of information to supplement traditional classroom teaching. However, despite the number of advantages MOOC offers over classroom teaching, studies also suggest several barriers to adopting MOOC such as language, internet connectivity, difficulty in using the platform, non-relevance of content, and difficulty reaching the rural population, non-accreditation etc. One of the significant and often cited drawbacks of MOOC is its dropout rate (Jordan, 2014). Studies have also found that a substantial number of MOOC users do not achieve what they intend to do, in other words, usefulness of the course (Henderikx, Kreijns & Kalz, 2017). Lack of publicity, non-relevance of information, lack of accessibility, and lack of proper instructions and support have been cited as other barriers (Ma & Lee, 2020). Consistent with Ma and Lee's (2020) study, the study conducted in India (Mohan, Upadhyaya & Pillai, 2020) has identified self-control and attitude as significant individual barriers to using MOOCs. Xing and Du (2019) have also disputed the significance of behavioural dispositions in predicting the likelihood of MOOC dropout. Research findings also reveal time constraints, lesser effectiveness compared to traditional learning, technical barriers and monotonous as some of the barriers to low usage of MOOCs among business students in India (Mohan, Upadhyaya & Pillai, 2020).

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Even though MOOC has emerged as a new trend in education, the availability of hospitality courses seems scarce and narrow. Only limited subjects have been covered with primary content across a few disciplines such as marketing, food and beverage, accommodation management, and culinary. Though this is a good start, considering the diverse demand of the hospitality industry, the current supply is inadequate (Tracey, Murphy & Horton-Tognazzini, 2016). Currently, in the hospitality sector, MOOC is provided by edX, Khan Academy, Alison, Udemy, International Federation for IT and Travel and Tourism (IFITT), Coursera, and Udacity, which offer courses in core operational departments of hospitality and allied sectors under their platform. However, the research about MOOC and related issues such as adequacy and effectiveness in hospitality education is in its initial exploration phase, unlike other disciplines, such as data science, management, and information technologies (Bozkurt & Keskin, 2016). Therefore, scholars emphasize the need for more research in the hospitality discipline to investigate the effectiveness of MOOCs (Tracey et al., 2016).

Many theoretical perspectives have been developed to understand how consumers decide to use and adapt to any new technology. The Technology Acceptance Model (TAM), built on the Theory of Reasoned Action (TRA), is one of the most popular and widely used theories for studying various technology-related fields and contexts. According to TRA, behaviour is explained by people's behavioural intention (BI), attitudes, subjective norms, and beliefs (Ajzen & Fishbein, 1980). Further, this theory argues that the user acceptance of information systems mainly includes two major components: perceived usefulness (PU) and perceived ease of use (PEOU). The PU in the context of MOOC adaption can be described as the extent to which a person believes that MOOCs can be a driving force towards achieving academic goals (Chen et al., 2017). Further, literature on MOOCs suggests that PU is a significant predictor of continuing MOOCs (Alraimi, Zo & Ciganek, 2015). Meanwhile, PEOU is another important construct found to have a positive influence on behavioral intention in the context of mobile learning applications (Chen, Sivo, Seilhamer, Sugar & Mao, 2013) and is believed to be a critical predictor of behavioral intention in the adoption of MOOC (Al-Adwan, 2020). Therefore, it is reasonable to assume that when students perceive any technology to be easy to use, they are likely to exhibit positive behavioral intention towards its adoption. Thus, we propose the following research hypothesis:

H1: PU significantly influences the intention to continue using MOOCs.

H2: PEOU has a significant influence on the behavioral intention of hospitality students.

Generally, individuals rely on others' opinions and support and encouragement whenever they are new to technology. Therefore, it is expected that organisational support (OS), such as guidance and visibility of teachers (Melicherikova & Piovarci, 2016) from the teachers and training conducted by the organisation, would result in higher judgements of Internet self-efficacy (ISE), which would further influence the BI of students. It is also found that infrastructure and technical support provided by the organisation play a crucial role in shaping the perception and subsequent usage of IT in the healthcare sector (Bhattacherjee & Hikmet, 2008). Thus, we propose the following hypothesis:

H3: Organizational support has a positive influence on the behavioral intention of hospitality students.

Drawing from the social cognition theory, self-efficacy is defined as one's degree of confidence in the ability to perform a behaviour in the face of various obstacles or challenges (Bandura, Freeman, & Lightsey, 1999). Besides, MOOC also face a number of pedagogical and technological challenges (Normandi Atiaja & Segundo Guerrero Proenza, 2016). Further, a host of literature within the information technology adapted ISE for predicting consumer behaviour (Mallya, Lakshminarayanan & Payini, 2019; Sharif & Raza, 2017), and a few studies have investigated it in the MOOC context. Meanwhile, researchers in the past have successfully adapted ISE as a moderator in TAM (Kao & Chien, 2017). Thus, the following hypotheses were proposed:

Therefore, we propose the following hypotheses:

H4: ISE has a moderating effect on the relationship between PU and BI.

H5: ISE has a moderating effect on the relationship between PEOU and BI.

H6: ISE has a moderating effect on the relationship between OS and BI.

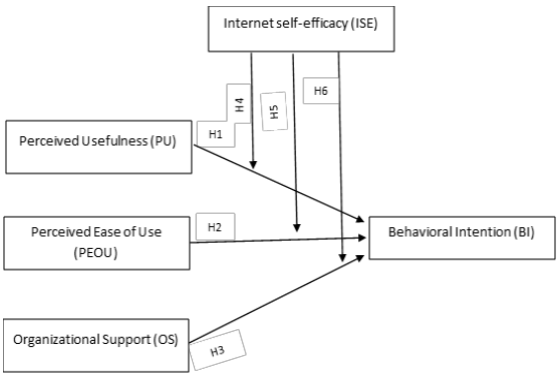

Figure 1 - Proposed research model based on TAM (Davis, 1989).

2. Materials and method

2.1 Background

This research is conducted in one of the top-ranked hospitality institutes in India; namely, Welcomgroup Graduate School of Hotel Administration (WGSHA), jointly run by Manipal Academy of Higher Education (MAHE), Manipal certified as an institute of eminence (IoE) by UGC and ITC Hotels, a part of the ITC Limited group of companies. It offers two undergraduate courses (Bachelor of Hotel Management and Bachelor's in culinary arts), two postgraduate courses (MSc in Hospitality and Tourism and MSc Dietetics and Applied Nutrition) and one postgraduate diploma in culinary arts. Based on UGC directives on MOOCs, WGSHA integrates a few courses under the open elective scheme as part of the curriculum. Students may register for courses, such as consumer behaviour, organisational behaviour, revenue management or business ethics, corporate social responsibility, sustainable tourism, and management of human resources etc., as open electives, digital marketing, bartending, food and beverage management, culinary management, hygiene and sanitation, nutrition etc. After completing the course, the student earns credit(s) and a certificate.

2.2 Participants, data collection and sampling method

The participants of this study were undergraduate and postgraduate students of WGSHA. An online survey using Google form was used to collect the data from the students. Students who had completed at least one MOOC program were considered fit to participate in this survey. Thus, this study adopted the purposive sampling technique to collect the data. This technique is viewed as appropriate in this study because it is expected that students who have completed at least one MOOC program will be able to provide a unique and more accurate assessment of use, ease of use and the OS to adopt MOOC. The data was collected between 2nd June to 17th June 2020. In total, 189 online survey questionnaires were mailed to students, followed by two more reminders at five days of the interval. Finally, 165 responses were received, resulting in 88% of the response rate.

2.3 Measuring instrument

The survey instrument had two sections. The first section had items related to three independent variables, one dependent variable and one moderator variable. The independent dimensions were measured using the scales developed (Igbaria, 1990) with necessary modifications specifically relevant to the adoption of MOOC. The moderator variable, ISE, was measured using five items (Mallya et al., 2019). Finally, the dependent variable, i.e., BI, is measured using a scale developed by (Venkatesh, Morris, Davis & Davis, 2003). The respondents were asked to express their agreement or disagreement regarding all the statements on a 5-point Likert scale where 1 strongly disagreed, and 5 strongly agreed. The second section of the measuring instrument captured the demographic details, such as age, gender, and education.

3. Results

The number of students participating in this survey was 165. Of these, 144 (87.3%) were undergraduates, and 21 (12.7%) were postgraduate hospitality students. The number of female students was 50 (30.3%), male 110 (66.7%) and 5 (3%) opted not to disclose their gender. The average age of the students was 21years.

Constructs	*Overall mean score*	*Pooled SD score*	*Factors loading range*	*Cronbach's alpha*
PU	3.72	0.99	0.89 to 0.94	0.95
PEOU	3.75	1.02	0.88 to 0.91	0.95
OS	3.74	1.03	0.88 to 093	0.95
ISE	3.71	1.06	0.79 to 0.94	0.94
BI	3.71	1.01	0.86 to 0.95	0.96

Table 1 - The mean, standard deviations, Cronbach's alpha and factor loadings of variables

3.1 Measurement model

A confirmatory factor analysis was performed using 165 samples to assess and validate the model fit. It was observed that all the factors were loaded onto their respective constructs. The model fit was assessed based on multiple indices. First, the chi-square ratio to the degree of freedom was 2.478, which was well within the recommended value of 3 (Hair, Black, Babin, & Anderson, 2010). Second, the Tucker-Lewis index (TLI), Incremental Fit Index (IFI), and Comparative Fit Index (CFI) were above the recommended value of 0.9 (Bentler & Bonett, 1980), i.e., 0.937, 0.926 and 0.937, respectively. Third, the RMSEA value exceeded the recommended value of 0.08 (Browne & Cudeck, 1992). Finally, the SRMR score was calculated, and it was found to be 0.0394, less than 0.08 as recommended by (Hu & Bentler, 1998), indicating the robustness of the model. Besides, it can also be inferred that the construed theoretical model is reasonably consistent with the data set.

3.2 Convergent and Discriminant Validity

The internal consistency and reliability of the measurement model and constructs in the proposed model were tested using composite reliability (CR) and average variance extracted (AVE) scores. The value of CR should be greater than 0.7 (Hair et al., 2010) to

indicate that the items measure the construct that is intended to measure. It was found that the CR scores were above these recommended values for all the constructs. Both convergent and discriminant values were calculated using the AVE score. It is recommended that the AVE should be greater than 0.5 (Hair et al., 2010). The AVE and CR values of the constructs are represented in Table II. The results suggest that the AVE scores are above the threshold value, indicating the constructs' reliability and convergent and divergent validity.

	CR	AVE	PU	PE	US	BI	ISE
PU	0.951	0.830	0.911				
PE	0.947	0.816	0.858***	0.903			
OS	0.953	0.836	0.730***	0.766***	0.914		
BI	0.956	0.813	0.874***	0.850***	0.779***	0.902	
ISE	0.942	0.764	0.712	0.803	0.696	0.756	0.874
CR=Composite reliability, AVE= Average variance extracted, values in bold are the square root of AVE, values in the off-diagonal are correlation among constructs in the model.							

Table 2 - Test of reliability and validity.

3.3 Hypotheses testing

Structural equation modelling was used to test the hypotheses proposed in the model. Each path and associated hypotheses were examined using t-statistic and the associated p-values (Table III). Table III also summarises proposed hypotheses and their associated inferences. Further, another measure of the model's fitness, i.e. R^2 value, was found to be 0.784, which was well above the recommended value of 0.5 (Hair et al., 2010). This suggests that all the independent constructs altogether were able to explain 78.4 % of the BI of the hospitality students to adopt the MOOCs. Further, the structural model analysis indicates that PU is the most significant positive factor of BI for hospitality students to adopt MOOCs, followed by PEOU. OS emerged as the third significant positive predictor of BI.

		Estimate	*S.E.*	*C.R.*	*P*
H1	BI <--- PU	0.461	0.086	5.373	0.001***
H2	BI <--- PE	0.236	0.087	2.715	0.007**
H3	BI <--- OS	0.199	0.059	3.363	0.001***

Table 3 - Direct effect.

3.4 Moderating effect of ISE

The moderating effect of ISE on the relationship between PU, PE and OS was calculated using PROCESS macro v3.4 (Hayes, 2018) with 5,000 bootstraps (Table IV). Results suggest that ISE had a moderating effect only between the OS and BI since the index of moderation that provides a formal test for moderation does not include zero (Hayes, 2018) (index = -0.071, Boot CI = [-0.1371, 0.0051]). In other words, students with interaction effects of ISE and OS tend to exhibit a higher level of BI towards MOOC.

	Standard β	*SE)*	*t-statistic*	*p*
PU×ISE→BI	-0.329	0.292	-1.1279	0.260^{ns}
PE×ISE→BI	-0.0144	0.0325	-.04413	.06596^{ns}
OS×ISE→BI	-0.071	0.0334	-2.1283	0.0348*
*Significant at 0.05 level, ns non-significant				

Table 4 - Moderation effect of ISE between IVs and DV.

	Coefficient	*SE*	*t*	*p*	*LLCI*	*ULCI*
Constant	- 0.1187	.3800	-.3124	0.7551	-0.8691	-.06371
OS	0.7017	.1238	.56696	.001**	.4573	.9461
ISE	0.6185	.1240	4.9897	.001**	.3737	.8633
Interaction	-.0711	.0334	-2.1283	.035*	-.1371	-.0051
*Significant at 0.05 level, ** 0.001 level						

Table 5 - Interaction effect of ISE between OS and BI.

4. Discussion and Implications

MOOC is perceived as the most evolutionary and innovative online learning platform in higher education, offering high-quality education from well-known universities around the globe. Factors such as cost efficiency of the courses, self-paced study, open access to educational resources, access to value addition courses, short duration, spot certification etc., make MOOC popular among the students. Though MOOC offers independent access to course content, specific concerns have come to light, such as low standardisation, lower effectiveness, and inflexibility, which adversely influence students' desire to enrol or continue education on MOOC. Meanwhile, this online platform is still nascent in India, especially in the hospitality and tourism sector context compared to developed countries. The hospitality stakeholders must understand the factors that affect the BI of the hospitality students in India. Thus, this study adapts the technology acceptance model to understand the ease of use and usefulness of the hospitality programs and the BI of the hospitality students to undertake these programs. This study also integrates OS as an additional independent construct to TAM to examine the BI of hospitality students. Additionally, the moderating effect of ISE between independent variables and a dependent variable is also investigated.

The findings of this study reveal that PU is a significant predictor of BI in MOOC adoption by hospitality students. This finding is in line with previous studies (Luik et al., 2019; Tao, Fu, Wang, Zhang & Qu, 2019; Tawafak, Romli, Arshah & Malik, 2020). Our findings suggest that hospitality students find MOOCs productive and effective in their academic performance

and that the courses helped them improve their academic accomplishments. The content of MOOC is found to be useful for improved decision-making among hospitality students. Further, findings also suggest that PEOU positively influences BI of hospitality students in adopting MOOCs. The findings are similar to previous studies (Al-Adwan, 2020; Al-Emran & Teo, 2020). In other words, hospitality students find it easy to use MOOCs and thus perceive courses offered on the MOOC platform to be helpful in the context of their academic activities.

Additionally, this study uncovers a positive relationship between OS and BI of hospitality students in the context of MOOC. The support and guidance provided by the teachers, mentors and top management of the organisation are found to positively influence students' behaviour to adopt MOOC for their academic accomplishment. This finding is in line with (Magid Igbaria, Parasuraman & Baroudi, 1996), who suggest that individuals are likely to exhibit favourable behaviour in an organisation where new technologies are widely used and supported. This indicates that OS plays a crucial role in implementing and adapting MOOCs in an academic environment. In-depth on-the-job training and organisation encouragement help build students' confidence and capabilities (Higgins & Gulliford, 2014), which further encourages them to adopt MOOC. Meanwhile, B. O'Mahony and G. Salmon (2014) find that higher education institutes that have provided access to non-traditional MOOC courses to on-campus students need additional support from the universities to develop learning skills for the successful completion of MOOC programs. They further propose that theoretical and liberal studies should be provided by universities using MOOCs to improve access for students in developing countries. When coupled with vocational elements such as on-the-job training, internships, etc., MOOC can provide holistic and rounded education to students. Finally, the findings of this study suggest that ISE moderates the relationship between OS and BI. Students with low ISE need higher OS to adopt MOOCs for academic purposes. However, for the students with high ISE, minimal support from the organisation is adequate. Thus, hospitality educators and trainers need to consider this observation and pay more attention to students with low ISE. The possible reasons for the positive impact of perceived usefulness and ease of use on behavioural intention can be attributed to many factors. For example, MOOC offers a variety of subjects. It also allows you to learn from peers around the world. MOOC is also available in different languages. The integration of MOOCs as an open elective subject(s) facilitates students to opt for a subject of their own choice as an elective subject to acquire knowledge in the areas that are interesting and important for them. Another reason could be the adoption of MOOCs by instructors, and universities are building different subject's MOOCs, including tourism and hospitality-related MOOCs (Lin, Cantoni & Murphy, 2018).

This study bestows few significant contributions to the hospitality education literature. First, it identifies the factors affecting the adoption of MOOCs by hospitality students by integrating TAM. Second, the inclusion of OS as an additional independent variable in TAM contributed to a better understanding of hospitality students' adoption of MOOCs. Third, this study integrates ISE as a moderator in TAM and provides better insights concerning MOOC adoption by hospitality students. Finally, this is the first study in the Indian hospitality education context to test the adoption of MOOCs using the TAM framework.

This study has several implications for hospitality educators and industry practitioners, particularly in the context of MOOC adoption for bridging the skill gap. This study demonstrates that hospitality students find MOOCs helpful in enhancing their skill sets. Also, they found the adoption of MOOCs to be an easy process. This is an encouraging finding for hospitality educators who must encourage and recommend more relevant MOOC courses to enable their students to enhance their skills. Another important finding of use is that there exists a positive relationship between the OS and students' adoption of MOOC, suggesting that verbal persuasion, encouragement from top management of the institute and module leaders play a crucial role in encouraging MOOC adoption by the students. OS plays a crucial role in creating a conducive environment to adopt new technology, in this case, MOOC. The top leadership of hospitality schools needs to accept the responsibility to identify the current and future needs of the hospitality industry and support the entire process of MOOC adoption. They also need to exhibit dynamic leadership to motivate hospitality students to register for MOOCs by identifying different courses available on the platform, thus, helping to bridge skill gaps. Besides, they should also organise IT training for those with low ISE. This is because students' ISE is a significant moderator between OS and MOOC adoption among hospitality students. Further, this study provides initial evidence for the moderating role of ISE between OS and behavioral intention among hospitality students in the context of MOOC. It confirms that ISE is a meaningful construct within the context of MOOC adoption.

6. Limitations and conclusions

The present study has a few limitations. First, it is conducted using data from a single hospitality institute, so the findings cannot be generalised to a larger context. Further, similar research is needed using data from other hospitality institutes in India. Second, the data used in the study is cross-sectional. Thus, longitudinal data are needed to assess the factors that influence the behavioral intention of hospitality students. Third, the findings are based on the behavioral intention of students. Future studies need to measure the factors that influence the actual behavior of hospitality students. This study is descriptive and thus needs further investigation by

including other stakeholders, such as module leaders, hospitality educators, and industry practitioners.

To summarise, MOOC has emerged as a game changer in higher education (Mohan et al., 2020). It is suggested that students are likely to complete the course if it is integrated into the university program (El Said, 2017). Thus, hospitality institutes must find innovative ways to adopt MOOCs in their academic curriculum based on the industry requirements. By doing so, they can play a significant role in bridging the gap between industry and academia. MOOC is considered an easy means to incorporate additional skill sets among the students. Thus, based on the literature on MOOCs and our study's findings, it can be concluded that the ISE and OS are two additional variables that can be integrated into the TAM. OS is crucial because learners can have a more streamlined and systematic learning experience, making learning more accessible, fun, meaningful and productive. Further, ISE, a belief in one's capabilities to organize and execute online learning, is a potentially critical factor in the adoption of MOOCs by hospitality students. The method and parameters used in this study can be repeated in other cultural contexts.

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Does time really heal? Academic burnout and life satisfaction as predictors of post-traumatic growth during the Covid 19 pandemic

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Abstract

The aim was to answer the question about the role of time from the trauma experience in associations between life-satisfaction, experiencing burnout and post-traumatic growth. The sample consisted of 199 university students. The participants were approached in the Internet by using university platforms, social media and e-mails. The study was performed in April 2020, during the peak of Covid19. Descriptive statistics, alfa Cronbach's, ANOVA and MANOVA were calculated to identify burnout level, traumatic growth and life satisfaction. Academic burnout indicators were significant predictors of post-traumatic growth in all groups, however different areas of problems were associated in relation to time from trauma. Past traumatic experiences and our attitudes toward the meaning of it in our lives changes over time. Due to these changes we may different react on a long-last crises and new threats in our life, like pandemic Covid 19. The positive effect of post-traumatic growth is not always connected with higher life satisfaction

KEYWORDS: Academic Burnout, Post-Traumatic Growth, Life Satisfaction, Time After Trauma.

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1. Introduction

Burnout syndrome as a long last crisis

Employee's or students' burnout from the role, does not occur overnight, it is a process lasting months or even years. Also, the person affected by burnout syndrome maintains symptoms for a long time. Cherniss (1992) indicates the importance of the moment when burn-in occurs. If it affects a group of people performing work recently, it is not a long-term process, while if an overwhelmed person performs work for a long period of time, it has many adverse consequences. In addition, Demerouti et al. (2002) note that burnout carries a long-lasting mental burden. This state is related mostly to individual, not environmental factors that are the basis for burnout. Therefore, the individual can struggle alone with the internal symptoms for a long time while looking for remedies. Some authors claim that burnout syndrome is a general term for various misdefined human crises. Burisch's theory of burnout is based on the theory of action (Burisch, 2002). According to the author burnout syndrome is best conceptualized as a highly nonspecific entity, the generic name for certain types of crises that manifest themselves in a multifaceted symptomatology (Burisch, 1993). One of the burnout core symptoms is loss of autonomy, which leads to functional disorder. Burisch's (1993) assumptions are based on episodes of action that can be any individual behavior lasting from several minutes to many years. Action episodes form a pyramid in which one-episode overrides others. The disturbances of action episodes contribute to the difficulties encountered by the individual in achieving personal goals or insufficient motivation to complete the task. According to the theory of action, burn-out refers to erroneously defined forms of collapse in monotone life. Burisch (1993) distinguished four types of disturbed episodes of action. These include difficulties experienced by burned–out person on the way to achieving goals, thwarting the motive, non-motivating reward or end result. According to the author, secondary stress leads to burn-out, which is the use of ineffective

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remedial strategies and, as a consequence, the loss of autonomy. When an individual cope with secondary stress, this affects personality development and enhances human remedial skills. On the other hand, the experience of failure at every step, may affect an increase in burnout symptoms. It is worth to add that burnout was also defined as a structural (Leiter, 1992) or spiritual crisis (Moczydłowska, 2016), in which personal overwhelmed is related to experiencing psychological chronic distress induced by ineffectiveness in undertaking actions and burdensome requirements in the work environment, as well as previous idealistic beliefs, values and life goals break down (Zaręba et al., 2020). Oftentimes, the process of burnout results in negative self-concept, negative attitudes toward others and various psychosomatic and mental problems i.e. depression and anxiety (Koutsimani et al., 2019).

Burnout and traumatic experiences

Experiencing traumatic event may be crucial for psychological disorders or ineffectiveness in various areas in life at a later stage in every plane, both family and professional as trauma triggers other problems (Fatwa et al., 2014). If the physical, mental or behavioral problems occur after a month with the ongoing maladaptive reactions and severe distress to a traumatic experience (re-experiencing trauma), Post-Traumatic Stress Disorder is recognized (Terr, 1988; Fatwa et al., 2014). Secondary traumatic stress is identified by Thomas and Wilson (2004) as part of a set of stress situations experienced by the individual, including trauma and fatigue. Whether the situation will be perceived by a person as traumatic depends on their resources (Wheeler, 2007). According to Jenkins and Baird (2002), traumatic stress is similar to burnout because they have a common ground, which is exposing individuals to emotional involvement in social relationships. In studies conducted by Galek et al. (2011) it has been shown that the higher the social support that an individual receives, the lower the level of burnout and traumatic stress. However, the authors of the study point out that not every type of social support received brings such an effect. Supervisory and family support are the most effective. PTSD symptoms lasts for months, or longer (Zlotnick et al., 2001), and its severity may differ from time to time. Chatard et al. (2011, p.47) stated that traumatic events generate disruptive effects, because they disrupt the capacity of the individual's meaning systems, self-esteem, and close relationships to perform their normal anxiety-buffering functions. Burnout is also often related to withdrawal and alienation and impairment of coping and emotional mechanism, as it is strongly associated with inability to reduce negative emotional states and sustain positive affect (Ferreira et al., 2019). In both abovementioned phenomenon the individual is more susceptible to anxiety, intrusive thoughts (ruminations), became oversensitive and avoid others, are related to change in self and worldview (American Psychiatric Association, 2013; Vandevala et al., 2017; Kumar, 2018). Vîrgă et al. (2020) found that psychological capital are protective factors in both burnout and secondary traumatic stress. Studies analyzing the relationship between academic burnout and post-traumatic growth (PTGI) are rarely undertaken. Ying et al. (2016) in longitudinal surveys analyzed relationships of PTGI, resilience and academic burnout in a sample of 788 adolescent survivors of the Wenchuan earthquake. The results indicated that students' burnout was negatively correlated to PTGI, what is more resilience moderated the longitudinal association between PTG and changes in academic burnout, with a stronger and negative correlations for individuals with low trait resilience.

PTSD, post-traumatic growth and life-satisfaction

Theories of posttraumatic growth (PTGI) include the concept of interpreting trauma as highly challenging life events, when the individual reflects on traumatic experience, and find positive outcomes or make a new sense of it as a result (Aftyka et al., 2020). PTGI, deriving benefits following potentially traumatic events, that manifest itself as profound transformations in various areas of life, and leads to improve in social relationships, finding new life paths, increasing life appreciation, openness to new deepened spiritual experiences and enhance awareness of self-strengths (Tedeschi, Calhoun 1996, 2004), widened sense of wisdom and well-being (Jayawickreme et al., 2014; Ragger et al., 2019), feel more empathy and compassion, and may look at their past experiences from a distance (Aftyka et al., 2020). PTG is often defined as a result of intentional rumination processes conducted in order to integrate a past difficulties into a previous view of the world, rather than a direct outcome of the traumatic event itself (Ragger et al., 2019). Satisfaction that the individual derives from life as well as the tasks performed is an important factor protecting against routine, boredom or even in traumatic situations faster recovery. As follows from studies carried out by Mosher et al. (2006) post-traumatic growth is synonymous with increase in life-satisfaction. However, in studies by Park et al. (2010) a relationship between post-traumatic growth and better adaptation was observed. Ruini and Vescovelli (2013) suggest that gratitude is an important predictor of satisfaction derived from the activities performed, and thus a positive attitude towards what the individual does in life. The literature is inconsistent on the time elapsed after trauma for growth to occur (Linley, Joseph, 2004). PTGI after trauma induced by chronic illness or disability in some studies was significantly related to time since it was diagnosed (positively or negatively) and some authors did not observe associations at all (Sörensen et al., 2019). Kunst (2011) found that distress may produce posttraumatic growth, however only until the level of distress is manageable, after which stage an individual is less likely to exhibit posttraumatic growth. According to PTGI

model proposed by Tedeschi and Calhoun (2004) the positive change is a complex process, which rarely occurs immediately after traumatic event.

The current study conceptual framework

The theoretical approaches described above suggest that burnout can be viewed as a long-last educational crisis of personal beliefs, values, and life goals related to education which is a gradually progressive process over time, leading to many adverse consequences, especially reducing the individual's ability to cope with new burdens **a**nd to be satisfied with life. However, to date, only a few studies have explored student burnout, life satisfaction, and PTGI altogether in the context of the time from the traumatic experience and situational crises, namely pandemic Covid 19. Thus, the main purpose of the study was to answer the question about the role of time from the trauma experience in associations between life-satisfaction, experiencing burnout and post-traumatic growth. In particular we were trying to get answers on a question what is the significance in post-traumatic growth of overlapping crises that last for a long period of time and may not be severe at first for a person (i.e. academic burnout whose symptoms escalate with the time past) with those that directly threaten the individual and affect every human being (pandemic Covid 19 - a new threat to life and health, however it is common and can be treated as a phenomenon inscribed in the everyday functioning of everyone), and those that relate to individual difficult life experiences from the past (Traumatic experiences from the past). Based on previous studies we assumed that: (1) the levels of post-traumatic growth (PTGI), life-satisfaction (SWLS) and academic burnout will be different in groups distinguished by time passing from trauma (2) the longer time from traumatic experience the higher PTGI and SWLS, and the lower academic burnout indicators; (3) higher academic burnout indicators will predict lower post-traumatic growth, and higher life-satisfaction will predict higher post-traumatic growth.

2. Materials and Methods

2.1 Participants

The sample consisted of 199 university students aged 18 to 48 years. Their mean age was M =21.92 years (SD = 5.00 years), and 84.9% of them were women. The participants were recruited in several universities from different fields of studying e.g. Teaching Faculties (44.4%), Social Sciences (15.4), Sciences (23.4%), Humanistic science (8.4%), Natural science (0.9%). One student did not mark the field of the study. Most of participants were satisfied with their academic achievements (N=134, 62.6%). 78.4% had positive attitude to the field of studying before pandemic period, and such positive attitude during pandemic time sustained the same approach 50.3%). Only 38.7% declared that online contact with teachers is comfortable for them, and 68.6% stated that they lack "face to face" contact with teachers.

2.2 Instruments

University student's burnout scale (USBS) is a 34-items scale with 4 - point Likert scale (1- strongly agree, 4- strongly disagree). The scale is based on SSBS scale originally proposed for secondary school students by Aypay (2012). It measures total level of burnout and its seven dimensions: Loss of interest in school (LIS), Burnout due to studying (BDS), Burnout due to family (BDF), Burnout due to doing homework (BDH), Being bored and tired of teacher attitudes (BTT), Need to rest and have fun (NRF) and Incompetence in school (ISS). In SSBS scale the higher score means the lower burnout.

Satisfaction with life scale (SWLS) by Diener et al. (1985) in polish adaptation of Jankowski (2015) measures specific life satisfaction domains and global cognitive judgments. A 5-item scale with 7-point Likert scale (1 - strongly disagree, 7 – strongly agree). The higher the overall score achieved by the individual, the higher the life satisfaction.

Post-traumatic growth scale (PTGI) by Tedeschi and Calhoun (1995) in polish adaptation of Ogińska-Bulik and Juczyński (2010) is 21-item scale with 6-point Likert scale (0 – strongly disagree, 5 – strongly agree). The higher the score, the higher the intensity of the positive changes. Inventory measures 4 factors that contribute to post-traumatic development: changes in self-perception, changes in relationships with others, greater appreciation of life, and spiritual changes.

2.3 Procedure

The participants were approached in the Internet by using university platforms, social media and e-mails. The study was performed in April 2020, during the at the peak of Covid19 cases in Poland. The responders volunteered for the study and received no payment for participation. Descriptive statistics, alfa Cronbach's, ANOVA and MANOVA were calculated with the SPSS version 22.0. Pearson's coefficients were performed by using STATISTICA 13.3 PL.

2.4 Ethics Consideration

The study was approved by the Ethic Commission. The respondents participating in the study were informed that they could resign from participation in the study at any time and that they would not receive any benefits for participating in the study. After the test, the participants could see their results and compare it with the average of people who took part in the study.

3. Results

3.1 Comparison analysis

The sample was divided into three groups differ with time period from traumatic experience. The first group experienced trauma in time period from 1 month to 1 year (N=47, 23.6%), traumatic situations of these participants mostly were connected with loosing somebody close to and work and financial problems. The most numerous group was group 2 with trauma that occurred from 1 to 5 years ago (90 students, 45.23%). The types of traumatic experiences that were most often indicated were the same as in group 1. In the last group the time from traumatic experience was over 5 years ago. In this group participants most often indicated loss of somebody close to and sickness or disability as the causes of the trauma (see Tab. 1).

Type of traumatic experience	Time from the trauma experience			Total sample (N=199)
	Group 1. From last month to one year (N=47)	Group 2. From 1 to 5 years ago (N=90)	Group 3. Over 5 years ago (N=62)	
Loss of sb close to	20	42	16	78
Work and financial problem	15	18	11	44
Family problems or divorce	2	12	12	26
Sickness or disability	5	10	19	34
Violent event (assault or accident	5	5	4	14
Other	0	3	0	3

Table 1 - The number and type of traumatic experiences in study sample (N=199).

The descriptive statistics for each of three group are presented in Table 2 and 3. According to one-way ANOVA significantly higher post-traumatic growth was found in groups with longer time period from traumatic experience (group 2, 1-5 years from trauma, and group 3, over 5 years from trauma) in comparison to group 1 (trauma experienced from 1 month to 1 year). The comparisons of the level of PTGI between group 2 and 3 was insignificant. MANOVA results indicated significant differences between groups in the burnout indicators and life satisfaction ($F_{(16,364)} = 2.00$, $p = .013$, $\eta^2 = .081$). However, these differences mainly are connected with higher level of life satisfaction in group 1 compared to group 3. Thus, hypothesis one was partially accepted, e.g. the levels of post-traumatic growth (PTGI) and life-satisfaction (SWLS) but not academic burnout was different in groups distinguished by time passing from trauma.

Variable: PTGI post traumatic growth total score						
	Group 1. From last month to one year (N=47)	Group 2. From 1 to 5 years ago (N=90)	Group 3. Over 5 years ago (N=62)			
Alfa	M (SD)	M (SD)	M (SD)	F	df	p
.92	56.43 (21.33)	64.38 (18.18)	67.13 (15.38)	4.83	2,186	.009

Table 2 - Descriptive statistics (Means and Standard deviations) of PTGI in three tested groups.

3.2 Correlation analysis

The longer time from trauma the higher post-traumatic growth (Pearson's $r = .21$, $p = .004$), and lower life satisfaction (Pearson's $r = -.22$, $p = .002$), and the lower burnout due to teachers' attitude (Pearson's $r = .16$, $p = 0.21$) (Statistics calculated for total sample).

There were a positive significant association between post-traumatic growth (PTGI) and life satisfaction in total sample ($r = .21$, $p = .004$), while burnout indicators did not significantly correlate with PTGI score. Burnout due to teachers' attitude (BDT) (Pearson's $r = -.46$, $p = .002$) and feeling of incompetence (ISS) (Pearson's $r = -.38$, $p = .012$) were significantly associated with post-traumatic growth in the group with the shortest time from trauma (Group 1). Feeling of incompetence (ISS) was also significantly correlated with post-traumatic growth in second group with time period from trauma experience from 1 to 5 years, however the correlations were positive (Pearson's $r = .24$, $p = .029$). In second group also life satisfaction positively correlated with PTGI total score (Pearson's $r = .55$, $p < .0001$). In the third group (over 5 years from trauma) all associations were insignificant.

Hence, the hypothesis two was partially accepted e.g. the longer time from traumatic experience the higher PTGI and SWLS, however only one academic burnout indicator was lower e.g. BDT.

3.3 Multiple regression analysis

A multiple regression analyses were performed to check if burnout indicators and life satisfaction were predictors of post-traumatic growth. The regression model for total sample was insignificant $F_{(8,172)} = 1.80$, $p = .081$, however lower burnout due to teachers attitude ($ß = .21$, $p = .05$) and higher life satisfaction ($ß = .22$, $p = .004$) were a significant predictors of PTGI. Similarly, according to the results, the model for group 3 (the longest time form trauma experience) appeared insignificant ($F_{(8,47)} = 1.72$, $p = .118$). Even though one variable - burnout due to parents' pressure (BDF) was significantly associated with the PTGI score in this group ($ß = .49$, $p < .01$). BDF was also significant predictor of PTGI in group 2 (with time period from 1 to 5 years from trauma experience). Life satisfaction turned out to be such a predictor only in the second group with time period from trauma between 1 to 5 years ago, ($ß = .59$, $p < .0001$). Loss of interest (LIS), burnout due to

Variables	Alfa	Group 1. From last month to one year (N=47)		Group 2. From 1 to 5 years ago (N=90)		Group 3. Over 5 years ago (N=62)		F	df	p
		M	SD	M	SD	M	SD			
LIS	.80	17.00	.56	16.99	.39	17.97	.49	1.40	2,188	.249
BDS	.81	17.07	.57	17.17	.39	17.79	.49	.65	2,188	.526
BDF	.79	15.19	.56	14.01	.39	15.24	.48	2.57	2,188	.079
BDH	.62	12.47	.41	13.57	.29	13.36	.36	2.49	2,188	.087
BDT	.72	10.47	.39	10.67	.27	11.48	.33	2.53	2,188	.082
NHF	.77	9.16	.42	9.09	.29	9.38	.36	.20	2,188	.820
ISS	.76	8.72	.40	8.53	.28	8.45	.35	.14	2,188	.874
USBS	.92	90.07	16.38	90.02	16.94	93.92	12.64	1.28	2,190	.281
SWLS	.85	25.21	.87	22.99	.60	22.21	.75	3.59	2,188	.029

Note: LIS - Loss of Interest in School; BDS - Burnout Due to Studying; BDF - Burnout Due to Parents; BDH - Burnout Due to Doing Homework; BDT - Being Bored and Tired of Teacher Attitudes; NRF - Need to Rest and Have Fun; ISS - Incompetence in School; USBS – Academic Burnout Total Score; SWLS – Life satisfaction

Table 3 - Descriptive statistics (Means and Standard deviations) of tested variables for three groups different in time period from traumatic experience.

studying (BDS), and burnout due to homework (BDH) significantly predicted PTGI in two groups i.e. group 1 with the shortest time period from trauma and group 2, 1-5 years from trauma (ß equal from -1.61 to 1.27). In group 1 also burnout due to teachers' attitude (BDT) (ß = -.69, $p < .01$) and in group 2 feeling of incompetence in school (ISS) (ß =.30, $p < .05$) significantly predicted PTGI (see Table 4). In a summary, the third study hypothesis, in which we assumed that higher academic burnout indicators will predict lower post-traumatic growth, and higher life-satisfaction will predict higher post-traumatic growth was also only partially accepted.

	Group 1. From last month to one year (N=47)	Group 2. From 1 to 5 years ago (N=90)	Group 3. Over 5 years ago (N=62)	Total sample (N=199)
Variables	ß	ß	ß	ß
LIS	1.27^{**}	$-.55^{**}$	-.01	.07
BDS	-1.61^{**}	$.76^{**}$	.25	.07
BDF	-.20	$-.22^{*}$	$.49^{**}$	.01
BDH	$.83^{*}$	$-.31^{*}$	-.08	-.08
BDT	$-.69^{**}$	-.08	-.35	$-.21^{*}$
NHF	.24	-.20	-.14	.09
ISS	-.20	$.30^{*}$	.12	.01
SWLS	-.08	$.59^{***}$	-.20	$.22^{**}$
F(df), p	$F_{(8,34)}$ =5.48, p<.0001	$F_{(8,73)}$ =9.41, p<.0001	$F_{(8,47)}$ =1.72, p=.118	$F_{(8,172)}$ =1.80, p=.081
$R^2/\Delta R^2$	.56/.46	.51/.45	.23/.10	.08/.03

Note: LIS - Loss of Interest in School; BDS - Burnout Due to Studying; BDF - Burnout Due to Parents; BDH - Burnout Due to Doing Homework; BDT - Being Bored and Tired of Teacher Attitudes; NRF - Need to Rest and Have Fun; ISS - Incompetence in School; SWLS – Life satisfaction

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 4 - Predictors of post-traumatic growth – results of regression analysis for three groups with different time period from traumatic experiences.

4. Discussion and Conclusions

The primary purpose of this study was to examine the relationship between academic burnout, life satisfaction, and post-traumatic growth in the context of time passing from trauma.

Our findings were partly in accordance with the first hypothesis, as the highest post-traumatic growth (PTGI) was discovered in group with the shortest time period from traumatic experience. Only life satisfaction significantly differs groups, with the lowest SWLS score in the sample with the longest time period from trauma. The findings confirmed that time past after traumatic experiences is related to higher post-traumatic growth, and surprisingly with lower life-satisfaction, and only one burnout indicator - lower burnout due to teachers' attitude. In particular, when considering time past from traumatic situation, post-traumatic growth (PTG) significantly correlated with higher life satisfaction only in a group with medium time from trauma (group 2), while such associations did not appear in the rest groups. PTGI also correlated with several indicators of burnout: in group 1 with higher burnout due to teachers' attitude (BDT) and higher feeling of incompetence in school and in group 2 with lower feeling of incompetence in school. In group 3 burnout was not associated with PTGI. Therefore, the second hypothesis was also only partially confirmed.

Finally, we also did not fully confirm the third hypothesis. The regression analysis revealed that apart from the insignificance of the model for total sample, higher life satisfaction and higher burnout due to family pressure were significant predictors of PTGI. Interestingly, higher life satisfaction significantly predicted PTGI, but only in group with medium time from traumatic situation (group 2). According to the results academic burnout indicators were significant predictors of post-traumatic growth in all groups,

however different areas of problems were associated in relation to time from trauma. Additionally, the model for group 3 was insignificant (with significant burnout due to family pressure as predictor of PTGI). In particular, some burnout variables played a different role in PTGI over time e.g. loss of interest, and burnout due to homework were positively associated with PTGI in group 1 (higher level of this burnout symptoms predicted lower post-traumatic growth) and negatively in group 2 (lower levels of these variables predicted lower post-traumatic growth). Similarly, burnout due to studying was negatively related to PTGI in group 1 and positively in group 2. Burnout due to family pressure was negatively connected to PTGI in group 2 and positively in group 3. These results may suggest that over time the meaning of the long last problems/chronic stress-symptoms changes. When we consider our crises connected with education in a perspective of traumatic experience and the meaning of it in our life, we may underestimate or overestimate these crises. Similarly, conclusion was made by Ragger et al. (2019), who stated that growth and stress after critical incidents are independent from each other and can co-exist.

As a summary, our studies indicated that academic burnout may be related to higher post-traumatic growth because we may minimize everyday overwhelming problems (such as lack of interest of university classes) in a perspective of our difficult experiences, but over time this effect starts to decrease. Even though some difficulties and education-stresses may be so disturbing that they suppress PTGI at first (duty to studying), yet with the time they start to dominate in our view of self, sense of actions, and the assessments of the surrounding social world. This may later reveal as a lower life satisfaction, because over time we feel more overwhelmed with the current crisis and may less positive interpret the meaning of traumatic past event. Despite the fact, that many models of PTGI and empirical results suggest that well-being is significantly related to changes induced by post- traumatic growth, not all studies confirmed such relations e.g. Hall et al. (2010) found no correlations between PTGI and well-being, even though they controlled several psychological and socio-demographic characteristics of participants such as: age, sex, ethnicity, education, religiosity, degree of terrorism exposure, self-efficacy, non-terrorism stressful life events, and loss of psychosocial and economic resources. In the light of our results, such lack of connections may be associated with the passing of time from trauma. Our findings suggest that positive change after trauma from the past, and experiencing long last crises are not associated with each other, after longer period of time from traumatic situation. Thus, the longer time from trauma is not connected with the weaker symptoms of long last crises, such as burnout. Interestingly, longer time period from traumatic experience was not related to higher life satisfaction, what suggests, that positive growth may not protect us from new and common threats. This may occur as we possibly interpret the new difficulties in negative way, as another burden we have to face in life, which in turn may decrease our life satisfaction.

Our findings should also be interpreted in the light of the psychological and social costs of the pandemic Covid 19. Specifically, the threat associated with the pandemic led to prolonged exposure to distress, fear of contagion, and social isolation. Meta-analysis of past studies pointed out that psychological effects related to the pandemic were separation from loved ones, loss of freedom, uncertainty about the advancement of the disease, and the feeling of helplessness, depression, and a rise in suicides (Saladino et al., 2020). The Covid 19 pandemic may also increase a feeling of fragility of life and one's mortality. Hence, anxiety about the sense of one's existence which normally stays on a latent level is updated and current crises cause us to start noticing the current recent problems but also past difficult experiences in a negative light. This state may force an individual to redefine the meaning of life, even if the past trauma was worked through. Moreover, our results partially confirm that changes in the core beliefs about self and the world caused by trauma, are also related to changes in the cognitive aspect of well-being, namely life satisfaction. This effect may be connected to the person's inability to experience satisfaction in the same way (or on the same level) as before the traumatic event. Trauma transforms people's feelings, but also factors that are taken into account when we evaluate our lives. People with trauma are also more prone to highly challenging life circumstances, which turn into fluctuation in life satisfaction. The overlapping of long-term (i.e. burnout syndrome) and situational crises (global health crises caused by Covid 19), combined with the activation of past traumatic experiences, seems to cause considerable difficulties in maintaining positive life satisfaction. Past and current threats to core beliefs and self-sense activate both intrusive and deliberate rumination related to traumatic experience (Triplett et al., 2011). Such subsequent deliberate thinking concentrates inter alia on finding the meaning of both life and the event, and ultimately producing a revised life narrative (Calhoun et al., 2010) and therefore may product changes in life satisfaction and growth. Triplett et al. (2011) stated that challenges to the assumptive world serve as a departure point for eventual growth. The authors found that the association between growth and life satisfaction is weak, however in this relation the presence of meaning in life plays a significant role. Therefore, posttraumatic growth will not necessarily be strongly associated with current levels of life satisfaction in a simple way. This regularity was also observed in our study. Abovementioned findings should also be considered in the light of type of PTGI. Boals et al. (2019) distinguished actual and perceived growth after trauma. They revealed that perceived PTGI is not significantly related to either actual PTG or perceived general growth. Furthermore, in their studies, higher levels of perceived PTG were significantly related to increases in distress and higher levels of avoidance coping. Our results partially confirm such regularity, and

the suggestion that perceived PTG may be more of a coping process than an accurate recall of posttraumatic change (Boals et al., 2019), as in our studies the directions of connections between PTGI and burnout indicators differ as the over time or lost its significance.

Our study revealed that positive effect of growth after traumatic experience is the strongest in longer-period of time, however group with medium (2-5 years after trauma) and the longest (over 5 years) were similar in PTGI. It therefore seems, that PTGI occurs and increase but only up to some point, and then persist on this level despite the passage of time. In addition, life satisfaction was the lowest in group with the longest time period from trauma. Hence, it is possible that we are enhanced but only on the type of situations that are connected with past trauma, however it not prepares as for new threats and seems not to be connected with crises that we experienced for a long period of time. The aforementioned regularity is partially confirmed by Łuszczyńska et al. (2012), who specified that post – traumatic growth may act as a palliative response to a life threat when it occurs shortly after a trauma (chronic or terminal illness diagnosis). However, in the long perspective PTGI may be linked to more profound positive life changes. It is also worth to add that results of longitudinal studies that measured growth showed that the highest rate of growth occurred from 2 weeks to 6 months after the assault (Ulloa et al., 2016).

Past traumatic experiences and our attitudes toward the meaning of it in our lives changes over time. Due to these changes we may different react on a long-last crises (burnout symptoms) and new threats in our life, like pandemic Covid 19. The positive effect of post-traumatic growth is not always connected with higher life satisfaction. Over time, this effect decreases, and when the new difficult situation that treats our life appears it may diminish our life satisfaction.

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Learner profiling: a study on Big Five Personality Traits and Lifelong Learning skills

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Abstract

There are many interventions introduced by Open University Malaysia in supporting its learners to successfully complete the programme that they have enrolled in. An example is the use of personality traits dimensions to predict learners' Lifelong Learning skills dimension. The research was carried out using a survey instrument which measures 34 items within six dimensions including the five dimensions based on the Big Five Personality Traits and the Lifelong Learning skills. The sample for this study was taken from the population of first semester learners during the September 2019 semester. All new learners are enrolled in one of the compulsory courses OUMH1603: Learning Skills for 21st Century. Data was collected online using the Survey Monkey platform within a-month duration. 411 out of 2546 (16.14%) responses were obtained. The data analysis was carried out based on descriptive statistics and structural equation modeling by using SPSS and AMOS software. The findings indicate that all dimensions have high Cronbach's Alpha scores (more than 0.8) which means that all dimensions are reliable. In addition, Openness to Experience, Conscientiousness, Agreeableness, and Emotional Stability showed positive correlations with the Lifelong Learning skills dimension. The instrument used in this study is able to support system and propose strategies for improving learners' Lifelong Learning skills.

KEYWORDS: Learner Profiling, Personality Traits, Online Evaluation Tool, Lifelong Learning Skill, Learners Support.

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1. Introduction

In the year 2000, Open University Malaysia (OUM) was established as the premier Open and Distance Learning (ODL) private institution in Malaysia. The goals of the university include promotion of Lifelong Learning (LLL) and increase the number of knowledge workers as a strategic move towards becoming a developed nation. Its philosophy of education differs from many other public and private universities as it embraces the open education philosophy and supports a large learner population of working adults. These learners have diverse entry qualifications and face multifaceted challenges. As such flexible education afforded by the open education philosophy is extremely crucial. In line with the vision of OUM of becoming the top flexible learning provider in the country, initiatives carried out at the university are dedicated towards ensuring that all of its programmes are developed according to the national quality assurance framework (the Malaysian Qualification Framework or MQF) and the regulations set by the Malaysian Quality Agency (MQA). Its mission is to widen the access to quality education and provide LLL opportunities by leveraging on technology, adopting flexible mode of learning, and providing a conducive and engaging learning environment at a competitive and affordable cost. Anyone interested to their further study also has the opportunity to enroll with OUM through its 'open entry' admission with Accreditation of Prior Experiential Learning (APEL) Centre.

OUM offers both Blended Learning and Online Learning. Both modes are largely based on self-managed learning using eModule (a self-instructional learning module) developed by OUM's Centre for Instruction Design and Technology (CiDT). Delivery of the programmes is managed by the Centre for Learning

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Technology (CLT) as well as the Centre for Teaching and Learning Management (CTLM). The former leverages the use of technology to create a conducive and engaging learning environment for OUM learners known as myINSPIRE (a moodle-based learning platform) that is located on a customized learner management system (MyLMS). myINSPIRE is a learning system that host e-modules, forum, live forums, additional learning resources and assessments. Meanwhile, CTLM administers teaching and learning support for learners by managing the manpower support and other resources: e-tutors and face-to-face tutors. eTutors support learners via asynchronous forum and synchronous live forum sessions, while face-to-face tutors support learners via face-to-face tutorial sessions at the university's well-distributed learning centres. Learners at OUM are also supported by other providers such as the Digital Library and the Centre for Learner Affairs (CLA); all support services are integrated through MyLMS.

The presence of an online learning environment that allows for a much more flexible learning environment is better suited to adult learners. Transition to a predominantly online learning environment is a natural move for OUM given that most adults in Malaysia have acceptable level of digital literacy (T Subramaniam et al., 2019). This is an even more pressing need in a world where physical social distancing is a new norm brought about by the COVID-19 pandemic. Past studies have often deliberated the issue of perceived isolation that online learners face even before the pandemic (Croft et al., 2010). This issue is further emphasized since many are returning to the world of education after a long absence. These learners need support. There are many initiatives that have been carried out to create a better understanding of OUM learners, and improving the curriculum in order to achieve the targeted outcomes of the programmes offered. The Centre of Research and Innovation (CRI) at OUM has been testing the use of personality traits to understand OUM learners better for some time and has successfully developed a simple and a reliable tool. This study reports the centre's effort to use the profile to also explore the relationship between the traits identified and the LLL skill that OUM hopes to foster among its learners. LLL is also one of the targeted learning outcomes in all OUM programmes.

2. Literature review

In 1987, psychologists, Costa and McCrae had introduced Big Five Personality Traits model in identifying personality dimensions of human being which is now widely used by many other researchers. The five dimensions identified by Costa and McCrae are: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. In 1992, Costa and McCrae had elaborated the representation of basic dimensions of personality using the five factors on the basis of four lines of reasoning and evidence. Through the years the items were improved and amended to suit the need of the study and the relevance of these dimensions were highlighted again by McCrae and Costa in 2004. In 2016, Cubel et al. had reported the relationship between the Big Five Personality Traits and Productivity. A person's productivity was shown partially influenced by the Big Five Personality Traits. The use of the Big Five Personality Traits to predict dimensions such as academic performance, job performance and life satisfaction was also proven by Lounsbury et al. in 2005. The Covid-19 pandemic also sees the use of the Big Five Personality Traits in predicting anxiety and depression (Nikcevic et al., 2021). Another interesting relation that was explored was between entrepreneurial personality and the Big Five Personality Traits by Luetner et al. (2014). Study also indicate that the Big Five Personality Traits have positive influence in academic performance (2011).

Academic performance at OUM refers to successful completion of the programmes undertaken that are marked by the achievement of the targeted learning outcomes of the programmes enrolled. Learning outcomes in all OUM programme are designed using the domains outlined in the Malaysian Qualification Framework (MQF). The eight domains under the first MQF version are: (i) Knowledge, (ii) Practical Skills, (iii) Social Skills and Responsibilities, (iv) Values, Attitude and Professionalism, (v) Communication, Leadership and Team Skills, (vi) Problem Solving and Scientific Skills, (vii) Information Management and Lifelong Learning Skills, and (viii) Managerial and Entrepreneurial Skills (MQA, 2010). Domains such as Knowledge, Practical Skills, Problem Solving Skills and Scientific Skills are measured through well-designed assessment methods within the courses the students are enrolled-in. Meanwhile, learners' development in four other domains: (i) Values, Attitude and Professionalism, (ii) Communication, Leadership and Team Skills, (iii) Information Management and Lifelong Learning Skills, and (iv) Managerial and Entrepreneurial Skills are developed through generic university courses: (i) Professional Ethics, (ii) Introduction to Communication (iii) Learning Skills for Open and Distance Learners, Basic Concept of Information Technology, (iv) Principles of Management, (v) Entrepreneurship, and (vi) Thinking Skills and Problem Solving. The domain under social skills and responsibilities are built into the hidden curriculum through interactions in forums, live forums and tutorial sessions. Responsibility is a facet that has been clearly identified under the Conscientiousness dimension. Thus, highly conscientiousness learners are likely to be responsible learners. Likewise, good social skills can be reflected in the measure of the Agreeableness dimension. Therefore, it is possible that a well-tested Learner Profiling System could be used as tool to depict the strength of learners in terms of the soft-skills targeted under selected MQF domains. The domains under MQF 2.0 differ slightly from those analysed earlier with the introduction of numeracy and digital literacy. The Learning Skills for

Open and Distance Learners course has been revised recently to improve its curriculum and to introduce learners to Numeracy, Digital Literacy, 4C (Creative Thinking, Critical Thinking, Communication Skills and Collaborative Skills), Global Citizenship and the Environment.

The plausibility of LLL skills to serve as important indicators for the performance of an adult learner are explored in this study. LLL can be defined as an on-going learning process that a person could engage with no age barrier and can occur in any format (formal, non-formal or informal). It is often self-initiated, but there are several underlying factors that could bring about the intention to embark on continuous learning. LLL skills can be influenced by few important elements such as self-directedness. Self-directness is an intrinsic element. It is also a facet that has been identified under the Conscientiousness dimension. Highly conscientiousness learners are likely to be self-directed in managing their learning process. Such learners are also likely to persist in completing their studies and thus successfully retained within the university. The correlation between personality characteristics and retention is also suggested in the study by Frydenberg (2007). LLL skills are also dependent on extrinsic elements such as the learning environment. Mourtos (2003) emphasized the need for students to be organized in embracing LLL. As such the design element of the online learning environment can be geared towards the development of LLL skills.

The aim of this study is to develop an online evaluation tool to identify the profiles of OUM learners using their personality traits and to understand how these traits influence skills such as LLL skills.

The objectives of this study are to:

- develop a learner profile system for OUM;
- identify the general profile of OUM learners;
- determine the correlation between the learner profiling and LLL skills.

3. Methodology

This study uses a survey instrument which was developed through review of previous studies and items that were developed based on the conceptual understanding of the previous studies. The items have been amended, and improved through several cycles before the items were determined fit for purpose of the current study. Six dimensions were explored including the Big Five Personality Traits (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability) and the LLL set of skills. Neurotism was renamed as Emotional Stability as suggested by O'Connor (1951). The items under LLL are largely adopted from the 2003 work by Mourtos. The quantitative method adopted in this study is a useful approach to describe the group of learners as the responses can be obtained much more efficiently through online mechanism. The survey instrument comprises of Learner's Identity Number and 34 items that were grouped under the six dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, Emotional Stability, and LLL skills. Learners were asked to respond to the items using a five-point Likert type scale, 1: Strongly disagree; 2: Disagree; 3: Neutral; 4: Agree; and 5: Strongly agree.

The population of this study is all first semester learners in September 2019 intake (Cohort 193). The online survey was carried out through an announcement containing the link to the Survey Monkey URL which was embedded on the Learning Skills for 21st Century (OUMH1603) course, which is a compulsory course for all first semester learners. Learners were requested to fill up the survey questions. A total of three reminders were sent to a total population of 2546 learners. Data cleaning resulted in a total of 411 responses (16.1%). The data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 22 and AMOS Version 25. The analysis performed includes Descriptive Statistics (mean and standard deviation) of each items and dimensions. Meanwhile the relation between the LLL skills and the five personality traits were tested using Structural Equation Modeling (SEM).

4. Findings

The finding in Table 1 shows the data obtained from the 411 learners. The highest mean value was observed for Openness to Experience with score of 4.30 (sd = 0.68). This is followed by construct Conscientiousness (mean = 4.21, sd = 0.71), Agreeableness (mean = 4.21, sd = 0.70), LLL skills (mean = 3.90, sd = 0.73), and Extraversion (mean = 3.79, sd = 0.87). Meanwhile, the lowest construct is Emotional Stability with mean 3.44 (sd = 0.92).

Dimensions	Mean (s.d)	Mean Ranking	Cronbach's Alpha (CA)	CA Ranking
Openness to Experience	4.30 (0.68)	1	0.855	3
Conscientiousness	4.21 (0.71)	2	0.857	4
Extraversion	3.79 (0.87)	3	0.831	5
Agreeableness	4.21 (0.70)	2	0.906	1
Emotional Stability	3.44 (0.92)	4	0.876	2
LLL skills	3.90 (0.73)	n/a	0.908	n/a

Table 1 - Summary dimensions of Learner Profiling and ranking.

It can be concluded that OUM learners have shown higher level of openness to experience, conscientious and agreeableness. They have shown moderate level of

Constructs	Items	Mean	Standard Deviation
Openness to Experience	I am always looking for new experiences	4.37	.695
	I view challenging situations as an opportunity to grow and learn	4.36	.661
	Creative ideas inspire me	4.27	.692
	I like to try new things	4.30	.661
	I like to find new ways of doing things	4.20	.690
Conscientiousness	I make careful judgement before making any conclusion	4.19	.723
	I think first before I act upon something	4.14	.726
	I always find the source to a problem	4.14	.685
	I check my work thoroughly before submitting	4.29	.717
	I am determined to complete my task well	4.28	.687
Extraversion	I find it easy to get close to people	3.74	.894
	I like the company of others	3.77	.835
	I like group activities	3.84	.889
	I like talking to people	3.83	.837
	I love bright colours	3.77	.919
Agreeableness	I am always polite to people	4.15	.751
	I am considerate and kind towards people	4.19	.682
	I like to cooperate with people	4.16	.700
	I like helping others	4.29	.671
	I am supportive of others	4.24	.709
Emotional Stability	I am free of worries	3.24	.994
	I usually feel relaxed	3.44	.907
	I remain calm in most tense situation	3.52	.906
	I am not affected by moods	3.40	.925
	I am an emotionally stable person	3.62	.854
LLL skills	I enjoy learning new things on my own	4.11	.699
	I am willing to read new materials on my own	4.02	.737
	I can assess the quality of the information that is available	3.91	.740
	I can analyse new content, patterns, ask key questions and synthesize new concepts	3.77	.744
	I can reason by inferring, predicting and inquiring	3.72	.699
	I reflect upon my learning process	3.88	.676
	I evaluate my achievement of the targeted learning outcomes	3.94	.683
	I use Continuing Professional Development (CPD) activities to improve my work	3.75	.827
	I am keen on sharing my knowledge and skills towards the development of best practices at work	4.07	.719

Table 2 - Details item of Learner Profiling survey.

LLL skills and Extraversion but low scores in Emotional Stability. The findings also indicate that all dimensions have a high Cronbach's Alpha scores (more than 0.8) which means that all items in the constructs are reliable. Further explorations on the constructs were discussed in the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) section.

In measuring the suitability of the data for EFA and CFA, the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test was conducted prior to the analysis. KMO measures the sampling adequacy for each construct and for overall model. Finding in Table 3 shows that the sample size is adequate as indicated by the KMO value that is close to 1 (0.937). The data is also suitable for reduction since the result is significant in Bartlett's test of sphericity.

In extracting the factors in EFA, the Principal Component Analysis method was used. The factors then were rotated by Varimax Rotation. The findings in Table 4 shows that there are 7 extracted constructs and the total variance from the Initial Eigenvalues explains that 40.03% in construct 1 (Openness to Experience) followed by 8.01% in construct 2 (Emotional Stability), 6.11% in construct 3 (Agreeableness), 4.38% in construct 4 (LLL), 3.63% in construct 5 (Conscientiousness), 3.25% in construct 6 (Extraversion) and 2.98% in the last construct of LLL. The construct for LLL skills was found to be divided into two distinct constructs. For the continuation of analysis in CFA by performing SEM method, both constructs were retained under the same construct.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.937
Bartlett's Test of Sphericity	Approx. Chi-Square	8985.592
	df	561
	Sig.	.000

Table 3 - KMO and Bartlett's Test.

Figure 1 presents the SEM for LLL skills against the big five traits: Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Emotional Stability.

Further analysis on the modeling between the LLL skills and all five dimensions that were evaluated revealed that there is a significant relationship between the LLL skills and Openness to Experience (p-value = 0.025<0.05), between the LLL skills and Conscientiousness (p-value<0.05), between the LLL skills and Agreeableness (p-value = 0.05), and between the LLL skills and Emotional Stability (p-value <0.05). Meanwhile the relationship between the Extraversion construct and the LLL skills is not significant as the p-value = 0.918 > 0.05.

Table 6 summarizes the score of the model and level of acceptance for each fitness index based on the level of

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.609	40.026	40.026	13.609	40.026	40.026	3.854	11.334	11.334
2	2.724	8.011	48.037	2.724	8.011	48.037	3.743	11.008	22.342
3	2.077	6.109	54.146	2.077	6.109	54.146	3.686	10.841	33.183
4	1.490	4.383	58.529	1.490	4.383	58.529	3.509	10.320	43.503
5	1.235	3.633	62.162	1.235	3.633	62.162	3.024	8.894	52.397
6	1.105	3.250	65.412	1.105	3.250	65.412	2.838	8.348	60.745
7	1.013	2.978	68.390	1.013	2.978	68.390	2.599	7.645	68.390

Table 4 - Total Variance Explained, Extraction Method: Principal Component Analysis.

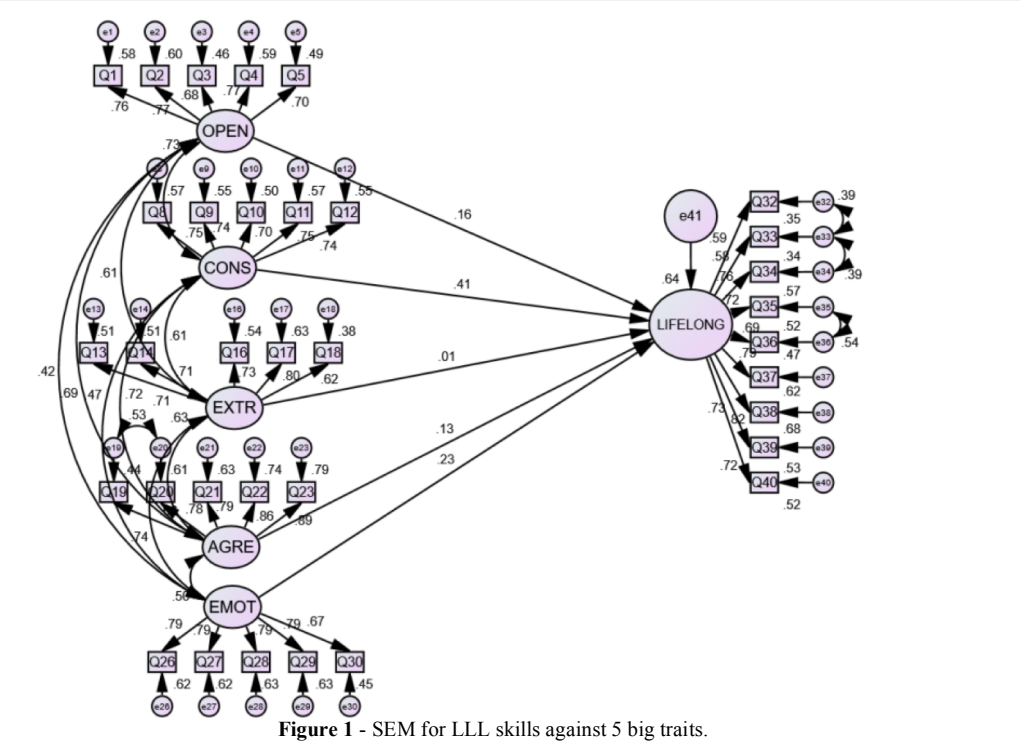

Figure 1 - SEM for LLL skills against 5 big traits.

			Estimate	S.E.	C.R.	P	Label
LIFELONG	<---	OPEN	.129	.057	2.244	.025	Significant
LIFELONG	<---	CONS	.337	.066	5.105	***	Significant
LIFELONG	<---	EXTR	.006	.055	.102	.918	Not Significant
LIFELONG	<---	AGRE	.110	.056	1.962	.050	Significant
LIFELONG	<---	EMOT	.165	.049	3.361	***	Significant

Table 5 - The regression weight for every path estimate in Figure 1.

Model/Fitness Index	GFI	CFI	RMSEA
Default model score	0.848	0.915	0.059
Level of acceptance	> 0.90	> 0.90	< 0.08
Comments	Moderate	Satisfactory	Satisfactory

Table 6 - Summary Fitness Indexes for the model in Figure 1.

acceptance suggested by Awang (2012). In conclusion, the model shows a satisfactory score for RMSEA (0.059<0.08) and CFI (0.915>0.90), and a moderate score for GFI (0.848<0.90).

Findings in this study suggest that learners with high degree of Openness to Experience, Conscientiousness, Agreeableness, and Emotional Stability are likely to have good LLL skills. This finding seems to echo the idea mooted by Riggio (2008) that the Extraversion trait may not matter.

5. Discussion

This study proves successful development of an online evaluation tool that can measure the five personality traits that were based on the Big Five Personality Traits developed by Costa and McCrae. The developed instrument is based on 25 items was integrated with 9 items within the LLL skills dimension, resulting in a total of 34 items. The instrument developed for this study was tested and is found to be a reliable instrument for the identification of learner's personality traits. Seven constructs were found instead of six through EFA, and confirmed through CFA. The LLL skills fell into two distinct constructs. Thus, it is necessary for the set of LLL Skills to be reviewed again in order to understand them better. A study by Solmaz in 2017 suggests that LLL skills can divided into four constructs: motivation, perseverance, curiosity, and self-regulations. The instrument tested leans towards self-regulation, and motivation. It is necessary to maintain the number of items to a minimum as past studies have shown that increasing the number of items and the longer response time cause learners to lose interest affecting the validity of their responses.

Findings in this study also depict the overall personality traits of OUM learners. The good news is that they have a high degree of openness to experience, conscientious and agreeableness between 4.3 to 4.2 mean values. They also seem to have moderate level of LLL skills and Extraversion with a mean between 3.8 and 3.9. This study suggests that perhaps effort is needed to improve the learning environment by analyzing the design element of the present online learning environment can be geared towards encouraging the learners to be organized in their learning process and therefore enhance their LLL skills (Mourtos, 2003). As an open university, OUM is concerned with the level of LLL skills among new learners.

However, the lowest mean among all construct are Emotional stability at 3.44. There are two concerns here. One, the low level of emotional stability has a negative impact of learners' LLL skills. Second, the level of emotional stability itself is a concern. A good level of emotional stability suggests maturity and potential to persist in their programme. This is a new pattern found amidst the studied cohort. Is this a trend among OUM learners who belong to the 25 to 35 age group? If this is so, it is of great concern and there is a need create the necessary support. The importance of e-counselling service that the university offers to its learners is even more important now than before. This relation was explored and shown to have positive impact in a recent study by Martin and Kuboja (2022).

This study also shows that all construct (Openness to Experience, Conscientiousness, Agreeableness, and Emotional Stability) have significant influences on the LLL skills except for Extraversion. This has been suggested by Riggio and Reichard (2008). The moderate level of the extraversion trait is not a concern as it does not relate to the LLL skills. Nevertheless, this prompts us to reconsider the design strategies that are used in designing materials, courses, learning environment and other systems. This study also found that OUM learners have high degree in three out four traits that have strong relation with LLL skills. Learners generally have positive traits in Openness to Experience, Conscientiousness, and Agreeableness. Learners will have good chance of mastering the LLL skills as long as they are supported through good counseling service. As such CRI is exploring the option of continuing this study by establishing a new project through a collaborative effort between CLA and OUM's experts in psychology.

This study can also be extended to explore how the personality traits are linked with the revised domain under MQF 2.0. Conceptual understanding of the traits may suggest a few links such as: (i) the Conscientious trait could have a strong positive influence on the facet of responsibilities (one of the MQA programme outcomes); (ii) the Openness to Experience could have a positive influence on the expected programme outcomes such as problem solving and scientific skills; and (iii) the Conscientious traits could also have positive influence on expected programme outcomes such as values, attitude and professionalism, as well as managerial skills. A desired programme outcome could also have positive correlations with more than one personality trait. These hypotheses can be tested by extending this study. Learner profiling instrument used as pre-test and post-test could potentially serve as a tool to provide indirect measure of learners' achievement of the 21st Century soft skills. The relation between the Big Five Personality Traits and the 21st Century Soft Skills that are also known as the Life Career Skills as identified under P21 Framework must be explored first. The list includes Flexibility & Adaptability, Initiative and Self-Direction, Social & Cross-cultural Skills, Productivity & Accountability, as well as Leadership & Responsibility. The overlap between these set of skills and LLL skills must be identified.

6. Conclusion

This study presents the continuous work carried out towards refinement of the instrument which measure the profile of learners based on the Big Five Personality

Traits. A set of items measuring LLL skills among learners was incorporated into the developed instrument. OUM learners from the 193-cohort showed high degree of Openness to Experience, Conscientiousness, and Agreeableness; moderate degree of Extraversion and LLL skills; and a low degree of Emotional Stability. Positive correlations between four out of the five personality traits and the LLL skills were established in this study. It appears that the importance of the Extraversion traits among learners might have been overemphasized. Learner with high degree of Openness to Experience, Conscientiousness, Agreeableness, and Emotional Stability would also be likely to have good LLL skills. The instrument could be used to identify learners who may not possess the traits to become a successful LLL skills, for example those with low degree of emotional stability. A specially designed counseling programme that could potentially improve learner's emotional stability must be introduced. Meanwhile, the design of the online learning environment can be improved towards encouraging the learners to be organized in their learning process and enhance their LLL skills.

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Educational data mining, student academic performance prediction, prediction methods, algorithms and tools: an overview of reviews

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Abstract

This overview study set out to compare and synthesise the findings of review studies conducted on predicting student academic performance (SAP) in higher education using educational data mining (EDM) methods, EDM algorithms, and EDM tools from 2013 to September 2021. It conducted multiple searches for suitable and relevant peer-reviewed articles on two online search engines, on nine online databases, and on two online academic social networks. It, then, selected 33 eligible articles from 2,500 articles. Some of the findings of this overview study are worth mentioning. First, only 3 studies explicitly stated their precise sample sizes, and only 5 studies explicitly mentioned their subject areas with maths and science, and computer science and engineering as the four most mentioned subject areas. Second, 20 review studies had purposes related to either EDM techniques, EDM methods, EDM models, or EDM algorithms employed to predict SAP and student success in the higher education sector. Third, there are six commonly used typologies of input variables reported by 33 review studies, of which student demographics was the most commonly utilised variable for predicting SAP. Fourth and last, seven common EDM algorithms employed for predicting SAP were identified, of which Decision Tree emerged both as the most used algorithm and as the algorithm with the highest prediction accuracy rate for predicting SAP.

KEYWORDS: Overview, Student Academic Performance, Educational Data Mining, Methods, Algorithms.

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1. Introduction

The last few years have witnessed an exponential increase in review studies exploring educational data mining (EDM) methods, algorithms, and tools for predicting student academic performance (SAP) (Khasanah, 2018; Saa et al., 2019; Shahiri et al., 2015). This is the case for diverse disciplinary fields, even though fields such as computer science and engineering seem to have conducted more such studies than others (Ashenafi, 2017). Most EDM review studies on predicting SAP have been conducted as either reviews (Ameen et al., 2019; Cui et al., 2019; Del Río & Insuasti, 2016; Durga & Thangakumar, 2019; Moreno-Marcos et al., 2019; Muttathil & Rahman, 2016; Shahiri et al., 2015); literature reviews (Alyahyan & Düştegör, 2020; Manjarres et al., 2018; Saqr, 2018); systematic literature reviews (Alban & Mauricio, 2019; Liz-Domínguez et al., 2019; Namoun & Alshanqiti, 2021; Papamitsiou & Economides, 2014); systematic reviews (Agrusti et al., 2019; Alamri & Alharbi, 2021; Aydogdu, 2020; López-Zambrano et al., 2021; Zulkifli et al., 2019); review syntheses (Aldowah et al., 2019); or surveys (Alturki et al., 2020; Ganesh & Christy, 2015; Jindal & Borah, 2013). While these review study types are not exhaustive, they represent a broad spectrum of the types of review studies that the current paper was able to locate.

2. Contextualising issues

This paper uses an overview of reviews in the same sense as a review of reviews. In an overview of reviews (hereafter an overview or an overview study), review studies or aspects featuring in review studies become key units or foci of analysis as opposed to aspects of

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primary studies (Polanin et al., 2016). There are different terms used to refer to a review of reviews. These include review of reviews, second-order review, umbrella review, tertiary review, meta-meta-analysis, synthesis of meta-analysis, synthesis of systematic reviews, summary of systematic reviews, or systematic review of systematic reviews (Grant & Booth, 2009; Moonsamy et al., 2021; Pieper et al., 2012). These terms constitute typologies of overviews. These typologies reflect the roles played by the respective overviews and the purposes these overviews are meant to serve.

Benefits of utilising overviews are:

- retrieving, identifying, assessing and integrating findings from several review studies leveraging previous research syntheses;
- aggregating the evidence provided by multiple reviews or contrasting multiple treatments on the same topic; and
- identifying a gap in existing reviews (Pieper et al., 2012; Polanin et al., 2016).

3. Literature review related to predicting student academic performance using EDM techniques

Student academic performance (SAP) is a crucial construct employed to determine student academic success at different educational levels (Khanna et al., 2016; Papadogiannis et al., 2020; Shahiri et al., 2015). Even though it has multiple definitions, at a basic level, SAP is the performance that students display in their academic tasks (e.g., assignments, tests and examinations). It is often reflected in students' past cumulative grade point average (CGPA)/grade point average (GPA) in a previous semester and in students' expected GPA in the existing semester. If the term *performance* is disaggregated from the phrase *student academic performance*, it embodies achievement in relation to assignments and courses, continuous progress in programmes, and a successful completion of programmes (Hellas et al., 2018; Khasanah, 2018). Moreover, it entails persistence, retention, progression, wastage, and success or progress (Hamoud et al., 2017). In this sense, SAP should be seen in the same way as student academic achievement (Alyahyan et al., 2020). However, SAP is a complex construct, and in this regard, there are multiple factors that impact on and affect it. These include the historical academic performance and the socio-economic background of students.

In this context, some of the factors (also known as attributes) employed to predict SAP are: academic factors (historical and current); student demographics; socio-economics factors; psychological factors; student e-learning activities; student environments; and extra-curricular activities (Kumar & Salal, 2019). The superordinate factors listed in the preceding set are often utilised to predict SAP by most scholars (Alturki et al., 2020; Khasanah, 2018). These superordinate factors are further categorised into specific subordinate factors with the former serving as input variables or performance features, and with the latter serving as output variables or performance metrics [18]. Nonetheless, at times there are overlaps between the superordinate and subordinate factors as certain scholars tend to conflate them (Alyahyan & Düştegör, 2020; Ashenafi, 2017; Hellas et al., 2018; Kumar & Salal, 2019).

Moreover, certain methods (or tasks) such as association rule mining, clustering, classification and regression are used for building models for predicting SAP. Such methods are at times referred to as techniques (Aldowah et al., 2019; Hellas et al., 2018), while Saa et al. (2019) call them EDM approaches. In this way, classification tends to be the predominantly used method. Furthermore, there are algorithms that are employed to predict SAP. Among them are Artificial Neural Network (ANN), Bayesian Network (BN), Decision Tree (DT), K-Nearest Neighbours (K-NN), K-Means; Naïve Bayesian classifiers, Neural Network (NN), and Support Vector Machine (SVM) (Alamri & Alharbi, 2021; Ashenafi, 2017; López-Zambrano et al., 2021; Namoun & Alshanqiti, 2021).

In certain instances, these algorithms are referred to as EDM techniques (Ashenafi, 2017), or as tasks or as methods (Alturki et al., 2020). The choice of prediction algorithms is determined by SAP outcomes to be predicted. For instance, classification algorithms such as DT, NN and NB classifiers are commonly used for predicting a binary outcome like pass/fail at a certain degree of probability (Alamri & Alharbi, 2021; Ashenafi, 2017; Shahiri et al., 2015). By contrast, SVM and linear regression are often employed for predicting numerical scores (Ashenafi, 2017). Furthermore, some of the tools belonging to software programmes such as WEKA, RapidMiner, MATLAB, KNIME, Apache Mahout, Rattle GUI are used for predicting SAP. Of these, WEKA appears to be the frequently used tool (Alyahyan & Düştegör, 2020; Alturki et al., 2020; Khasanah, 2018; Kumar & Salal, 2019).

4. Purpose of the study

The purpose of this paper was to compare and synthesise findings of review studies conducted on predicting SAP in higher education through utilising EDM methods, algorithms, and tools from 2013 to September 2021. The major focus was on review studies related to the higher education sector. The following served as research questions (RQs) for this study:

- RQ1: What are the primary purposes of the review studies investigated in this overview?
- RQ2: What common input (predictor) and common output (target) variables do these review studies employ to predict SAP?

- RQ3: What common educational data mining (EDM) techniques (or methods) and algorithms do they employ in predicting SAP?
- RQ4: What algorithms are reported to have the highest prediction accuracy for SAP?
- RQ5: What common EDM tools do these studies employ in predicting SAP?
- RQ6: What are the key results of these review studies?

5. Literature search strategy

The search strategy for relevant review studies was conducted online from March 2020 to September 2021, and started by locating search engines, databases, and academic social networking sites. Subsequently, two online search engines (Google and Bing), nine online databases (Google Scholar, Microsoft Academic, Semantic Scholar, IEEE Xplore, ERIC, ScienceDirect, Emerald; JSTOR, SpringerLink), and two online academic social networks (ResearchGate and Academia.edu), were identified (Figure 1). Search strings were arranged into super- and sub-strings in keeping with the major area of focus of the overview: predicting SAP through using EDM methods, algorithms, and tools. These search strings consisted of the following keywords: predicting student academic performance; educational data mining techniques; educational data mining algorithms; and educational data mining software tools. To ensure that a wide range of review studies on the major focus area of this overview was covered in all the search combinations, two commonly used Boolean operators, *AND* and *OR*, together with parentheses and double quotation marks (where necessary), were employed in the search strategy. Examples of these search combinations were as follows:

- predicting student academic performance AND educational data mining techniques AND educational data mining algorithms AND educational data mining software tools
- predicting student academic performance OR educational data mining techniques OR educational data mining algorithms OR educational data mining software tools.

In certain instances, the word, *techniques*, was replaced with *methods* and *tasks*. The afore-said keyword combinations, together with their relevant iterations, were queried in the three search engines, in the nine online databases, and in the two online academic social networking sites mentioned earlier. Moreover, dependency and snowball search strategies were employed based on the bibliographies of the journal articles obtained from the three sets of online search platforms.

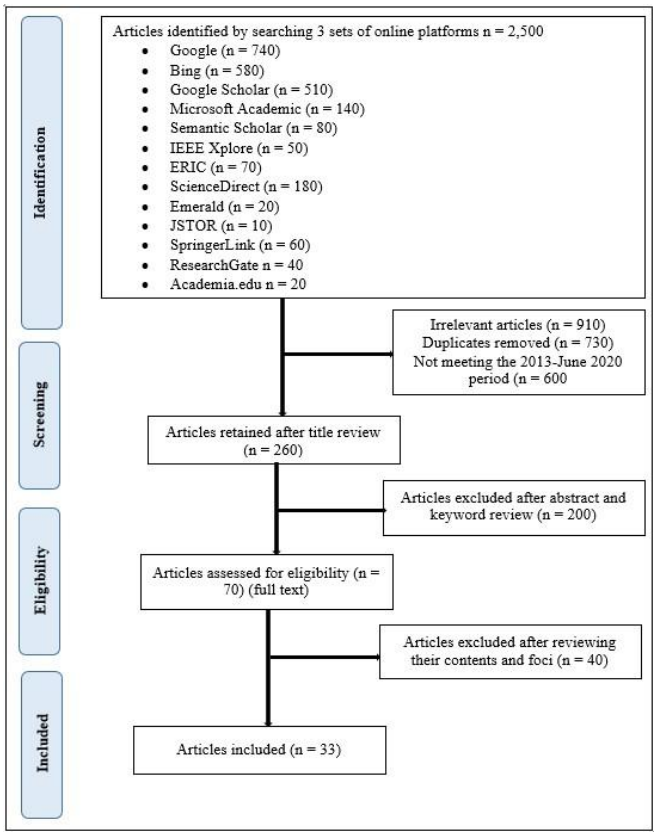


Figure 1 - The PRISMA flow chart and the online search platforms.

5.1 Eligibility criteria and selection of studies

The criteria for including and excluding review studies are as listed below. They were formulated to respond to the major focus area of the current overview.

- review studies focusing on predicting SAP using EDM methods (techniques or tasks), algorithms and tools;
- focus on higher education;
- review studies published between 2013 and September 2021;
- review studies published in peer-reviewed journals and by (internationally) recognised conference organisations;
- mention of a specific years/duration covered (e.g., 2010 to 2015); and
- review studies published in English.

Review studies were identified and selected by following a four-phase selection process informed by the PRISMA approach as illustrated in Figure 1. One of the key aspects of this approach is to ascertain that there is clarity and transparency in the search and selection processes ((Moher et al., 2009). The first phase involved screening articles, which were obtained from the three sets of online search platforms by querying a combination of search strings mentioned earlier. This phase yielded 2,500 articles. The second phase entailed screening these articles by reviewing their titles. This resulted in 260 articles being retained. Thereafter, the third phase was conducted during which 200 irrelevant and duplicate articles were eliminated by reviewing their abstracts and keywords. In the fourth phase, 30 irrelevant articles were identified and excluded after review their contents and foci, resulting in 33 full-text articles judged as relevant being retained from 40 articles. These 33 articles served as the major source of data sets for the current overview.

5.2 Data extraction, coding and inter-rater reliability

Data sets, based on the purpose and on the major focus area of the overview, were extracted from 33 full-text articles mentioned above. A coding scheme consisting of categories based on 14 specific features of the major focus area (Appendix A) was developed. Examples of these categories are: total sample size; purpose of review; input variables; output variables; and EDM techniques. Raters used this coding scheme to extract data from the 33 articles, code them, and match them to each of these categories. To ensure data extraction and data coding consistency, three raters extracted and coded data. The coding protocol used was based on Miles and Huberman's (1994) inter-rater reliability (IRR), which employs the following formula:

$$reliability = \frac{number\ of\ agreements}{number\ of\ agreements + disagreements}$$

In keeping with this formula, the three raters had a mean IRR of 77% agreement for all the data they had coded for the 14 categories. An IRR of 77% agreement is deemed to be sufficiently reliable (Miles & Huberman, 1994).

5.3 Data analysis

Two related and complimentary techniques were used to analyse data sets: content analysis and thematic analysis. The choice of these two analytic approaches was informed by the types of data sets extracted from the 33 articles. Content analysis lent itself well to quantitatively representing categories and themes extracted from the data, while thematic analysis was employed to qualitatively present these categories and themes (Vaismoradi & Snelgrove, 2019).

6. Findings

he findings presented in this section of the overview are grounded on the data extracted from the 33 full-text articles and are informed by the manner in which the extracted data were codified as highlighted in the relevant section above. Additionally, the findings respond to the six research questions stated earlier.

6.1 A Panoramic view of the thirty-three review studies

Of the 33 review studies investigated, 9 were systematic reviews; 8 were reviews; 5 were systematic reviews; 4 were surveys; 3 were literature reviews; and the last 4 were a meta-analysis, a critical review, a comparative analysis, and a review and synthesis, apiece (Figure 2). In all, there were nine different types of reviews, with systematic reviews as a typology constituting the most of these review studies.

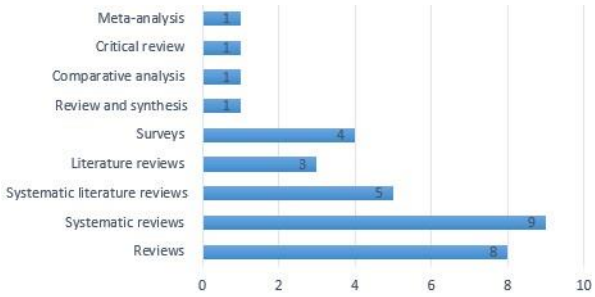


Figure 2 - Types of review studies reviewed.

Additionally, these 33 review studies had their authors from diverse albeit, in some cases, the same countries of origin. For instance, on the one hand, as depicted in Figure 3, 6 reviews were written by authors based in India, while 4 studies and 3 studies were written by authors from Saudi Arabia and Spain, respectively. On the other hand, 2 reviews had authors from Greece, Malaysia, Italy, and Germany, each. The remaining 12

reviews were written by authors from either single, dual, or multiple countries.

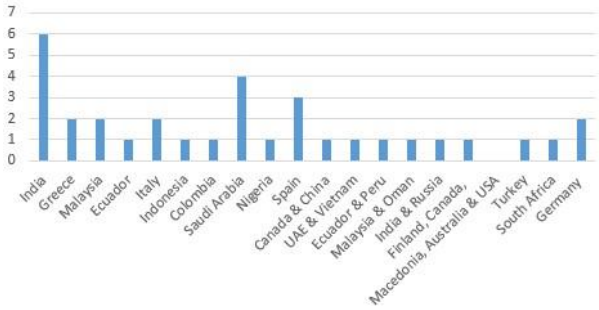
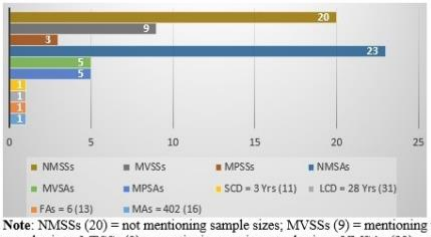


Figure 3 - Authors' and review studies' countries of origin.

Even though the 33 review studies were published between 2013 and September 2021, the aggregate time duration covered by these studies spanned 29 years (1992-2021) (Table 1). The study with the longest duration (longest time span) is review study 31, which covered a 28-year duration (1992-November 2020) (see Figure 4 and Appendix A). This study contrasts with review study 11, whose duration is 3 years (2007-2010). The study that had the most articles is review study 16, which reviewed 402 articles. Its converse is review study 13, which focused only on 6 articles.



Note: NMSSs (20) = not mentioning sample sizes; MVSSs (9) = mentioning vague sample sizes; MPSSs (3) = mentioning precise sample sizes; NMSAs (23) = not mentioning subject areas; MVSAs (5) = mentioning vague subject areas; MPSAs (5) = mentioning precise subject areas; SCD = shortest coverage duration; LCD = longest coverage duration; FAs = review study with fewer articles; MAs = review study with most articles

Figure 4 - Review studies with most and least articles, and with longest and shortest coverage duration, and studies mentioning and not mentioning subject areas and sample sizes.

There are 5 studies that mentioned precise subject areas, with natural sciences (maths and science) and computer science and engineering mentioned by 4 studies. Similarly, 5 studies mentioned vague subject areas, while 23 studies did not mention their subject areas. In this case, 3 studies provided precise sample sizes, and collectively, their sample sizes totalled 46,695 participants. Nine studies provided vague sample sizes, with 20 having not stated their sample sizes.

6.2 Purposes of the review studies

As illustrated in Figure 5, 20 review studies had purposes focusing on EDM techniques, EDM methods, EDM models, or EDM algorithms used to predict SAP and student success in higher education. Of these review studies, 15 explicitly mentioned SAP or academic/student performance in their purposes, with 3 of them mentioning both SAP and dropout prediction. Of the remaining 5 studies, 3 referred to predictive models, while 2 referred to predicting student success. The remaining 10 review studies had their purposes on reviewing or surveying EDM techniques and tools, and 2 had their purposes on student dropout prediction. The other remaining review study did not mention its purpose.

Note: EDM = educational data mining; SAP = student academic performance; SS = student success; SP = student performance

Figure 5 - Aspects identifiable from the purposes of the review studies.

6.3 Common input (predictor) variables and common output (predicted) variables employed as reported by review studies

Six typologies of input (predictor) variables emerged as the most common typologies of input variables used for predicting SAP by the reviewed studies. These are pre-university academic factors; university academic factors; student demographics; family factors; psychological factors; and student e-learning activities (Table 2). Of these collective factors, student demographics appears in 30 review studies. It is followed by both university academic factors and psychological factors. High school background and admission scores rank as the most common pre-university academic factors employed, whereas graduation percentage is reported as the commonly used aggregated attribute for university academic factors. For student demographics, gender and age are the two most common attributes reported to have been used, while family is the common attribute reported to have been employed for family factors. The common attributes for psychological factors are surveys and participation, and student discussion posts/online discussion forums are the commonly used factor for student e-learning activities.

As regards the common output variables, both university academic factors and pre-university academic factors emerged as the two frequently used attributes under these types of SAP predictor variables (Table 3).

RS 1.	To survey research trends of EDM tools, techniques & educational outcomes.
RS 2.	To provide an overview of current knowledge of LA and EDM.
RS 3.	To survey the most recent studies on EDM practices and techniques.
RS 4.	To provide an overview of DM techniques used to predict student performance; and to establish prediction algorithms that can identify the most important attributes in student data.
RS 5.	To explore EDM methods and models for improving academic performance and institutional effectiveness.
RS 6.	To survey literature in EDM in higher education and to focus on applying EMD to predict academic performance.
RS 7.	To explore the application areas and techniques of EDM, and factors affecting student academic performance.
RS 8.	To establish how performance prediction studies have evolved from those using traditional data to those utilising sophisticated data.
RS 9.	To survey different DA techniques that have been used to predict student performance and progress.
RS 10.	To determine the existing state of research on predicting student academic performance.
RS 11.	N/M
RS 12.	To present a review works in which DM techniques were used to solve educational problems and to provide a classification associated with them.
RS 13.	To offer a methodological systematic review of empirical LA research in medical education and to provide an overview of the commonly used methods.
RS 14.	To identify studies using EDM techniques to predict university dropout.
RS 15.	To provide a systematic review of university student dropout prediction through DM techniques.
RS 16.	To shed light on specific learning problems not yet addressed by previous reviews.
RS 17.	To present a comprehensive review of studies dealing with SAP and dropout predictions. **NB:** Not framed as a goal, purpose or goal).
RS 18.	To review methodological components of predictive models developed and implemented in LA applications in HE.
RS 19.	To try to comprehend a few literary works on academic performance prediction of engineering students with the focus on grade predictions.
RS 20.	To find the most critical factors affecting the student performance used by most studies; and to find the most used algorithm and the accuracy of DM algorithms.
RS 21.	To provide an overview of the current state of research activity regarding predictive analytics in HE.
RS 22.	To identify the characteristics of the MOOCs used for prediction; to describe the prediction outcomes; to classify the prediction features; to determine the techniques used to predict the variables; and to identify the metrics used to evaluate the predictive models.
RS 23.	To identify the most commonly studied factors that affect the students' performance and the most common DM techniques applied to identify these factors.
RS 24.	To identify the predictive methods for students' academic performance in HE.
RS 25	To review the latest trends in predicting students' performance in higher education.
RS 26.	To provide guidelines for educators willing to apply DM techniques to predict student success.
RS 27.	To conduct a comprehensive review of EDM studies in Turkey.
RS 28	To identify and present research published over the last five years (2015-2019) in relation to assessing students' academic performance using data mining techniques.
RS 29	To investigate explainable models of student performance prediction from 2015 to 2020.
RS 30	To find the most used algorithm by researchers in the field of supervised machine learning in the period of 2010-2020.
RS 31	To provide an overview of the current state of research in EDM.
RS 32	To obtain the most effective EDM approaches used to identify students that may underperform in computer programming.
RS 33	To create a comprehensive understanding of the landscape of academic performance prediction by focusing on the attainment of learning outcomes.

Table 1 - Purposes of individual review studies.

Pre-university academic factors	High school final grade (11); high school background (2, 4); distance high school, entrance exam (9, 32); pre-course performance, school performance (10); high school type, high school department, high school grade, admission score (17, 29, 32); linguistic features extracted from college admission application essays (18, 19, 25); teaching medium, class size, school reputation (20, (21); CGPA (23); GPA, assessment (26) (n = 16)
University academic factors	Internal assessments and external assessments, CGPA (4); end-of-semester exam, GPA, assignment, attendance, unit test, graduation, graduation percentage (5, 25, 28, 29, 32, 33); pass/fail, exact score (8); mid-term marks, lab test grade, scholarship (9, 10); drop out or not (11); behaviour in certain courses (12, 15); students' self-assessment, task complexity evaluation (16, 17); enrolment (18, 19); sessional marks (20); notes (24); achievement scores (26) (n = 18)
Student demographics	Student demographics (4, 10, 21, 28, 32); gender (5, 9, 10, 11, 17, 19, 20, 24, 25, 26); age (10, 17, 20, 23, 24, 25, 26); race, marital status, nationality (17, 18, 22, 25, 27); language, origin, educational background (24, 26, 32) (n = 30)
Family factors	Family background, parents' education (5) or father's education, father's occupation, mother's education and mother's occupation (11, 25); family (9, 10); (19); support (20); number of siblings, student's place of residence (23); (26) (n = 9)
Psychological factors	Psychometric factors (4); self-confidence, interest, course and degree ambition, participation (9, 32, 33); engagement, personality, task time, motivation, self-regulation (10); learning strategies survey, LMS questionnaires (13); (15); student preferences, planning strategies, satisfaction (16); stress management, first generation learner, learning style (17); attitude and socio-emotional surveys, teaching quality and style (18); weight (20); student effort, classroom characteristics (21); (22); instructor's knowledge and clarity, course evaluation surveys, students' environment (23); learning time (24); study behavior (25, 32); scales (26) (n =18)
Student e-learning activities	Discussion posts/online discussion forums (2, 3, 33); log data (10); students' LMS data usage, students' access data to and time usage (13, 29); student activity data from LMSs (18, 28); platform use (22); message chat logs, frequency of course clicks (23); (25); navigation data (26) (n = 12)

Table 2 - Common (input) predictor variables employed as reported by review studies.

Pre-university academic factors	Admission exam grade (6); academic background, pre-post enrolment factors (7) (n = 2)
University academic factors	Course grade, GPA, pass/fail course, semester, year, drop out or not, scholarship (6, 30, 31, 33); CGPA, GPA, class attendance, sessional marks, final grade, course content (7); course grade/score, exam/post-test grade, course grade range, pass/fail, programme/module graduation/retention, SGPA, assignment performance (e.g., grade, time to completion), course retention/dropout, knowledge gain, number of courses passed or failed (10, 30, 31, 33); risk of failing a course, dropout risk, grade prediction and graduation rate (21, 30, 33); scores prediction (22) (n = 13)

Table 3 - Common output variables employed as reported by review studies.

6.4 Common EDM methods employed as reported by review studies

There are seven commonly used EDM methods for predicting SAP as reported by the reviewed studies (Table 4). Of these, the most commonly used EMD method is classification, which is reported by 16 review studies. It is followed by clustering, which is reported by 14 review studies. Both regression and association rules are ranked third and fourth, respectively. Naïve Bayes is the least commonly used as it is referenced by only 7 review studies.

Classification	1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 16, 21, 23, 24, 25 & 26 (n = 16)
Clustering	1, 2, 3, 5, 6, 7, 9, 12, 16, 23, 24, 25, 26 & 27 (n = 14)
Regression	2, 4, 5, 6, 7, 9, 16, 21, 22, 24, 25 & 26 (n = 12)
Association rule(s)	1, 2, 3, 5, 6, 7, 9, 12, 15, 16 & 26 (n = 11)
Decision Tree(s) (DT(s)	12, 14, 15, 17, 18, 19, 20, 22 & 25 (n = 9)
Support Vector Machine (SVM)	14, 15, 17, 18, 19, 20, 22 & 25 (n = 8)
Naïve Bayes (NB)	15, 17, 18, 19, 20, 22, 25 (n = 7)

Table 4 - Common EDM methods employed as reported by review studies.

6.5 Common EDM algorithms (classifiers) and common EDM software tools employed as reported by review studies

Pertaining to the commonly used EDM algorithms for predicting SAP, there are seven algorithms referenced by the reviewed studies (Table 5). Of these seven EDM algorithms, DT is the most commonly used algorithm as it is mentioned and cited by 24 review studies. It is followed by SVM (n = 20), ANN (n = 19), NB (n = 15), and K-NN (n = 13), respectively. Naïve Bayes classifiers is the least commonly used EMD algorithm for predicting SAP. However, when Bayesian classifiers are clustered together, they emerge as the most frequently utilised EDM algorithms as reported by 28 review studies.

DT (Decision Tree)	3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 22, 23, 25 ,27, 29, 30, 31, 32 & 33 (n = 24)
SVM	4, 5, 7, 8, 9, 14, 15, 17, 18, 19, 21, 22, 23, 24, 27, 28, 29, 30, 31 & 33 (n = 20)
ANN (Artificial neural networks)	4, 5, 7, 8, 9, 11, 14, 15, 17, 18, 19, 21, 22, 23, 27, 28, 30, 32 & 33 (n = 19)
NB (Naïve Bayes)	3, 4, 7, 9, 10, 14, 15, 17, 18, 19, 21, 22, 29, 31 & 32 (n = 15)
K-NN (K-Nearest Neighbour)	4, 5, 7, 9, 15, 17, 18, 21, 23, 24, 26, 30 & 31 (n= 13)
BN (Bayesian network)	5, 8, 11, 14, 26, 28, 31 & 33 (n = 8)
Naïve Bayes classifiers	8, 23, 24, 27 & 32 (n = 5)
Algorithm(s) reported to have the highest prediction rate	DT (n = 7)

Table 5 - Common EDM algorithms (classifiers) employed as reported by review studies.

Seven of the review studies reported on and mentioned the EDM techniques or algorithms with the highest student performance prediction accuracy rate. Of these studies, DT is reported to have the highest prediction accuracy rate by four studies (a 100% and a 99% predication accuracy rate by one study). It is followed by Naïve Bayes, which has a mixed prediction accuracy rate: two studies rate it as having a high prediction accuracy rate, one of which rates it to have a prediction accuracy rate of 100%), whereas two studies rate it as having a low prediction accuracy rate (a 76% prediction accuracy rate in one study).

In this context, three EDM software tools are reported to be frequently used for predicting SAP. These are WEKA, SPSS and RapidMiner, with WEKA as the most commonly used of the three EDM software tools (Table 6).

WEKA	1, 3, 6, 14, 15, 20, 25, 27 & 28 (n = 9)
SPSS	5, 6, 14, 15, 25 & 27 (n = 6)
RapidMiner	4, 14, 20, 25 & 27 (n = 5)

Table 6 - Common EDM software tools as reported by review studies.

7. Discussion

In this section, the discussion of the findings is structured in response to the six research questions of the study. As pointed out above, 33 review studies constituted the focal point of the present overview. Except for four studies, the rest (n = 29) were reviews of different typologies: systematic reviews (n = 9); classical reviews (n =8 systematic reviews (n = 5); surveys (n = 4); and literature reviews (n =3). In their review of reviews, Kim et al. (2018) investigated qualitative reviews (narrative and thematic reviews) and quantitative reviews (systematic and meta-analysis reviews) as part of the articles (n = 171) included in their study on hospitality and tourism.

Concerning subject areas, maths and science, and computer science and engineering featured among the subject areas mentioned by 5 studies. In this case, 3 studies mentioned sample sizes that together totalled 46,695 participants. A review of reviews in a different but related area that offers subject areas on which its reviews focused is Kim et al. (2018). Of the 13 reviews this overview reviewed, economics and finance (n = 29), customer behaviour (n = 24), and marketing (n =22) are reported as the top three subject areas mentioned by the reviewed studies, respectively. The overview mentions that sample sizes of its 171 reviews ranged from less than 10 to more than 10,000, with systematic reviews having the highest sample sizes. In the current overview, the 3 reviews that mentioned specific sample sizes were a systematic literature, a literature review, and a meta-analysis (see Figure 4 and Appendix A).

Pertaining to the purposes of the 33 reviews, it emerged that the purposes of 20 reviews had to do with either EDM techniques, EDM methods, EDM models, or EDM algorithms utilised to predict SAP and student success in higher education. By contrast, of the remaining 13 studies, 10 reviewed or surveyed EDM techniques and tools, whereas 2 focused on student dropout prediction. A study that had purposes (or objectives) as one of its focal points of analysis is Khanna et al.'s (2016) systematic review, which had reviewed 13 articles. Among the purposes of the 13 articles it analysed, educational data mining (EDM) methods or techniques employed for predicting student performance featured prominently in the purposes of 10 of these articles. The other study, Papamitsiou and Economides' (2014) systematic literature review of 40 articles, had six purposes, of which prediction of student performance was the second most common purpose after student behaviour modelling.

Of the six typologies of input variables reported to have been used by the 33 review studies, student demographics emerged as the most commonly used input variable for predicting SAP, with both gender and age as the most common attributes. It was followed by both university academic factors and psychological factors, with graduation rate, and both surveys and participation as the most common attributes for each of these two collective factors, respectively. In Khasanah's (2018) review of 10 articles, student personal information and family information were the two most popular collective factors used, with gender and age, and father education and mother education, as their most common attributes, in each case. Pre-university (high school results) and university (GPA and assessment grades) factors and student demographics (gender and age) are the most influential factors reported in Alyahyan and Düştegör's (2020) literature review of 19 articles. For output variables, both pre-university academic factors and university academic factors were the two frequently employed cluster of factors with reference to these types of SAP predictor variables.

As characterised in the findings section, the four most commonly used methods were classification, clustering, regression, and association rules, respectively, while Naïve Bayes was the least utilised method. Similarly, both classification and clustering were the most popularly used EDM methods in Papamitsiou and Economides' (2014) systematic literature review, while regression was the third most used method. Classification was found to have been the most popularly used EDM method in Ganesh and Christy's (2015) survey of 10 articles, with association rules and clustering as the second and third most used methods, successively. Again, classification was found to be the top-most utilised EDM method (n = 40) by Del Río and Insuasti's (2016) review study of 56 articles.

In relation to the seven EDM algorithms identified from the 33 review studies, Decision Tree (DT) was found to be the most commonly employed for predicting SAP, with Support Vector Machine (SVM) and Artificial Neural Network (ANN) being the second and third most used algorithms, respectively, while Naïve Bayes (NB) was the least used algorithm. Nonetheless, as a cluster, Bayesian classifiers were the most frequently utilised, overall. One review study that found DT to be the most used EDM algorithm is Cui et al.'s (2019) review of 121 articles. It was referenced by 46 of these articles, followed by Naïve Bayes (n= 32), SVM (n = 26), and neural networks (NN) and multi-layer perceptron (MLP) (n = 26). Similarly, DT had a frequency of 49 as opposed to two of its nearest algorithms, Bayesian classifiers (f = 36) and NN (f = 29) in Agrusti et al.'s (2019) systematic review of 73 studies.

In another scenario, DT and Naïve Bayesian classifiers (as categories) had the frequencies of 35 (24.8%) and 14 (9.9%) out of the total number of 141 algorithms identified from 34 articles in Saa et al.'s (2019) systematic review. However, when viewed as individual algorithms, Naïve Bayesian classifiers had the frequency of 13 (38.2%), followed by SVM with the frequency of 8 (23.5%). DT had the frequency of 4 (11.8%). In terms of the student performance prediction accuracy, only nine review studies stated EDM techniques or algorithms that had such a prediction accuracy. DT emerged as the EDM algorithm that had the highest student performance prediction accuracy rate as mentioned by 6 of the 9 studies, while Naïve Bayes had mixed prediction accuracy rates. In Ganesh and Christy's (2015) survey, DT generated the most consistent prediction results as opposed to Naïve Bayes, J48 and JRip.

Lastly, pertaining to EDM software tools for predicting SAP, WEKA emerged as the most commonly employed tool, followed by both SPSS and RapidMiner. WEKA was similarly found to be an EDM software tool used by 15 of the 20 papers (even though in one instance it was used in tandem with RapidMiner), while both RapidMiner and Matlab were each used by 3 papers in Kumar et al.'s (2018) review. In the same breath, WEKA appeared in 14 articles, followed by SPSS (n =9) and R (n = 8) and RapidMiner (n = 5) in Agrusti et al.'s (2019) in systematic review of 73 articles.

8. Conclusions, limitations and further research

The purpose of this overview was to compare and synthesise the findings of review studies conducted on predicting SAP in higher education using EDM methods, algorithms, and tools from 2013 to September 2021. For subject areas, maths and science, and computer science and engineering were cited by the review studies that explicitly mentioned their fields of study. Humanities and social sciences subjects did not feature in any of these review studies. Concerning sample size, only 3 studies explicitly stated their precise sample sizes, of which the total number was 46,695.

Among the EDM methods used for predicting SAP, four emerged as the most commonly used: classification, clustering, regression, and association rules. Classification was the most commonly used of the four methods. Naïve Bayes was the least utilised method. Of the seven commonly used EDM algorithms identified by the 33 review studies for predicting SAP, DT was the most commonly employed, followed by both Support Vector Machine (SVM) and Artificial Neural Network (ANN) respectively, with Naïve Bayes (NB) as the least used algorithm. Nevertheless, as a cluster of algorithms, Bayesian classifiers were the predominantly used algorithms. Moreover, DT was an EDM algorithm that was reported as having the highest prediction accuracy rate for predicting SAP. With respect to EDM software tools, WEKA was the most commonly utilised tool, followed by both SPSS and RapidMiner.

Finally, it is critical that future reviews on predicting SAP using EDM methods, algorithms, and tools should

avoid the pitfalls identified above and those highlighted elsewhere in this overview. Most importantly, more overview studies are needed to build on the current overview study with a view to comparing and synthesising the different aspects of existing and future review studies focusing on predicting SAP using EDM methods, algorithms, and tools.

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Technologies for improving laboratory learning in healthcare professions: the case of instructional video

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Abstract

Audiovisual cognitive artifacts in all their forms are increasingly used in flipped, blended, MOOCs and conventional teaching and learning processes. During the health emergency due to the SARS-CoV2 pandemic, they were in many cases, in schools and universities, the only response to the need to follow up on training processes, which were compulsorily remote, becoming the educational media *par excellence*. This work concerns the use of educational technologies, specifically two audiovisual didactic texts, carried out in compliance with international multimedia design standards, to support conventional face-to-face didactic activities, in the field of professional health training (Laboratory for the simulation of radio-pharmacy activities, at the University of Ferrara, Italy). It is functional research to verify, on the one hand, the reinforcement of declarative knowledge (through a questionnaire administered in person immediately after the videos had been viewed) and, on the other hand, the perception of the effectiveness of the educational resources used (through a questionnaire administered online one week after the video had been viewed) for the reinforcement of procedural knowledge. All the instruments were administered to the entire group of students attending the degree course for medical radiographers (21 subjects), divided into two groups: the first group consisting of 11 subjects who still had to carry out the practical internship period; the second group consisting of 10 subjects who had already completed the internship. The final objective is twofold: (1) to contribute to the research area of video-based learning aimed at experimentally verifying the design principles underlying multimedia learning; (2) to verify the application of this methodology within laboratory teaching of medical degree courses and the health professions in order to meet educational needs in terms of improving the learning processes of complex manual procedures.

KEYWORDS: Instructional Video, Video and Medicine, Subjective Shot, Multimedia Learning.

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1. Introduction

The work is part of the strand of international research according to which the use of educational videos that comply with instructional design standards can contribute to learning. There is much evidence today that shows how these texts can have a significant impact on learning, provided that they are carried out in accordance with precise theoretical paradigms (Sweller et al., 1998; 2019; Clark & Lyons, 2010; Mayer, 2009) and accompanied by the overall planning of the training intervention (Laurillard, 2012; Rivoltella, 2021). In particular, the audiovisual text defined as an "educational video" seems to be useful for experiential, laboratory teaching aimed at learning procedural knowledge. In practice, the outcome of the viewing can have a significant impact on the student's ability to solve problems or to carry out an orderly set of operations - professional skills and abilities - to be performed to achieve a particular purpose.

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The scope of the application is that of the health professions. Laboratory activities, especially in professional health-care courses, aim to provide practical skills. In our specific case, the *medical radiology health technician* must be able to carry out interventions that require the use of sources of ionizing radiation, both artificial and natural, of thermal, ultrasonic and magnetic resonance energies as well as interventions for physical or dosimetric protectionism. In this sense, the main objective of the teaching module called "Laboratory for the simulation of radio-pharmacy activities", in which the survey was carried out, is to integrate theoretical knowledge and practical knowledge, thus promoting the development of skills and abilities in students.

In view of the above, a training activity based on the use of the educational video was developed, designed and produced according to recommendations of multimedia design referring to a series of now classic studies on cognitive theories of multimedia and integrated learning from the latest scientific evidence in the area of video-based learning. The first ones argue and show how multimedia learning depends on optimizing the information presented in relation to the functioning mechanisms of students' mental and cognitive processes (Sweller, 1998; Sweller et al., 1998; 2019; Clark & Lyons, 2010; Mayer, 2009, 2014; Clark & Mayer, 2016). This means that mental effort must be pushed toward an active reasoning process based on the operations of selecting relevant incoming information, organizing it in coherent mental representations, and then integrating it with the mental representations already possessed. In relation to this field of research there are various international studies (Ibrahim et al., 2012; Brame, 2016; Clark & Mayer, 2016) according to which the enhancement of the educational content through video or multimedia presentations improves learning processes, as long as they are made with the intention of reducing the extraneous cognitive load, increasing the relevant one, and managing the intrinsic one.

In addition to this, a new research area appears particularly promising in the field of the design of the didactic video relating to the complementary use of the double point of view of the camera, objective or third person, subjective or first person. Such use would lead to an increase in the activation of the neural system (Mirror neuron theory) and positive effects on the learning processes: greater involvement and improvement of the processes of storing and subsequently retrieving information (Garland & Sanchez, 2013; Jannin et al., 2017); greater effectiveness in remembering and putting into practice processes observed in subjective terms thanks to psychological self-reference factors (Bugaiska et al., 2015) and incarnation/personification (embodiment theory) according to which one learns with the body as well as with the mind (Robbins & Aydele, 2009). The subjective point of view creates a state of self-reference (the student refers what he/she sees to him/herself) and of identification in what is being observed and therefore a higher propensity to deep learning. This plausible simulation of the media learning experience makes it easier to implement the observed procedure (transfer).

The scientific objective of our work is to highlight how visual artifacts, when resulting from the conjugation between didactic theories and design theories, can increase the effectiveness of teaching actions, facilitate the acquisition of practical-experiential knowledge and make students more aware of their learning processes.

2. Materials and methods

2.1 Research settings

The research is the result of a multidisciplinary collaboration. In fact, the work group consists of teachers from different areas – pedagogists with experience in technologies and disciplinary experts of the degree course considered – united by the awareness that in formal teaching-learning contexts it is necessary to find meaningful educational solutions, that is, such as to contemplate the dimensions of effectiveness, of project research and of critical reflection on what is being done during and at the end of the course. Thus, a training unit was designed focusing on the educational video as a tool. In fact, many studies indicate that audiovisual texts can improve learning when they reproduce the task to be carried out and especially when the task requires the acquisition of motor procedures (Arguel & Jamet, 2009). In our case it was a question of showing the activity that is carried out in the radio-pharmacy of a nuclear medicine, that is, the preparation of radio-pharmaceuticals of *Technetium-99m* (obtained by means of kits available in freeze-dried formulations) and the relative quality control.

The training unit was then the subject of a qualitative-hermeneutical survey aimed at detecting the point of view of students regarding the effectiveness and usefulness of the "educational video" tool.

2.2 Research steps

The research was divided into a series of steps. First of all, the creation of two videos on technical issues related to the production of Technetium radio-pharmaceuticals, which represent the most widely used radio-pharmaceuticals for single-photon nuclear medical diagnostics. Specifically, the first, *Elution of the* $^{99}Mo/^{99m}$ *Tc generator* (duration: 6'52"), with the aim of illustrating the process which starts from the acceptance of a portable Tc-99m generator to its elution, the second, ^{99m}*Tc-HDP: Production and control of radio-pharmaceutical quality* (duration: 11'20"), with the aim of illustrating the steps necessary for the production and

quality control of Technetium radio-pharmaceuticals obtained "by a kit".

The videos were produced by the multimedia laboratory of the University of Ferrara, as mentioned, in compliance with the international recommendation on the principles underlying multimedia learning, now recognized as valid by the scientific community in terms of structure (modular and indication of precise objectives for a single step), duration (short), presence/absence of the teacher (in relation to cognitive load), complementary use of visual and sound messages, attention towards the technical aspects to guarantee good audio and video quality (Brame, 2016; Clark & Mayer, 2016; Mayer, 2014). In addition to the use of these principles, the design of the two artifacts provided for an important use in quantitative terms of a mode of communication that is proving its effectiveness in learning procedural knowledge typical of the health education considered: use of perspective in subjective or first person, according to the mirror neuron theory, and considering the psychological factors of self-reference (Bugaiska et al., 2015) and of incarnation (Embodiment Theory) according to which learning takes place through the body as well as the mind (Robbins & Aydele, 2009).

Questionnaires

Two questionnaires were then prepared, the first (questionnaire A), composed of 16 multiple-response items, to check that the contents of the videos were understood and stored (declarative knowledge), the second (questionnaire B), composed of Likert scale, Yes/No, multiple-choice and open-ended questions, to record the perception of students in relation to the effectiveness and usefulness of the two educational videos. Questionnaire B, in particular, was structured in 4 sections related to the following dimensions:

1. the impact that the two videos had in terms of clarity of the message, duration, degree of involvement, perceived difficulties due to the speed of presentation of the educational message, the structure of the video;
2. the usefulness of the pre-internship video to systematize/reinforce the theoretical knowledge acquired during the teaching part, to better deal with the practical work in the hot lab, to identify the fundamental steps on which to focus in the laboratory activity;
3. usefulness of the post-internship video to systematize/reinforce the theoretical knowledge acquired during the teaching part, to mentally retrace the steps and procedures of the activity of radio-pharmaceutical training and to consolidate what was learned during the training;
4. personal views on the role of the video in terms of remembering/memorizing the illustrated steps/procedures, communicative and didactic aspects (duration, how to access the resource, preferences on the presence/absence of the teacher in the video, presence of a soundtrack).

Once the two questionnaires had been drawn up, they were subjected to screening (pre-test) by experts on the subject and to a group of subjects with characteristics similar to those of our survey. This made it possible to refine and reformulate some of the questions, in fact improving them.

It was then administered to the whole group of students (21 subjects) split into two groups:

1. the first group (group 1), composed of 11 subjects who still had to carry out the period of practical professional training, at the Radio-pharmacy facility of the Nuclear Medicine Service of the Ferrara University Hospital Trust;
2. the second group (group 2) composed of ten subjects who had already performed the internship.

This choice was dictated by reasons related to the pandemic. For safety reasons, the internship was to be carried out during specific weeks established by the University and this resulted in a substantial misalignment in terms of "time" between the participants, who could not all be present at the same time in the classroom at the time of projecting the video. It should be noted that in preparing "Questionnaire B", the research group took this data into account by providing different sections for the two groups.

Data collection

The data collection included the administration of the two videos on 30 March 2021 to group 1, which had already completed the period of practical professional training and on 6 April to group 2, which had not yet completed the period of practical professional training. However, one of the subjects in group 2 did not attend due to being in isolation.

The projection took place, for both groups, inside a classroom; the viewing was preceded by a brief introduction, by the teacher whose laboratory was being used, in order to specify in detail the educational objective of the two audiovisual texts. At the same time the subjects were informed that after the viewing a test would be administered on the contents conveyed by the videos themselves. The single video was viewed twice in a row, with a short pause between each time. The break was used for the teacher to answer the questions asked by the group.

After the second viewing, questionnaire A was administered on the educational content, while questionnaire B was administered online one week after the video had been viewed (group 1 from 7 to 22 April; group 2 from 13 to 28 April).

3. Results

3.1 Questionnaire A on declarative knowledge

Group 1 and 2

The knowledge acquired in relation to the predefined training objective was evaluated through questionnaire A. The evaluation criteria are as follows: correct answer: 2 points; wrong answer: 0 points; no answer: 0 points.

The performance of all the students (21 subjects) was more than satisfactory. However, it should be noted that there was no significant difference between the two groups. The critical analysis of the results referring to questionnaire A, which does not show any great differences between the two groups, and the comparison with the students in the classroom immediately after completion, highlighted the limit of the verification tool used due to the teacher's lack of familiarity with this new type of training tool delivered.

3.2 Questionnaire B on the usefulness of the video artifact

Below are the results of the questionnaire divided into groups: pre- and post-internship.

Group 1 pre-internship

The results of the first part of the questionnaire are very encouraging and, although referring for a small group, confirm the quality of the educational choice made. In question No. 1, which asked students to evaluate the clarity of the two messages conveyed by the videos for learning purposes, 7 subjects indicated the maximum value of the scale (5 gradient scale), 3 the value of 4, only one subject indicated the neutral value of 3.

For all subjects the length of the films (question 2) was appropriate and none of them had any difficulty in following them (as mentioned, the duration of the two instruments was respectively 6'52" and 11'20").

High results also emerged with respect to the degree of involvement: Two subjects felt “very involved” in the films, eight “involved”, while only one subject declared indifference/neutrality to this emotional-cognitive aspect.

Ten members of the group were then able to identify with the figure of the operator, one instead only at times; likewise, ten imagined themselves carrying out the actions described and narrated by the videos, while one did not.

The results of the second part of the questionnaire are also encouraging: the usefulness of the videos, both for tackling the internship and to support the preparation for the laboratory activities, was acknowledged by the majority of the group. Specifically, in order to systematize the knowledge, five subjects considered the educational video tool to be “very useful”, five “useful” and one subject “fairly useful”.

An identical configuration of responses was obtained regarding the perception of the effectiveness of the video in offering the possibility to discriminate between the fundamental steps of the activities represented, thus allowing a greater focus to be made on them at the time of the internship.

The data in part three of the questionnaire appear to be entirely consistent with the above. The whole group considered the video to be effective before the internship and also during it.

As far as the request for suggestions is concerned, in general, the subjects did not express themselves much, however, the few data obtained are interesting: two subjects proposed liberalizing access, on a dedicated channel or institutional platform, to the two artifacts, so that they can be seen, according to requirements, during the course of the internship; one subject, in expressing his appreciation for the educational initiative, suggested considering future video productions contemplating greater intervention (talking head) of the teachers of the course in addition to an “engaging narrative voice”.

Group 2 post-internship

From a preliminary analysis, the results of the subjects who viewed the videos after carrying out the internship seem to be in line with those of their colleagues in group 1 (pre-internship).

In question 1, on the evaluation of the clarity of the two messages conveyed by the video texts, the results were very high: Three subjects indicated the maximum value on the scale, five the value of 4, and one the value of 3.

All the subjects considered the duration of the two videos appropriate in relation to their understanding of the content transmitted by them (question 2).

The degree of involvement by the group of post-internship students also highlighted very high results: Two subjects reported the maximum value and six reported the value of 4, only one student assigned a low average score of 2.

Eight students were able to identify themselves in the figure of the operator and 1 “at times”; eight members of the group imagined themselves performing the actions described by the two video texts, only 1 did not feel this sensation. In particular, five recognized themselves in the production of radio-pharmaceuticals by a kit, three in the quality control of radio-pharmaceuticals by a kit, one did not respond.

Only one out of nine subjects had some difficulty in following the procedural information transmitted through the two videos.

The results of the second part of the questionnaire appear to be the same as in Group 1: the usefulness of the videos, in order to deal with the internship activity, and to support preparation for the laboratory activities,

was recognized by the majority of the group. Regarding the usefulness of the video to systematize and strengthen the theoretical knowledge acquired during the teaching part, three subjects considered the educational videos "very useful" (5 on the Likert scale), four subjects considered them "useful" (4 on the Likert scale), two expressed an average judgement (3 points on the Likert scale).

The educational video tool also appeared to be useful for mentally revising the steps and procedures of the practical training in a hot lab: on the Likert scale at 5 levels (not at all 1, very 5) three students responded "very", four gave a score of 4, therefore very high, two gave an average score of 3.

The two videos were also very useful for consolidating the actions and the specific procedures seen during the internship: on the 5-level Likert scale (not at all 1, very 5), five subjects responded "very", 2 gave a score of 4, and two subjects an average score, equal to 3.

For group 2, the data in part 3 of the questionnaire also appear to be entirely consistent with the above. Almost all subjects believe that it is more effective for learning to view the films before the internship (seven students), only two during the internship, and none after.

The most remembered video passages appear to be the Tc-99m elution process by three subjects, and the quality control by another three subjects. The comment of one of the three subjects with reference to the Tc-99m elution process is particularly interesting: "The video allows you to see an otherwise invisible step when attending the laboratory in a hot lab".

As regards the request for suggestions, the main indication points towards the use of the two free mode educational video resources, to promote customization and self-learning.

4. Discussion

The results in terms of reinforcing declarative knowledge and usefulness with respect to procedural knowledge, by our sample, confirms that compliance with the standards identified by international research in terms of the design of educational audiovisual texts results in positive outcomes on learning.

While working with a small group of students (21), the results reinforce our idea of an "educational video," reinforcing the choices made in terms of the strategy used to promote skills and abilities. They provide a clear indication of the need to transform/revitalize the teaching paradigm, based on verbal and written language, into a learning paradigm, integrated by the use of new digital languages and focusing on the student, in line with indications from international research.

As we have seen, the involvement generated by the two video artifacts was high, and this, in addition to being consistent with the affirmation of numerous researchers who indicate the audiovisual resource as the preferred resource by university students (Carmichael et al., 2018; Ramlogan et al., 2014; Mitra et al., 2010), indicates how useful it is for learning to have tools that can keep attention active, while avoiding the perception of excessive cognitive cost. The degree of involvement, which appeared to be "very high" for more than 80% of the subjects involved, also shows how the video texts used to support experiential, laboratory type didactics, particularly for the learning of procedural knowledge, determine greater participation in problem-based learning processes (Rasi & Poikela, 2016) thanks to the possibilities to learn by seeing experts work in the field as well as by following the procedures and operations in detail (Ramlogan et al., 2014; Cooper & Higgins, 2015). According to one approach, supported by audiovisual communication, it can reduce the cognitive load necessary in the attempt to mentally recall real situations or to perform a "mental animation"process in order to give concrete meaning to the processes, especially in STEM subjects (Castro-Alonso et al., 2018).

100% of our subjects considered the video duration appropriate to the content transmitted, confirming what is already recognized by international research, that is, the greater functionality of short videos compared to longer ones (Carmichael et al., 2018; Pi & Hong, 2016). A "short" length – in the order of 10-15 minutes – is in fact more engaging (Doolittle et al., 2015; Guo et al., 2014), results in lower rates of abandonment of online courses, for example, (Vitiello et al., 2018, in Wang et al., 2020), and encourages the desire to use video educational resources for future learning (Giannakos et al., 2016). Data on the analysis of millions of video sessions within MOOCs on mathematics and other scientific subjects showed a maximum average involvement time of 6 minutes, regardless of the length of the video (Guo et al., 2014). Other research shows that very long videos result in mental wandering effects (low concentration) linked to difficulties in retaining the information received (Risko et al., 2012). In the enjoyment of the videos administered to our two groups we found no difference in perception, in terms of differentiated involvement according to the different duration of the artifacts, 6' and 52" the first, 11' and 20" the second. This leads us to two considerations. *(1)* The student's attention is not an easily standardized parameter but may depend on different factors, internal to the video (design factors) and external (overall design of the training intervention or the teaching unit). In our case the use of the resource in the classroom, in the presence of the teacher, may have had a beneficial effect despite the longer duration of the second video. *(2)* A duration exceeding the identified attention threshold can be better managed through the application of the principles of segmentation (Mayer, 2009) and modularity; in fact, this prevents overloading the working memory and has a beneficial effect on the

involvement, attention and motivation of the students (Ljubojevic et al. 2014, in Altinpulluck et al., 2020).

A cognitive process without sustained attention that facilitates the selection of incoming perceptive information and limits the amount of external stimuli, makes it more difficult to achieve effective learning.

The video is an effective resource in terms of learning manual procedures by virtue of the use of the multiple point of view of the functional camera to "see better", the phenomena of magnification or underlining, and the simplification and organization of the observed events. Many complex procedures do not take place from a single point of view, but require changes in space and changes in focus on the areas where manual intervention takes place. We like to recall that the ability to learn procedural movements from observation is due to the effectiveness of our mirror neuron system and a relative neurophysiological circuit that is activated when someone is performing an action, but also observing another person performing the same action as the other (Pelligrino et al., 1992; Rizzolatti & Craighero, 2004; Rizzolatti & Sinigaglia, 2008). This learning mechanism, which is functional not only to imitation but also to memory and understanding, points towards the use of video in high-risk vocational training, such as that in the medical field (Boucheix et al., 2018).

Alongside the mirror neuron theory, the studies on viewing manual procedures according to a dynamic and subjective perspective should be mentioned (Jannin et al., 2017; Garland & Sanchez, 2013; De Koning & Tabbers, 2011). In these cases psychological factors, called self-reference factors, can play an important role in promoting the memory of the observed processes (Bugaiska et al., 2015). Not only that, according to the theory of incarnation-personification (embodiment theory), it is believed that people can learn with their body as well as with their mind (Robbins & Aydele, 2009): the first-person perspective creates a state of self-reference (what observers see refers to themselves) that establishes a stronger link between those who observe and what they observe, thereby increasing the propensity towards deep learning.

In our case, this phenomenon was experienced by 82% of the subjects, 14 % sometimes felt this sensation, less than 5% did not experience any sense of identification.

It can therefore be inferred that the learning of manual procedures is essentially based on alternation between "watching the instructor" and "putting what has been observed into practice." The alternation of the two points of view, objective and subjective, and the simplification-organization of the observed events determine a plausible simulation of the media learning experience which more easily determines the learning (in terms of transfer) of complex manual procedures.

The responses of the subjects in reporting the ability to imagine themselves performing the operations described in the video, confirm, on the one hand, the effectiveness of the mechanism described above and, on the other, the success of the design choices we made during the design of the instruments: more than 90% experienced the feeling of imagination compared to the personal performance of the actions/procedures described in the videos.

The video passages most remembered by the students were the Tc-99m elution process and quality control. It is also interesting to note the comment made by a subject in reference to the Tc-99m elution process: "the video shows a step that would otherwise be impossible to see even by being present during the process in a hot lab". These words emphasize how video images can be fundamental for knowledge of what is really difficult to see in physical reality.

5. Conclusions

In conclusion, the survey revealed how audiovisual texts can have a significant impact on learning provided they are carried out in accordance with precise communicative-educational paradigms.

The data obtained, although referring to a small group, confirm that the use of the first-person perspective in educational videos that are functional to learning skills and procedural knowledge is of extreme interest in the health professions (Thomson et al., 2017; Fukuta & Morgan, 2018). Moreover, the results indicate possible routes to be followed to bring educational innovation into teaching interventions that have their own figure in the laboratory activity.

For this reason, we believe that the improvement and application of this communicative-educational methodology within laboratory teaching in the medical and health field can respond to qualitative needs (improving the learning processes of complex manual procedures) and logistical needs (the number of students in the medical/health area has risen considerably in many Italian universities, making it difficult for them to attend practical and laboratory activities). We also believe that all university education can benefit from the contribution of digital educational resources to address the challenges of the post-pandemic era.

Note

The entire research project was shared by the authors. However, it is specified that: Licia Uccelli is the author of the Abstract and of paragraph 2.1; Lara Salani of paragraph 3.1; Giovanni Ganino of paragraphs 1 and 5; Loredana La Vecchia of paragraphs 2.2, 3.2, 4.

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The future of soft skills development: a systematic review of the literature of the digital training practices for soft skills

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Abstract

Soft skills are becoming increasingly important in the workplace. Due to their interpersonal nature and experiential face-to-face reality, they are often touted as nearly impossible to develop online; our study finds that an increasing body of literature is offering evidence and solutions to overcome impediments and promote digital technologies use in soft skills training. This review aims to perform a state of the art on the research on digital solutions for soft skills training using a systematic review of literature.

A systematic literature review following the PRISMA statement was conducted on the ISI Web of Science, where from 109 originally collected papers, 37 papers were held into consideration for the in-depth analysis.

This paper aims at bringing clarity for both research and practice to facilitate and promote more effective online training initiatives as well as innovative solutions for training in different areas.

In recent years, the global economy has been facing structural changes, rapidly evolving into the world of digital transformation. The unpredictability of the nature and pace of the changes will make it crucial that individuals in groups, organizations and societies alike develop skills for dealing with all kinds of situations, especially soft skills and in particular emotional and social competencies. In this work we look into the literature in a systematic way in order to understand the types of competences most addressed, most commonly used techniques and positive and negative results of the training, in order to give the reader a clear understanding of the state of the art in digital training practices for soft skills.

KEYWORDS: Soft Skills, Transversal Skills, Online, Digital, Systematic Review, Digital Transformation.

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1. Introduction

Personal transversal competences that characterize relationships between people, also known as soft skills (Cimatti, 2016), have a major impact on human behavior when dealing with others, including in the workplace (Ahmed et al., 2012). There seems to be some consensus on the need for higher education institutions (HEIs), to focus the development of soft skills as well as disciplinary knowledge (Schech et al., 2017), especially because they both essential for career perspectives as

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well as personal development (Rasipuram & Jayagopi, 2020).

While the term "skill" may refer to "the ability of performing something well" (Golowko, 2018), the term "soft skill" encompasses the ability of people to communicate with each other and work well together (Andrews and Higson 2008), social aptitudes, language and communication capabilities, friendliness and other characteristics that are typical of interpersonal relationships (Cimatti, 2016). Hard skills by opposition are perceived as the technical skills that involve working with equipment, data or even software (Laker & Powell, 2011).

Both hard and soft skills are significant in terms of the requirements to become employable in today's labor market (Asonitou, 2015). Soft skills like motivation, social skills and others are believed to be crucial for future leaders (Marques, 2013), while critical thinking, leadership or problem-solving can contribute positively to the market, organizations and society in general (Asonitou, 2015).

Soft skills also make a difference in times of crises. The COVID19 outbreak and further consequences of the pandemic have organizations adapting (even more) rapidly and rethinking their strategy (Schneider et al., 2020). This paradigm shifting reality is bound to keep evolving in a society facing challenges deriving from globalization and climate change such as further pandemics, terrorist attacks, extreme weather events, technological revolutions, etc. To deal with constant change and crises, the area of soft skills is bound to become even more of a priority, considering its potential benefits in terms of people's performance dealing with disturbing and unexpected phenomena individually as well as in groups, organizations, and societies.

Contemporary crises challenges include realizing that the evolution into the digital era is inevitable, including in training and developing soft skills.

The use of technologies for developing competencies can foster the democratization in the improvement of soft skills in locations where there is a lack of training of people, often due to situations of poverty or scarcity of resources, situations of political and social instability (including armed conflicts), and to provide solutions for more vulnerable populations such as refugees and migrants. Further, in situations of global crisis like the COVID19 pandemic, the online training of soft skills may also have a positive impact in organizations worldwide.

Since the scientific production and paper publications have been rising exponentially, we propose that literature review studies in which the literature is analyzed in a systematic way have an added relevance not only to gather what we already know about the existing literature but also to ensure that the existing content is as least biased as possible.

Thus, this paper aims at bringing clarity and creating a panoramic view on the state of the art of soft skill development using digital technologies. We will begin by presenting our method, including the choice of database, Boolean equations and inclusion and selection criteria, followed by the presentations and discussion of results and we will conclude this paper with remarks on the main findings, how they may apply and influence theory and practice, as well as study limitations and future research.

2. Materials and Methods

A consistent systematic review and meta-analysis should follow re-established and standardized procedures like the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009) which is the methodology we opted for.

The PRISMA statement was originally designed to evaluate the effects of health interventions, but the system is applicable to other interventions (Page et al., 2021). PRISMA includes a structure for searching and selecting papers to be considered and how to systematize the contents of each analyzed document.

Starting with the search of papers, a systematic literature search was performed to identify relevant studies that identified soft skills and digital training programs on the ISI Web of Science database with the key phrases "Soft Skills", "Training OR Education" and "Digital OR Online". The search of all these phrases was conducted at the "Topic Field". Moreover, three types of documents were considered: Articles, Early Access and Review.

2.1 Study Selection

Inclusion and exclusion criteria of papers in this study are presented in Figure 3.The selection of studies for eligibility and data extraction was undertaken by two independent reviewers, accordingly to the Cochrane Collaboration's recommendations (van Tulder et al., 2003). Any disagreements were solved with the help of a third reviewer, expert in the field.

3. Results

A total of 109 studies, were originally identified from the database research. Since a single database was used for data collection (ISI Web of Science), it was not necessary to proceed with duplicate removals. In a first instance, all the 109 abstracts were read and analyzed using the SPIDER tool, which is to say that after being read, the content of the abstract was placed in a table that identified Sample, Phenomenon of Interest, Design, Evaluation, Research type. The SPIDER tool is an alternative to the more commonly used PICO or PICOS formulation for defining key elements of a review question, known for being more suited to qualitative and mixed methods studies and more commonly used in

social sciences (Cook, Smith and Booth, 2012). This step resulted in the elimination of 39 papers, due to inadequate sample or field (e.g. digital rectal examination in oncologic diagnostic). After, the full-text analysis, a total of 37 studies were included in this systematic review of literature.

Before looking into the full text analysis, authors found it useful to analyze the bibliometric data of the total sample (109 papers).

Figure 1 represents the number of publications per year of the 109 articles identified on the ISI Web of Science.

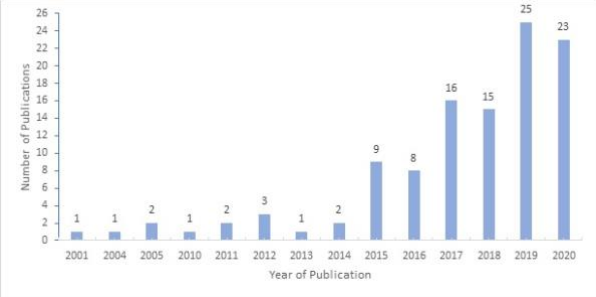

Figure 1 - Number of publications per year.

By analyzing the graphic, we can observe how there is an increase of interest in the theme of online training for soft skills which supports the relevance of our study. Our data collection was conducted in August of 2020 so it is understandable that the number of publications per year in 2020 is slightly lower than in the previous year and we can forecast it will probably be higher than previous year by the end of the civil year.

Figure 2 refers to the type of study that was published in this area since 2000. The majority of studies are qualitative (72%), only 16% of the studies are quantitative and 12% of the studies are mixed method.

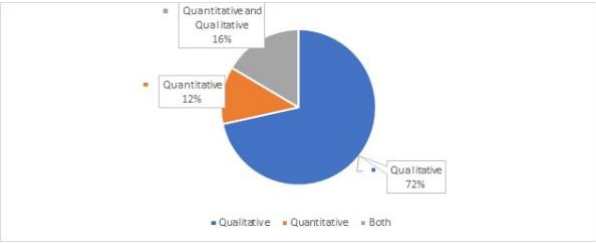

Figure 2 - Type of study.

Results show that most studies are qualitative including systematic reviews and literature narratives which may suggest that the research is trying to conceptually clarify the field in order to make more informed empirical decisions.

The PRISMA diagram (Figure 3) (Moher et al., 2009) facilitated the organization of a clear systematic review of literature. After the screening phase, a rigorous eligibility assessment was conducted using a set of inclusion and exclusion criteria to achieve the final number of studies that would be included in our qualitative analysis.

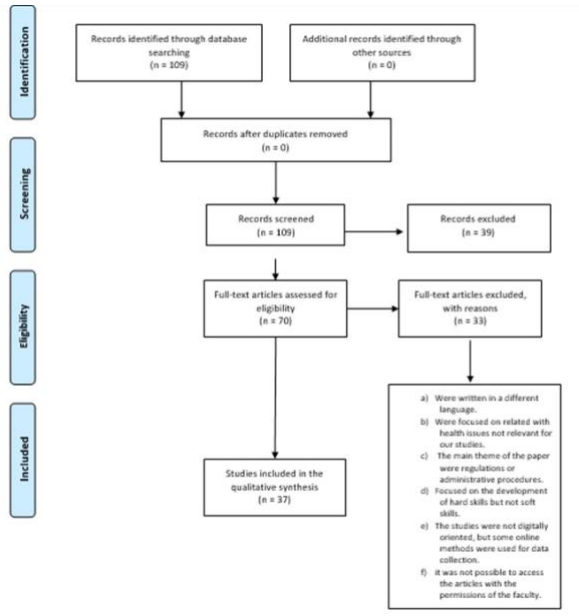

Figure 3 - PRISMA 2009 Flow diagram.

After analyzing the full text of the 37-paper selection, and systematizing the information in a table, five major thematic areas and study types were identified (Figure 4), although some studies fell into more than one category.

Figure 4 - Thematic areas and study types found in the systematic literature review.

The category "pedagogical models and strategies" identifies studies that refer to the acquisition of soft skills with digital technologies in educational contexts for the arts, humanities, or computer sciences and even in teaching related to software engineering. They refer to instances where soft skill development with digital technologies happened as a secondary outcome from other specific contents. This group includes 13 papers

addressing themes in active soft skills teaching/learning methodologies (including game-based learning, case-based learning, role-play and collaborative learning, as well as simulations)

Course modalities studies (8 papers) assess how different online training methodologies may be used to develop these types of competencies, including Massive Open Online Courses (MOOCs), blended learning and hybrid models. Some outstanding results include the confirmation that MOOCs may be applied in several areas, such as medical education programs (for health professionals), engineering, programming, marketing. In terms of blended learning models, studies are mostly related to education, especially considering the education model of European universities. The studies related to hybrid models, these are mainly focused on education for the development of skills for future professionals (specialists in IT and in the field of theology).

Comparison studies (8 papers) focus both the differences on outcome and implementation of online vs face-to-face courses (4 papers) as well as the differences in learning and training hard *vs* soft skills (4 papers).

Case studies and specific experience reporting studies (15 papers) detail specific experiences in underdeveloped countries (2 papers), referring issues like the effective use of social networks for more collaborative learning in underdeveloped countries; higher education (9 papers); experiences in organizations (3 papers), namely in the area of services, peace missions and even in the area of theology are also dealt with.

Literature Reviews (4 papers) compose the last set of studies we found.

4. Discussion and Conclusions

The digital transformation and digital training technologies have the potential to exert a positive influence in the management decision to develop people since they create a larger flexibility of where and when the training may take place (Mahajan, Gupta & Singh, 2019; Ibanez-Carrasco et al, 2020; Rasipuram & Jayagopi, 2020).

4.1. Pedagogical Models

Our literature review revealed that there seems to be evidence that supports the efficacy of soft skills training in a digital environment via several strategies and methodologies including game-based learning (GBL) (e.g. Garcia et al, 2020), case-based instruction (CBI) (e.g. Lyons & Bandura, 2020), massive open online courses (MOOCS) (e.g. Mahajan, Gupta & Singh, 2019), blended learning and hybrid models of learning (e.g. Ibanez-Carrasco et al, 2020), which we will present next.

Game-Based Learning (GBL) is a pedagogical method that uses games (digital and non-digital) to support students' knowledge acquisition and cognitive development that has shown good results in the area of software engineering training and shows promise in other areas like developing competencies in project management (Garcia et al., 2020). GBL has a modality called "game jams" in which games are created and learning becomes a meta part of the process itself which has been found to be suitable both for business and learning processes; these are touted to develop soft skills such as communication and collaboration as well as contribute for teaching in other areas like technology, arts and mathematics, for example (Merilainen et al., 2020). The potential of GBL seems to go beyond the educational promise and might be used in other real-life contexts (Garcia et al., 2020) such as peace keeping missions (Holohan & Holohan, 2019). Despite role-playing being considered the most effective tool for building the necessary soft skills in this area, it can bring a lot of additional costs and logistic problems. Virtual training in role-playing could be the best option to create universal training digitally for promoting real world interaction; it offers the possibility to reach people from a wider set of backgrounds, cultures and genders and to develop skills such as communication, collaboration, social and cultural skills (Holohan & Holohan, 2019), with possibilities of applicability in several disciplines (Schäfer et al., 2004).

These methods benefit from the fact that they represent an authentic (even if simulated) context; students play the game by applying knowledge and developing competencies which creates a parallel between the perspectives and solutions of case studies in situations of real life (Jonassen, 2011). This learning method offers a wide variety of options in terms of solutions, as there is usually no one single solution: similarly to real-life contexts, discussion and collaboration are required to find the best option (Lyons & Bandura, 2020).

Case Based Instruction (CBI), the pedagogical method of using group case-studies to develop competencies, encompasses several phases such as recognizing the problem, framing the problem, searching for alternatives, developing a plan of action and evaluating progress which require soft skills in order to do a better job (e.g. leadership, communication, collaboration, etc.), which are thereby stimulated and developed (Lyons & Bandura, 2020).

4.2. Course modalities

Massive Open Online Courses (MOOCs) have been increasing over the years mostly due to the growing using of the internet. They are as the name refers Massive due to the large number of participants (which can be virtually unlimited), Open because they are often open-access courses (with free cost and no requirements needed in order to enroll the course), Online (via the internet) and Courses (since their structure range from the learning objectives to the learning assessment)

(Mahajan et al., 2019). MOOC's may be considered relevant especially in distance learning education since they are considered to be flexible and easy to access in comparison with the more traditional methods which might be costly and unpractical (Mahajan et al., 2019). MOOC's show promise in promoting creativity (Cinque, 2017; Mahajan et al., 2019; Poce et al., 2017) and improving soft-skills like communication and problem-solving which are highly valued for employers (Cinque, 2017). MOOC's require individuals to self-regulate (Cinque, 2017); the lack of this element can lead to decreased motivation by the students and high dropout rates (Mahajan et al., 2019; Poce et al., 2017). High dropout rates have given rise to questions about the quality of the method itself (Stracke, 2017) as have the fact that they are usually taught in the English language which may be a barrier to some possible participants, and the fact that these mostly seem to be created for higher education students, which means that MOOC's tend to focus the development of employability skills and not many others (Cinque, 2017; Mahajan et al., 2019).

MOOCs seem to be effective in developing skills in areas like marketing, engineering and computer programming (Mahajan et al., 2019) and present a good option in areas such as health care where the need to continually improve their knowledge is fundamental and provide learning opportunities for on the job teachers development (Mahajan et al., 2019; Poce et al., 2017). Soft skills might benefit from this approach due to different elements which might help an instructor create a space to inspire and offer intellectual challenge to any level of participation (Cinque, 2017; Poce et al., 2017).

Blended learning is often confused with hybrid models, but is different since in they conjugate face-to-face and online methodologies in separate moments, whereas in the hybrid approach classes are simultaneously online and face to face (Roberts, 2019). Blended learning seems to preferable for educational purposes since it is taught in a flexible environment, allowing students to choose the method that suits them best (Pisoni, 2019; Roberts, 2019). By comparing two groups of students (one with hybrid model and other with just a face to face approach), Glazunova et al. (2020) referred that hybrid models can be useful in terms of the development of crucial competences for future IT Professionals, including hard and soft skills.

4.3. Comparison Studies

When comparing face-to-face *vs.* online modalities studies found that the online methods are perceived as beneficial since they can be conducted worldwide in a massive or non-massive scale. The main downside encountered in terms of the online modalities is due to the difficulty in terms of perceiving the behavior of the participants which in a face-to-face environment is not considered a problem (Wisshak & Hochholdinger, 2020).

Regarding the reflections of hard *vs.* soft skills development, the soft skills trainers tend to easily manage relationships, interactions, and communication within a group in a more transparent way than hard skills learners. In terms of education, soft skills trainers seem to have more skills in terms of learner-activating methods which enhances the ability to work well in a group (Rasipuram & Jayagopi, 2020).

4.4. Case studies and specific experience reporting studies

The fact that a large number of studies in our sample (N=9) refer to learning experiences in higher education, reveals a keen interest in a context that is associated with pedagogical innovation and excellence, which may indicate that the online development of soft skills is at a blooming stage and will likely become more popular in higher education as well as organizations where studies have already begun, initial studies in both contexts are showing promise (e.g. Rashid, 2015). The advantages of e-learning stem from the greater ease of diversification of learners in different contexts, but also include being able do interact with more organizations and people of interest, as reported by Ibanez-Carrasco et al (2020), where a blended approach to training HIV researchers in Canada also allowed them to contact online with persons living with HIV, leaders in the field, and a variety of stakeholders (including nonprofit staff and policymakers) – a feat that would be much more challenging in a purely face-to-face approach and has a clear impact in gaining insight and empathy with different perspectives.

It seems clear that although the vast majority of studies of learning in a digital environment are applied to hard sciences, their application in different fields like theology and social sciences in order to promote creativity and to develop soft skills is inevitable (Roberts, 2019). The case studies found in our research detail strategies and programs where digital approaches on their own or in a blended approach show promise in the development of creativity via design thinking (Vasileva, 2018) and other "life skills" like communication skills, teamwork and leadership skills, language skills in reading and writing and information literacy (Rhodes, Danaher & Kranov, 2018). Programs have also used the digital learning approach as a strategy for increasing student engagement (Miller, 2018) and academic success (Rashid, 2015)

4.5. Literature Reviews

The fact that literature review type of studies constitutes a significant portion of the studies we found seems to indicate clearly that the field is searching for conceptual clarity and defining its own identity. The subjects of these studies span from the narrow and technical (e.g. the use of open badges as a strategy for motivation [Virkus, 2019]) to wider more conceptual approaches (e.g. the use of game-based learning to develop soft skills [Garcia et al, 2020]) and they focus both the more

traditional entities of learning but also focus the challenges brought about by digital workplaces and the digital training that can be associated with them (Lyons & Bandura, 2020).

These studies indicate that the methodology used intends to ensure more accurate research elicited by clear conceptualizations, relating to different types of learning methodologies. The literature review methodology allows the researchers to have a broader view of the existing methods and types of learning reported by previous researchers (Garcia et al., 2020; Rasipuram & Jayagopi, 2020) and brings new insights into the state of the art, as well as provides important clues for future research.

4.6 Conclusions

The main purpose of this literature review was to investigate the state of the art in the training of soft skills using digital solutions.

The results of this study show that several types of methods can be used to develop technical and soft skills online in a wide range of areas. Although most of the studies were conducted for the educational context, these findings can be also valuable for organizations to implement.

This paper addressed some of the main findings regarding the efficacy of different methods and approaches for developing soft skills digitally as stated in the literature. Considering the different perspectives of online training of soft skills so far, MOOC's can be considered one of most used tools since they are less costly for users and are suitable for large-scale educational purposes. Game-based learning seems to be useful in creating contexts where skills are put into practice (e.g., management and programming simulations) and therefore considered promising in the training of soft skills. Other approaches such as hybrid models, blended learning and case-based instruction also seem to present positive results in terms of soft skills development, from different angles.

In all it seems clear that in the digital context (similarly to face-to-face training) active methodologies seem to be the key to develop soft skills efficiently; the key apparently being to maximize the opportunities offered by the different contexts (digital and face-to-face), instead of trying to simply overcome the faults of each one, meaning that these two approaches represent different learning paradigms and should be treated as such in every step of the training, from conceptualization to delivery and assessment, etc.

We found that the literature seems to be in a rather initial stage, where a lot of theoretical work is conducted and very few large scale, quantitative works have been published. In the future this seems to an important avenue for research, especially for MOOC's, which have a large body of users to begin with, studies should be conducted in order to apply this method to other fields rather than just education (Poce et al., 2017). In terms of the blended learning approach, a framework should be developed to gather the quality of this method (Pisoni, 2019).

In sum, the training and development of soft skills is becoming increasingly important in higher education as well as the organizational context, and the use of digital technologies training has become widespread during the pandemic, which merely accelerated a worldwide tendency in education. Despite traditionally soft skills requiring a face-to-face context, tools and methodologies are being developed to bridge this gap and create effective solutions. This will provide users the opportunity to develop these competencies remotely and in a more flexible manner, which can be an important asset in the dissemination of these crucial contents throughout the world, including both developed and developing countries as well as vulnerable populations, whether in a crisis situation or not. Thus, this can be an effective and sustainable solution for training and developing populations' soft skills.

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