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Participation and feedback as motivational triggers: insights from online students' approach to learning

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Abstract

Since 2020, university courses and services have been affected by the COVID-19 global health emergency. Necessary safety measures have compelled educational systems to quickly convert to distance learning and, consequently, to modify their instructional design processes so that they can meet students' needs. Changes have been seen in all teaching contexts, but in vocational higher education courses characterised by hands-on workshops that provide an experiential form of learning, professors are particularly pressed to find suitable formats for their virtual courses that allow students to participate and feel motivated to learn. Through the use of two qualitative case studies – a first-year and a third-year Education Sciences degree course, a three-year programme, at the University of Macerata, Italy – the present study focuses on motivational drivers. This article specifically describes and analyses the second case study, taking into account the lessons learnt and the inputs from the first case study. The data collection tools (questionnaire, observation grids) were designed starting from interpretative categories identified through analysing the first case study, in order to test the following research hypotheses and explore their connotations: (1) active student participation in group work can be a motivational challenge; and (2) both professor and peer feedback can be a key promoting aspect. The results of the study highlight the potential role of collaborative task-oriented practical learning activities in bridging students' participation and feedback processes and fostering their motivation.

KEYWORDS: Students' Participation, Motivation, Feedback, Online Learning Activities, Collaborative Approach.

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1. Introduction

Since the second term of the 2019–2020 academic year, the COVID-19 global emergency has necessitated a range of safety measures in higher education, including the rapid conversion of courses to an online format in order to meet students' needs. Given that students were not prepared to that shift, it was necessary to rethink certain aspects related to students' motivation and e-Learning. Teachers today are required to consider a new perspective: that of a cohort of students who are accustomed to face-to-face classes and are often not ready to embrace an online teaching/learning path. This issue not only pertains to students' access to the necessary technological facilities, but also to their digital competencies, despite their familiarity with common technological devices and apps.

Degree courses that require a strict connection between theory and practice and that normally offer hands-on activities to provide an experiential form of learning, may prove difficult to convert into a virtual setting that still encourages students to participate and feel motivated to learn. To this end, the present study focuses on motivational drivers, using two qualitative case studies: a first-year and a third-year Education Sciences degree course, a three-year programme, at the University of Macerata in Italy. This article specifically describes and analyses the second case study, taking into account

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the lessons learnt and the inputs from the first case study (Fedeli & Pennazio, 2021).

2. Background

Previous international research (Chae & Shin, 2016; Fredericks et al., 2004; Hattie & Timperley, 2007; Laurillard, 2012; McFadden & Munns, 2002) has frequently highlighted the variety of connections that exist between student engagement, feedback and motivation. In the present study, these aspects are analysed in the context of an online teacher-designed task practice environment (Laurillard, 2009a).

Student engagement is a meta-construct (Fredericks et al., 2004) that reveals itself in different levels of interaction between the following variables: the actors involved (teachers and learners as well as their reciprocal feedback), the discipline and the teaching/learning process (students and their conceptualisation through practice; teachers and the didactic transposition). Prior studies of interaction and student engagement have focused on both a cognitive and a socio-emotional level of analysis (Fredericks et al., 2004; Isohätälä et al., 2020; Price et al., 2011) and have also addressed the role of feedback as a driver of student engagement (Hattie, 2009).

Feedback can be defined as 'information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding' (Hattie & Timperley, 2007, p. 81). However, when applied in a formal learning context, it needs to be conceptualised within a social learning practice (McFadden & Munns, 2002; Price et al., 2011). Teachers or learners use feedback that can satisfy different needs (cognitive and motivational) according to the specific actors involved (teachers and/or peers), the modalities in question (written/oral/multimedia) and its integration into the learning process (feedforward and/or assessment). Furthermore, Hattie and Timperley (2007) discriminate among feedback based on the task and the process as well as self-regulation and oneself as a person.

Learning activities, as practical aspects of a course, can represent an instructional design open issue in order to identify how they can encourage students' interaction and participation and offer teachers and learners the opportunity to activate a feedback process.

According to Conole (2007, p. 82), learning activities can be defined as 'tasks involving interactions with information to attain a specific learning outcome' and represent a key driver in pedagogical frameworks like Laurillard's (2009a, 2012) conversational framework. More specifically, the activities framed in an instructional design 'might be focused at the level of the individual learner, pairs of students, group based or whole-class based. Depending on the nature of the task being undertaken there may be a range of tools and resources that the students use in order to complete the task. Finally tasks may contain an assessment component that might be diagnostic, formative or summative in nature' (Conole, 2007, p. 85).

Instructional design processes based on hands-on learning activities take into account students' artefacts, that is, 'representations of practice' (Sharpe et al., 2004, p.19). The outcome of the final task represents a 'product' created by learners that describes 'their current conceptual understanding'(Laurillard, 2009a, pp.11-12).

Following the suggestions underlined by the conversational framework (Laurillard, 2012), any learning activity should point at how and why learners are to participate and thus feel motivated at both the intrinsic and the extrinsic level. Further questions pertain to when and under what conditions a requested final product can enhance students' motivation and enrich the available inputs for a deep feedforward process. The integration of technology in the instructional design of a course – in terms of online learning management systems and communication/ interaction tools to develop individual and/or collaborative activities – can help answer these open questions (Barkley et al., 2014; Bergdahl et al., 2018; Robinson et al., 2017; Siklander et al., 2017).

Online collaboration, which affects both students' participation in an activity and the way feedback is provided by peers, differs from its equivalent in face-to-face contexts (Barkley et al., 2014), where group work and outcomes are developed and concluded in the space-time of the class via a synchronous channel of communication. Indeed, online learning lets teachers and students take advantage of both synchronous and asynchronous tools and provides a variety of options for giving or offering feedback. It also enhances the 'care perspective' (Robinson et al., 2017), which is expressed in various scaffolding dimensions in learner-centred contexts, such as support tools (e.g. help forums) and interaction tools for peers and teachers (e.g. video chats and written individual/group/collective feedback).

Triggers of teaching and learning (Renninger & Bachrach, 2015; Siklander et al., 2017) need to be investigated in greater detail as motivational drivers in technology-enhanced learning contexts. Best practices could highlight the successful integration of technology in learning activity design and group work efficacy, the activation of a goal and community orientation and reflection in the class, and the development of self-regulation in embracing a feedback culture.

3. Materials and Methods

The methodological framework within which this study is situated is a qualitative multiple-case design (Baxter, & Jack, 2008; Yin, 2013), following previous insights from the literature concerning the appropriateness of such a methodology for studies in educational contexts (Militello et al., 2020; Schoch, 2019).

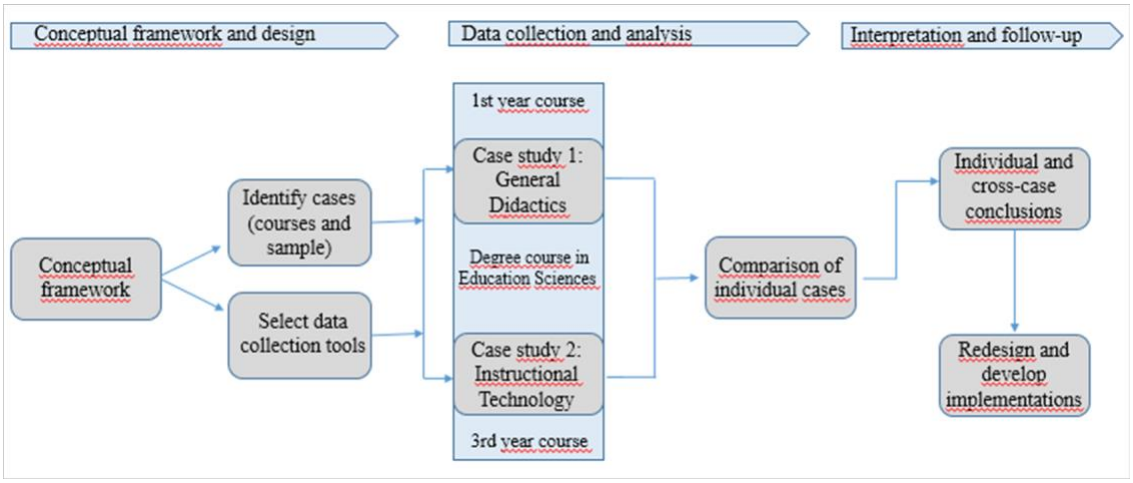

Figure 1 - Research design.

A sequential, three-step research design was used, with distinct phases to realise the research's rationale, from the exploration of the conceptual framework and the selection of the two case studies, to the data analysis and final research outputs in terms of a report of the results and the development of follow-up actions (Figure 1).

The cases identified and selected are two distinct courses ('General Didactics' and 'Instructional Technology') within the same curriculum aimed at training educators in the field of the socio-pedagogical context in the Education Sciences degree course, a three-year programme, at the University of Macerata in Italy. At the organisational level, both courses share the same professor and offer eight European Credit Transfer and Accumulation System (ECTS) credits with a total of 48 hours of teaching time, but with a different audience: the former course is for first-year students, whereas the latter is for third-year students. The two courses were selected as a source of significant data due to both their similarity and their respective schedules. Indeed, the 'General Didactics' course took place in the second term of the 2019–2020 academic year, when the emergence of the COVID-19 health emergency required a quick conversion from face-to-face to distance learning in order to apply the necessary security measures, while the 'Instructional Technology' course was run completely online in the first term of the 2020–2021 academic year. This sequence allowed the researcher to take into account the results of a first analysis to proceed with the second case study and thereby undertake a deeper cross-case investigation. Specifically, the data collected in 2019–2020 were coded and analysed before the start of the second case study, revealing a set of categories and related subcategories to be investigated further (Fedeli & Pennazio, 2021) and whose interpretative impact was likely to be enhanced by the data collected later in the second case study as the results of modified course design choices.

The 'General Didactics' course had been developed almost entirely asynchronously, except for a small number of online video meetings dedicated to sharing the professor's feedback on the outcomes of students' collaborative activities. These meetings thus had a specific purpose and used a video conferencing system from the professor's personal account (not institutional). By taking into account the strengths and weaknesses highlighted by the first case analysis, the researcher – who is the professor of both courses – made some changes to the course with respect to the 'space-time' of the didactical action. These were mostly related to particular gaps highlighted by students with regard to motivation, engagement and feedback, such as the need for significant synchronous contact with the professor and peers.

The 'Instructional Technology' course was organised as follows:

- Use of the institution's online video conferencing system Microsoft Teams for synchronous meetings. Class meetings with the professor could thus occur in an online environment that was already familiar and easily accessible to students. Moreover, students had the opportunity to autonomously use a dedicated channel for synchronous group work meetings;
- Maintenance of the institutional OLAT LMS for general guidelines and information regarding the course (e.g. introduction, news, resources) as well as development of asynchronous activities (individual, collaborative and collective) and professor support (e.g. a help forum);
- Retained a principle of six hours of work per week, but now with an equal distribution between synchronous meetings with the professor and an asynchronous learning task to be completed by students;
- Proposed a reduced number of activities (five) and a final project activity. The latter task took five weeks to complete, as a particularly complex activity requiring a global perspective on the discipline and the ability to exert a leverage on the instructional technology's connections with didactics, design and social educational contexts;

- Provided a set of authentic resources (e.g. cases, reports, grids) to enrich the materials and help the students prepare to develop practical activities in which they could put the theoretical concepts of the discipline into practice.

The 'Instructional Technology' course represents the second case study as a source of data. The sample comprised the portion of the students who completed the questionnaire and at least some of the weekly activities. Data collection tools (questionnaire, observation grids) were designed starting from the interpretative categories identified in the first case analysis in order to test the following research hypotheses and explore their connotations: (1) active student participation in group work can be a motivational challenge; and (2) both professor and peer feedback can be a key promoting aspect.

The two case studies shared the same qualitative approach: a content analysis (Bardin, 1977) supported by the use of 'NVivo 11 plus' qualitative data analysis software. The units of analysis corresponded to the single answers to each open question asked in the final questionnaire. The data attained were then triangulated with the researcher's notes taken during participant observations of the course activities.

The questionnaire was organised around a set of closed-ended questions with a distinct set of pre-defined responses with either a single option (e.g. 'Yes'/'No') or limited multiple-choice options (e.g. 'Always', 'Often', 'Sometimes', 'Never') as well as open-ended questions aimed at developing a deeper understanding of students' perceptions of teaching/learning processes. Each open-ended question was designed to favour the articulation of statements in line with the research hypotheses as highlighted by the results of the first case study, specifically pertaining to the relationship between student engagement, group activities and feedback as motivational triggers (Table 1).

A final open-ended question ('If you wish, you can leave an additional comment') enabled students to add any further thoughts on the course and/or on the professor's approach. A free-response question format is widely used in assessments because it can 'provide a more authentic portrait of student thinking' (Hubbard et al., 2017, p.1). It is also widely used in qualitative research, as it allows respondents to address connotations that differ from that hypothesised by the researcher and thereby enables the analysis to include interpretative categories of 'indigenous typology' (Cicognani, 2002; Patton, 2002) when identified as consistent with the research objectives.

3. Results

The sample comprised students who reported developing the online practical activities proposed during the course (48 students) and who were available to complete the final questionnaire.

Students were first asked if they appreciated the feedback format and approach used in the course

Open questions	Interpretative categories (from the first case study)
What encouraged you to get actively involved, week by week, in the completion of the activities?/ What made you stop participating in the activities?	Challenge (personal and relational); peer support.
How valuable was it to present your group work to the whole class during the synchronous meetings? How valuable was the feedback you received in those meetings?	Challenge, transversal skills, feedback (received from professor/peers).
How valuable was it to see other groups' work during the synchronous class meetings? How valuable was it to give feedback to your peers?	Feedback (given to peers).
If you could choose a preferred modality to receive feedback from your professor, what would you choose and why?	Technology impact; professor-student relationship.
If you could choose a preferred modality to receive feedback from your peers, what would you choose and why?	Technology impact; peer relationship.
What do you feel you have learnt from the experience of online group work?	Technology impact; challenge, transversal skills.
In group work you could use different tools (Teams, forums, wikis). Which tools were most useful for collaboration and why?	Technology impact.
This year the course was delivered completely online. Next year the course will be run again in a face-to-face context as usual. Is there something you would suggest the professor keep of the online course design? Why?	Technology impact, professor-student relationship; peer relationship; feedback.

Table 1 - Final questionnaire: open questions in the final questionnaire as a source of interpretative data.

('Yes'/'No' question) and then to motivate their answer. As shown in the figure below (Figure 2), a total of 75% of the respondents reported completing some or all of the activities, among whom 95% provided a positive answer with respect to feedback.

Five activities were proposed and designed according to the following parameters to foster interaction and collaboration (Table 2).

The learning activities had two objectives: (1) to engage students in putting into practices the conceptual disciplinary nodes; and (2) to help students understand the relational dimension in social contexts where being able to collaborate and be part of a team is a primary skill. In order to achieve these objectives, activities, including those requiring the completion of an individual step, were used to provide a collaborative space, whether this was synchronous or asynchronous.

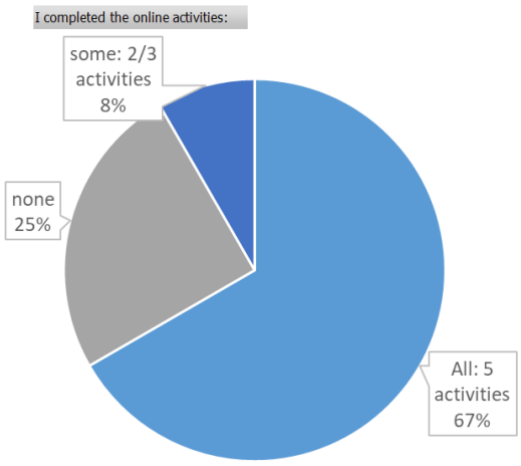

Figure 2 - Percentage of respondents who completed the activities.

Learning activity	Type of task (Conole, 2007)	Type of representation of the outcome (Sharpe et al., 2004)
Activity 1: Having been given a formal document about the competencies of social educators, students will explain, according to their vision, how technology can support the development of such competencies.	Communicative and productive: peer discussion and collaborative creation of a short explanatory text.	Presentational: group's explanations.
Activity 2: Given the need to train future educators about digital competency, students will search for useful information, create a booklet and design a self-assessment tool for prospective educators.	Information handling, communicative and productive: students select and classify resources in order to create an informative multimedia booklet with the addition of a self-assessment test for prospective educators to test their level of competence.	Informational: booklet + self-assessment test (with rubric).
Activity 3: Having been given an online wiki environment to explore and analyse, students will check the graphical and functional aspects and summarise them through the use of a table and a narrative presentation.	Experiential, communicative and productive: students explore the online environment, test it and collect reflections through a peer discussion of its strengths and weaknesses; finally, they create two artefacts (a table and a presentation).	Visual & imagery: data are visually organised in a table. Presentational: group's explanations through a presentation tool (PowerPoint).
Activity 4: Having been given a list of links of educational blogs and a set of parameters to assess graphical and functional blogs' interface, students will perform their analysis and design a potential blog project whose target audience is a social educational context.	Experiential, communicative and productive: students analyse different kinds of blogs (standard/integrated in websites) and experience their accessibility and usability; they then discuss and compare viewpoints and finally draft a graphical scheme of a potential blog.	Visual & imagery: graphical blog's interface with functional notes.
Activity 5: Starting from the existing educational uses of social networking systems, students will search for case studies and/or best practices connected to the professional contexts of social educators to make a resume in the format they prefer.	Information handling and productive: students search and select proper resources to join useful identified inputs in a product/artefact that should highlight trends in and modalities of social network use by social educators.	Stories: discipline-based case study report.

Table 2 – Learning activities described according to typology of tasks and representation of outcomes.

Collaboration was encouraged through discussions (e.g. in a forum) and through production tasks (e.g. written/multimedia reports, analyses, presentations), necessitating the development of a design process through wiki systems or simple online documents with shared editing rights.

For the purposes of data analysis and further interpretation, it is important to underline that 75% of the sample stated that during the two previous academic years, they did not experience hands-on activities in any course and did not engage in group work during their classes. When asked whether they had previous experience of online collaborative work, the percentage was even higher: 79.2% of the respondents, to be specific.

The units of analysis were coded into main categories (nodes) and subcategories (sub-nodes) (Figure 3) and will be discussed here according to the following distribution: (1) feedback and its nine subcategories; (2) participation and its six subcategories. The subcategory 'Motivation' is a shared node but with different connotations, which will be discussed separately.

'Feedback' and 'Participation' were defined as primary nodes (in grey), whose interpretation below is organised around the dimensions highlighted by the students and reorganised in the analysis (dark blue for a first-level 'child' connection and light blue for a second-level 'child' connection).

The dimensions identified were strictly interwoven and are graphically displayed in Figure 3 as a directed map. The map takes into account the value of the occurrences of categories, as reported by the analysis, with regard to the students' references to direct questions addressing the concepts of feedback and participation, but also as shown in the free texts that most students provided as a final comment in the questionnaire.

4.1 'Feedback' category

As noted above, the positions of the nodes in Figure 3 do not imply that they were neatly distributed. Sub-nodes located at the same level, such as 'Learning process', 'Motivation' and 'Self-awareness', actually carry conceptual cues that reciprocally cross one node to another. What justifies their identification as single categories is the convergence of a specific connotation that takes into account a host of associated meanings. The choice was made to code the data into the three aforementioned direct subcategories in order to better comprehend the students' primary foci.

The 'Learning process' subcategory includes all data pertaining to references made by students to 'learning' as either an individual or a social process where an insistence on the 'process' connotation is clearly identifiable in connection with feedback. Feedback, in fact, was predominantly meant as feedforward, an opportunity offered by the professor or by peers to progress in the learning path, make adjustments, attain a deeper vision and improve one's effort in the direction of meeting the learning objectives set. Statements referring to feedback as having a transformative connotation included: 'It was useful to understand where the group had a misunderstanding about the task and what was the proper direction'; 'It was useful to be able to improve my performance the next time'; 'Receiving feedback enables you to start from that information to develop the other tasks'. Furthermore, the characteristics of feedforward being offered during the performance and not just at the end were underlined in statements like: 'I was able to understand that I was not going in the right direction'; 'The forum tools let the professor leave a comment step by step following the whole progression of the development of the assigned task'. The social dimension refers to both small group work and

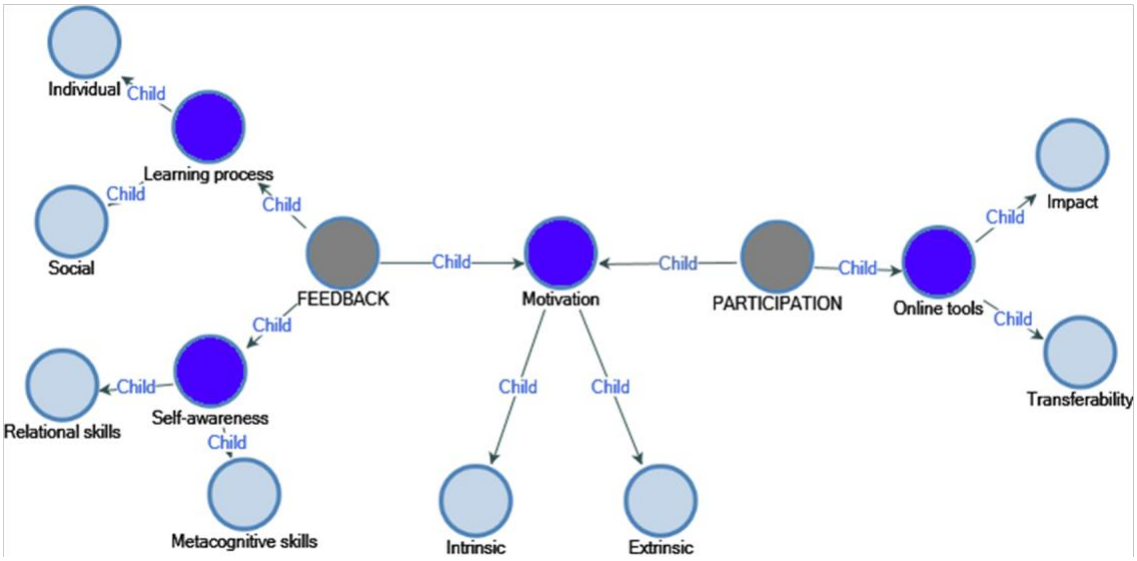

Figure 3 – Map of categories.

collective meetings with all students. The peer feedback given during group work was greatly appreciated in terms of reaching common learning objectives thanks to the proactive feedback provided: 'I could see different ways to interpret the activity and develop the task'; 'There were perspectives I could not even imagine without my peers' feedback'). However, other feedback expressed scepticism: 'Other group members perceived that they did not understand the task and so we decided to ask the professor for clarification'. In contrast to the small group feedback, the feedback received during collective meetings, where the output of the activity in question was explicit and freely discussed by colleagues, included negative elements pertaining to competition among students and difficulties in accepting feedback on the resulting product. Remarks such as that above, even though they were present in just a few answers, are interesting to discuss. Indeed, it seems that feedback offered when the activity process is already underway was, according to the students, an advantageous variable in the learning process, whereas feedback given at the end of the process, once the activity is completed and the final product (which reifies the outcome of the activity) is shown, was less likely to be considered acceptable (maybe because it recalled an assessment intention). It is relevant to note that assessment was never explicitly mentioned and associated with feedback in the students' responses, but some of the expressions used to answer questions directly referring to peer feedback and connected to the presentation of the final product of group work implied a degree of disappointment. It can be assumed that such perceptions are attributable to either the actor of the feedback (peers), the object of the feedback (the final product) or the way in which the feedback was communicated (with the whole class as the audience). This may engender relevant open issues: is there a full awareness about the concept of formative feedback and its range of action? Are students ready to accept/offer feedback without preconceptions? Such open questions can be addressed in future research, but a possible focus for additional reflection are the data collected and coded under the 'Self-awareness' category.

Being aware was mostly intimated by students in two skill dimensions: metacognitive and relational. The following statements encapsulated how the students expressed a self-reflection process in which they took into account the way they planned, acted and made decisions, but also how they simultaneously adopted self-regulation: 'Being able to see the outcomes of group work other than the one in which I was a member let me pay attention to multiple directions, not just what I was doing, but also what others were doing. I was able to consider the topic from different perspectives, including methodologically, and I learnt that I could modulate in different ways the way I can act'; 'By visualising others' choices, I recognised how and why I made some decisions'. Feedback was one of the variables which contributed in activating metacognitive skills that are always mentioned in relation to collaboration and interactions occurred during the course activities. Such relational skills were often connected to a perception of gained self-awareness, for instance: 'When interactions occur, you can question yourself and manage to put into practice what you have in mind thanks to your critical and divergent thought'; 'I understood how useful it is to work collaboratively when every group member feels free to give their own advice'. The students referred to feedback as: (1) a process in which the results obtained indicate a major understanding of the discipline as both an individual and a social effort and achievement; (2) a deeper awareness on the modalities, on a metacognitive and relational level, you can adopt to be an active learner; and (3) a motivational input for maintaining engagement in the learning process.

In the 'Feedback' category, motivation can be considered a possible result of the iterative process activated by the professor to engage students through written and oral discussions of course activities. Motivation was apparent at the extrinsic level in terms of: (1) the students' satisfaction of seeing their contribution in group work reified and visible and thus a socially recognised or useful object (e.g. 'I showed something I made'; 'I could express myself'); and (2) the acquired awareness, present in a number of statements, of the educational value of being engaged in peer feedback and its relevance for the students' future professional identity and self-concept (Bereiter, 2002; DeNisi & Kluger, 2000).

Intrinsic motivation mainly appeared with reference to activities involving students as active actors (and not just receivers) in offering their feedback: 'I could be helpful and I discovered that my suggestions were useful to others'. In this way, the peer feedback process helped the students discover the social or community value of feedback (Tuck, 2021).

4.2 'Participation' category

Motivation, as noted above, is a shared conceptual subcategory and will be discussed here with respect to its strict connection to the active students' participation in practical activities. In this dimension, motivation was present at both the intrinsic and the extrinsic level. The students referred to intrinsic motivation in a substantial way: (1) the pleasure of being challenged when applying their strategies of interaction within a group in order to be efficient in situations that are problem-based and task-oriented and, most of all, new in the disciplinary aspect and in the methodological approach (hands-on activities and group work); (2) the satisfaction of experiencing what effective teamwork means, specifically conflict resolution and active listening skills ('I was able to explain my reasoning to others, but also I became used to listening and understanding others'), an understanding of how to manage time and deadlines ('Be respectful of others' time and wait for their contributions without assuming an overarching role') and, finally, being able to manage the communication flow, learning how to negotiate with others and, if

needed, intervening when an improvement is required ('Help without being disagreeable'); (3) the discovery of the authenticity of one's relationship with peers. This last remark is extremely interesting if we consider that most of the misgivings observed during the first attempts at online collaboration were justified by students as a 'distance' issue involving the difficulty of online communication. Having now developed comprehensive experience of online activities and participation, it seems that the students' perceptions regarding the effectiveness of group work reflected how they overcame the initial stereotypical barrier (online learning equals 'distance' among actors) .

Extrinsic motivation was present in references to a 'reward': two students explicitly appreciated that their effort was recognised by the professor and also added value to their final assessment.

The second subcategory explores the impact of online interaction and collaboration tools on the learning process as well as on the students' opinions regarding the transferability of the online opportunities to the course management in a face-to face context. When analysing the perceived impact of the use of technology, it is necessary to distinguish between synchronous (video chat on Teams) and asynchronous tools (wikis and forums in OLAT). Students were encouraged to use both channels and identify their advantages and disadvantages during group work. As a result, the impact of synchronous meetings on the perceived efficacy of group management and work achievement appeared far stronger both in terms of students' clear preferences and their degree of autonomy in handling the associated tools. In their responses, the students perceived synchronous collaborative writing or discussions as time-consuming and complex; they felt that these tools are less able to contribute to their final objective compared to video meetings used during weekly activities, even when the task at hand does not require group work. The students also stated that because they can see each other and talk directly, they come to know each other better, recalling the impact of 'socio-cultural learning' in pedagogy and didactics (Wertsch, 1985). This requires deeper reflection at a systemic level on the relational dimension in distance learning as a key factor to consider in the course design process.

Transferability was mostly mentioned in the students' answers to the last question: 'Next year the course will again be run in a face-to-face context as usual. Would you suggest the professor keep anything of the online course design? Why?' According to their responses, most of the students would maintain the practical section of the course with group activities, although a number of others would prefer to continue having such group activities in an online environment alongside face-to-face classes. When the students were asked to specify the reason behind their choice, two aspects became apparent: (1) the opportunity for the professor to monitor in a more detailed way the activity process when the tasks are performed online rather than in presence; (2) online software like Teams lets students more easily show their work to the whole class for a presentation of the final output and for collecting useful inputs thanks to feedback. One can summarise that the students recognised different functions in the use of technology and acquired a broad vision of what a learning process implies in terms of design and course implementation in order to encourage active participation and achievement of course's objectives.

4. Conclusion

The two case studies took place in different academic years, but the students reported a similar approach to group work, as the two cohorts were both unfamiliar with collaborative activities (in presence and online). The main difference was that the students taking the 'Instructional Technology' course were more motivated to participate in online activities, as they perceived that they could use digital tools that would help them appropriate of the core contents of the discipline.

The final artefacts created and presented by the students each week tended to be described by the respondents as a relevant driver of their motivation, as they provided evidence of their growing understanding both in disciplinary terms and in terms of the social value of group work and necessary competencies. Indeed, the outcomes of group work can be described as 'active artefacts' (Sharpe et al., 2004), that is, representations of practice in different formats and results of students' collaborative efforts.

The use of hands-on activities helped the students develop high-level, transversal skills that also play a relevant role in reference to the diverse digital interaction and collaboration tools used, enabling them to overcome 'the mismatch between the predominant HE focus on discipline knowledge, and the workplace requirement for high-level cognitive, or "knowledge", skills' (Laurillard, 2009b, p. 525).

Problem-based and task-oriented practical learning activities are useful in developing professional skills (Stošić et al., 2020) and were perceived here as strengths of the course that should additionally be used in the design and implementation of future face-to-face courses.

In conclusion, it is necessary to build, step by step, a culture of formative feedback. Even though the students appreciated and recognised feedback's value in its different typologies, most of them reported that they were not always prepared to play an active role in giving feedback to peers and sometimes faced difficulties in exploiting it as well. Even when 'good' feedback has been given, the gap between receiving and acting on it may be wide, given the complexity of how students make sense of, use and give it (Taras, 2003, quoted in Evans, 2013, p. 94).

Preparing students as future professionals requires a major effort in the application of a balanced learning

offer where core contents can find a transformative level of application. Course workshop sections can help students find the opportunity to exert and develop transversal skills (e.g. communication, inform judgements). Refection processes, assessment practices and feedback, which are described in detail in the Dublin Descriptors and are already a reference framework in university degree courses, should be widely applied in all disciplinary courses. Future research should explore how interdisciplinary connections implemented, for example, through co-teaching practices enable effective interaction between theoretical and practical learning opportunities.

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Modelling academic delivery challenges during COVID-19: a binary logistic approach

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Abstract

This study identifies significant challenges that academicians working in higher education experienced during the COVID-19 pandemic, as physical classrooms transformed into virtual ones. The study includes evidence from the experiences of higher education academicians from three countries: namely, India, Malaysia, and the United Arab Emirates. The study adopts a quantitative research method to analyse the challenges that impacted the ease of coping with pedagogical delivery and the significant differences across the three countries. The study uses binary logistic regression modelling to evaluate the significance of the identified factors. The findings indicate that academicians experienced challenges working from home while adapting to the new model of teaching. Contrary to the established results – gender, lack of formal training, work experience and home environment, which did not seem to impact consistently across the three geographical locations. This also is the highlight of the study, as we used the log odds to illustrate the probabilities of impacting factors in each geographical location on the Ease of Coping – the dependent variable. The findings of this study may be directed to comprehend the most substantial factors specific to ease of coping. As the universities prepare themselves for the 'new normal', this study will contribute towards a paradigm shift in higher education, thereby enhancing the development of a framework for an effective teaching model to address pedagogical transition.

KEYWORDS: Higher Education, Transition during Pandemic, Work from Home Challenges, Binary Logistic Regression.

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1. Introduction

In the wake of the digital era with Industry 4.0 and globalisation, there have been transformations and changes in the adoption of communication technologies, impacting learning environments in the education sector (Balyer and Oz, 2018). The higher education sector has embraced the transformation to adopt e-learning due to its flexibility and availability beyond geographical boundaries.

The concept of online learning has become increasingly popular amongst the world's leading universities, and it is revolutionising the contemporary higher education sector. Ananga and Biney (2017) described 'distance education' as a concept of academic delivery wherein teaching and learning activities are separated in time and space, and technology is a primary factor that where in blended learning and online delivery is likely to be the future

Technology is the media that is instrumental in the field of distance education, and this can enhance the learners' experience (Bozkurt, 2019).

Despite the advent and acceptance of online teaching, many universities continued with classroom teaching. Face-to-face teaching was yet to be adopted, while

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some universities considered the implementation of blended learning. This integrated form of blended learning was led by instructors who guided face-to-face communication in combination with computer-mediated experiences (Bryan & Volchenkova, 2016). Dzibun (2018) argued that blended learning has opportunities and challenges and is an individual phenomenon that students experience.

The global higher education community saw a sudden and unprecedented shift from classroom teaching to online teaching due to the COVID-19 pandemic in March 2020. This study focuses on the experiences of academicians and the challenges that they faced in this sudden transition. The main attributes of the study are working from home, lack of formal training to deliver classes online, and engaging students in this new virtual setting. One of the aspects of the study is also to understand if gender has been an influencing factor from a work-from-home perspective. The research focuses on the experiences of academicians who are full time faculty members in universities/colleges and institutes of higher education and teaching face to face from India, Malaysia, and the United Arab Emirates who were forced to transition to online teaching due to COVID restrictions. The study also attempts to compare if there were any specific differences in the attributes impacted due to the regional contexts.

COVID-19 has caused disruption, and generally, disruptions create opportunities (Rao & Sreekanth, 2020). The disruption in the higher education sector has seen a paradigm shift of technological and technical advancements in the model of academic delivery within a short period. The online delivery model has given access to digital resources to upgrade knowledge, adapt to new technologies online, and consider the best practices to work from home, as an instructor. With the agility in remote learning, universities will have to work on addressing global solutions for global challenges that are beyond the transformation of the traditional classroom setting to online teaching (Buitendijk et al., 2020). The pedagogical transition and innovation in higher education is the outcome of the current scenario where in blended learning and online delivery is likely to be the future.

2. Materials and Methods

2.1 Materials (Related Studies)

Transition to Virtual Classrooms during the COVID-19 Pandemic

COVID-19 pandemic resulted in a massive and disruptive shift to the online delivery model as universities shut down their physical campuses. Faculty members started delivering classes online in a matter of a few days without adequate preparation in terms of the teaching content or technology competencies to complement this change (Bao, 2020). Since online teaching emerged as a response to an immediate requirement, there were barriers such as lack of online teaching experience for academicians and technical support to deliver on those platforms, among others. Ali (2020) argued that an online teaching environment is not about technology. Pedagogical and instructional challenges that demand universities to have more coordination and careful decision making are essential in this transformation. Some of the difficulties include readiness of the faculty members to deliver classes online, confidence while delivering on e-platforms, student accessibility, and motivation. Girdharan (2020) discussed the ease of coping for transnational higher education institutions that had prior experiences of learning with peers and faculty members in their offshore campuses. As students and faculty members were aware of these models of education, it was more convenient to facilitate online platforms.

E-learning has encouraged the use of the latest technologies and, if delivered with quality, technology can be an essential tool to support or replace traditional teaching methods, according to Gorska (2016). One of the significant challenges in online teaching is the changing faculty role in the transition from face-to-face to online classes. According to Young (2006), the students have an added increased responsibility for self-learning, and hence, it is crucial to enhance the overall effectiveness of the online classes. The (lack of) readiness of teachers to accept computer-based teaching and the unavailability of various related support systems could hinder the effectiveness of online teaching-learning endeavours (Leontyeva, 2018).

COVID-19: Impact on Higher Education in India, Malaysia, and the United Arab Emirates

The higher education community saw a rapid transition to deliver online education in various universities across the world to continue learning. Crawford et al. (2020) discuss responses by the higher education sector in India during the COVID-19 pandemic, which saw the closure of campuses and the postponement of the commencement of classes and examinations. Further, the government authorities in India launched several virtual platforms that were accessible to students, and higher education institutes started training their faculty members as new technologies challenged the traditional classroom setup. Some of the problems encountered in India were network issues, internet connection speed discrepancies, and the inability to reach underprivileged children who lacked technical gadgets to continue learning online, as stated by Jena (2020).

The United Arab Emirates (UAE) suspended all physical classes across schools and universities in the first week of March and ensured the transition to online teaching. Bensaid and Brahimi (2020) concluded in their assessment of universities in the Gulf region during the pandemic that due to the digitalisation-established distance education and digital

transformation in the region, the transition to online learning has been effective. They stated that universities created their digital delivery platforms for the online delivery of education. Investment in the model of online teaching, policies for universities, high internet penetration rate, and provision of resources were factors that accelerated the smooth transition for universities in the GCC.

Malaysia saw the closure of both public and private universities and all teaching and learning activities, examinations, student activities, and research programmes continued online from March 2020, as explained by Crawford, et al. (2020). Da-Wan (2020) noted that the disruption began with the Movement Control Order and it occurred during the beginning of the new semester. Universities took the approach of postponing the examinations and some of the major challenges included internet connectivity and access for the students in rural areas.

Work from Home: Challenges and Opportunities for Academicians

The concept of 'work from home (WFH) existed for several years, but during the COVID-19 pandemic, the global workforce worked remotely as many countries announced restrictions and lockdowns. This became a necessity and was accepted by both employees and employers worldwide. Lippe and Lippényi (2019) found that one of the drawbacks of working from home is lack of peer learning - that individuals may not be able to learn the skills that they could have from their colleagues at their workplace, and this impacts their performance. Another aspect is time management as individuals must now transform/innovate/change their skills and knowledge to suit the current demands, and this can intensify the hours of work. Savic (2020) identified the advantages of WFH, which include flexibility, improved work-life balance, and enhanced productivity. In contrast, disadvantages include isolation and lack of division between time for work and home life, resulting in long working hours. In their study focusing on teachers' willingness to work, Shareen and Mahammad (2020) concluded that respondents who had children were not willing to work from home as compared to those that did not have children or were single.

Time management is important because those who can manage time well can be more efficient in the home environment. Further, saving on travel time can also help to reduce stress and enhance productivity (Purwanto et al., 2020). However, Belzunegui-Eraso and Erro-Garcés (2020) argued that WFH in social isolation can impact health and productivity. According to Allenet et.al. (2015), WFH can build strong ties with the family to create family-centred communities, but at the same time, can replace workplace-related ties and contribute to an individualised society that breaks social norms.

Role of Formal Training in Online Teaching

Online teaching practices require academicians to go through formal training or professional development programmes. The necessary knowledge and skills for the pedagogical transformation can be enhanced (Nísháet et.al., 2019). Zhu and Liu (2020) suggested providing learning opportunities to future teachers at all levels. However, at the same time, the curriculum and pedagogy need an update to be more successful online pedagogy models for future practices. The findings of the study by Bailey and Lee (2020) conducted during the COVID-19 pandemic conclude that teachers unfamiliar with online teaching express frustration with e-learning, while those with experience of online education influence students' expectations. This indicates that there is a relationship between online teaching experience and expected outcomes of the course delivery.

Time management, adopting appropriate teaching styles, and enhancing student engagement and student satisfaction are challenges that academicians have experienced (Kebritchi et al., 2017). The effectiveness of the teachers in an online teaching–learning environment is always a concern. With the rapid increase in online teaching, faculty members must have skills and be more competent in their roles for positive student outcomes (Frazer et al., 2017). Some of the challenges that the faculty members face in the online model are managing different time zones, adhering to the administrative policies of the university and working with limited resources and other academic duties (Steel, 2010).

The experience in an online class is different for students than that in a traditional classroom. One of the challenges that academicians have experienced in conducting online courses is keeping students engaged in the virtual environment, according to Rogers (2011). Harris (2011) emphasised professional development programmes for faculty members, including online certification programmes that can train faculty members on the use of the integration of emerging technologies in discipline-specific learning outcomes. The support from peers and mentoring colleagues to exchange best practices and technological improvements can enhance the students' experience (Young and Bruce, 2011).

Student Engagement in a Virtual Environment

Gillette-Swan (2017), Wall et al. (2006)cited in Croftet al. (2015), and (Jones, 2017) discussed that many of the face-to-face models of practices are adapted in the online teaching model. Yet the 'one size fits all approach by academicians who are unfamiliar with the online environment cannot be adopted, as the context of online teaching differs in an online model. Hence, there is a need for pedagogical strategies to address students who experience isolation. Social isolation has been one of the most significant challenges that students experience in an online environment; this leads

to the discontinuation of studies (Ali and Smith, 2015). Motivation impact students' engagement in an online learning environment, which may be both extrinsic and intrinsic. Extrinsic factors are influenced by the establishment of time frames in the model of flexible online learning, whereas individual factors are based on individual feedback by faculty members (Keiset al., 2017).

Motivation plays a vital role in engaging students and further, factors such as personal, social, and other circumstances, can influence students' motivation (Harnett, 2016). The balance of social and family commitments with educational commitments also impacts student engagement in online classes (Parkes et al., 2014). Online teaching also has weaknesses, one of which is a lack of real-time interaction between faculty members and students. The learning environment online is not engaging for students as it lacks two-way interaction, faculty feedback, and community presence; Despite its challenges, some of the advantages of online education seen during the COVID-19 pandemic are the flexibility offered for students, saving of travel time, and engagement of experts who were otherwise unavailable for face-to-face classes (Khatiand Bhatta, 2020). Studies on online education indicated that students, like faculty members, also require orientation and training to adapt to the online environment. In their study, Kim et al. (2019) concluded that students who are competent and well versed in digital skills have digital readiness and more possibilities for academic achievements.

2.2 Methods

This study aims to answer two specific research questions, as follows:

1. What factors significantly affect the ease of coping (EoC) with academic delivery during the COVID-19 pandemic? The factors identified are 'work from home' (WFH-H1), 'ease of student engagement' (ESE-H2), 'formal training for online teaching' (FT-H3), 'work experience' (WE-H4), and 'home environment' (HEnv-H5).
2. Is there a significant difference in these effects across the three countries? (GL – H6)

While increased flexibility and family time have been observed as motivators of WFH, the high frequency of work meetings, the tendency to overwork, physical lethargy, and difficulty in managing family time are some of the outcomes (Butler & Jaffe, 2020). Shifting the workspace to one's home and maintaining the demanding work conditions is challenging, given the work orientations required (Bick, et al., 2020). Alipour et al. (2020) confirmed that not all jobs are suitable for WFH and both challenges at home and the work characterisations affect the performance of employees, including high-skilled workers.

H1: WFH challenges impact EoC.

As described earlier, motivation, student preparedness, and pedagogy are vital to student engagement during academic sessions. The push to transition from physical classrooms to online platforms is unprecedented, brought about by the COVID-19 pandemic. Due to the presence of a dynamic learning environment, online learning and flipped classrooms primarily show a high level of student engagement (Burke & Fedorek, 2017). The unprecedented transition to a remote model of delivery has disrupted the face-to-face instruction model, thereby impacting the continuity of student engagement in the online environment (Gares, et al., 2020). Student engagement is vital to good teaching experiences, both in terms of pedagogy and content delivery. The study hypothesises that the degree of student engagement impacts the EoC.

H2: ESE impacts EoC.

Buzzetto-Hollywood (2007) discussed the importance of supporting faculty members in their transition to the new online learning environment, both technically and pedagogically, by learning through examples, workshops, forums to share experiences, and resource sharing. Mentoring and peer support can further be helpful while being able to experience the learning process themselves by enrolling in online programmes. Mehić and Hadžić (2020) agreed that teachers should develop competencies for training, not only for the use of information, communication skills, and technologies but also for competencies in pedagogical methods.

H3: FT impacts EoC.

Digital transformation is not new to academia. However, a large proportion of this fraternity was engaged in the traditional model of delivery, up until the pandemic forced the members to transition., Christensen and Knezek (2018) established the associations between supportive professional development, enthusiasm, and willingness as key factors in the integration process. The study also confirmed that academics with a higher affinity to technology tend to implement faster (Panichkina, et al., 2018). Abrupt transitions without prior training and a suitable teaching and learning strategy pose adaptation problems.

H4: WE impacts EoC.

Stadtlander et al. (2017) stated that while working virtually, separating areas of work and family life by time and creating virtual communities to address loneliness can help faculty members. Nakrošiene et al. (2019) identified factors that should be considered in the WFH situation, which include professional aspects such as time management, enhancing productivity from home, and reduced communication with colleagues as well as personal aspects such as saving on travel time, work-life balance, and taking care of family members.

H5: HEnv impacts EoC.

Countries around the world have responded differently to the pandemic. This study hypothesises that the geographical locations where the respondents are based have an impact on and moderate the effect of the

independent variables (IVs) on the Dependent Variable (DV). H6 is formulated as follows

H 6: GL moderates the impact of the IVs.

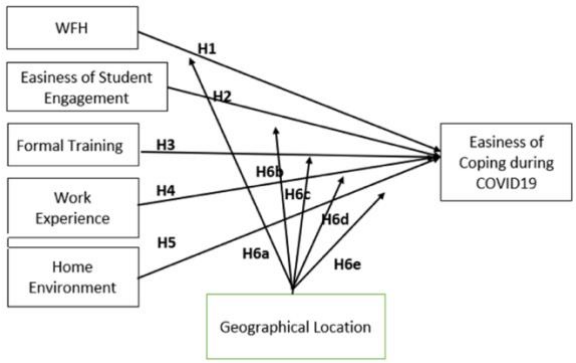

Figure 1 - Conceptual Framework and Hypothesis.

In addition to evaluating the effect of the independent variables (IV), namely, WFH (H1), ESE(H2), and WE The uniqueness of the study

This study adds to the current literature by analysing the impact factors on the easiness of dealing with the unprecedented changes triggered by the COVID-19 pandemic in pedagogical delivery by academics in higher education. The results help to justify the factors identified using the Binary Logistic regression model and thus to calculate the potential of the faculty facing challenges in the current situation.

2.3 Research Methodology

Sampling

600 academicians primarily engaged in the classroom and face-to-face models of teaching were approached via digital platforms. The academicians are also those who were forced to migrate to the online mode of teaching during the lockdown period owing to the COVID-19 pandemic. Given the restrictions of movement and outreach challenges, the respondents were contacted through a convenience sampling technique. Respondents hailed from India, Malaysia and the UAE. 446(74.35%) completed and valid responses were used to further the study.

Survey Instrument

The questionnaire used in this study was based on the factors identified through the literature review outcomes. Three constructs Work from home - WFH (Lippe & Lippényi, 2019), Student Engagement – ESE (Gillette-Swan, 2017; Croft, Dalton & Grant, 2015) and Ease of Coping – EoC (Kim, Hong & Song, 2019) were reviewed and developed consistent with the prior studies.

Thirteen items are used to evaluate the degree of challenge for the WFH construct, ten items for the ESE construct, and six items for the EoC construct. Each item was rated by the respondents on a scale of one to five.

(H4), this study also hypothesises the impact of two variables, FT(H3) and HEnv (H5), measured as a function of the family constitution. (See Fig 1)

Method of Analysis

The Binary Regression Model: the Dependent variable EoC (Y) is dichotomised into two values: 1(mean score more than 3) and 0(mean score less than or equal to 3). Individual Logistic regression models are constructed for each geographical location to predict a discrete outcome, from a set of variables that may be continuous, discrete, dichotomous, or a mix of any of these.

$$E(Y_{GL}/X_{GL}) = \text{Log Odds } \frac{1-\pi_j}{\pi_j} = b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots\ldots + b_kx_k$$

$$\log\left[\frac{1-\pi_j}{\pi_j}\right] = b_0 + b_{WFH}WFH + b_{ESE}ESE + b_{FT}FT + b_{WE}WE + b_{HEnv}HEnv$$

$$\frac{\pi_j}{1-\pi_j} = e^{X_j^T\beta} \text{ Hence } \pi_j = \frac{e^{X_j^T\beta}}{1+e^{X_j^T\beta}}$$

The mean scores of the constructs (WFH, ESE) are used to generate the regression models.

3. Results

A total of 446 complete usable responses were received (74.3% response rate). Table 1 presents the demographic summary.

The constructs show satisfactory Cronbach Alpha values (See Table 2), indicating high construct validity and good internal consistency. The factor loadings (Table 3) indicate sufficient variance for each of the factors defined. There were no items with loadings less than 0.5 and hence no item was deleted/omitted from the original list.

The Kaiser–Meyer–Olkin measure of sampling adequacy (Table 4) that indicates the proportion of variance in the variables, which may be caused by underlying factors is 0.923. High values (close to 1.0) generally indicate that factor analysis is useful with the data. Bartlett's test of sphericity verifies the hypothesis that the correlation matrix is an identity matrix, indicating that the variables are unrelated and therefore unsuitable for structure detection. The chi-square value shows a significant value ($p<0.05$), thereby indicating the usefulness of the factor analysis for the given data.

ANOVA and Binary Regression analysis. Country-wise analysis

This study hypothesises that the countries differ among themselves concerning their academics' EoC. This hypothesis is validated using ANOVA (one way). The

Factor	Demographic Summary n = 446				
Gender	Females: 235 (52%)		Males: 211 (47.5%)		Prefer not to say: 2 (0.4%)
Age	25–35: 95 (21.3%)	35–50: 283 (63.5%)		50–60: 54 (12.1%)	Below 25 or above 60: 14 (10.1%)
Based out of	India: 168 (37.7%)		Malaysia: 160 (35.9%)		UAE: 118 (26.5%)
Received formal training	Yes: 150 (33.6%)		No: 195 (43.7%)		Learned on their own: 101 (22.6%)
Experience in academia: 235 (53%)	0–2 years: 48 (11%)	2–5 years: 54 (12%)	5–10 years: 88 (20%)	10–15 years: 118 (27%)	>15 years 138 (31%)
Experience in industry and academia: 211 (47%)	Up to 2 years: 4 (1%)	2–5 years: 80 (18.4%)	5–10 years: 37 (8.5%)	10–15 years: 28 (6.3%)	>15 years: 62 (14%)

Table 1 - Demographic Summary of the Respondents.

Construct	Overall Mean	s.d.	Cronbach′s Alpha
WFH	2.52	0.923	0.917
ESE	2.68	0.891	0.930
EoC	2.18	0.772	0.921

Table 2 - Construct Reliability and Factor Loadings.

	Component		
	1	2	3
WFH1: Time management	.687		
WFH2: Working in a home environment	.973		
WFH3: Productivity while working from home	.757		
WFH4: Working in isolation	.705		
WFH5: Socialising with peers	.605		
WFH6: Level of comfort working from home	.775		
WFH7: Upgrading knowledge and peer learning	.715		
WFH8: Learning new tools and technologies	.769		
WFH9: Adaptation to technology	.801		
WHF10: Internet connectivity, speed, etc.	.737		
WFH 11: Content delivery online	.767		
WFH12: Support from university	.639		
WFH13: Support from peers	.719		
ESE1: Adaptation to the model of online delivery		.682	
ESE2: Motivation of students		.762	
ESE3: Students interaction during ESE4: sessions/classes		.811	
ESE5: External issues such as connectivity, speed, etc.		.735	
ESE6: Peer learning		.754	
ESE7: Response to online assessments		.724	
ESE8: Access to continual learning through resources online		.699	
ESE9: One-to-one student feedback		.765	
ESE10: Personal engagement with students		.778	
EoC1: Accepting the change			.724
EoC2: Staying positive			.831
EoC3: Getting a fresh perspective			.828
EoC4: Focusing on what I can control			.789
E0C5: Setting new goals			.756
EoC6: Staying connected with co-workers			.668
Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser normalisation. a. Rotation converged in five iterations.			

Table 3 - Factor Loadings Rotated Component Matrix[a].

Kaiser–Meyer–Olkin measure of sampling adequacy		.923
Bartlett's test of sphericity	Approximate chi-square	9746.913
	Df	378
	Sig.	.000

Table 4 - KMO and Bartlett's Test.

Country	N	Mean EoC Score	SD
India	168	2.1826	.823
Malaysia	160	2.3519	.730
UAE	118	1.9493	.692
Total	446	2.1816	.772

Table 5 - Country Statistics.

	Sum of Squares	Df	Mean Square	F	Sig.
Between groups	11.006	2	5.503	9.596	.000
Within groups	254.039	443	.573		
Total	265.045	445			

Table 6 - One Factor ANOVA (Effect of GL on EoC).

	(A)	(B)	(C)	(D)	(E)	(F)
		Cell values indicate Exp(β)				
No	**Factor**	**India -initial model**	**India Reduced model**	**Malaysia - initial model**	**UAE-Initial model**	**UAE Reduced model**
1	Intercept	0.003*	0.079	0.192	0.011*	0.069
2	Gender	2.046		0.980	3.587*	3.103
3	Age	1.327		1.819	2.823	
4	HEnv	1.751		0.787	0.796	
5	FT	1.295		1.261	1.022	
6	Exp	0.920		1.001	0.893*	0.945826
7	WFH_Average	1.641*	1.469	1.085	0.932	
8	STD_Average	1.117		0.806	1.004	
Goodness of fit						
9	Hosmer	99.447	32.209	72.178	61.612	38.932
10	Df	81.000	31.000	77.000	60.000	36.000
11	p-value	0.080	0.407	0.634	0.418	0.339

Table 7 - Country-Wise Binary Regression Analysis – *significant at 5% los; ** significant at 1% los

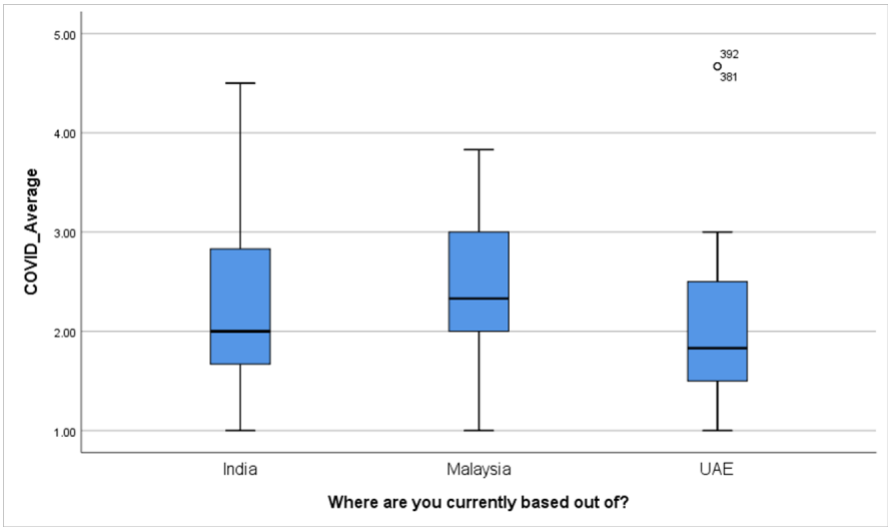

Figure II - Box plot diagram, Country-wise distribution.

country-wise descriptions are indicated in Tables 5 and 6. The ANOVA results presented in Table 6 show a significant difference between the mean scores of the countries.

The post hoc analysis shows significant differences ($p<0.05$) based on pair-wise comparisons. Using case-wise listing, a binary logistic regression model is developed for each country to evaluate the significance of the impacting factors and verify the hypothesised moderating effect of GL. Table 7 shows the region-wise analysis for the respective initial and reduced models.

The Hosmer-Lemeshow statistic suggests a good fit if the value of significance is more than 0.05. Here, the model matches the data properly (Hosmer, Lemeshow & Sturdivant, 2013). All p-values (see row 11 of Table 7) show p-values higher than 0.05 indicating a good fit by the data.

In addition, some of the findings in this study are contrary to a few established studies. Across all three locations, Age, formal training (Buzzetto-Hollywood, 2007) and home environment (Nakrošiene, Buciuniene & Goštautaitė, 2019) did not show (statistically) a significant impact on the easiness to cope.

Interpretations

Responses from Indian respondents indicated Work from Home as a significant challenge. For every unit increase in the challenge faced while working from home, these academicians indicated a 146% (see Col C, Row 7) increase in their difficulty to cope with the transition. Their counterparts in the UAE indicated Gender and experience as more significant. Gender was coded as 1-Female and 2-Male. The value 3.103 (in Col F row 2) indicate that men found it three times more difficult to cope with the transition as compared to women while working during the lockdown. The value corresponding to age in the same column is 0.94: indicating that employees with lesser work experience found it more challenging to adapt to the new scheme of affairs. Incidentally experience across the three countries (See columns B, D and F, Row 6) show equal or less probabilities – indicating that members with more experience at work showed more flexibility to the change. In the case of Malaysia, although none of the factors indicated any statistical significance (p-values>0.05), the overall model bears a good fit.

5. Discussion and Conclusions

With the COVID-19 pandemic disrupting classes and activities on campus, the only option available for faculty members and students was to be acclimatised to online platforms as soon as possible. This unusual and unprecedented shift from the comforts of the face-to-face classroom model to the e-learning method was not devoid of challenges, given the paucity of time within which the academicians were expected to adapt to the latter. This is a comparative study based on observations from three countries. Data was collected through a self-administered survey form and informal discussions with the participants. Technical issues included connectivity problems, low bandwidths, data plans insufficiencies, and expenses to upgrade one's technical facilities. Unfamiliarity with the online platforms that were created was the primary concern when the transition began. Time management and Working in home environment were reported to pose the most difficulties from among the 13 potential challenges listed in the survey. (See Appendix 1)

This study establishes the causal effect between the EoC and the difficulty level experienced in the challenges while WFH, ESE, and WE. WFH is identified as more challenging for the academicians due to their settings in the home environment, which led to difficulties in their transition. Adapting to new technologies in the home environment also impacted the EoC. Further, keeping the students engaged in participative learning and ensuring they stayed motivated throughout the sessions was also seen as a challenge by the academics. Faculty members were concerned that students tend to be easily distracted. Dhawan (2000) identified that some of the challenges of student engagement in a virtual environment can be related to technological issues, including problems logging in, issues with audio and video, and network connectivity.

The study does not show a significant association between FT and EoC. Although FT is important for the transition, academicians probably adopted this through their pedagogical approaches. Those who experienced greater difficulties tended to find it difficult to cope. However, a certain amount of resilience was observed with age. The factor value indicated a negative association between age (measured in increasing order, from young to old) and EoC (measured, from easy to difficult). Saiyadetal. (2020) cited Bawane and Spector (2009) who stated that pedagogy and knowledge of the content, along with technology are competencies identified for the faculty members' role in online teaching. Therefore, experienced faculty members found it easier to cope in the virtual environment due to their experience and knowledge of course content.

This study attempted to evaluate the differences in GL as a differentiating factor regarding the EoC. The ANOVA results showed a significant difference across the three locations. Although the factors (significantly) impacting EoC were the same for all the three locations (see Table 5), the degree of the effect varied. The faculty challenges were similar in their EoC. A significant difference in the UAE as opposed to India and Malaysia was that some universities had adopted online learning and the faculty members were aware of how to deliver content online (Crawford et al., 2020).

Quattrone et al. (2020) argued that higher education institutes could take the opportunity that has been created by the COVID-19emergency to be more sustainable and resilient to new changes. However,

face-to-face interaction, which is the human aspect of traditional teaching, can never be entirely replaced by an online platform (Onyema et al., 2020). The educational landscape of the post-COVID-19 times includes a post-pandemic pedagogy and the rethinking of the current practices, according to Murphy (2020). The future will witness technology-based learning that the COVID-19 crisis has brought about, even though institutions may commence face-to-face operations (Daniel, 2020). Further, universities should evaluate the strategies adopted in remote teaching and enhance their contingency plans, which will enable their teachers to adapt to various online solutions and strengthen student engagement and learning experiences for quality education (Salceanu, 2020).

In conclusion, the findings in this study have valuable implications for academicians and university administrators. Universities can therefore build their infrastructure to facilitate flexible learning by enhancing the competencies of academicians to adapt to the new normal for effective delivery. This can also be explored through curating the teaching-learning process to align with ever changing technological advancement. Online teaching and blended learning models existed but were never fully adopted. Today in this context Higher Education has a 360-degree transformation with blended learning as the future and is widely being accepted by the faculty and student's community. Therefore, the study is instrumental in identifying challenges and experiences of academicians that have brought many opportunities for effective teaching-learning in Higher Education.

6. Recommendation for future research

Respondents from the three different geographical locations considered for the study have indicated similarities in most factors and conflicting on a few. This study restricts itself to establishing the hypotheses cited and does not investigate further into the socio-cultural aspects of the cause of variation/similarity. This will be a good start for further studies in this direction.

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From technologies for a few to technologies for all. Analysis of inclusive technologies perception in teachers in training

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Abstract

The paper presents the results of a survey conducted with teachers of lower and upper secondary schools who attended, in e-Learning mode, the specialization course for support in 2020 at the University of Macerata (Italy). The purpose of the survey was to: (1) extrapolate the teachers' point of view on the inclusive use of technologies at the beginning of the laboratory, (2) highlight the presence or absence of an inclusive logic underlying the teaching approach generally chosen in the use of tools and technological applications and finally, (3) analyze teachers in training perception about the skills they think they have learned at the end of the laboratory. Referring to the principles of Universal Design for Learning (UDL), the inclusive logic underlines the importance of knowing how to design educational interventions mediated by technologies that can be used by all students (not only those with Special Educational Need) therefore the presence/absence of the design aspect in teachers in training was considered fundamental to set up the laboratory path. In addition, the creation of the laboratory on the Teams platform has allowed teachers in training to learn and experience the inclusive potential that e-Learning can have if supported by a good design framework. In the contribution, the results of the investigation and the organization of the laboratory will be presented.

KEYWORDS: TIC, Inclusion, Teaching, Active Participation.

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1. Introduction

Inclusion, like active participation and belonging (Felder, 2018) to an educational and social context made of equality and mutual respect (Kiuppis et al., 2014; Koutsouris et al., 2020; Bochicchio, 2017), is the logic that must support the creation of learning environments in schools (Fraser et al., 2003; Goh et al., 2002; Pinnelli, 2020) based on the collaboration and active participation of teachers (Bhroin et al., 2020; Bush et al., 2020) and students (Jolliffe, 2007) considered these as an integral part of the school system regardless of the characteristics of their functioning (WHO, 2001).

The inclusive logic arises from a critical reflection connected to cultural, political, and practical-methodological transformation (Booth et al., 2014) and its application in the school context depends on the way in which teachers think about didactic and relational practices and prepare learning paths accessible to all students. Therefore, the question of teacher training becomes important (Gil-Flores et al., 2017) with particular attention to support teachers, (De Anna et al., 2015; Pinnelli, 2020) who must not only possess specific skills on disability but methodological, didactic, technological, and relational skills necessary to implement inclusion practices for the whole class (Fedeli et al., 2019; Pennazio, 2017a). Among the variables for improving the quality of inclusion, Information and Communication Technologies (ICT), as demonstrated by national and international literature (Calvani, 2010, 2020; Calvani et al., 2014; de Anna, 2012; Hamburg et al., 2015; Higgins et al., 2012; Pinnelli, 2020; Sánchez Utgé et al., 2017) were found to

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be effective in fostering teaching/learning processes for all students. Some research, (Fedeli et al., 2019) conducted with teachers who have attended training courses in the past to become support teachers, have shown that these teachers generally associated, at the beginning of the course, the use of ICT for inclusion to specific tools for disability that refer instead to the use of Assistive Technologies (AT) (Cook et al., 2002). Starting from these considerations, the contribution presents the results of a survey conducted with teachers of lower and upper secondary schools who attended the ICT laboratory in 2020 as part of the "Support course" at the University of Macerata. This survey is significant because it shows a change in the initial perception of teachers in training (regardless of the ability to use technologies) about the value of applying ICT tools for inclusion, as demonstrated in other research in the sector (de Anna, 2016; Covelli, 2016; Pagliara, 2016). The identification of tools considered by teachers useful for inclusion also highlighted the abandonment of the specialist dimension.

2. Inclusive technologies and teacher training

The introduction of technological tools in inclusive school environments requires an overall redesign (Calvani, 2020) of the training activities based on new teaching models, methods, and techniques (Jonassen, 2010; Novak, 2002) guided by the pedagogical perspective of meaningful learning. This redesign must be accompanied by more active didactic strategies (simulations, problem solving situations, cooperative learning, tutoring) (Bonaiuti et al., 2013; Calvani, 2014; Johnson et al., 1994; Kagan et al., 2009) that make possible and support the dialogical processes, the productive confrontation, the negotiation of meanings, the construction of knowledge. The teacher's design intentionality and his teaching mediation capacity therefore become fundamental in the integration of tools involved in the learning process with the pre-established objectives (disciplinary and technological) and the activities / modalities through which it is thought to reach them (Antonietti, 2003). The creation of technological teaching allows for school inclusion on three levels: (1) operational, (2) access to content, (3) development of skills (Chiappini et al., 2004). As part of this teaching, technologies respectively assume roles that correspond to specific ways of understanding educational action: (1) compensatory tools, to "do" (inclusion on the operational level); (2) tools to develop disciplinary skills and competences in learning contexts that respond to students' training needs (inclusion in terms of skills development); (3) tools to learn knowledge and content in compliance with the methods of access to the most appropriate information for students (inclusion in access to knowledge) (Chiappini et al., 2004).

The introduction of a technology into the classroom can generate inclusion if the same technologies have been made accessible through the use of adequate TA (Cook et al., 2002; Scherer, 2005) and by the type of design that supports the overall teaching intervention by the teacher (Tipton, 2020; Zayyad, 2019). This reflection refers to the plan of accessibility/usability and design. The design is based on the principles of Universal Design for Learning (Rose et al., 2000; Vinci, 2012; Zascavage et al., 2009) according to which digital technology allows an easier and more effective personalization of student learning paths provided that its use is carefully planned and flexible (Carruba, 2018; King-Sears, 2009; Vinci, 2012).

It is possible to identify two roles for technologies: (1) support in performing exercises (training and strengthening of skills); (2) environment to organize collaborative, metacognitive and remote work (Chiappini et al., 2004; Ranieri, 2010). Thinking from an inclusive perspective, this last role should prevail as it is connected with the creation of inclusive learning environments (Baldiris Navarro et al., 2016).

As Vinci (2012) claims, technologies are part of those "tools" that mediate the relationship between teacher and student, convey information and knowledge, allow the teacher to implement multimedia teaching that uses different media to communicate knowledge through stimulation of different sensory channels and linguistic codes.

In order to include technologies in the context of inclusive teaching, however, it is not enough that teachers know and are able to use them, but it is essential that they also know how to choose technologies in according (1) to their educational/didactic objectives, (2) to the operating characteristics of each one, inserting them correctly with regard to times (when), spaces (where) and ways (how) in design of a specific class with its specific needs. In this perspective, the teacher becomes a learning co-designer (Kalantzis et al., 2012; Vinci, 2012).

Educational innovation through digital technologies depends by the initial and in-service training of teachers who are called to reformulate traditional teaching-learning methods by using the potential that ICT offers in terms of pedagogical accessibility and inclusion (de Anna, 2012, 2014a; Sánchez Utgé, 2016).

2.1 The ICT laboratory

The ICT e-Learning laboratory (Ministerial Decree of 30 September 2011), carried out at the University of Macerata with first and second grade secondary school teachers, was aimed at guiding students to acquire skills to design inclusive teaching-learning interventions mediated by technologies. The laboratory was divided into five modules: (1) Computer accessibility and network resources (10 h); (2) Adaptations with technologies (15h); (3) Collaboration and metacognition with e-technologies (20h); (4) e-books and animations (20h); (5) The creation of a multimedia product (20 h). During the modules, the teachers in training were able to gain experience with: (1) the accessibility functions of

the computer (speech synthesis, magnification, color discrimination, etc.); (2) the basic programs (Word, PowerPoint, Excel, Publisher, Google Forms); (3) the creation of educational resources and applications by using different software (Cmap, Padlet, Quizlet, Google Keep, Canva, Epubeditor, Animaker, PowToon, MovieMaker, ScreenCast, Araword). The teachers worked in groups on the Teams platform and they have learned how organize an inclusive e-Learning path.

3. Materials and Methods

3.1 The research design

The laboratory aimed at making teachers in training to acquire the skills necessary to design inclusive educational interventions (mediated by technologies) it was preceded by an investigation phase. It had the purpose of: (1) extrapolating the beliefs of teachers with respect to the inclusive meaning of technologies and their initial knowledge on the use of technological supports; (2) highlight the presence or absence of an inclusive logic in the didactic approach generally chosen in the use of technological tools and applications and, finally, (3) analyze the perceptions of teachers in training about the skills they believe they have learned at the end of the laboratory. These perceptions made possible to evaluate the presence of a predisposition to design in teachers. The first two aspects were fundamental to set up the laboratory in order to respond to the needs of the teachers.

A qualitative methodology was used for the survey.

For the initial phase, a questionnaire was prepared through the Google application, administered online, consisting of four questions:

1) What is inclusive didactic?
2) What support can technologies provide for inclusion?
3) Do you know any inclusive technology?
4) What are the areas of competence that a teacher should have to use technologies in a conscius an inclusive way?

For the final phase, only one question was administered (always online with the Google application) with the aim of evaluating the perceptions of the teachers in training about the skills they believe they have learned at the end of the laboratory (What do you think you having learned from the laboratory)?

The contribution offers an analysis of the answers given to the four initial questions and to the final question considered fundamental to (1) understand the teachers' initial perceptions of the inclusive value of technologies, (2) justify the organization of the laboratory presented in the previous paragraph and (3) evaluate its effectiveness from the point of view of the acquisition of design skills, based on the final considerations offered by the teachers.

3.2 Participants

Teachers from lower secondary school (52.1%) and upper secondary school (47.9%) participated in the survey for a total of 96 teachers (N = 96).

Most (53.1%) of the teachers are in the age group between 30-40 years, so they are rather young teachers, with a teaching experience (65.6%), ranging from 1 to 5 years for most of them (60.9%). However, more than half of the teachers (59.4%) declared that they never had experience as a support teacher and for those who have had it (94.9%), it is an experience of about 1-5 years. Less than half of the teachers, 36.5% declare that they have attended training courses on ICT, while 63.5% declare that they have not attended any courses.

The analysis of the personal data made it possible to obtain initial information on the teachers in training also confirmed by the subsequent answers to the questions. (1) Being quite young teachers, they have a good level of confidence in the use of technologies and this was confirmed by the questions about the frequency of use of technological supports in daily teaching; (2) despite they haven't experience and specific training on support, many of them have shown from the beginning that they have a clear understanding of the logic of inclusion and (3) the importance of having design models for the inclusive use of technologies.

These aspects, as will be shown in the following paragraphs, represent an element of evolution with respect to the approaches to technologies shown by teachers in previous training courses of this type, where their approach was mainly of a compensatory type, i.e. learning the use of specific technologies in relation to various types of disabilities.

4. Results

The analysis of the answers provided by the teachers in training in relation to the questionnaire was carried out according to the methodology of Qualitative Content Analysis (Schreier, 2012) and it highlighted the conceptual categories represented within the maps shown below.

Within each map it is possible to observe, for each conceptual core, each category (represented with ovals) and the respective elements (represented with box).

The first question “What is inclusive didactic?” aimed to (1) bring out the idea of inclusion possessed by each teacher, considered fundamental as a determining element in the choice of specific teaching strategies and methodologies (active, cooperative learning, tutoring, flipped classroom, metacognition); (2) hightlight in teachers the presence “design forms” to organize accesible path for all with the use of technologies.

Map 1 highlights, in relation to the conceptual core “Inclusive didactic”, the presence of eight categories (accessibility, participation and involvement, overcoming difficulties, didactic strategies and

methodologies, didactic activities, design, use of tools, learning environment) with their respective distinctive elements.

The second question "What support can technologies provide for inclusion?" had the purpose of extrapolating the position of teachers in training about the inclusive value of technologies attributable to the use of the same according to the logic of the UDL. This approach is fundamental in thinking of technologies not as specific tools to cope with deficits and disabilities (typical dimension of AT Assistive Technologies), but as multimodal and multimedia facilitators/mediators to design and implement educational paths to satisfy the needs of all students stimulating active participation and collaboration. Map 2 highlights, in relation to the conceptual core "ICT support for inclusion", the presence of eleven categories (facilitation of learning, collaboration, expansion of information, learning/ teaching support, flexibility and accessibility of

MAP 1 – TEACHERS' PERCEPTIONS ON INCLUSIVE DIDACTIC

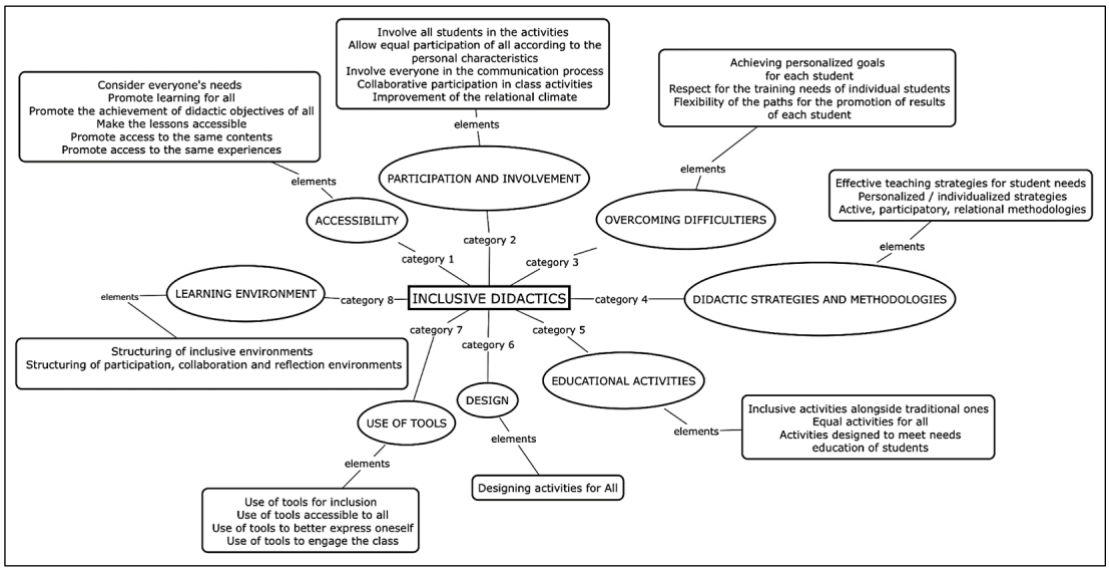

Table 1 - Conceptual categories related to Inclusive didactis.

MAP 2 - TEACHERS' PERCEPTION ON THE INCLUSIVE VALUE OF ICT

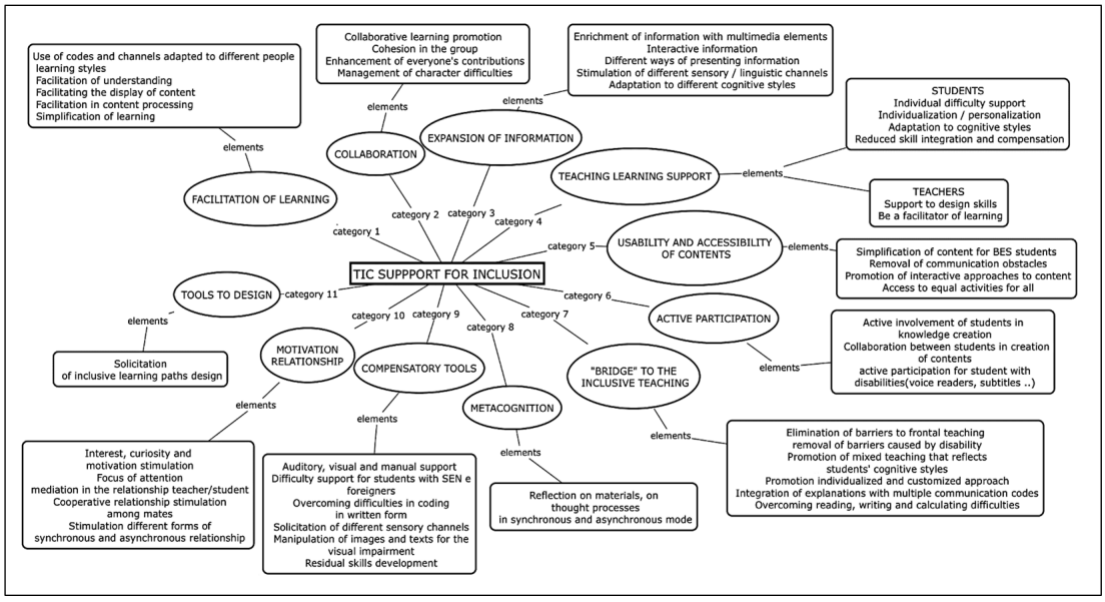

Table 2 - Conceptual categories related to the inclusive value of ICT.

contents, active participation, "bridge" for inclusive teaching, metacognition, compensatory tools, motivation and relationship, tools for design) with their respective distinctive elements.

The third question "Do you know any inclusive technology?" was aimed at extrapolating the incoming knowledge of teachers in training. Specifically, the aim was to understand whether these teachers, despite not having (most of them) experience in teaching support, identified the inclusive value of technologies in: (1) hardware (eg adapted keyboards) and software (eg speech synthesis, reading for specific learning disorders)

MAP 3- INCLUSIVE TECHNOLOGIES IDENTIFIED BY TEACHERS

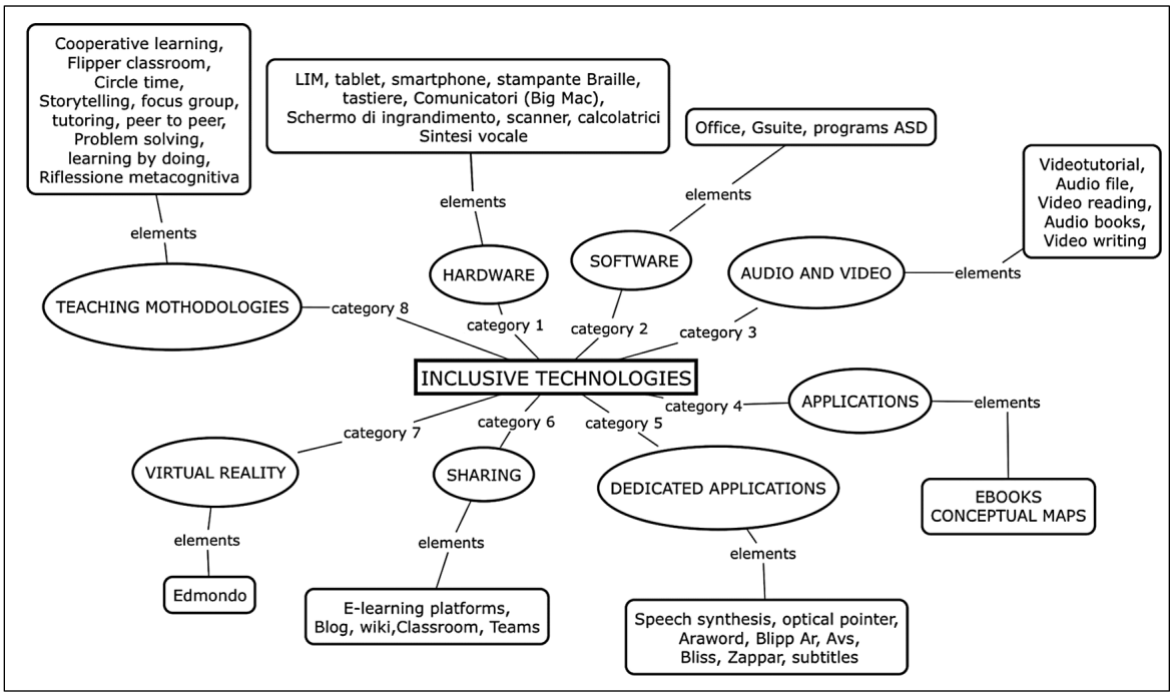

Table 3 - Conceptual categories relating to the identification of inclusive technologies.

MAP 4 – AREAS OF COMPETENCE OF INCLUSIVE TEACHING IDENTIFIED BY TEACHERS

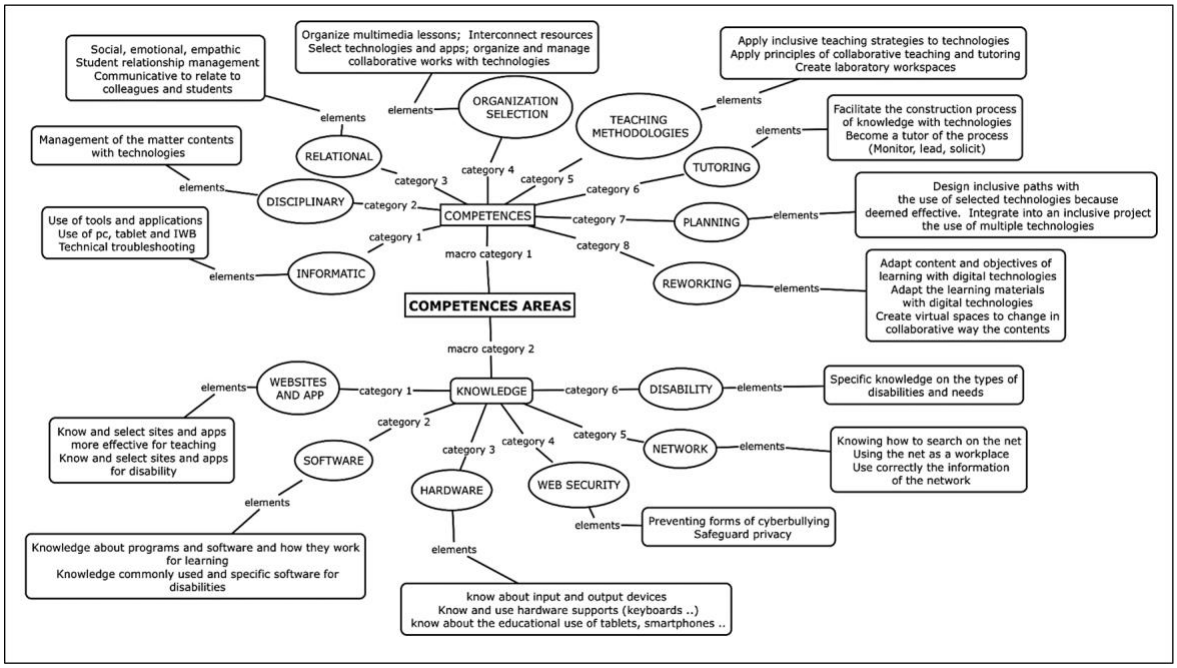

Table 4 - Conceptual categories relating to competence areas.

MAP 5- IDENTIFICATION OF LEARNING ACHIEVED WITH THE LABORATORY

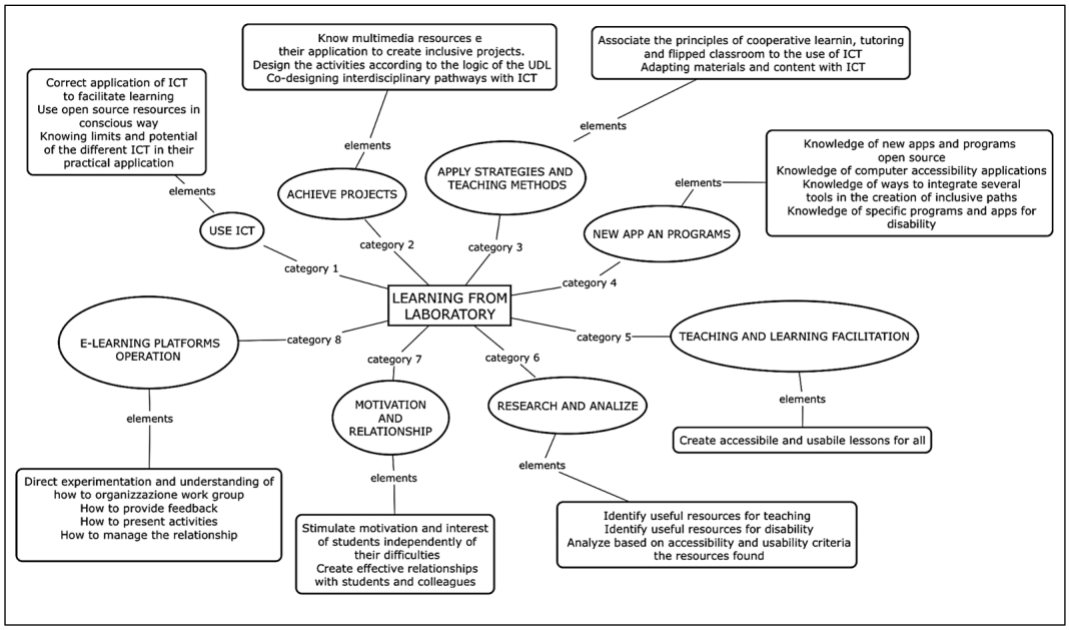

Table 5 - Conceptual categories relating to the learning achieved with the laboratory.

specific for special educational needs; (2) specific hardware and software to teaching a discipline to student with BES; (3) tools and applications born not with the aim of inclusion but for their characteristics can make teaching inclusive and encourage the active participation of all students. Map 3 highlights, in relation to the conceptual core "Inclusive technologies", the presence of eight categories (hardware, software, audio and video, applications, dedicated applications, sharing, virtual reality, teaching methods) with their respective distinctive elements.

The fourth question "What are the areas of competence that a teacher should have to use technologies in a conscius an inclusive way?" it had the purpose of verifying whether the teachers considered essential the possession of a technical competence only or if instead they led to the effective an inclusive use of technologies also in areas of competence relating to teaching, design, relationship, to communication. In fact, to promote inclusive processes it is not enough to have high-level technical skills but it is essential to know how to insert technological tools in a design framework that justifies their use and makes the proposed path coherent and interdisciplinary. Map 4 highlights, in relation to the conceptual core "Areas of competence", the presence of two macro categories "skills" and "knowledge" with the categories connected to them: eight categories for the first macro category (Informatic, disciplinary, relational, organizational and selection, methodological and didactic, tutoring, design, re-elaboration) and six categories for the second macro-category (sites and apps, software, tools, web security, network, disabilities). The respective distinctive elements are identified for all categories.

Finally, the last question asked at the end of the laboratory "What do you think you have learned from the laboratory you attended?" had the objective of connecting the teachers' initial expectations (influenced by their idea of inclusion and inclusive teaching, by their conception of technologies as only compensatory tools or facilitators and mediators of the learning path) with the perception of what has been learned and with changes occurred in their way of thinking about inclusive teaching with the use of different technologies. The aim was to evaluate the overall satisfaction of teachers in training with respect to the path taken. Map 5 highlights, in relation to the conceptual core "Learning from the laboratory" the presence of eight categories (use of ICT, achieve projects, apply teaching strategies and methodologies, new APPs and programs, facilitation of teaching and learning, research and analyze, motivation and relationship, functioning of e-Learning platforms) with their respective distinctive elements.

5. Discussion

The categories relating to the conceptual cores "Inclusive education" (map 1), ICT support for inclusion (map 2) and "Areas of competence" (map 4) are taken into consideration, highlighting the existence of some connections that stimulate reflections on the relationship: teaching – use of technologies – skills.

5.1 Category – Design

The first recurring category is design, which occupies a predominant space as a fundamental element in inclusive didactic and as a tool that allows effective and useful inclusive technological paths to be implemented to reach objectives and contents that cannot be obtained only with traditional teaching, in according with the literature (Calvani, 2020; Tipton, 2020; Zayyard, 2019). The design is intended like a framework that supports, justifies and gives value to the use of one or more technological tools. These tools are chosen because they allow to generate paths in which all students, regardless of their functioning characteristics, can actively participate, achieve objectives, build their knowledge, use the information made available to the teacher in different ways (reading, listening, watching) in an individual and/or collaborative way and produce materials that reflect their potential. From a didactic point of view this design recalls the principles of UDL (King-Sears, 2009, Zascavage et al., 2009; Rose et al., 2000) and is realized thanks to the potentiality of different technological tools, as observed by teachers in training (edit images and text, add images and text and speech synthesis, insert audio and video files, different writing systems such as Araword). The analysis of the skills considered by teachers in training fundamental for using ICT in an inclusive sense, it has highlighted, in according with the leterature (Pinnelli, 2020; Calvani, 2020), that the design competence is perceived as a priority by teachers in training. It is an innovative aspect because highlights, compared to the first "Support courses" (Fedeli et al., 2019; Pennazio, 2017a), a change in the conception of the inclusive use of technologies linked to a more knowledge of the inclusive didactic. The departure from the concept of integration has generated a vision of technologies as tools to create inclusive learning environments (Pinnelli, 2020) supported by careful design in which technologies interact with disciplines, with objectives, with methodologies and didactic strategies, relational dynamics, evaluation methods.

5.2 Category - Didactic strategies and methodologies

The second category that occurs more frequently is "teaching strategies and methodologies" which is identified by teachers in training as a fundamental variable of inclusive teaching. The absence of methodologies of active teaching (e.g. cooperative learning, tutoringig, peer to peer) and individualization /personalization strategies that overtake the more traditional forms of teaching, it is perceived by teachers in training as a barrier that hinders the creation of an inclusive environment. This is a category strictly connected to the previous one (design) and it uses the technologies like "a bridge" to realize itself. In this perspective technologies are considered by teachers in trainer like multimodal and multichannel tools/strategies to build collaborative path, to create and modify contents, to promote active interations with teachers and mates. (Bush et al., 2020; Bhroin et al., 2020; Jolliffe, 2007). In this way, the real and / or virtual classroom becomes a collaborative environmen that support the knowledge building and it satisfies everyone's needs. Even the aspect of metacognition and, therefore, of metacognitive teaching (Ranieri, 2010) finds in the positions of teachers in training a greater possibility of implementation with the use of technologies (building a presentation with Canva, creating an e-Book that contains contents but also activities; for example, require to return in a reflective way to contents, to synthesize, to create connections, to have a clear understanding of the mental processes necessary to solve a task). The analysis of the skills considered fundamental by teachers in training identifies, in accordance with the literature (De Anna et al., 2015; Sánchez Utgé et al., 2017), the possession of didactical/ methodological competences essential for proposing technological paths. Without adequate knowledge of how a strategy/methodology must be managed (e.g. cooperative learning, tutoring have rules that must be respected) it is not possible to associate a functional use of the technological tool because this adds rules (e.g. tool sharing) during the use of the traditional methodology. Therefore, the main teachers' need is the knowledge of these methodologies applied to technologies.

5.3 Category - Participation and involvement

Participation and involvement emerge as a third recurring category. Inclusive teaching promotes (1) the participation of all students (regardless of their functioning characteristics) in the life of the class (eg discussing with classmates and teachers, expose their position with respect to certain contents, attend in communication) (Bush et al., 2020; Bhroin et al., 2020; Jolliffe, 2007) (2) and active collaboration (Johnson et al., 1994; Kagan et al., 2009), that enhancesthe contribution that, every student can offer with respect to his potential. Also in this case, technology is identified by teachers in training as fundamental in guaranteeing an equal and active participation of all students in class life this is guaranteed in the case of severe disabilities, also by the use of TA (Cook et al., 2002; Scherer, 2005; Tipton, 2020; Zayyad, 2019). These can support and help the student in the possibilities of expressing themselves (communicators, optical pointers), of writing (braille keyboards), of listening (subtitling tools also present in computers as an accessibility) and to participate in the activities proposed with technologies not specifically dedicated to disability. Among the skills considered fundamental by teachers in training there is the "tutoring", where teacher became tutor to support with specific actions (e.g. monitor, solicit, guide, provide feedback, advise) the knowledge building process mediated by technology of students.

5.4 Category – Accessibility

Closely connected with the previous category, it was indicated by the teachers in traing "Accessibility" which is understood, in inclusive didactic, as the possibility of guaranteeing the ideal conditions so that all students are able to achieve the same objectives and the same knowledge respecting their needs and their cognitive characteristics (Chiappini et al., 2004). Obviously in the case of severe disabilities, objectives and knowledges can be simplified, reduced but must fall within the same disciplinary area, in the same content (summarized in its founding core) to ensure access to the same experiences. In this process a fundamental role is attributed by teachers to technologies that allow you to manipulate and simplify content (e.g. Google Keep allows you to capture a text in paper version, transform it into OCR making it editable, to this text it is possible to add a speech synthesis, a video file, or associate a text in Araword). Competence considered essential by teachers to promote accessibility is "Organization and selection" understood (1) as the ability to organize multimedia lessons by interconnecting different resources in order to make the content presented usable in different ways; (2) the ability to select technologies and APPs suited to the content to be conveyed and the characteristics of the students.

5.5 Category – Motivation and relationship

Another category that emerged is "motivational/ relational" which in inclusive didactic refers to the teacher's ability (1) to motivate through engaging lessons and through an encouraging relational style), (2) to stimulate students to continue learning tasks despite the difficulties, helping them to find appropriate strategies for their cognitive characteristics and useful for improving their performance (Heafner, 2004). According to the teachers, it becomes essential to create flexible paths with the use of technologies in which it is possible to organize learning materials using various codes and formats (slides, flash cards, concept maps, design, interactive bulletin boards), focusing attention and motivation of the student who is always actively involved. In this perspective, the relational – motivational skills of the teacher (Ranieri, 2010) are considered fundamental both to understand, on an emotional level, which technology is most suitable according to the needs of students, and to manage the relationship with students / colleagues in in the choice of technologies to use.

5.6 Category – Tools

The last category highlighted by the teachers is "use of tools" that in inclusive didactic, refers to the indispensability of technological tools to create learning paths that can be followed by all students with their own specific methods (individualization/personalization). The emphasis on tools, at the level of inclusive technologies, inevitably includes specific tools and APPs for disability (compensatory) that fall within the scope of TA, emphasizing the importance of creating a dialogue between the various technologies used. But the emphasis placed on the tools also includes all those useful for expanding information (enriching it with video, images, audio, texts). The range of technologies considered inclusive by teachers in training will be analyzed later. It is important at this stage, to underline that the competence connected to the category tools is (1) information technology (understood as technical knowledge, of management and resolution of any problems); (2) of re-elaboration of information in digital format; (3) disciplinary connected to the ability to choose and manage the the most suitable tool and application to convey the specific content of each discipline in relation to the student's needs.

5.7 Conceptual core: Inclusive technologies

The analysis of the categories contained in the conceptual core "Inclusive Technologies" has led to an interesting observation: teachers in training do not consider as inclusive technologies only those dedicated to students with disabilities (TA), but the commonly used technologies to which they associate the use of active teaching methodologies (cooperative learnng, flipped classroom, circle time, story telling, tutoring, peer to peer, problem solving, metacognitive reflection).

The categories of this conceptual core include, (1) hardware (IWB tablets, smartphones, computers, and specific hardware such as Braille printers, communicators ect.), (2) software (Office, GSuite and software dedicated for example to students with DSA), (3) Audio and Video (tutorials created by the teacher or available on the web, audio books etc.), (4) Applications (to create e-books and concept maps), (5) Dedicated applications (speech synthesis, optical pointer, Araword), (6) sharing tools (e-Learning platforms, blogs, wikis, Teams, classrooms etc.), (7) Virtual Reality (Edmondo). The identification of the categories confirmed a positive aspect in an inclusive sense: since the start of the laboratory, the teachers have demonstrated that they possess the foundations of an inclusive logic that does not aim at the realization of specialized interventions reserved for students with disabilities but at creating paths made accessible to all from the outset in compliance with UDL design principles (King-Sears, 2009; Rose et al., 2000; Zascavage et al., 2009).

5. Conclusion

The initial attitude of the teachers of "predisposition towards the logic of inclusion" made it possible to create the laboratory according to the articulation in modules presented in paragraph 2.1 (taking into account the emerging needs of teachers in training). Since vision of technologies was already connected with the principles of inclusion, teachers was help to (1) understand how commonly used technological tools, software and apps

can be used in teaching with an inclusive value; (2) apply inclusive teaching methodologies and strategies to the same technological tools; (3) implement projects, including interdisciplinary ones, in which the use of the various technological tools is justified and represents an added value from the point of view of inclusion; (4) research/select new open source applications and evaluate their effectiveness; (5) learn how to create inclusive paths by associating the use of multiple technological applications. At the end of the course, the teachers declared that they felt satisfied with the laboratory for the positive response with their initial expectations. Map 5, presented in the "Results" paragraph, shows in detail the main categories relating to the conceptual core "learning from the laboratory"; it highlights how these coincide with the initial needs expressed by the teachers. The interesting aspect of this survey is that teachers in training have shown from the beginning that they know that inclusive optics requires not focusing attention only on the use of Assistive Technologies but that it is important to consider the potential that ICT makes available to design learning environments in which an inclusive teaching prevails, in according to the principles of Universal Design for Learning (UDL). The starting point must always be didactical design.

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Franco Bochicchio wrote the paragraphs,1, 2.

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The impacts of integrated e-Learning system toward the challenges facing education sector during and post Covid-19 pandemic

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Abstract

Due to the Covid-19 pandemic, the school campuses have stopped face-to-face lessons to reduce its outbreak among students and staff members. This study presents a conceptual framework to investigate the factors influencing the usage of e-Learning platform among students of higher education institutions and their e-Learning system as course delivery. These factors include technology infrastructure support, system quality, information effectiveness and the e-Learning. The current study applied the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT) and DeLone-McLean Model to explain the factors affecting e-Learning platform usage. This study has designed and proposed a theoretical framework based on information obtained from a newly developed questionnaire, which were distributed to two hundred and thirty (230) students from UI, *LAUTECH*, Ibadan poly and Okeogun poly located in Oyo State, Nigeria. This study involved students of these higher education institutions and the empirical data were analyzed using the Partial Least Squares Structural Equation Modelling. The findings revealed that technology infranstructure support, system quality and information effectiveness significantly influence the usage of e-Learning to enhance the service quality of higher education institutions among students. In this light, the outcomes of this study are useful for higher education insititutions adapting e-Learning to help them strategise future e-Learning portals to enhance their performance in different aspects, such as the Websites and multinational web-integration. It is worth noting that the theoretical background of this study is limited to TAM and DeLone-McLean, IDT and its scope is only limited to just four public institutions in Oyo state. Hence, the author did not include other measures of e-Learning usage and other factors like online service quality.

KEYWORDS: Covid-19, Technology Infrastructures Support, Information Effectiveness, E-Learning Course Delivery, Higher Education Institutions.

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1. Introduction

The first cases of the novel coronavirus, or Covid-19 was reported in Wuhan, China at the end 2019 and the disease has spread to all over the world in early 2020 and to date, it has affected economies and social life globally. Similar to other sectors, the COVID-19 pandemic has affected education in many ways. The WHO advised governments to take actions to reducing the spread of coronavirus by reducing social contact, hence, many countries have enforced a lockdown where schools and universities are forced to close and face-to-

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face teaching and/or exams are halted. Some education systems announced exceptional holidays to better prepare for this distance-learning scenario (Gonzalez *et al*., 2020; Ehlers, 2020; Branchetti et al., 2021; Capone & Lepore, 2021; Chan et al., 2021). As a result, many schools and universities turn to various e-Learning platforms to facilitate the teachers and students and in some cases, national television shows or social media platforms are used to support virtual learning.

The Covid-19 outbreak has prompted widespread school closure around the world and highlights the role played by e-Learning systems (Viner *et al*., 2020; Owusu-Fordjour, Koomson & Hanson, 2020). According to a recent report by UNESCO (2020), the Coronavirus pandemic has affected educational systems worldwide, leading to the widespread closure of schools in affected countries. As of 28th March, 2020, over 1.7 billion learners are not attending classes due to school closure. According to UNESCO, over 100 countries have enforced nationwide closure of schools and universities, impacting nearly 90% of the world's student population (UNESCO, COVID-19 Educational Disruption and Response, 2020). School closure does not only affect students, teachers, and families, but have far-reaching economic and societal consequences, (Owusu-Fordjour, Koomson & Hanson, 2020). Furthermore, school closures in response to COVID-19 have shed light on various social and economic issues, including student restrictions (Jamerson, Josh, & Joshua, 2020) and impact of e-Learning (Karp & McGowan, 2020).

Digital learning, has predominantly changed how students learn over the last few months. E-learning helps facilitate teaching and training with the use of information communication technologies (ICT) to any student, anytime and anywhere. Digital learning technologies are mostly employed by universities and other educational organisations to supply new and innovative ways in delivering teaching to students (El-Masri & Tarhini, 2017). In this regard, studies on e-Learning acceptance have mostly incorporated students as subject to explain the factors impacts of the acceptance of e-Learning technology among students. It could also be argued for teachers' and instructors' acceptance and use of technology is crucial for the successful adoption and implementation of e-Learning technologies (Al-Samarraie et al., 2018). The importance of e-Learning is evidenced as schools begin to close to control the Covid-19 outbreak as schools and universities are recognize the benefits of using e-Learning technologies to deliver online classes for their students and other curriculum activities (Marchisio, Rabellino & Sacchet, 2020; Sahu, 2020; Chahrour et al., 2020). It is therefore important to identify the factors that could influence students' and teaching staff's opinion on the use of a specific e-Learning technology from anywhere, any time.

It was reported that by 10 March 2020, one in five students worldwide are studying home due to the school campuses closure due to the COVID-19, and one in four university students have been sent home. (UNESCO, 2020). On the 13th March 2020, governments in 49 countries have announced or implemented school closure; 39 countries ordered that schools are closed nationwide while 22 countries implemented localised school closure (UNESCO, 2020). Between 16th to 19th March, 2020, this figure increased from 49 to 73 countries according to UNESCO. Nigeria is one of the countries that ordered all school campuses to close in the middle of March 2020 (Adedigba, 2020; UNESCO, 2020). As a result, 50% of students worldwide are affected by school closure as at 19th March, 2020 as 102 countries enforce lockdowns to contain the spread of the virus. Furthermore, 11 countries have ordered a localised lockdown on at-risk locations. The lockdowns and closures have affected 850 million students (UNESCO, 2020; Owusu-Fordjour, Koomson & Hanson, 2020). In this light, most education institutions have turned to the online platform to continue their teaching activities.

E-Learning refers to the spread of knowledge which is facilitated primarily by electronic means through the Multimedia, Tele-learning, Flexible Learning and the intelligent Flexible Learning Models. E-Learning is also described as web-based training, online training, distributed learning, or technology for learning (Hong et al., 2017). While this form of learning currently depends on networks and computers, it will likely evolve into systems consisting of different channels via wireless, satellite and technologies such as cellular phones (Zhang, Patras & Haddadi, 2019). It incorporates application of ICT in performing various institutional activities including course delivery geared towards achieving the goals of an institution. The E-Learning platforms creates a high degree of interactivity between users and incorporate different elements such as Presentation technologies, The World Wide Web, Computer Mediated Conferencing, Multimedia materials, Computer, Computer Based Training, Audio conferencing and Videoconferencing, Streaming Audio and Video, Simulations, Visualisation tools and Email (Sawant, 2016; Hong et al., 2017; Muda & Erlina, 2019). E-Learning helps teachers to work collaboratively to plan programmes, share expertise and provide support to students in remote areas with no or limited educational infrastructure. E-learning ensures quality assurance, quality management and accountability in teaching and learning, (Adams, Sumintono et al., 2018). Due to its many advantages, E-Learning can serve to fill the gaps of school closure in Nigeria due to Covid-19 outbreak.

The Nigerian Federal Ministry of Education has directed the closure of all tertiary, secondary and primary schools nationwide to control the outbreak of Covid-19 in the country. The Permanent Secretary in the Ministry of Education, Sunny Echono, confirmed this to PREMIUM TIMES. The ministry ordered the closure of all the 104 unity schools universities, colleges of education, polytechnics and others in the country from March 26 (Adedigba, 2020). This closure is a bid to maintain social distances between students and teachers to reduce

the spread of Covid-19 among students and staff of higher institutions in Nigeria. Subsequently, e-Learning programmes have been introduced as to provide students access to learning. All public higher education institutions have introduced ICT policies that embrace the adoption and promotion of e-Learning due to the advantages associated with this mode of e-Learning, which has been proved useful in the midst of the Covid-19 outbreak. Several initiatives are taken to improve e-Learning service provision and e-Learning service support in Nigeria; however, these attempts seem to have little real effect (Eze, Chinedu-Eze & Bello, 2018).

It is high time for faculty members, students, and administrators to learn from this critical situation and to overcome these challenges. This crisis has opened up the opportunity to explore the potential of online learning. As most higher education institutions' students are young and energetic, they are capable of learning through the online platform. Thus, faculty members could motivate the younger minds and increase their active participation. Higher education institutions' authorities should also encourage students and faculty members to stay connected through the online or any social media platform to facilitate interactions and communication during this extremely difficult time. Students should be provided with course instruction and other services in an online format to support their academic progress (Sahu, 2020). Training programmes should be organised as quickly as possible for faculty members to support the use of the online learning platform. This experimentation will guide higher institutions around the worldwide to upgrade their technical infrastructure and make online learning a core aspect of teaching and learning (Sahu, 2020). Meanwhile, over the last few months, public universities in Nigeria have started to apply e-Learning, however, there is yet any evaluation the level of e-Learning use as a course delivery method. This study is set to examine the actual status of e-Learning in higher education institutions in Nigeria in a bid to improve the application of e-Learning as course delivery method. The uncertainty over the use of e-Learning in Nigeria higher education institutions, has led to the formulation of the research problem to verify the actual status of e-Learning in Higher education institutions in Nigeria to replace face-to-face lesson during school closure. It is hoped that implementation and usage of e-Learning as a course delivery method could be expanded in Nigeria.

2. Literature Review

2.1 Covid-19 on School Closure

COVID-19 outbreak has brought some sort of education reform, specifically in the development of online teaching to replace face-to-face lessons due to school closures to contain the spread of Covid-19 worldwide. Many teachers and students have been excited by the move to the online delivery mode. Faculty have already started preparing lesson plans to deliver online teaching to their students. Online teaching is not a new mode of delivery for many universities where many faculty members have received training to use online learning platforms either as a delivery mode or as an add-on to face-to-face teaching (Sahu, 2020; Chahrour et al., 2020). On the other hand, the transition to online mode has raised questions for the faculty about their efficiencies on using existing technologies (Sahu, 2020). Furthermore, not all students and lecturers have access to computers and IT equipment at home (Xiang et al., 2020). Thus, working from home might present a challenge to some faculty members. Some universities also do not have sufficient infrastructure or resources to facilitate online teaching with immediate effect. Thus, the quality of online education is a critical issue that needs proper attention (Sahu, 2020; Chahrour et al., 2020).

Starting from March 2020, many countries have ordered the closure of educational institutions to reduce the spread of Covid-19 within the community to break the chains of transmission (Spina et al., 2020). Universities across the world have postponed or cancelled all campus events including workshops, conferences as well as intra and inter universities sports tournaments. Researchers have started to examine the potential impact of the COVID-19 outbreak on the academic progress and mental health of university students (Sahu, 2020; Spina et al., 2020). It was reported that universities have moved rapidly to replace face-to-face delivery of courses and programs to online delivery mode (Sahu, 2020). In this regard, e-Learning is the solution to the Covid-19 school closure around the world. Similarly, e-Learning has become front and centre in Nigeria after the ministry of education ordered the closure of Schools in the country from March 26 as a proactive step to prevent the spread of Covid-19 (Adedigba, 2020).

2.2 E-Learning Platform as a Course Delivery

This present study highlights the importance of e-Learning to contain spread of Covid-19 pandemic (Capone & Lepore, 2021). In recent months, there is an on-going trend in higher education to set up e-Learning systems that provide students with access to learning content via the online platform. Furthermore, this trend is attributed to the change in students' demographic factors as well as in the educational delivery market conditions and in innovation technology (Al-Rahmi et al., 2018).

Digital Learning is commonly known as e-Learning. Thus, e-Learning is defined as the delivery of learning using completely through the Internet and digital technology. It is among the earliest application of web-based technology (Sfenrianto et al., 2018) and e-Learning is getting more popular worldwide. Almost all universities and colleges have developed their own digital learning portal for their students and faculties (DeLone & McLean, 2016). E-Learning has shown bigger impact on all types of the student in the 21st

century as institutions use e-Learning to facilitate learning for students (Al-Samarraie et al., 2018). E-Learning really helps students to participate in online class from anywhere at any time using different platforms. While most Universities have implemented e-Learning earlier (Adams *et al*., 2018). Freeze, Alshare, Lane and Wen (2019) highlighted that e-Learning users' face lack of system quality, such as software and general applications, lack of technology infrastructure design, low information quality and limited effective information on system usage among students. Studies have found that quality of system and information quality of the e-Learning platform could increase the interest of the users (Panyajamorn, 2019; Freeze et al., 2019). The present study aims to examine Nigerian students' perception on the importance of the e-Learning system.

Technological Infrastructure Support

It is important to highlight the issue of technology infrastructure support on e-Learning platform in response to school closure to curtail the spread of Covid-19 outbreak. Technological support infrastructure comprises of, among others, the Internet connection. The internet is described as a significant component in the provision of e-Learning portal for students to support remote learning. The study conducted on the adoption of ICT in the Nigerian SMEs content by Ibrahim and colleagues (2017) reported that in 2010, only 28.9% of the population in Nigeria use the internet, indicating a very low internet usage. While internet usage in the country has increased to 46.1% in 2016 (Internet World Stats, 2016), the cost of internet subscriptions in Nigeria is still very high and has caused many business organisations not to use it. The Internet service is also unreliable which creates a major setback for Nigerian MEs. Aremu, Shahzad and Hassan (2019) stated that Nigeria needs to improve the Internet connection in country in order to the enterprise organisations, education sectors to easily adopt and implement ICT technologies for their organisations. In this regard, Ibrahim et al. (2017) reported that even though most SMEs have their own websites, the sites are not functioning well due to the lack of quality Internet connection. This also happens to many universities, both public and private sectors as well among the public in African countries, especially in Nigeria, due to poor technological infrastructure support linked to low Internet connection quality. It is important to note that Internet usage is very important in business operation nowadays and network problems seriously affect MEs business organisation in developing countries, particularly in Africa. Moreover, it generally affects the continent's economy (Aremu, Shahzad & Hassan, 2019).

The provision of ICT infrastructure and support is directly linked to the rate of e-Learning system usage among university students. Poor Internet connection and unreliable Internet access, lack of regular electricity power supply, high cost of computer ownership, lack of reliable Internet services from Internet service provider have really affected domestic and commercial internet usage (Chopra et al., 2019; Sharma et al., 2020). Therefore, the quality of technology infrastructure support, such as internet connection is very important to enhance the usage of e-Learning platform among students. Thus, it is hypothesized that:

H1. There is a positive relationship between the impacts of technological infrastructure support-internet usage on e-Learning as a course delivery.

System Quality

The Covid-19 pandemic has imposed school closure globally and e-Learning system has been extensively used by teachers and students who are stuck at home. Technical system quality has been found to have a significant positive effect on e-Learning system user's context. According to the information system success model proposed by DeLone and McLean (2016), system quality refers to technical success and the accuracy and efficiency of the communication system that produces information. Chopra et al. (2019) highlight the importance of the system quality on the E-Learning portal. Hence, the e-Learning system should be working efficiently and has a fast response time. The system quality in e-Learning will generate query results more quickly. Thus, system quality will increase the interest of the end user. Moreover, user-friendly interface and modern graphical interface increase the level of the user satisfaction. Aremu, Shahzad & Hassan (2019) highlighted that internet service providers should adopt new changes and modify the system time to time to enhance the quality of the system. The system quality element has been utilized in the area of e-Learning system, which proved whether the user is grateful with the quality of e-Learning system. While, system quality could be reflected by reliable learning, ease learning, the convenience of access, the usefulness of system feature and response time of an information (Freeze et al., 2019). Additionally, as suggested by DeLone and McLean, system quality is conceptualised through the intention of users on e-Learning platform, user friendly, tangible feedback, security and standardisation. Freeze and colleagues (2019) acknowledged system quality based on job performance, work quality, effectiveness of work, usefulness and response time. While validation and reliability of the sytem quality also have significant relationship with the e-Learning system. In this research, system quality is assumed to have a positive impact on e-Learning system usage among higher institutions students. This study hypothesizes that:

H2. There is a positive relationship between system quality and e-Learning course delivery.

Information Effectiveness

WHO has recommended that schools all around the world to be closed in March, 2019 to reduce the spread

of the Covid-19 outbreak. In this light, the e-Learning system presents a solution to enhance future learning methods. Information effectiveness refers to the use of e-Learning for delivering information which would be important for learning and which is updated regularly. Information effectiveness also refers to the user's belief regarding the effectiveness of data given on a specific portal or the degree to which the user complete precise and well-timed information over the electronic learning interface. Thus, it had been proved by previous e-Learning study's that there was a big impact of effectiveness information on the e-Learning usage among students (Sawant, 2016; Al-Samarraie et al., 2018; Freeze et al., 2019).

Information effectiveness focuses totally on content needs, relevance, information accuracy, completeness, and timeliness. Moreover, the information should be relevant to the actual user, and therefore the required information is available at the proper time to the proper person also as might be captured by all users of the system (Sfenrianto et al., 2018). In this light, the aim of information effectiveness is to support students with the online knowledge with similar effective information at any time. Thus, an e-Learning system should have quality information effectiveness. In this light, past studies found that information effectiveness influences e-Learning usage (Ali, Hossain & Ahmed, 2018; Freeze et al., 2019). Information effectiveness captures e-Learning platform issues and providing students with learning information is the primary goal of a course web site. While, deciding what content to put on a web site is extremely necessary, addressing the difficulty of how user acceptance is affected by web site features and the way information is delivered are equally important (Ali, Hossain & Ahmed, 2018; Sfenrianto et al., 2018; Ali, Hossain & Ahmed, 2018; Freeze et al., 2019). This study proved that content and information effectiveness have a positive impact on the use of e-Learning system among students, thus, this study hypothesizes that:

H3. There is a positive relationship between information effectiveness and e-Learning course delivery.

2.3 Theoretical background

The Technology Acceptance Model (TAM)

In this study, TAM was used to determined e-Learning system as a course delivery in the content of higher education institution. The TAM can be applied to any specific domain of human or computer interactions (Taherdoost, 2018). The model indicates that system usage is indirectly affected by e-Learning system. Many researchers have conducted empirical studies to examine the explanatory power of the TAM, which produced relatively consistent results on the acceptance behaviour of IT end users (Agag & El-Masry, 2016; Taherdoost, 2018). Researchers have agreed that TAM has high validity in predicting the individual acceptance of numerous systems (Agag & El-Masry, 2016; Taherdoost, 2018; Dwivedi et al., 2019). In summary, TAM provides an explanation of the determinants of technology acceptance to explain user intention to use end-user information technologies and user populations (Taherdoost, 2018). Several studies have examined TAM as a model to explain how people adopt and use an e-Learning system. Selim (2003) stated that there is a need to investigate TAM in the context of web-based learning. TAM examines two significant elements, perceived usefulness, which can be defined as the extent to which a university student believes using e-Learning will boost his or her learning, and perceived ease of use which reflects the extent to which one believes using e-Learning will be free of cognitive effort (Selim, 2003). Also, Selim (2003) presented the course website acceptance model and tested the relationships among perceived usefulness, perceived ease of use and intention to use among university students using the structural equation modelling techniques of the program. The researcher concluded that the model fits the collected data. In this light, the usefulness and ease of use are good determinants of the acceptance and use of a course website as an effective and efficient learning technology. In the present study, the e-Learning system refers to the platforms, specifically, Zoom, WebEx, Skype, web-based learning operated by the university to deliver online lectures. The study also measured the perception of the e-Learning system quality among students based on the DeLone and McLean as information system success model, which explains the impacts of system quality on e-Learning context.

Diffusion of Innovation Theory (DOI)

Agag and El-Masry (2016) introduced the Diffusion of Innovation Theory (DOI). It is defined as a process used to present and spread an innovation among members of a social setting through some particular channels over a specific period of time (Sheikh et al., 2017). In addition, an innovation intended for adoption is defined as an art, idea, practice, or an object perceived as new by an individual. In this regard, this technology may be simply perceived as new by a novice. The Diffusion of innovation theory (DOI) has been in use for years to examine the acceptance of innovations in many fields such as, agricultural tools and organisational innovations (Agag & El-Masry, 2016). Agag, and El-Masry (2016) re-defined the constructs for the adaptation of DOI into the information system context. It is contended that Diffusion of Innovation (DOI) theory is the rate of adoption of innovations, which is influenced by five factors: compatibility, relative advantage, observability, complexity and treatability. It examines the success factor of ERP adoption and individual factor, organisational factor, innovation factor and task factor (Aremu, Shahzad & Hassan, 2019).

The DOI theory has been used to examine the users' acceptance of computer programs (such as computer games) and other widely used technologies. In this regard, it uses communication and media channels to deliver innovation to the society (Aremu, Shahzad & Hassan, 2019). Due to above arguments, IDT was used

in this study to examine the technology infrastructures support while DeLone and McLean model was used to explore information effectiveness on e-Learning system usage among students. Numerous studies have successfully integrated IDT and DOI into TAM to investigate users' technology acceptance behaviour (Agag & El-Masry, 2016; Taherdoost, 2018; Dwivedi et al., 2019). Several studies have attempted to examine all IDT characteristics with the integration of TAM. In this research, the TAM is improved by combining IDT and DeLone-McLean model measured technology infrastructures support, system quality, information effectiveness and e-Learning system as a course delivery platform and will be observed as additional research constructs to increase the credibility and effectiveness of the study.

3. Methodology

Research Framework of the study

The proposed conceptual framework is based on TAM, IDT and DeLone-McLean model. It stipulates that the key to a successful use of e-Learning among students is to maintain a technology infrastructure support, system quality and information effectiveness to enhance e-Learning system in various higher education institutions.

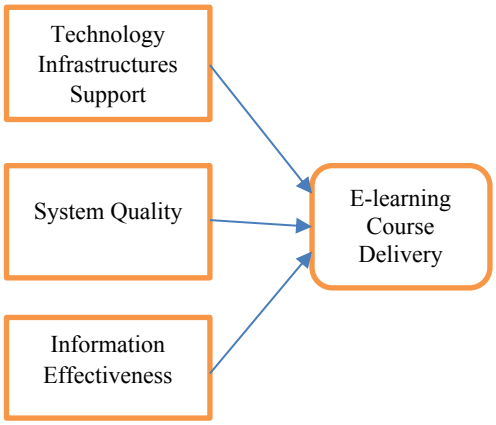

Figure 1 - Research Framework.

Data Collection

This study adopts the guiding principle of SEM developed by Hair et al., for sample size. In line with the Hair et al., SEM parameters sample size determination, the study involved a population of 550 university students. Hence, the minimum sample size required is 230 students. 390 sets of questionnaires were distributed via email to university students. Aremu, Shahzad and Hassan (2019) stated that smaller sample size entails greater tendency of error while a bigger sample size could generate more accurate result. The data were collected from students of public higher institutions, namely UI, *LAUTECH*, Ibadan poly and Okeogun poly located in Oyo State, Nigeria. The sampling size was calculated by parameters numbers of the size. Out of the 390 sets of questionnaires distributed, 369 were received while only 230 were useable. Meanwhile, Tables 1-4 summarise the results for items measuring each construct. The Cronbach Alpha was used to ensure that the items fit this study. Some modifications were made to the items.

No	Items	**Alpha**
1	Taking class via the e-Learning allowed me to arrange my work for the class more effectively.	0.87
2	The advantages of taking class via the e-Learning outweighed any disadvantages.	
3	Taking class via the e-Learning allowed me to spend more time on non-related activities.	
4	There were no serious disadvantages to taking class via the e-Learning.	
5	Taking class via the e-Learning allowed me to arrange my work schedule more effectively.	

Table 1 - E-Learning Course Delivery (Sun, Tsai, Finger, Chen & Yeh; 2008).

No	Items	**Alpha**
1	My current internet service provider provides me with sufficient information to participate in e-Learning class.	0.86
2	My current technology internet service provider provides an attractive network to participate in e-Learning class.	
3	My current internet service provider provides an up-to-date internet services to participate in e-Learning class.	
4	My technology internet service provider provides an easy way to use internet services to participate in e-Learning class.	
5	My quality of internet speed is low to participate in e-Learning class.	
6	My technology internet service provider provides a fast and reliable network to participate in e-Learning class.	

Table 2 - Technology Infrastructures Support (Aremu, Shahzad & Hassan, 2019).

No	Items	**Alpha**
1	I am satisfied with e-Learning functions lectures	0.78
2	I am satisfied with the Internet speed via e-Learning class	
3	I am satisfied with e-Learning content lectures delivered	
4	I am satisfied with e-Learning interaction	
5	I am satisfied with using e-Learning as a learning assisted tool to received lectures	

Table 3: E-Learning System Quality (Liaw, 2008).

No	Items	**Alpha**
1	I believe e-Learning can assist learning efficiency	0.76
2	I believe e-Learning can assist learning performance	
3	I believe e-Learning can assist learning motivation	
4	I believe e-Learning contents are informative	
5	I believe e-Learning is a useful learning tool	

Table 4: E-Learning Information Effectiveness (Liaw, 2008).

4. Analysis and Discussions

This study used PLS to analyse the data and to test the various hypotheses for this study. In a PLS analysis, the first step is to evaluate the outer model or measurement model, as shown in Figure 2. The outer model involves identifying the reliability, internal consistency reliability, content validity, convergent validity and discriminant validity of individual items (Hair et al., 2016).

Measurement Model

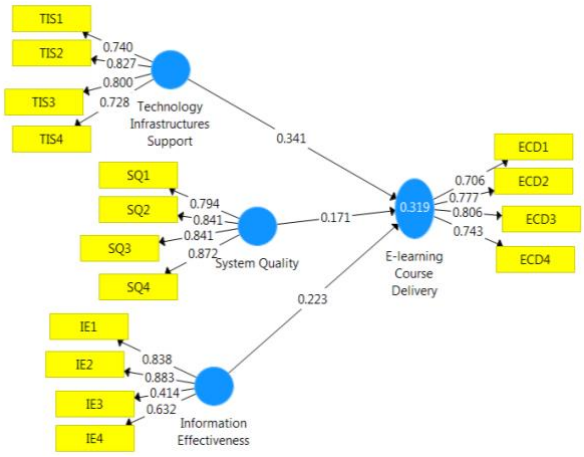

Figure 2 - PLS Algorithm Measurement Model (*Source: author's own findings*).

Internal Consistency Reliability

Internal consistency reliability refers to the extent to which all indicators of a particular (sub) scale evaluate the same concept (Hair et al. 2016). In this regard, the composite reliability score value must be at least 0.70 and AVE score value should be more than 0.50 (Hair et al. 2016). The results of the constructs in Figure 2 are shown in Table 5 and 6 below. As shown in Table 5, all the variables included in this study have AVE and composite reliability more than the threshold value of 0.50, which suggests a reliable measurement model. This study used Cronbach Alpha to observe internal consistency of the data. According to Sekaran and Bougie (2010), $\alpha > 0.9$ is deemed as excellent, $\alpha > 0.8$ is good and $\alpha > 0.7$ is acceptable. In this study, values of Cronbach are in an acceptable range. The result in Table 5 presents that the average variance extracted (AVE), Cronbach alpha and composite reliability values of all variables are in acceptable range.

Constructs	Items	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
E-Learning Course Delivery	ECD1	**0.706**	0.756	0.844	0.576
	ECD2	**0.778**			
	ECD3	**0.805**			
	ECD4	**0.742**			
Information Effectiveness	IE1	**0.847**	0.696	0.797	0.513
	IE2	**0.887**			
	IE3	**0.622**			
System Quality	SQ1	**0.794**	0.858	0.904	0.702
	SQ2	**0.841**			
	SQ3	**0.841**			
	SQ4	**0.872**			
Technology Infrastructures Support	TIS1	**0.754**	0.778	0.857	0.600
	TIS2	**0.827**			
	TIS3	**0.863**			
	TIS4	**0.728**			

Table 5 - Indicator Loadings, Internal Consistency Reliability, and Convergent Validity.

Table 5 shows that the Cronbach alpha of each variable is more than 0.70. Except for the information effectiveness with 0.696. While composite reliability of IE shows the threshold value of 0.797. This indicates that all variables of this present study have high consistency, high reliability and their AVEs exceed the threshold values, indicating the reliability of the measurement model.

Discriminant Validity

Discriminant validity is another criterion, which assesses the degree to which a variable is truly distinct from other variables (Hair *et al.,* 2016). Thus, it denotes the extent to which a particular element differs from other constructs (Duarte & Raposo, 2010). A greater level of discriminant validity suggests that the variable is distinct and could capture some phenomena that other variables do not. In this study, discriminant validity was ascertained using the square root of AVE and it should be greater than the correlations among latent constructs (Aremu, Shahzad & Hassan, 2019). This study considered the discriminant validity to confirm the external consistency of the model. The comparison

among the latent constructs is explained in Table 6. The square root of AVE of the constructs are e-Learning course delivery (ECD) = 0.759; Information effectiveness (IE) = 0.716; System quality (SQ) = 0.838 and Technology infrastructures support (TIS) = 0.775.

	E-Learning Course Delivery	Information Effectiveness	System Quality	Technology Infrastructures Support
E-learning Course Delivery	**0.759**			
Information Effectiveness	0.411	**0.716**		
System Quality	0.355	0.305	**0.838**	
Technology Infrastructures Support	0.488	0.398	0.345	**0.775**

Table 6 - Discriminant Validity Matrix.

Note: the bolded numbers in Table 6 represent the square root of average while others represent latent variable correlations.

Table 6 illustrates that the square root of AVE is greater than the correlation between latent variable indicating the acceptable discriminant validity (Aremu, Shahzad & Hassan, 2018). Initially, this research has explained the framework and indicated the links between the relationships among the variables based on the past literature. In this regard, the existing literature might need to be revised and modified based on the confirmatory factor analysis that has been conducted in this study. The CFA indicates that none of the variable should be discarded. This is in line with the recommendation with Hair et al. (2016) that stated variables with at least two items should be retained.

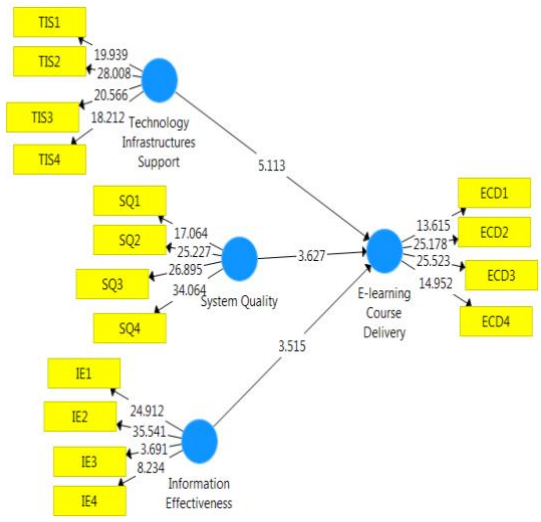

Figure 3 - Structural Model Direct Relationships (Source: author's own findings).

Table 7 highlights that all hypotheses are supported as they have a p-value of less than 0.05. H1 is supported, hence there is positive direct impact of technological infrastructure support on e-Learning course delivery (β= 0.341; T=5.113; p< 0.000). Furthermore, system quality has a direct positive impact on e-Learning course delivery (β= 0.171; T=3.627; p < 0.000), and H2 is supported. Information effectiveness also has a positive direct impact on e-Learning course delivery (β= 0.223; T=3.515; p < 0.000) and based on this result, H3 is supported. Therefore, all the three hypotheses (H1, H2 and H3) are supported. The results show the direct impact of technological infrastructure, system quality and information effective on the use e-Learning system as a course delivery platform.

CONSTRUCTS	Beta	T - Values	P - Values	Decision
Information Effectiveness -> E-Learning Course Delivery	0.223	3.515	0.000	Supported
System Quality -> E-Learning Course Delivery	0.171	3.627	0.000	Supported
Technology Infrastructures Support -> E-Learning Course Delivery	0.341	5.113	0.000	Supported

Table 7 - Result of hypothesis testing.

5. Discussions and Conclusion

This study presents a conceptual framework that examined the impacts of e-Learning system usage among higher education institutions. It has demonstrated the relationship between technology infrastructures support, system quality and information effectiveness, variables linked to the performance of e-Learning platform as a platform for course delivery. The determinants in the theoretical framework were chosen based on the input obtained from the newly developed structured questionnaire.

The results have interesting implications to both institutions and students. The finding shows that technology infrastructure support, system quality and information effectiveness significantly influence the usage of e-Learning platform and these inputs could be used to enhance the quality of services provided by higher education insititutions. The findings are in line with Al-Rahmi *et al.* (2018) and Aremu, Shahzad and Hassan (2019) who suggested that technology infrastructures support, system quality and information effectiveness fully impact the usage of e-Learning platform among students. This is because e-Learning platform connects and streamlines school operations and drastically affects the quality of services provided to the

students. Therefore, higher education institutions need to focus on aspects like technology infrastructure support, system quality and information effectiveness to ensure the successful usage of e-Learning system and to enhance the quality of services provided.

This study shows that the use of e-Learning system significantly influences students' and schools' performance. The use of e-Learning platforms has been seen to be highly efficient in providing learning support while students and teachers are forced to stay at home amidst the Covid-19 outbreak. Furthermore, the use of e-Learning platform has been found to minimise operational cost, and improves quality of services. This implies that e-Learning system usage could help schools to sustain their quality of services and competitiveness. Therefore, schools should continue to select the most appropriate e-Learning portal. It is also deduced that the e-Learning usage and implementation, influences school and students quality performance, in line with the findings of other studies (e.g. Al-Rahmi *et al.*, 2018).

This study have used TAM and DeLone-McLean, IDT to empirically establish that technology infrastructure support, system quality and information effectiveness factors generally contribute to technology adoption in the case of e-Learning system usage among students. This implies that e-Learning system could help support learning during the covid-19 outbreak and post-Covid-19 pandemic.

5.1. Theoretical Implication

Although technology adoption phenomena have been widely studied across different contexts, specifically at the individual (Student) and school (College) levels. There has been no coherent attempt to examine the phenomena in the perspectives of e-Learning system usage among students to enhance the e-Learning platform usage particularly in the context of Nigerian higher education institutions. This study can be considered as unique in the field of information system and e-Learning system in higher education institutions. Moreover, this present study provides empirical evidence in supporting the theoretical relationships hypothesised in the study's framework. It has explained the relationship between the variables such as, technology infrastructures support, system quality, information effectiveness and their significant impact on the rate of e-Learning platform usage among students.

The implications of this research on the e-Learning platform system is not only limited to validating the TAM and DeLone-McLean, IDT in the context of e-Learning platform, it also extends both constructs to increase the conceptualisation of technology use. This present study examined the factors affecting the use of e-Learning platform system by extending TAM and DeLone-McLean, IDT to include factors that are more related to information system and e-Learning usage among higher education institutions students. Both DeLone-McLean, IDT and TAM are considered as the IS tangible factors that could help higher education institutions strengthen and enhance their services. This study also helps researchers by providing an understanding about the different relationships between technology infrastructures support, system quality, and information effectiveness and their significant impact on the use of IS for online learning and how higher education institution students use the online learning system. This confirms that the effectiveness of the e-Learning system depends on the students' perceptions.

5.2. Practical Implications

This present study has several practical implications on the provision of e-Learning platform technology in Nigerian higher education institutions and other countries. Thus, the study findings will help the Nigeria government, ministry of education and higher education institutions policy-makers as well as the top managements of Nigerian universities, Polytechnics and college of education in designing the policies and programs on e-Learning platform system in the country.

The results of this study can help higher education institutions to understand and verify the significant relationship between the major variables and dependent variable. In this light, there are several practical recommendations drawn logically from the statistical findings and the results provide the top management of higher education institutions with practical recommendations to develop understanding on the implication of technology infrastructures support, system quality and information effectiveness in the improvement of e-Learning system.

The study's findings have empirically established that all factors (i.e., E-Learning system, System Quality, Information effectiveness have significant impact on the e-Learning as a course delivery) generally contribute to IS usage including the e-Learning system based on DeLone-McLean, IDT and TAM. Thus, factors in the DeLone-McLean, IDT and TAM could directly contribute positively or negatively to quality of e-Learning system provided by higher education institutions. Thus, administrators of higher education institutions could use the IS success model to enhance higher education institutions quality services by considering the relationships between factors as proposed based in TAM and DeLone-McLean, IDT. This implies higher education institutions should focus on improving the provision of e-learning system by adapting the DeLone-McLean, IDT and TAM to increase their competitive advantage.

5.3 Limitations and Recommendations

This study's scope is limited to the e-Learning among higher education institutions students in Nigeria. In terms of the methodology, this study is only limited to small population which makes it hard to generalise the data accurately to other population. On the other hand, this study provides several recommendations for future studies as stated below, first, future studies should cover

a larger population or a country as a whole so that the results can be generalised to the entire population. Second, future studies should include both private and public institutions to see their level of inclination towards online class through e-Learning systems and how it affects institutions' performance. This study also provides several recommendations for the ministry of education. First, e-Learning system has a high potential to grow and there are many applications have been created to promote and facilitate e-Learning website application for ads only. Second, the ministry of education should use this medium to reach out to their target institutions, especially in promoting their agenda. In this unprecedented health crisis, the e-Learning platform has had higher impacts compared to the traditional way. Meanwhile, students can attend their class online anywhere they go as long as they can access the e-Learning platform and can attend lectures without the need of a complex mechanism. Lastly, the use of e-Learning platform system among students could actively shape a school's learning culture and enhance the quality of services.

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Technological Pedagogical Content Design (TPCD) for a User-centered Website: A Case Study in Finland

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Abstract

Research on behavioral factors influencing website quality has resulted in user-centered website design methods. User Experience (UX) research and design are promising in identifying users' needs, requirements, expectations, and desires to enhance their satisfaction with digital products and services. This study employs User Experience Honeycomb to understand the user aspects and utilizes Technological Pedagogical Content (TPC) for a systematic redesign of the content of a user-centered website. The website of Suomen Yrittäjät, the umbrella association of Finnish SME entrepreneurs, is the context of the case study in Finland and the data is collected from immigrant entrepreneurs with the user-experience method. The data is analyzed based on TPC components. The content of website is redesigned based on TPCD assuming immigrants as adult self-learners who learn knowledge and attitudes about entrepreneurship in Finland through the Suomen Yrittäjät website. This learning and knowledge-transfer process are argued to increase their cultural adaptation into the Finnish society. The novelty of TPCD is a pedagogical view on users to learn information, values, and skills through web pages. TPCD is a practical model offering systematic instructions to utilize user-experience methods for designing user-centered websites and other digital services.

KEYWORDS: Website Designing, TPCD, User Experience, Entrepreneur, TPACK, User-Centered Website.

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1. Introduction

In the modern digital age, the Internet facilitates our communication, information retrieval, and knowledge sharing. Based on a survey of Business Data Platform, 4.66 billion active Internet users worldwide cover 59.5 percent of the global population (Business Data Platform, 2021). Further, many studies show a significant growth of the total number of Internet and digital-system users during the pandemic because of increasing use of digital education and healthcare systems, distant work, and online marketing efforts (Effenberger et al., 2020; El Junusim, 2020; Candela, 2020; Kinnunen & Georgescu, 2020). Indeed, today, more than ever, people lean on the Internet resources in order to find trusted, unbiased, updated and valid information. It increases the importance of the mission of websites, platforms, and digital companies to provide original and valid information for their users. Many individuals, companies and organizations are attempting to find better ways to understand and satisfy their audiences and potential customers through their websites. Accordingly, various studies have focused on methods and instruments to evaluate website qualities (Phuong & Dai Trang, 2018; Agrawal et al., 2019; Albelbisi, 2020, Longstreet et al., 2021).

While websites are expected to be reliable resources for receiving information, some user-experience studies have demonstrated that many websites are not meeting the minimum expectations of the users (Goncalves et

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al., 2014; Abuaddous et al., 2016; Abuaddous et al., 2016; Rocha, 2017). Due to the popularity of online shopping, numerous studies have attempted to define the important factors affecting the quality of marketing websites (Semerádová & Weinlich, 2020; Camilleri, 2021). Further, the utilization of Information and Communication Technologies (ICT) as motivational tools have received attention to enhance performance and promotion of the users in educational systems (Hashmi et al., 2019). However, limited number of studies have focused on how to structure and transfer information on organizations' websites for public users with accurate, practical, and pedagogically appropriate instructions. Accordingly, this study utilizes Technological Pedagogical Content Design (TPCD) model to create a user-centered website, particularly, for the purpose of information transfer. TPCD employs a behavioral and pedagogical lens and utilities user experience research for understanding users' needs, expectations, and experiences. It introduces systematic instructions to design a user-centered website.

The rest of the article is divided into four more sections. Section 2 explains the challenges of user-centered design of digital services, particularly websites. In section 3, Technological Pedagogical Content Design approach (TPCD) is illustrated. Section 4 describes the implications of TPCD through the user-experience case study to design the English-language part of the website of Suomen Yrittäjät (Eng. "Entrepreneurs of Finland"), which is the main interest group and service organization for the privately owned small and medium sized enterprises (SMEs) operating in Finland. Section 5 discusses the results and section 6 concludes the paper.

2. Website Designing

The literature indicates how researchers and organizations are attempting to find and introduce framework, models, methods, and tools for evaluating and designing a website. For example, Hasley and Gregg (2010) suggested the Website Information Content Survey as a tool to make cross-website comparisons and use it as a guidance for practitioners seeking to match their website's information mix to a customer's demand for product, company, and channel information. The authors believed that their tool (survey) would help web designers to understand the user interest and satisfaction to make users return to the website for purchases. Some other studies emphasize customers characteristics of a website. For example, Tarafdar and Zhang (2005), after analysing 40 successful websites, categorize websites in five groups including retail, financial services, news & information, search & portal, and entertainment. They believe that customers expect websites to be designed differently based on their different purposes. Further, Garett et al. (2016, p. 5), by reviewing the literature, found 20 design elements affecting user engagement and defined key design elements including navigation, graphical representation, organization, content utility, purpose, simplicity, and readability. They noted that, *«Different disciplines and industries have different objectives in designing websites and should thus prioritize different website design elements»*. While some studies have focused on the effects of technical aspects of a website on its quality (Sreedhar et al., 2010), others have paid attention to social theories and factors enhancing customers' (users') engagement (Busalim et al., 2019).

Regardless of the purpose of websites, the users determine the success and effectiveness of a website by their rate of acceptance and actual use. In the general context, an early theory of attention to the (human) user returns to Davis et al. (1989) and their introduced behavioral model known as Technology Acceptance Model (TAM), which originated from the Theory of Reasoned Action (TRA). Based on TRA, individual willingness, rational decision making, views and subjective norms affect the behavioral intention to use technology. Based on TRA, the views and subjective norms are separately effective on the individual view. Since Davis and his colleagues did not find any significant effect of subjective norms on the behavioral intention, the usefulness, nor the ease of using technology, they omitted them from their initial of technology acceptance model (Figure 1).

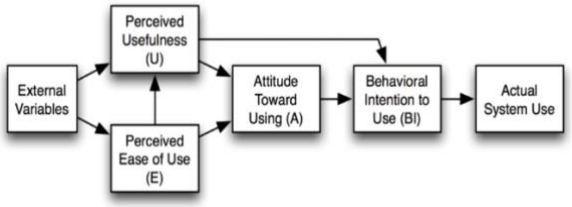

Figure 1 - Technology Acceptance Model (TAM), version 1 (Davis et al., 1989).

Extending the Davis model with the addition of key variables led to presenting a Unified Theory of Acceptance and Use of Technology (UTAUT). Later, Venkatesh et al. (2012) mixed eight theories and presented the unified acceptance theory and use of technology. Based on UTAUT, the acceptance and the use of technology have the following attributes: performance expectancy, effort expectancy, social influence and facilitating condition. Four effective variables such as age, gender, experience, and choice authority also directly or indirectly affect the behavioral intention to use technology (Venkatesh et al., 2012).

In respect to designing a website as a particular technology and digital service, the recent research attention has moved toward human mind. The understanding of how to enhance the effectiveness of websites (Busalim et al. 2019; Wang et al., 2019; Diederich et al., 2022) using behavioural and

psychological perspectives of user engagement have categorized the theories as social theories (e.g., social support, social presence, social exchange, and social influence), mass communication theories (e.g., uses and gratification, and parasocial interaction), and behavioural theories, (e.g., theory of planned behaviour and theory of reasoned action). Busalim et al. (2019) introduced a research framework of factors influencing customer engagement on websites with elements such as social factors, technical factors, motivational factors, moderators, and outcomes.

2.1. User-centered Design

Regarding attention to behavioral science in digital designing, Donald Norman introduced the term of *user-centered design* in his research laboratory at the University of California San Diego (UCSD) in the 1980s, and since then the term has been in active research use (Abras et al., 2004). Norman states four basic suggestions for user-centered designing:

«1) Make it easy to determine what actions are possible at any moment. 2) Make things visible, including the conceptual model of the system, the alternative actions, and the results of actions. 3) Make it easy to evaluate the current state of the system. 4) Follow natural mappings between intentions and the required actions; between actions and the resulting effect; and between the information that is visible and the interpretation of the system state» (Norman, 1990, p. 188).

Concurrently user-centered website as a feature of user-centered design is based on the users' context, requirements, and satisfaction. Designers use a combination of research methods and tools such as surveys and interviews and brainstorming to understand users' needs (Interaction Design Foundation, 2020). Four phases are suggested for a user-centered web design. At the first stage, the team of designers study the context of users and then define the users' needs and design a solution based on them. The outcome evaluation is continuous until the result is satisfactory. Accordingly, designing a website is described by different expertise and teams. For example, Holston (Nielsen Norman Group, 2012) defines the creation of a website as the project with eight phases (cf. Figure 2): 1) project definition (including project summary, goals, target audiences, messages), 2) project scope, 3) wireframes and site architecture, 4) visual design, 5) site development, 6) site testing, 7) launch, and 8) site maintenance. The key in creating a user-centered website is to focus on the users' needs and requirements and the satisfaction that follows from the user-experience research and design.

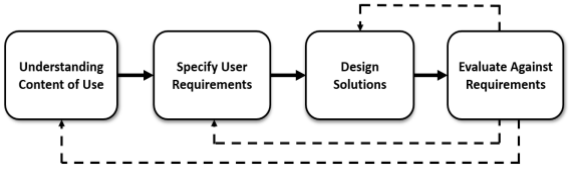

Figure 2 - Phases of user-centered approach (Interaction Design Foundation, 2020).

2.2. User Experience (UX)

The emergence of the user-centered design term is built on the concept of User Experience (UX) and derived by Don Norman. According to Jacob Nielsen and Donald Norman *«User experience encompasses all aspects of the end-user's interaction with the company, its services, and its products. The UX design takes into consideration to help user to fulfil the tasks with a product».* (Nielsen Norman Group, 2012).

The UX design is empowered by the models, methods, and techniques of user-experience research. They provide the knowledge to understand the motivations and requirements of users for turning them into actionable user-centered design products. Some of the UX models and techniques include, e.g., a value proposition to make a map of the key aspects of a product, competitive audit analysis to find the advantage of a product, cultural probes to find the ways of inspiring the users, stakeholders interviews, user interviews, brainstorming to generate ideas and visualize a broad range of design solutions, task analysis, usability testing, concept testing, A/B testing, aye move tracking, accessibility audit, and SWOT analysis to find strength, weakness, opportunity and treats (Horiachko, 2019).

Due to the development and broad acceptability of the modern user experience's research methods, Rohrer (2014) has summarized 20 popular methods in a three-dimensional framework of 1) attitudinal vs. behavioral dimension, 2) qualitative vs. quantitative dimension, and 3) the context of use dimension. For each dimension, certain key questions need to be answered through data collection and analysis. However, one of the widely used models is "User Experience Honeycomb" derived by Peter Morville (2005). The user experience honeycomb is a tool that explains the various faces of user-experience design through seven qualities (Figure 3).

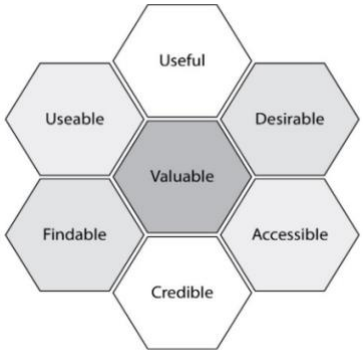

Figure 3 - User-experience items (Morville, 2005).

In the context of website designing, usability is a key issue. While attractive websites may look desirable for users, making information findable is very important. Accessibility of information through alternate types of devices or for different users is another criterium to enhance the design quality. Credibility of a website refers to how much users make other users believe and trust the provided information. The visual feature of the design needs to be attractive and easy to follow and, obviously, users are right to request for valuable information (Morville, 2005).

In this study the User Experience Honeycomb is applied to understand the users' requirements in order to design a user-centered website based on TPCD.

3. Technological Pedagogical Content for Web Designing

Numerous studies have theorized, modelled, and investigated the user experience framework, methods, and instruments to understand the acceptance and satisfaction of websites through user studies (Mtebe, 2019; Lourensia, 2020; Dang, 2020; Hartomo, 2021; Vila et al., 2021). This study adopts the UX to collect the data of users for designing a user-centred website based on Technological Pedagogical Content Design (TPCD). TPCD is originated from the Technological Pedagogical Content Knowledge (TPACK) framework introduced by Mishra and Koehler (2006) with an emphasis on using technology for learning a content for not only presenting technology but also for enhancing learning. TPACK is an educational technology framework, which utilizes a pedagogical lens in using technology for teaching and learning. TPACK has shown its potential for developing teachers' knowledge for using technology in the previous studies of the authors (Hosseini 2015a, 2015$_b$, 2016), as well as other researchers along different areas of knowledge and technology (Chai & Koh, 2017; Sintawati & Abdurrahman, 2020; Wijaya, 2020). While TPACK focuses on knowledge, Technological Pedagogical Content Design (TPCD) uses that knowledge in practice in the broader contexts for user-centred design, also outside of teacher education systems (Hosseini, et al., 2021). TPCD views the users as the self-learners who learn information through digital services (e.g., websites). TPCD is a potential model not only to define the criteria for evaluating a design, but it also offers systematic instructions for how to design an effective user-centered website. TPCD is standing on three assumptions: (1) many digital services are not successful to reach an understanding based of the information of their users; (2) each user is an adult self-learner, who learns the content of a website; and (3) the integration of technology to designing the content of a digital service (TPC) facilitates the transfer of information to the users (Hosseini & Okkonen, 2021).

TPC is defined as an integration of three fundamental components: (a) technology, which means all different aspects of technology that are available to create a website; (b) pedagogy, which provide a guidance to design a website on the proven learning theories; and (c) content, which defines the limits of knowledge related to a subject, which is proposed to be presented on a website. Further, there are three sub-integrations of TPC including Pedagogical Content (PC), Technological Content (TC) and Technological Pedagogy (TP) as seen in Figure 4.

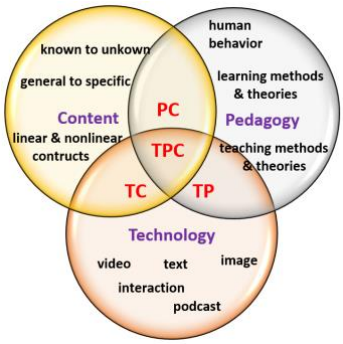

Figure 4 - Technological Pedagogical Content for designing a website (Hosseini et al., 2021).

The TPCD utilizes a user experience method for collecting data from users. It was seen in the literature how user experience design employs behavioural science to use technology for marketing. Based on a commentary report from Norman by Hassenzahl (2013): *«Design has moved from its origins of making things look attractive (styling), to making things that fulfil true needs in an effective understandable way (design studies and interactive design) to the enabling of experiences (experience design)»*. Accordingly, Gladkiy (2018) presents the UX as the intersection of information, user needs, and business goals (Figure 5).

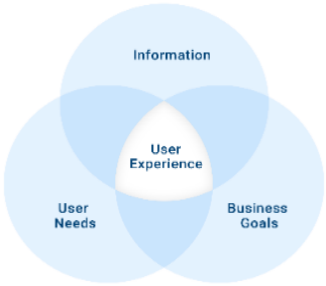

Figure 5 - User Experience (Gladkiy, 2018).

Similarly, Morville (2005) defines the UX as crossing context, user, and content (Figure 6).

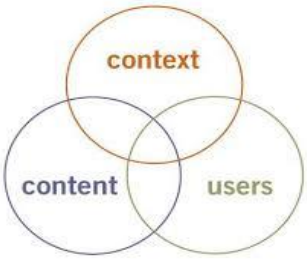

Figure 6 - User Experience (Morville, 2005).

While behavioural, social, and technical aspects to design a website are suggested in previous studies (Busalim et al., 2019), the novelty of TPCD is the integration of pedagogical principles in designing (Hosseini & Kinnunen, 2021). TPC is an intersection of technology, pedagogy, and content (cf. Figure 4). It suggests designers to understand the users as the learners and to consider learning theories and methods to increase their knowledge or change their attitude.

4. Case Study: Suomen Yrittäjät Organization Website

TPCD is a potential model for designing websites, particularly, when the information transfer to users is the top priority for stakeholders. This section explains how the TPCD model is utilized to redesign the English part of the website of Suomen Yrittäjät organization.

4.1. Aim and Scope

The aim of this study is to demonstrate the applicability of TPCD to design a website through constructed systematic instructions. The English part of Suomen Yrittäjät website is the case of study. The aim of the website is to provide information and guidance for non-Finnish speaking entrepreneurs in Finland to create and run their businesses in Finland. Studies have acknowledged a bilateral relation between cultural adaptation and successfulness in business in a host country (Jun et al., 2001; Weck & Ivanova, 2013). Indeed, an effective website can be a valid and reliable online source of information for immigrant entrepreneurs in any country.

4.2. Study Design

This study employs user experience case study. According to Merriam (1988, p. 28): *«a bounded system or case must be selected because it is an instance of some concern, issue or hypothesis»*. The case study method has shown its strength in situations where a researcher is examining the process, events, problems, and programs in a particular situation to bring understanding of a phenomenon, studying an innovation, evaluating programs, or informing policy (Merriam, 1988). According to Zainal (2007, p. 1): *«Case study method enables a researcher to closely examine the data within a specific context. In most cases, a case study method selects a small geographical area or a very limited number of individuals as the subjects of study»*. Further, this study employs design study and user experience (UX) methods to understand the user needs, expectations, and learning styles for creating a user-centered website.

4.3. Context of the Study

Suomen Yrittäjät website (https://www.yrittajat.fi/en/) is selected as the case to study the experiences of users of the English version of the website. Suomen Yrittäjät was founded in 1995 in Helsinki. It was created by the merger of the Confederation of Finnish Entrepreneurs and the Confederation of Small Industries although the history of its activities dates back to 1939. Currently, it is the largest and most influential business federation in Finland. It consists of more than 115,000 businesses of all sizes, from all corners of the country, and includes the entire range of businesses and entrepreneurs. Suomen Yrittäjät aims to promote entrepreneurship in Finland, and other international bodies, mainly by influencing the actions of the Finnish government within the European Union.

"Suomen Yrittäjät appoints prominent people from the leadership of each business sector to follow international developments within their field of responsibility" (https://www.yrittajat.fi/en/about-suomen-yrittajat/working-internationally-526846).

Suomen Yrittäjät website is presenting information in the Finnish, Swedish and English language. This study utilizes TPCD for redesigning the content of the English version of the website with the English-speaking migrants in Finland as the target user group.

4.4. Data Collection

The study utilizes user experience (UX) methods (Hassenzahl, 2013; Morville, 2005) to collect the data and thematic analysis for designing the user-centered website.

Three interviews were conducted with different cases.

First, the pilot interviews were conducted with three immigrant entrepreneurs through the audio calls at different times to understand their experiences with the Suomen Yrittäjät website. They were asked about the business areas and lengths of their entrepreneurship, membership in Suomen Yrittäjät. This interview round helped the author find the questions and the best method for the main interviews.

The second interview round was implemented with the network development manager of the Suomen Yrittäjät website.

As the main data collection method, the group interview with six immigrant entrepreneurs with different backgrounds (field and nationality) was organized. The participants were experienced entrepreneurs and active members of Suomen Yrittäjät, therefore, open questions and brainstorming was found as a suitable method to receive their opinions and suggestions for proposed solutions. The interview topics covered their challenges in their early stages of entrepreneurship in Finland and the potential information and experiences that could have helped them deal with those challenges and run their businesses. The interviewees participated actively for two hours to discuss their expectations from the new website. The interviews were recorded, transcribed, and categorized.

4.5. Procedure

"What, How and Why" model is a strategy of the user experience method. Hassenzahl (2013) summarizes his findings from the UX experience in a simple conceptual "What, How and Why" model. He defines "What" as the things that people do through an interactive product. The "How" is the way that a designer selects the techniques to increase features in an acceptable and beautiful way, and "Why" answers to what motivates a user to use a product. TPCD is using the basic questions to determine the practical levels for designing a website as follows (Figure 7):

(4.5.1) Defining the aim of the website (P analysis);

(4.5.2) Preparing the content (C analysis and developing PC);

(4.5.3) Presenting the content (TPC creation).

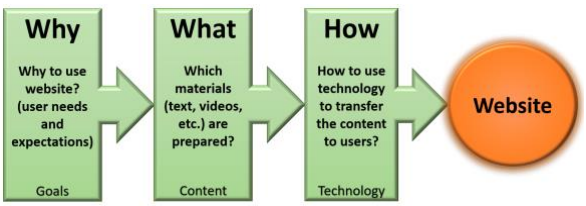

Figure 7 - The stages of designing a user-centered website based on TPCD.

4.5.1. Defining the Aim of the Website

In order to define the aim of the website, the users are categorized to public, entrepreneurs and members (Figure 8). The pilot interviews with immigrant entrepreneurs provided information to make a test website. At the next step, the aims of the website were clarified through an interview with the development manager of the website. Then unstructured interviews were conducted to define the objective goals of immigrant entrepreneurs as the target group to understand user experiences with the current website.

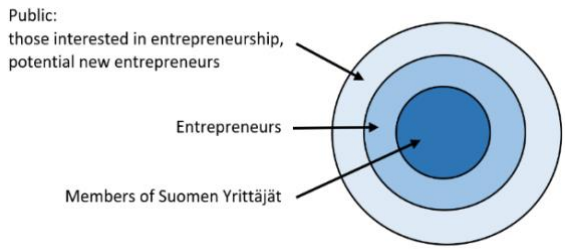

Figure 8 - Users of Suomen Yrittäjät website.

The pilot interview results of user experiences indicated immigrant entrepreneurs experience toward findability, usefulness, and desirability (Table 1).

Participants	Quotes	Analysis/ issues
Participant (A) has been managing a restaurant for more than 15 years ; He told that he was the member of Suomen Yrittäjät for about 7-8 years but he had given up his membership.	*« I am not so patient to read the website content. I prefer to get new information about training and workshops from a newsletter, and every time I have questions, I ask others on Facebook ».*	He was not able to find anything else than advertising for workshops and training courses (findability).
Participant (B) is a young entrepreneur having a translation company.	*«My company is very small and I do not need much help. I know Finnish language and I see useful information on the Finnish version of the website, but it may not be much applicable for me ».*	Usefulness of the website's content
Participant (C) is running a restaurant and he is aware of the content and usefulness of website content.	*« I don't feel in a need for that. It is more useful for big companies ».*	Usefulness of the website's content and its desirability

Table 1 - The user-experience results of the first interviews with immigrant entrepreneurs

Based on the initial results, the test website was designed in Google sites. In the test website, the content of the current website was used but the navigation and the features of the first page were changed. In other

pages, the content divided to short texts and predictable links were provided (Figure 9).

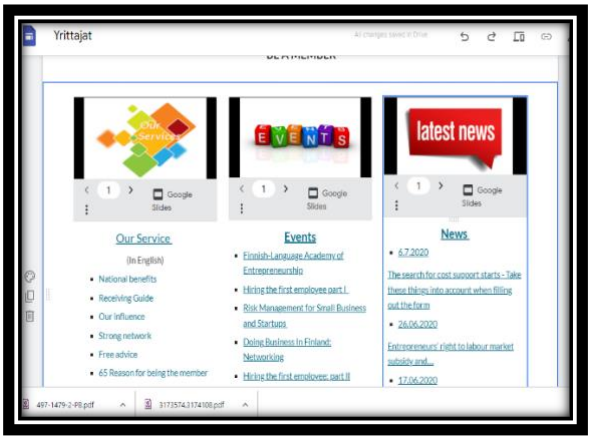

Figure 9 - A sample page of the testing website.

Next, during the interview at Suomen Yrittäjät with their network development manager, the aim for the English website was clarified as follows:

- We want to improve the everyday life of the entrepreneur.
- We want to be relevant to entrepreneur in every stage.
- We want to be customer centered.
- We offer information to help and build the community.
- We influence political decisions at different levels.
- We want our customer to feel we are there for them.

The interview with six immigrant entrepreneurs was recorded and transcribed. The results provided valuable data for a) evaluating the current website through UX themes, and b) instructions to proceed at each stage of designing a user-centered website through TPC themes (Table 2).

Since the content of the current English-language website is constituted by the translated parts of the Finnish version of the website, the target group (for whom the information/content is created) is Finnish entrepreneurs and not immigrants. Obviously, Finnish

Quotes	TPC components	UX elements
It is a huge gap of information about running a business special for someone who has come from a different [country and] background for running a business in Finland.	Content	Accessibility
Some courses were useful but some [others] were very basic	Content	Usefulness
I suggest the information be organized in detail. It should be set up as the following questions where each question leads [us] to a right path in our own business area.	Pedagogy	Findability
Many people [entrepreneurs] who are from other countries need resources to help [them to understand] how to sell products. Should someone else do that [for them] or he/herself needs to learn and sell [her/his products] or is any tool available for that? What is law? What is a boundance of immaterial? [Limitations of sales]. They [law and rules] are published somewhere but it cannot be found easily [for the user].	Content and Pedagogy	Findability
I suggest that information of the different industries be available [on the personal profile in the site] like a calendar year so that an entrepreneur receives the alarm that what, when and which action should be done [in its exact time].	Pedagogy (TP)	Findability
[we need to know] What are the main points that they are going to do? For example, there is an abundance [forbidden rule] of sales marketing that took 5-6 years for me to realize [it]. When someone starts a business, what [information] he/she can get from government.	Content	Usefulness
Practical information [that] helps starting, selling, closing, and reporting needs to be improved on the website.	Content	Usability
I believe in starting a business, an entrepreneur should know what kind of business is saturated [in the society] and I did not have any resources to select the business based on that. In other countries like Canada, information is available about who is doing what and professional services are available; [we know] what others are doing.	Content	Findability
I believe for something [some businesses] like [opening] a restaurant people may know how they go through but for the individual company or industry, information is not available. When I was in the UK or Canada, I knew whom he should talk about but here I don't know.	Content	Findability
In my opinion, a good website would be the way that, what kind of company you want [to get information about it, you] click it and then you can get [all] resources, market sales, and regulation [about the particular industry]. Each industry is different in colander. [About the tasks that should be done in each industry]	Pedagogy and (PC)	Desirability
If [the discussion] comes to immigrants, I value communication. Being in more groups. I still like [to contact] someone on the phone and tell her/his about the problems. Nowadays we are missing [information about] what not to do. Because we are still making the same mistake. It means materials are not enough or [we are] miss publishing [them] or misunderstanding [them]. Why do people still make the same mistakes?	Pedagogy (TP) Community	Desirability Findability
Some podcasts or videos, are more attractive especially for youngest that are modern.	Technology	Desirability
They [immigrants] do not have a similar society like Suomen Yrittäjät to look for and know about it [in their own countries]	Technology	Desirability Findability
I think another issue is the service doesn't have tracking [finding entrepreneurs and collecting them]. I think I even wasn't aware of about Suomen Yrittäjät before someone suggested me	Technology	Desirability Accessibility
People usually listen and watch more than read. You can see many organizations have many materials that you get bored, and you become lost in those materials. Nowadays there is a need to audio and video materials when you are not required to read.	Technology	Usability
There is a lot of information that people are not looking for and they do not know they exist.	Content and (PC)	Findability

Table 2 - Analysis of interviews regarding TPC components and UX elements.

entrepreneurs as locals are familiar with many regulations, which immigrant entrepreneurs with various backgrounds may not know. It reduces the usefulness and usability of the content for immigrants. Further, regarding TPCD, attention to pedagogical principles in presenting information may increase the accessibility and findability of the content that are not presented satisfactory on the current website. As it was suggested, diversity in materials and interactive functions by using technology can enhance the desirability of the web pages for users. However, the content of the website appears valuable and credible because a valid organization is behind the information (Table 2).

In the first stage, the results are used to clarify the website goals (a pedagogical part of the website designing). In the next stages, they are being used for the content and techniques selections (Table 2: columns 3 and 4).

Aims of Suomen Yrittäjät		Expectations / user needs
Entrepreneur in every stage	⟷	Entrepreneurship as a journey
Customer centered	⟷	Interactive website/ user tracking
Everyday life of the entrepreneur	⟷	Calendar of tasks, law, rules, etc.
Customers feel we are there for them	⟷	Professional services and resources
Building a community	⟷	Making a good networking

Table 3 - Compromising the aims of website owner and user.

Usefulness of the website is the most important factor to enhance the website quality. It is the result of overlapping the goals of users and website owners. Clarifying the goals is the starting point of website designing, which may direct further stages. Table 3 indicates the compromising aims of Suomen Yrittäjät website with expectations of immigrant entrepreneurs as the users. The overlapping goals suggest how the website should be planned to fulfil the key goals.

4.5.2. Preparing the Content (C analysis and developing PC)

In the pedagogical process, the goals are a guidance to select the content. Further, looking at the result of users' interviews indicates that, in many subjects, the content is missing on the website, not useful, usable, nor findable for immigrant entrepreneurs. Based on the results, the main topics that the participants/users need are listed in as follows:

- How to run a business in practice
- Calendar of tasks, law, rules, and regulations for different industries
- Available professional services and resources
- Other business work and competition in each area
- Government projects and networking with them
- Sales bounds in business in Finland
- Introducing Suomen Yrittäjät in the English version of the website
- Providing resources (supporting financial resources)
- Suggested content sequence presented as a journey

Some participants' suggestions were about how the content should be presented or tracked on the website. It needs to integrate components of TPC in designing, e.g., content sequences should be like a journey (Pedagogical Content); tasks should be defined as a calendar (Technological Content) or the website should be more interactive (Technological Pedagogical Content). However, in this stage of systematic designing, analysing the content is focusing on a) keeping content in line with website goals, b) defining outlines, and c) keeping outlines in sequences. During the process of developing the content (or materials), different users are taken into consideration.

Most websites have different kinds of users with different backgrounds and demands. As the results of the interviews indicated, findability is the most critical issue in organizations' websites, and it should be considered in each stage of web designing. Based on Pedagogical Content, the content sequence is reasonably determined (e.g., as unknown to known). Also, the visibility of the content on Suomen Yrittäjät website is needed for public as well as specific users including new and experienced entrepreneurs, and members. Members are supposed to receive more accurate, critical, and interactive content on the website (Figure 10).

Preparing the matrix of goal-content ensures the inclusion of all the required content related to each goal (Table 4). In this matrix, the compromised goals are divided into sub-goals. Outlines are originated from sub-goals. Each goal is defined to enhance or change the cognition or attitude of the users that in this project includes public, non-member entrepreneurs or members of Suomen Yrittäjät organization. Outlines are used to make the subcategories and the navigation features of the website when the content is inserted on the webpage.

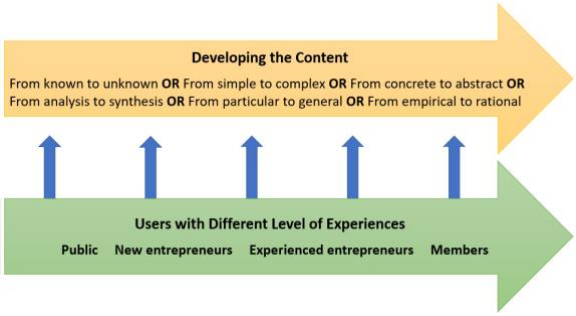

Figure 10 - Development of content.

Since there are many levels of outlines, the content map is organized using concept or mindmap tools (cf. Figure 11 for an illustrative purpose). The mindmap tool helps to organize the sequence of the content as the linear or nonlinear constructs (Hosseini & Okkonen, 2021). Mindmaps or concept maps are based on (a) a construct

Goals: users will know		Outlines		Proposed change in..	Target group
Main goals	**Sub-goals**	**Level 1**	**Level 2**		
Entrepreneurship in society (Cognitive) Encouraged to start business (attitude) Able to start a business (skill) Feel supported in the current business (attitude)	Who is an entrepreneur?	Conceptual and practical definition of entrepreneur and its place in the Finnish culture and society	Definition of an entrepreneur	Knowledge	Public
			Importance of entrepreneurship in the Finnish culture and society	Knowledge Attitude	Public, particularly immigrants
			Main challenges and advantages of being an entrepreneur	Knowledge Attitude	Public and new entrepreneurs
			The characteristics of an entrepreneur	Knowledge	Public
			Organizations related to creating a business in Finland and their service	Knowledge	Public, immigrants, new entrepreneurs
	Business in Finland	Different business area	Categories of business areas and industries	Knowledge	New entrepreneurs

Table 4 - The matrix of goals context.

of knowledge and (b) pedagogical principles. For instance, the process of opening a company in Finland may be presented as the linear content sequence, while introducing organizations to create a business in Finland and their service can be presented paralleled. The attention to reasonable sequences of content is based on user tracking and it helps predict where a user expects to find information and increase the findability of web pages. Appropriate sub-categories are recommended as an important factor to find the content (Morville & Sullenger, 2010).

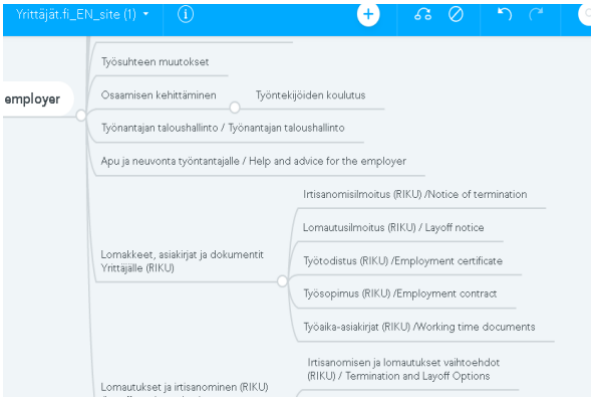

Figure 11 - A part of the online mindmap page to organize the content.

4.5.3. Presenting the Content (TPC Integration)

The style of the English-language pages on Suomen Yrittäjät website is designed in line with the main Finnish website. Since the renewal of the Finnish website involves an amount of time and work, this part of the project is still in progress. Obviously, designing the English version of the Suomen Yrittäjät website based on TPCD must be the result of a team work to integrate technology, pedagogy, and content. When the authors prepare the information as the content of the website, technologists are responsible to make materials in different formats based on the diversity and characteristics of users and formats of content such as image, text, podcast, videos, etc.

Diversity of materials attracts users with different backgrounds. One important expectation of the interviewees for the website was preparing a sequence of content as a journey. As a pedagogical rule, each user (or learner) has different speed to go through the material and learn it. Therefore, linking web pages in the way that users can find their required information in the easiest and fastest way would increase the findability of information.

Morville (2010) warns about users' googling to find information rather than using the navigation of the website. He recommends to website designers to consider multiple ways of accessing information to enhance findability (Morville & Sullenger, 2010).

Thus, even only a linear link between content as it is expected in concept/mindmap tools can be enough to enhance the findability of information on a website. Further, most users are not so patient to read long texts and pages, therefore, the content is divided into short content objects called "Learning Content Objects" (LCOs), which have clear or objective learning goals and materials that can be text, image, etc, or a combination of them. Each LCO is given a code. Linking LCO codes not only shows the sequence of content on the pages but also shows how they can be accessed through different users' journey paths (Table 5). The further attempt would develop a coding system as a digital program.

The TPC design (TPCD) is standing on the key conception of TPC knowledge (TPACK) as how to use technology for enhancing learning, not merely technology usage (Mishra & Koehler, 2006). Therefore, the principles for creating a website based on TPCD are recommended as follows: 1) reasonable classification in titles, categories, and descriptions; 2) simplicity (e.g., in colour, fonts, text, and pictures); 3) meaningfulness of items; 4) minimality; 5) clear instructions; and 6) feedback facilities (Hosseini & Okkonen, 2021).

No	Learning Content Object number	Navigation (Menu layers)		Accessing links others than menu
		Immediate previous code	Immediate next code	
1.	The stage of entrepreneurship (b)	0	(b.1)	
2.	To become an entrepreneur (b.1)	b	(b.1.1)	
3.	The establishment of a company AND buying a business (b.1.1)	(b.1)	(b.1.2)	a.1.3
4.	Basics of being an entrepreneur, general info (b.1.2)	(b.1.1)	(b.1.2.1)	
5.	Business planning (b.1.2.1)	(b.1.2)	(b.2.1.1)	
6.	practical advice (b.1.2.1.1)	(b.1.2)	(b.1.2.2)	
7.	Choosing a company form (b.1.2.2)	(b.1.2.1.1)	(b.1.2.2.1)	a.1.2
8.	Company types (b.1.2.2.1)	(b.1.2.1.1)	(b.1.2.3)	
9.	Legislations / regulations (b.1.2.3)	(b.1.2.3)	(b.1.2.4)	c.2.3
10.	Financing (b.1.2.4)		b.1.2.4.1 b.1.2.4.2	

Table 5 - Coding learning content object and links.

5. Discussion

Due to the mission of digital services for the quality of information transfer, the quality of websites has received increased attention in recent studies (Phuong & Dai Trang, 2018; Agrawal et al., 2019; Busalim et al., 2019; Albelbisi, 2020; Longstreet et al., 2021; Qalati et al., 2021). The most of these studies focus on e-commerce and marketing websites (Camilleri, 2021; Semerádová & Weinlich, 2020; Qalati et al., 2021). TPCD is a practice for integration of technology, pedagogy, and content and it appears suitable for any content-based website, e.g., a public government website (Hosseini et al., 2022_a). It employs different pedagogical aspects to define how a user as an independent adult learner can learn new knowledge, attitudes, and skills through the content of a website, while TPCD, accordingly, provides the critical instructions for a web designer to improve the quality of the content on the website (Hosseini et al., 2022_b).

TPCD a multidisciplinary model that uses pedagogical theories for using technology in a non-educational setting as well as an educational setting. It is built on Technological Pedagogical Content Knowledge (TPACK), which is a proven framework for technology integration. Mishra and Koehler (2006) proposed TPACK for developing teachers' knowledge to use technology efficiently in an educational environment. However, Technological Pedagogical Content Design (TPCD) is proposed for designing a technology based on the pedagogical rules and principles to enhance the quality of websites. It is transforming theories to practices and it provides a practical and accurate instructions for website designers on how to utilize pedagogy for: 1) directing users' minds (e.g., using Bloom taxonomy to define the goals), (2) understanding users characteristics (e.g., considering users' learning styles), (3) organizing the content (e.g., by using Gestalt principles), and (4) providing user-interaction methods (e.g., considering Edgar Dale's cone of experience), not as a sequence path but in an integrative way (Hosseini et al., 2022_c).

TPCD instructions utilize the previous theories and models of the two disciplines of information technology science as well as human science, particularly, education science to maximize the effectiveness of using technology for transferring the content. In this study, the well-established User Experience (UX) method was employed to clarify the gap. The UX method guides a website designer to realize *what* should be done to enhance the quality of the website. TPCD defines the systematic steps to show *how* the gaps can be filled.

In the presented case study, TPCD demonstrated its potential on how to improve existing organizational websites through (re)designing them. Although organizations' websites include valid and reliable information, users may have problems in finding the specific information for their needs from the abundance of web pages. TPCD was applied for redesigning the content of Suomen Yrittäjät website (its English part). The interviewed immigrant entrepreneurs needed valid online information on entrepreneurship in their host country, Finland. The lack of knowledge to start and continue work in a host country has always been an important issue for immigrant entrepreneurs (Cruz, 2018; García-Cabrera & Lucía-Casademunt, 2020; Hosseini & Hytönen, 2022) and, e.g., an entrepreneurship association owning the organization's website is responsible to provide accurate, updated, and unbiased information for them. As a reliable user-centered website designed by TPCD, it potentially benefits its entrepreneurial users, the association itself, and the society as whole.

6. Conclusion

TPCD, by making a bridge between the two disciplines of Instructional Technology and Information Technology, takes a broad perspective with a novel idea to enhance the quality of content. Understanding different experts from different disciplines (content, pedagogy, and technology sciences) is a challenging

task. TPC knowledge has already shown its potential for integrating technology into pedagogy to teach a content in an educational system even the existing diversity of content and the high speed of the technological advancements have made it difficult to provide a comprehensive design model. In this article, a starting point was constructed for transferring knowledge into a practical design.

In a narrow context, the results of this study provide insights for organizations to understand the needs and expectations of immigrant entrepreneurs and how to assist them in their entrepreneurship in host countries. These can help immigrants' cultural adaptation and increase economic activity in host countries.

The important challenge of the Suomen Yrittäjät website was limited resources. Immigrant entrepreneurs are demanding for information, which may be evident and obvious for locals. However, based on the report of the development manager of the website, the majority of the website traffic directs to the Finnish language site. And because most of the users are Finnish speakers, the majority of resources is accordingly used for the Finnish site. Therefore, in spite of understanding the needs and content suggestions, the priority of the investment for website development is still on the Finnish website and only a small amount of content is produced for immigrant users. The resource limitations force the website developers to be more critical in selecting content to present the important subjects based on the whole scale of user needs and to provide the best possible service. By utilizing pedagogical rules to define the goals and organizing the content, TPCD was found a valuable tool in assisting the website developers to select the content. Noticeably, designing a website of a big organization like Suomen Yrittäjät takes time and most likely some iterative development rounds with feedback and evaluations of the designed website.

This study was purposed to provide practical and systematical instructions to design an organization's website with a pedagogical viewpoint. In this respect, TPCD provided positive results from the real-case application presented in this paper, while further steps are required to reach TPCD's full potential and implications. Putting TPCD under practical experiments on designing either websites or various aspects of digital services may help identify the context-specific strengths and gaps for further TPCD development.

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The impact of Facebook usage in education on students' academic performance at the University of Jordan

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Abstract

Facebook, as a social networking site, is one of the most important means of communication technologies that have been widely adopted by college students and their professors worldwide. The purpose of this study is to shed light on the impact of Facebook on higher education generally and specifically on the academic performance of the students of the University of Jordan. For the completion of this study, the researchers selected a random sample of students from the University of Jordan and gave them a questionnaire on how Facebook affected their academic performance. The collected data was analyzed and tested by using correlation tests through SPSS, a data analysis program. The independent variable measured: 1- communication among students and communication between them and the faculty members; 2- sharing of resources and materials; 3- and collaboration among students. The academic achievement of students was measured by examinations and/or by continuous assessment such as (their GPAs, overuse or multitasking, and the time they spend on studying). Three pre-determined hypotheses tested are: (H1) Communication through Facebook has no significant impact on students' academic performance. (H2) The sharing of educational resources and materials through Facebook does not significantly influence students' academic performance. (H3) Collaboration among students through Facebook has no significant influence on their academic performance.

KEYWORDS: Facebook, Education, Students' Academic Performance.

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1. Introduction

Hundreds of thousands or even millions of people are heavily immersed in Web 2.0 technologies (i.e. blogs, twitter, podcasts, wikis, social network sites (SNSs), virtual worlds, video sharing and photo sharing). Social network sites are quickly becoming ubiquitous online and the social media has become one of the most important communication means in recent times.

Currently, social networks exist as a means to provide communication among people regardless of location, enabling them to easily share information, have access to files, pictures and videos, send messages, and conduct real-time conversations. Simply, they allow easy and effective communication with colleagues and coworkers. Studies showed that social network tools support educational activities by facilitating interaction, collaboration, active participation, resource sharing, and critical thinking (Ajjan & Hartshorne, 2008; Selwyn, 2009).

Using social networks in educational and instructional contexts can be considered as a potentially powerful idea, simply because students spend a lot of time on these online networking activities. Although university professors have started to address this phenomenon, there have been only a limited number of studies on social networks in education.

As a new means of communication, Facebook caters for a specific population whose members share a common interest in communicating, exchanging ideas, and sharing information. This specific population can be

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represented by any group of people in any society. Limited in scope, this study focuses on the effect of the usage of Facebook on the academic performance of a specific group of people, represented by university students within their educational environment. The population of this study is a sample of students from the Faculty of Business Administration and the Faculty of Information Technology at the University of Jordan (UJ). Modern, yet the oldest higher educational institution in Jordan, the UJ has dedicated itself to the advancement of knowledge, research and community service, offering more than 3500 different courses in 18 faculties (the website of the University of Jordan UJ).

2. Literature review

One study finds out that students spend approximately 30 minutes on Facebook as part of their daily routine (Pempek et al., 2009). Another study points out a significant negative relationship between Facebook use and academic performance (Kirschner & Karpinski, 2010). A third study shows that the majority of students claimed to use Facebook log into their accounts at least once daily. Similar results are also reported in (Boogart, 2006; Rouis et al., 2011; Junco, 2011; Junco & Cotten, 2012). According to a Nielsen Media Research study, conducted in June 2010, almost 25 percent of students' time on the Internet is now spent on social networking. As for the relationship between social media and grades, a study released by Ohio State University reveals that college students who utilize Facebook spend less time on studying and have lower grades than students who do not use the popular social networking sites (Kalpidou et al., 2011). It is reported that, on average, Facebook users score lower GPAs than their peer Facebook nonusers.

Another study points out that Facebook is currently used by people of different ages, education levels, gender, social status, and cultural backgrounds, but the same study stresses the fact that the vast majority of Facebook users are university students, aged between 18 and 25 (Mazman & Usluel, 2010). Another study, conducted by (Boyd & Ellison, 2008), shows that Facebook could be used as a supplemental tool in education. According to (Cavus et al., 2021), e-Learning and social networking sites contribute to solving education problems, especially in times of crises, such as during the COVID-19 pandemic. The study of (Mukhtar et al., 2020) shows many positive advantages of e-Learning in terms of ease of access and convenience of use in many scientific fields. During the COVID-19 pandemic, e-Learning offered an opportunity for sustainable development. The educational institutions that used it gained a competitive advantage, through the redefinition of teaching methods and channels of interaction (Sá & Serpa, 2020). The pandemic has contributed to activating the supporting capabilities, increasing the speed of response levels, managing resources and multimedia elements, and learning and practicing knowledge and skills (Chen et al. 2020; Chapman, & Marich, 2020; Liu, & Hung, 2020). The study of Greenhow and Chapman, published in 2020, indicates that social media has a role in promoting education and building societies whose citizens are aware of the importance of the use of both social media and traditional education systems, especially in times of crises, such as the COVID-19 crisis.

3. Background

3.1 Importance of Facebook

An online social networking service, Facebook was founded in February 2004 by Mark Zuckerberg and his roommate and fellow at Harvard University. As a social utility, it helps people communicate more efficiently with their friends, family and coworkers.

Many organizations work to develop technologies that facilitate the sharing of information through the social graph, the digital mapping of people's real-world social connections. Anyone can sign up for Facebook and interact, in a kind of trusted environment, with people they know. Facebook was reported to have more than 21 million registered members generating 1.6 billion page views each day (Ellison et al., 2007).

Facebook members can join networks based on school affiliation, universities, employers, and geographic regions. Facebook can be used for keeping track of old and new friends. It is free to join Facebook, and this requires only that you be over 13 years of age and have a valid email address. In 2006, Facebook was used at over 2,000 United States colleges and was the seventh most popular site on the World Wide Web with respect to total page views (Ellison et al., 2007). Undoubtedly, Facebook helps you connect and share with others.

3.2 The Benefits of Facebook in Education

When involved in classroom networks, students use Facebook as an academic tool. They also use it as a social network. Students and lecturers can be more closely connected, which in return can strengthen the lecturer-student relationship.

A unique social networking site, Facebook helps create connections between students and faculty members within an online academic community (Peruta & Shields, 2017; Liu, & Hung, 2020). It eases communication within such a community, through facilitating uploading photos and videos, with a wide variety of courseware options. According to the chart below, 52% of the users of Facebook are people aged between 18 and 34. Thus, most of the Facebook users are university students, who can access Facebook from their PC's, laptops, tablets, or smart phones (Burbary, 2011).

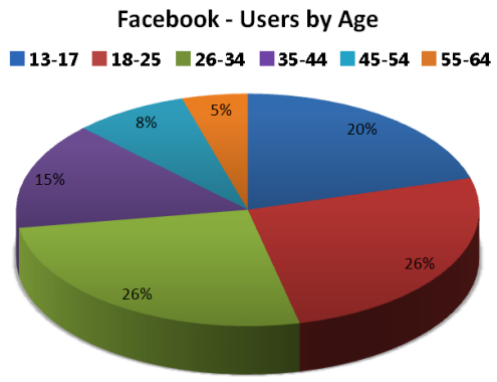

Figure 1 - Facebook Users by Age.

In higher educational institutions, Facebook is used to provide virtual training. Virtual learning environments offer an opportunity for flexible and active learning under a constructivist approach. They also cater for innovation in teaching and learning processes (Luo et al., 2017; & Almenara et al., 2019; Liu & Hung, 2020). Recently, Facebook has developed its downloadable applications, which can supplement its educational functions. Social influence is the most important factor in adopting the use of Facebook. Offering an opportunity for peers to interact and share ideas, Facebook is an educational tool for communicating. In addition to helping peers share ideas about various projects, Facebook enables both learners and teachers to choose the topics to be discussed. On Facebook, they can ask and answer questions and share information (Arteaga et al., 2014; & Hew, 2011).

4. Research goals

The objectives of the study are:

1. to show how college students use Facebook, i.e., to determine the purposes of their use of Facebook.
2. to assess, in students' opinion, whether the use of Facebook has affected their academic performance or not.

5. The Proposed Model and Hypotheses

The research model in (Figure 2) proposes a direct impact of the usage of Facebook on education, including communication, sharing of materials and resources, and collaboration. It also indicates that there is a direct correlation between Facebook and the ease to access knowledge, therefore affecting academic performance. Thus, this model posits that there is a direct impact of Facebook on the academic performance of the students of the University of Jordan, reflected by their GPAs, overuse or multitasking, and the time they spend on studying.

Beneath the graph, each dimension of Facebook usage at the University of Jordan is discussed in more detail, followed by related hypotheses.

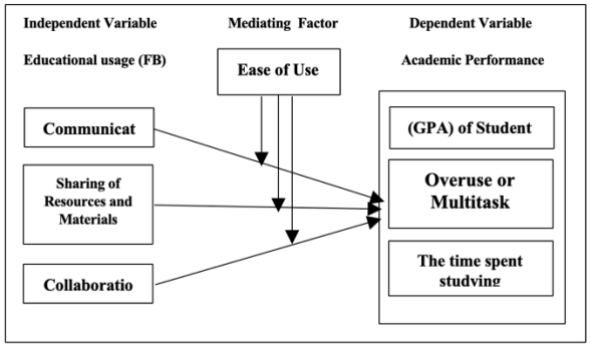

Figure 2 - The Research Model: The Impact of Facebook Usage in Education on the Academic Performance of Students at the University of Jordan.

5.1 Educational usage

As mentioned earlier, a study conducted by Boyd shows that due to students' digital proceeding and participation, Facebook could be used as a supplemental tool in education (Boyd & Ellison, 2008). According to that research, the possible factors that may affect Facebook usage are communication, sharing of resources and materials, collaboration, and ease to use. These factors are suggested to play an influential role in Facebook usage, mainly in education. Like other social networks, Facebook facilitates informal learning because of its active role in members' daily lives. Like other social networking sites too, Facebook supports collaborative learning, helps engage individuals in critical thinking, and enhances communication and writing skills through activating collective work in personalized environments (Ajjan & Hartshorne, 2008; Lockyer & Patterson, 2008). Below, some explanation is provided.

5.1.1 Communication

Communication refers to the active interactions between educators and students and among students themselves on the one hand, and on the other between students and personnel at university, which helps students access information on classes, courses, resources, announcements, departments, delivery of homework assignments, and other related links (Ekahitanond, 2018).

Communication through social networking also occurs between administrators, parents, and other community members (Butler, 2010). Not only do college students spend the greatest amount of their personal time communicating face-to-face or on the phone, but it also seems that social networking sites, mainly Facebook, might have the lion's share of these interactions among

themselves (Hanson et al. 2012; Ekahitanond 2018). According to (Meyers, 2004; Paolini, 2015), communication increases effectiveness and student motivation. It also builds rapport and allows instructors to grow professionally.

HO1: Communication has no statistically significant impact on the use of Facebook in education and eventually on students' academic performance.

5.1.2 Sharing of Resources and Materials

People exchange ideas and information through Facebook. They can also share their resources, materials, projects and documents with their staff members to build collaborative communities in higher educational institutions (Peruta & Shields, 2017). Facebook provides students with plenty of resources and materials, as well as with activities based on exchanging multimedia resources, videos, animated videos, and audio materials. Thus, through Facebook, students can easily access some links to external resources or pages, with audio and visual materials and resources.

HO2: Sharing of instructional resources and materials on Facebook has no statistically significant influence on the academic performance of students at the University of Jordan.

5.1.3 Collaboration

As Facebook contains different categorical groups and communities, it provides opportunities for members to join new networks in a way to open up spaces for collaborative learning (Selwyn, 2009; Al-Rahmi & Othman, (2012). On Facebook, people can exchange information and share knowledge within groups. In education in particular, the usage of Facebook for collaboration among members of academic groups on issues related to their universities, departments, and classes, help them carry out their common responsibilities and homework assignments. Such activities surely influence the academic performance of students, besides helping teachers both formally and informally. Simply, Facebook can be used by both as a sounding board to give informal academic advice, to receive suggestions, and to share thoughts (Amador & Amador, 2017).

HO3: On Facebook, collaboration in education has no statistically significant influence on the academic performance of students at the University of Jordan.

5.2 Usability

Ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Rogers (2003) and Thompson, Higgins, & Howell, (1991) consider ease of use as complexity and, to them, it is defined as "the degree to which a system is perceived as relatively difficult to understand and use".

Ease of use can be achieved through the use of certain software applications, websites, tools, machines, processes, or anything a human being can interact with. In human-computer interaction and computer science, usability studies the interaction with a computer program or a web site (web usability). Usability differs from user satisfaction and user experience because usability also considers usefulness. So the social networking sites, as important applications, are utilized in education to achieve many values and benefits. Thanks to the unique features of Facebook and its usability, students can perform better.

HO4a: Usability or (ease of use) of Facebook in education has no statistically significant influence on the GPAs of students.

HO4b: Usability or (ease of use) of Facebook in education has no statistically significant influence on the time students spend studying.

HO4c: Usability or (ease of use) of Facebook in education has no statistically significant influence on students' overuse or multitasking.

5.3 Academic Performance

Academic performance or achievement can be defined as the outcome of education, the extent to which a student, teacher or institution has achieved their educational goals. Aiming at measuring academic performance through dimensions such as the GPAs of students, the time spent on studying, and multitasking, this study will focus on how the use of new technologies, primarily Facebook, in education influences the academic achievement of the students at the University of Jordan.

The study will address that issue, taking into account the results of the most recent exploratory survey study that has reported a negative relationship between Facebook use and academic achievement, as measured by self-reported GPA and hours spent for studying per week (Karpinski & Duberstein, 2009). The study will also consider the results of a study conducted by Al-Rahmi & Othman, (2012), which states that when the quality of technology use is not closely monitored or ensured, computer use may do more harm than good to students' achievement. However, the study will consider the exploratory findings of another group of researchers, which show no relationship between Facebook use and the GPAs of students (Pasek, More & Hargittai, 2009). Given the overall consensus that the questioned relationship between social networking sites and academic performance remains largely unanswered, the study might help unravel such a relationship.

5.3.1 Student's Grade Point Average (GPA)

Grading in education is the process of applying standardized measurements of varying levels of achievement in a course. Grades can be assigned in

letters (for example A, B, C, D, E or F), as a range (for example 1 to 6), as a percentage of a total number, as a number out of a possible total (for example out of 20 or 100), or as descriptors (excellent, great, satisfactory, needs improvement). GPA is calculated by taking the number of grade points a student earns in a given period of time divided by the total number of credits taken by the same student.

Based on that grading system, it has been reported that college students' use of social networks has been linked to a decrease in academic success, with 8.9% of students in 2000 reporting this occurrence (Junco & Cotten, 2012). As the trend to use social media networks becomes more prominent among college students, academic failure is likely to occur. A recent study of college undergraduate students revealed that 76% of them felt that Facebook™ had a negative effect on their ability to study effectively (Pempek et al., 2009). The same study also showed that 82% of the same students felt that Facebook™ had a positive influence on their social, not educational, lives (Pempek et al., 2009).

5.3.2 Multitasking

Defined as the synchronous execution of two or more processing activities at the same time without loss of efficiency or effectiveness, multitasking is a phenomenon, explained by some by the fact that that there has been a specific evolution of our brains. Yet, to others, that is fallacious reasoning, for to them human beings are not really capable of multitasking, but can, at best, switch quickly from one activity to another (Kirschner, Sweller & Clark, 2006; Sweller, Kirschner & Clark, 2007). Therefore, multitasking on Facebook and study time split the students' attention, causing a decrease in knowledge retention (Junco & Cotten, 2012). This is because during multitasking, students engage in an unrelated activity that reduces their ability to fully comprehend knowledge being taught. It also distracts their attention from their schoolwork and adds excess loads on the brain (Wood et al., 2012). When working memory is overloaded, the brain is unable to effectively understand the information being learned (Sweller, 1994).

This is consistent with the CLT, which states that the combination of typical learning processes and external distractions can result in a reduction of the brain's ability to effectively process knowledge (Sweller,1994) and to build an effective schema (Burak, 2012). Some have even theorized that when two tasks are switched back and forth, the brain may remove one task from working memory, so that the brain does not have excess load amounts (Kieras, Meyer, Ballas & Lauber, 2000).

As technology improvements have occurred (Burak, 2012), multitasking within the classroom, represented by students' easy access to social networking sites through cell phones and laptops, has increased, leaving detrimental impact on their ability to learn and store knowledge (Ellis et al., 2011).

5.3.3 Time Spent Studying

According to Boogart (2006), heavy Facebook use is observed among students with lower GPAs. No control variables were implemented in the analyses, though. Conversely, Kolek & Saunders (2008) found that there was no correlation between Facebook use and GPA in a sample of students from a public Northeast research university. Kirschner & Karpinski, (2010) suggest that Facebook™ users spend fewer hours studying, when compared to non-users, which may lead to their poor academic performance. The theories of Astin (1984) and Chickering & Gamson, (1987) suggest that the amount of time allocated for academic work is predictive of academic success. The more the hour's students spend studying, the better the grades they score.

6. Research Methodology

6.1 Instrument Development

This study follows a quantitative methodology. Data was collected by means of an online survey and a paper format was distributed manually. A random sample of students from the University of Jordan was selected.

The survey consists of three sections. The first section includes five questions about demographic characteristics, including gender, age, social status, educational level, and the type of college. The second section focuses on specific information on whether or not the student has an account on Facebook, whether he/she uses Facebook for educational purposes, how often he/she checks his/her account on Facebook, the length of time spent on Facebook for educational purposes, and information about his/her GPA. The third section includes questions on certain specific information. All questions use a five point Likert-scale, consisting of these levels: strongly agree =5, agree =4, neutral=3, disagree=2, and strongly disagree =1.

6.2 Sampling and Questionnaire Distribution

For the purposes of the current study, a random sample of students, representing the business and IT faculties at the University of Jordan, was taken. Equal proportions of the different departments were examined. The study includes postgraduate students only.

6.3 Reliability

The Statistical Package for the Social Sciences (SPSS) has been used to get the overall stability coefficient of the study variables.

The fact that this coefficient is rated at 88.8% in this study indicates that the instrument items have reached a value higher than that of the required minimum reliability limit, usually rated at 65% (Sekaran & Bougie, 2013). The Table 1 indicates an acceptable degree of reliability required for scientific research purposes.

6.4 Data Analysis and Results

The gathered data was analyzed by the version 18.0 of the Statistical Package for the Social Sciences (SPSS), utilized for the purposes of descriptive statistics. Analytical statistics were used to test the study hypotheses. Hypotheses were analyzed by using regression analysis and variance analysis to calculate the F-value.

6.4.1 Descriptive Analysis

Descriptive statistics, which describe a set of data quantitatively, are used to find out how similar or scattered data are about a particular mean. Central tendency measures include the arithmetic mean, median, and mode. The dispersion measures include standard deviation, minimum value, maximum value, variance and others. By using normal distribution tests, descriptive statistics can indicate whether data is normal or not, as shown in Tables 2 and 3 below. As Table 2 shows, the mean of the Gender variable is equal to 1.39, and the standard deviation of the Gender variable is equal to 0.488. The mean of the Age variable, as Table 2 shows, is equal to 2.51, and the standard deviation is equal to 0.624. The maximum value of the Age variable is 4, and the minimum value of the Age variable is 2. The mean of the Social Status variable is equal to 1.29, and the standard deviation is equal 0.454. The mean of the Highest Degree Earned variable is equal to 1.97, and the standard deviation is equal to 0.157. The mean of the Type of College variable is equal to 1.58, and the standard deviation is equal to 0.494. The minimum value is equal to 1, and the maximum value is equal to 2.

6.4.1.1 The Demographic Data of the Study

1. *Gender*: In the light of the study results, Table 4 shows that the percentage of the male participants was greater than that of the female ones. Of the 318 participants, 195 were males, representing 61.3% of the total sample, and 123 were females, representing 38.7% of the total sample. See Figure: 3.

2. *Age*: Table 4, which classifies the study sample based on age, shows that the highest age category included the age range 20-29 years old. The frequency of that category was 179 of the total sample comprising 56.3%. The second category included the age range 30-39 years old. The frequency was 117 of the total sample comprising 36.8%. The lowest age category included the age range 40 years old and above. The frequency of that category was 22 of the total sample comprising 6.9%. See Figure 3.

3. *Social Status*: The sample included single and married individuals. Table 4 shows that 226 single individuals constituting the largest portion of the sample, comprising 71.1% of the total sample, participated in the study. The other 92 students who also took part in the study, comprising 28.9% of the total sample, were married. See Figure:3.

4. *Highest Degree Earned*: This study included students at the master's and PhD levels, as shown in Table 4. 310 students at the master's level constituted the largest portion of the sample comprising 97.5% of the total sample, followed by 8 students at the doctoral level, comprising only 2.5% of the total sample. See Figure: 3.

Variables		Cronbach's Alpha Value
Independent Variables	Communication	81.3 %
	Sharing of Resources and Materials	70.3 %
	Collaboration	68.2 %
Mediating Factor	Usability	62.0 %
Dependent Variable	Academic Performance	71.7 %

Table 1 - The Reliability Statistical Analysis of the Study.

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	318	1	2	1.39	.488
Age	318	2	4	2.51	.624
Social Status	318	1	2	1.29	.454
Highest Degree Earned	318	1	2	1.97	.157
Type of College	318	1	2	1.58	.494
N	318				

Table 2 - The Descriptive Statistics of the Study.

			Statistic	Std. Error
Gender	Mean		1.39	.027
	95% Confidence Interval for Mean	Lower Bound	1.33	
		Upper Bound	1.44	
	5% Trimmed Mean		1.37	
	Median		1.00	
	Variance		.238	
	Std. Deviation		.488	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		1	
	Skewness		.467	.137
	Kurtosis		-1.793	.273
Age	Mean		2.51	.035
	95% Confidence Interval for Mean	Lower Bound	2.44	
		Upper Bound	2.58	
	5% Trimmed Mean		2.45	
	Median		2.00	
	Variance		.390	
	Std. Deviation		.624	
	Minimum		2	
	Maximum		4	
	Range		2	
	Interquartile Range		1	
	Skewness		.838	.137
	Kurtosis		-.312	.273
Social Status	Mean		1.29	.025
	95% Confidence Interval for Mean	Lower Bound	1.24	
		Upper Bound	1.34	
	5% Trimmed Mean		1.27	
	Median		1.00	
	Variance		.206	
	Std. Deviation		.454	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		1	
	Skewness		.934	.137
	Kurtosis		-1.135	.273
Highest Degree Earned	Mean		1.97	.009
	95% Confidence Interval for Mean	Lower Bound	1.96	
		Upper Bound	1.99	
	5% Trimmed Mean		2.00	
	Median		2.00	
	Variance		.025	
	Std. Deviation		.157	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		0	
	Skewness		-6.093	.137
	Kurtosis		35.348	.273
Type of College	Mean		1.58	.028
	95% Confidence Interval for Mean	Lower Bound	1.53	
		Upper Bound	1.64	
	5% Trimmed Mean		1.59	
	Median		2.00	
	Variance		.244	
	Std. Deviation		.494	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		1	
	Skewness		-.346	.137
	Kurtosis		-1.892	.273

Table 3 - Descriptive Statistics: Test of Normality.

The Variables		Frequency	Percent	Cumulative Percent
Gender	Male	195	61.3	61.3
	Female	123	38.7	100.0
	Total	318	100.0	
Age	Less than 20 years	0	0	0
	Between 20 - 29 years	179	56.3	56.3
	Between 30 - 39 years	117	36.8	93.1
	Between 40 - 49 years	22	6.9	100.0
	50 years or older	0	0	0
	Total	318	100.0	
Social Status	Single	226	71.1	71.1
	Married	92	28.9	100.0
	Total	318	100.0	
Highest Degree Earned	Master	310	97.5	97.5
	PHD	8	2.5	100.0
	Total	318	100.0	
Type of College	Humanity Colleges - (IT College)	186	58.5	58.5
	Scientific Colleges -(Business College)	132	41.5	100.0
	Total	318	100.0	

Table 4 - The Demographic Data of the Study.

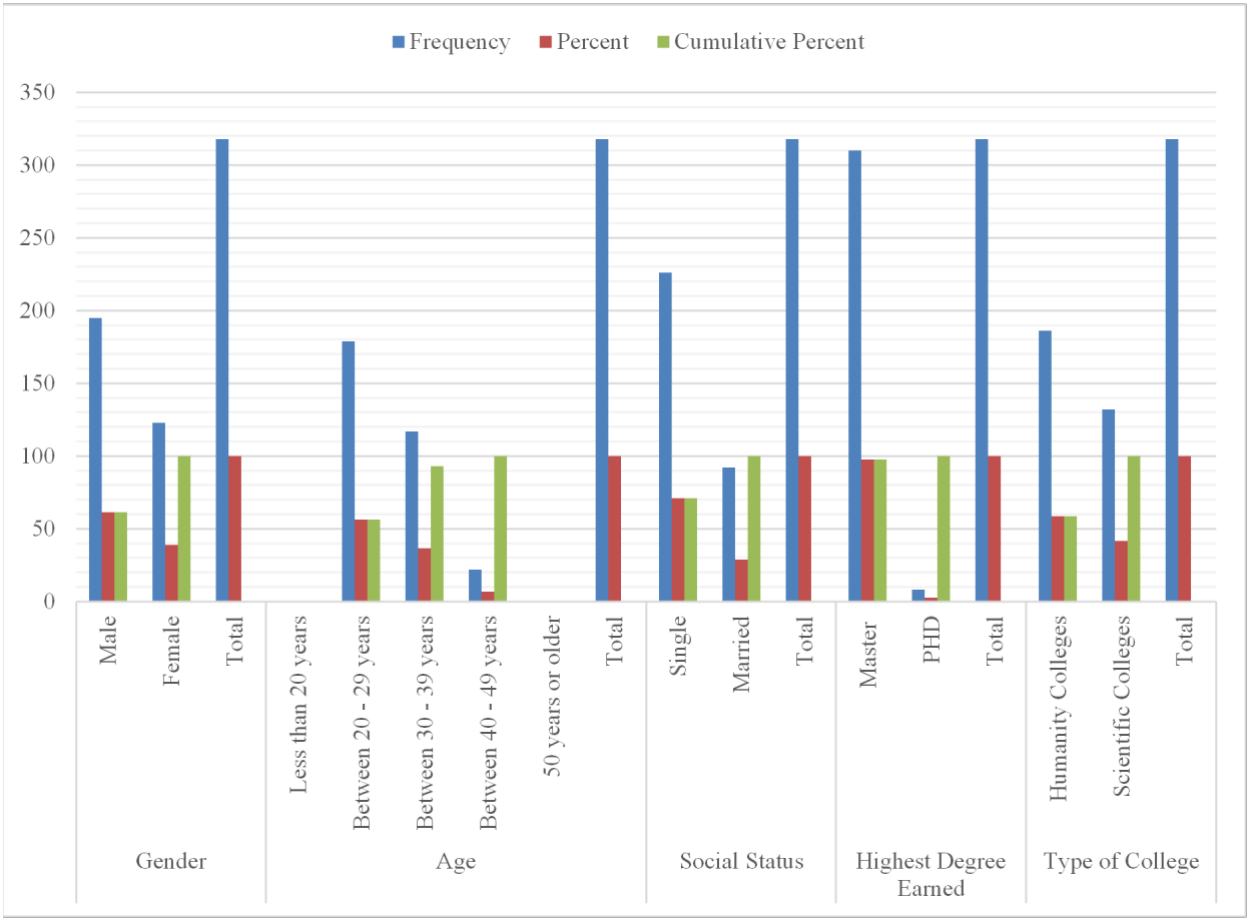

Figure 3 - The Demographic Data of the Study.

5. *Type of College*: Both colleges or faculties of the humanities and science were included in the study. Table 4 shows that faculties of the humanities represented the highest frequency. 186 individuals comprising 58.5% of the total sample, were from the humanities, while 132 individuals, comprising 41.5% of the sample, were from the faculties of science. See Figure 3.

6.4.1.2 Facebook Usage

In the paragraph on Facebook usage as a tool in education, there are 4 questions. Below are the answers to them, as shown in Table 5.

Question 1. Do you use a Facebook account for educational purposes? Table 5 shows that the number of students that use Facebook for educational purposes is greater than the number of students who do not. 309 students comprising 97.2% of the total sample use a Facebook account for that, while only 9 students comprising 2.8% of the total sample do not.

Question 2 On average, how often (many time per day) do you check your account on Facebook? As shown in Table 5, the frequency of students who check their Facebook accounts 5 times a day is the greatest. 138 students comprising 43.4% of the total sample check their accounts 5 times daily. 99 students comprising 31.1% of the total sample check their accounts once daily. 66 students comprising 20.8% of the total sample check their accounts 6-10 times daily. 15 students comprising 4.7% check their accounts more than 10 times daily.

Question 3. How much time do you spend daily on Facebook for educational purposes? As shown in Table 5, 162 students comprising 50.9% of the total sample spend less than 30 minutes a day on Facebook for educational purposes. 122 students comprising 38.4% spend approximately one hour daily for the same purpose. 34 students comprising 10.7% spend one to two hours daily for that too. No students spend more than three hours daily on Facebook for educational purposes.

Question 4. What is your GPA? Based on the results shown in Table 5, 263 students comprising 82.7%, the highest percentage, have very good GPAs. 34 students comprising 10.7% have excellent GPAs. 21 students comprising 6.6% have good GPAs. No students have acceptable GPAs.

6.4.2 Hypotheses Testing

In this section, the study hypotheses will be discussed, analyzed and measured based on the three independent variables and the mediating one used in the study. The extent of their influence on the academic performance of the postgraduate students of the Faculties of Business and Information Technology (IT) at the University of Jordan was measured.

1. *Measuring the direct impact of the Independent Variables on the Dependent Variable (in the absence of the Mediating Factor)*.

In the light of the results of the linear regression analysis, as described in Table 6, there is a statistically significant positive relationship among all independent variables and the dependent variable. This relationship is represented by collaboration, sharing of materials and resources, communication, and dependent variable academic performance. The value of (R) was as follows: R= 0.49, R= 0.77, R= 0.92, and the value of the coefficient of determination (R2) was as follows: R2= 0.24, R2= 0.60, R2=O.86. These ratios indicate what can be explained by the academic performance

Question			**Frequency**	**Percent**	**Cumulative Percent**
1.	**Do you use Facebook account for education purpose?**	Yes	309	97.2	97.2
		No	9	2.8	100.0
		Total	**318**	**100.0**	
2.	**On average, how many times in a day can check your account on Facebook?**	Once a day	99	31.1	31.1
		5 times a day	138	43.4	74.5
		6-10 times a day	66	20.8	95.3
		More than 10 in a day	15	4.7	100.0
		Total	**318**	**100.0**	
3.	**What is the length stay in Facebook for education?**	Less than 30 minutes	162	50.9	50.9
		Approximately an hour	122	38.4	89.3
		Between 1 - 2 hours	34	10.7	100.0
		More than 3 hours	-	-	
		Total	**318**	**100.0**	
4.	**What is your GPA?**	Excellent	34	10.7	10.7
		Very Good	263	82.7	93.4
		Good	21	6.6	100.0
		Acceptable	-	-	
		Total	**318**	**100.0**	

Table 5 - Facebook Usage Data of the Study.

through the three independent variables in this model, and the remaining ratios are caused by other factors that cannot be explained or measured in the model of this study.

In addition, when explaining this case, the null hypothesis shall be rejected, which states that there is not any statistically significant impact of the use of Facebook in education on the academic performance of the postgraduate students at the University of Jordan, through the independent variables as follows:

- Communication on Facebook has no statistically significant impact on education and eventually on students' academic performance. According to the statistical rule and because the value of the (sig. F) is less than $\alpha = 0.05$, then the null hypothesis is rejected and the alternative hypothesis is accepted, which means that communication on Facebook has a statistically significant effect on education and eventually on students' academic performance.
- Sharing of resources and materials: the null hypothesis is rejected and the alternative hypothesis is accepted because the value of (sig. F) is less than $\alpha = 0.05$. This means that sharing of resources and materials through Facebook has a statistically significant effect on education and eventually on students' academic performance.
- Collaboration: the null hypothesis is rejected and the alternative hypothesis is accepted because the value of (sig. F) is less than $\alpha = 0.05$. This means that there is a statistically significant effect of collaboration on students' academic performance.

As a result, the highest contribution into the variance occurred in the dependent variable is represented by collaboration with (β) coefficient of 1.074, then the sharing of resources and materials with (β) coefficient of 1.062, while the lowest contribution represented by communication with (β) coefficient equal 0.702.

2. *Measuring the direct impact of the Mediating Factor (Usability or Ease of use) on the Dependent Variable (Academic Performance).*

In the light of the results of the linear regression analysis, as described in Table 7 below, there is a statistically significant positive relationship between the mediating variable, usability, and the dependent variable, academic performance. This relationship is represented by the value of (R) which was R= 0.808 and the value of the coefficient of determination (R2) which was R^2= 0.653.

In addition, when explaining this case, the null hypothesis shall be rejected, which states that there is not any statistically significant impact of usability; i.e. the ease of use of Facebook, on education and on the academic performance of the postgraduate students at the University of Jordan. The value of (sig. F) was less than $\alpha = 0.05$, as shown in Table 7 below.

As a result, and as shown in Table 7, the contribution degree into the variance occurred in the dependent variable is represented by usability with (β) coefficient of 1.091. This is a confirmation that there is a direct relationship between the mediating variable (usability or ease of use) and the dependent variable (academic performance), in the absence of the independent variables in this study.

3. *Measuring the direct impact of the Independent Variables on the Mediating Factor (Usability or Ease of use).*

In the light of the results of the linear regression analysis, as described in Table 8 below, there is a statistically significant positive relationship among all independent variables and the mediating variable (usability or ease of use). This relationship is represented by collaboration, sharing of resources and materials, communication, and the mediating variable (usability or ease of use). The values of (R) were R= 0.337, R= 0.581, R= 0.791, and the values of the coefficient of determination (R2) were as follows: R^2= 0.114, R^2= 0.338, R^2= 0.625. These ratios indicate what can be explained by the usability of the Facebook through the three independent variables in the study model, and the remaining ratios are caused by other factors that cannot be explained or measured in the model of this study.

In addition, when explaining this case, the null hypothesis shall be rejected, which states that there is not any statistically significant impact of the independent variables and the mediating variable (usability or ease of use of Facebook) on the education of the postgraduate students at the University of Jordan. The value of (sig. F) is less than $\alpha = 0.05$, as shown in Table 8 below.

As a result, and as shown in Table 8, the highest contribution into the variance occurred in the mediating variable is represented by collaboration with (β) coefficient of 0.678, then the sharing of materials and resources with (β) coefficient of 0.590, while the lowest contribution represented by communication with (β) coefficient of 0.356.

4. *Measuring the effect of both the Independent and Mediating Variables on the Dependent Variable.*

As shown in Table 9, it was found that there is a strong positive relationship between all independent variables and the dependent variable in the presence of the mediating variable. This relationship is referred to by the values of (R): R= 0.841, R= 0.891, R= 0.936, and the values of the coefficient of determination (R2): R2= 0.708, R2= 0.794, R2= 0.876. Note that, compared to the first case, the values of (R) and (R2) have increased with the presence of the mediating variable with all independent variables. This is evidence of the amount of contribution to influence and the strength of the

1.Measuring the direct impact of the Independent Variables on the Dependent Variable (in the absence of the Mediating Factor):						
H_{O1}: Communication has no statistically significant impact on the use of Facebook in education and eventually on students' academic performance.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.492[a]	.242	.240	.34995	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		12.366	1	12.366	100.979	.000[a]
Residual		38.699	316	.122		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	1.357	.298		4.548	.000	
Communication	.702	.070	.492	10.049	.000	
H_{O2}: Sharing of instructional resources and materials on Facebook has no statistically significant influence on the academic performance of students at the University of Jordan.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.775[a]	.601	.600	.25394	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		30.688	1	30.688	475.879	.000[a]
Residual		20.378	316	.064		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-.207	.209		-.991	.322	
Material and Resources Sharing	1.062	.049	.775	21.815	.000	
H_{O3}: On Facebook, collaboration in education has no statistically significant influence on the academic performance of students at the University of Jordan.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.928[a]	.861	.861	.14966	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		43.987	1	43.987	1963.775	.000[a]
Residual		7.078	316	.022		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-.312	.106		-2.961	.003	
Collaboration	1.074	.024	.928	44.314	.000	

Table 6 - The hypotheses testing results to the independent variables (Communication, Material and Resources Sharing, and Collaboration) on the dependent variable (Academic Performance).

2.Measuring the direct impact of the Mediating Factor (UsabilityEase of use) on the Dependent Variable (Academic Performance):						
Testing hypotheses: H_{O4a}, H_{O4b}, and H_{O4c}		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.808[a]	.653	.652	.23675	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		33.353	1	33.353	595.051	.000[a]
Residual		17.712	316	.056		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-.400	.195		-2.048	.041	
Usability or Ease of use	1.091	.045	.808	24.394	.000	

Table 7 - The hypotheses testing results to the mediating variable (Usability or Ease of use) and the dependent variable (Academic Performance).

relationship between these variables and the dependent variable.

Also, based on the results in Table 9, we shall reject the null hypothesis and accept the alternative hypothesis that there is a statistically significant effect of the independent variables in the presence of the mediating variable on the dependent variable because the value of (sig. F) is less than $\alpha = 0.05$.

As a result, the highest contribution into the variance occurred in the mediating variable is represented by collaboration with (β) coefficient of 0.678, then the sharing of materials and resources with (β) coefficient of 0.590, while the lowest contribution represented by communication with (β) coefficient of 0.356.

In addition, the contribution of the independent and mediating variables in the proposed study model to the dependent variable through the value of (β) coefficient is in the descending order shown in Table 10 below. From these values, we notice that the mediating variable mediates the relationship between the independent variables and the dependent variable where the value of (sig. F) was closer to zero. Hence, after completing all the previous steps, it can be shown that the mediation is complete between the mediating variable (usability) and the dependent variable (academic performance) in this study.

7. Discussion and Conclusion

The technological development that the world is witnessing nowadays is an incubator for the massive emergence of applications and electronic means of communication, and Facebook is one of the electronic means that can play an effective role in the process of

3.Measuring the direct impact of the Independent Variables on the Mediating Factor (Usability or Ease of use):						
Communication on Usability or Ease of use		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.337[a]	.114	.111		.28034
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		3.180	1	3.180	40.464	.000[a]
Residual		24.834	316	.079		
Total		28.014	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	2.835	.239		11.860		.000
Communication	.356	.056	.337	6.361		.000
Material and Resources Sharing on Usability or Ease of use		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.581[a]	.338	.336		.24230
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		9.462	1	9.462	161.176	.000[a]
Residual		18.552	316	.059		
Total		28.014	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	1.822	.200		9.121		.000
Material and Resources Sharing	.590	.046	.581	12.696		.000
Collaboration on Usability or Ease of use		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.791[a]	.625	.624		.18231
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		17.511	1	17.511	526.828	.000[a]
Residual		10.503	316	.033		
Total		28.014	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	1.411	.129		10.976		.000
Collaboration	.678	.030	.791	22.953		.000

Table 8 - The hypotheses testing results to the independent variables (Communication, Material and Resources Sharing, and Collaboration) and the mediating variable (Usability or Ease of use).

4.Measuring the effect of both the Independent and Mediating Variables on the Dependent Variable:						
Communication and usability or Ease of use on Academic Performance.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.841[a]	.708	.706	.21770	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		36.137	2	18.068	381.245	.000[a]
Residual		14.929	315	.047		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-1.416	.223		-6.347	.000	
Usability or Ease of use	.978	.044	.725	22.395	.000	
Communication	.354	.046	.248	7.664	.000	
Material and Resources Sharing and usability or Ease of use on Academic Performance.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.891[a]	.794	.793	.18270	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		40.551	2	20.275	607.411	.000[a]
Residual		10.515	315	.033		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-1.536	.169		-9.072	.000	
Usability or Ease of use	.729	.042	.540	17.189	.000	
Material and Resources Sharing	.632	.043	.461	14.684	.000	
Collaboration and usability or Ease of use on Academic Performance.		R	R Square	Adjusted R Square	Std. Error of the Estimate	
		.936[a]	.876	.875	.14169	
Model		Sum of Squares	df	Mean Square	F	Sig.
Regression		44.741	2	22.371	1114.226	.000[a]
Residual		6.324	315	.020		
Total		51.065	317			
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	-.690	.117		-5.880	.000	
Usability or Ease of use	.268	.044	.198	6.128	.000	
Collaboration	.892	.037	.771	23.816	.000	

Table 9 - The hypotheses testing results to the independent variables (Communication, Material and Resources Sharing, and Collaboration) and the mediating variable (Usability or Ease of use) on the dependent variable (Academic Performance).

Highest contribution	***Medium contribution***	***Lowest contribution***
Collaboration = 0.892	Material and Resources Sharing = 0.632	Communication= 0.356
Usability = 0.268	Usability = 0.729	Usability = 0.978

Table 10 - The contribution of the independent and mediating variables on the dependent variable in the proposed model in the study.

electronic communication in many fields, especially in higher education. Looking at the results shown previously in Tables 6 - 10, it is found that each of the three independent variables, whether alone or together, (collaboration, the sharing of resources and materials, and communication), in addition to the presence of the mediating factor (usability or ease of use) have a positive impact, statistically significant, on the dependent variable represented by the academic performance of the students in the study. This leads to the following conclusions:

1. Universities should be encouraged to invest in using these tools and applications in all their academic departments, the humanities and science.

2. Facebook applications should be used because of their positive impact on the learning process and teaching methods, and because of the diverse environment they can offer to both teachers and students, which will greatly boost the academic performance of students and upgrade the skills of both teachers and learners.

3. Facebook applications should be used since they have certain features and characteristics that make Facebook function as an educational platform and as an electronic source available at any time to all. Information and educational resources needed by students can be shared easily and quickly on Facebook, and they can be kept for a longer period of time.

4. Information sharing and easy access to data or other information can be achieved through Facebook.

5. Facebook usage can help educational institutions achieve their strategic goals, improve their competitiveness, and add new work values to the services they offer.

6. All educational institutions, public and private universities in particular, should cooperate, collaborate and work hard to provide electronic educational platforms available to everyone at all times, and to use various means and applications in education and for society development.

7. All other educational institutions that do not use such electronic means should have deep insight in this field and should move forward towards starting using such applications, due to the progress they can achieve in science. Such adoption will create new opportunities for innovation and diversity in technology as well, which will eventually impact positively all development sectors in the country.

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University climate in distance education contexts: developing an assessment instrument

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Abstract

The article presents the validation of an instrument for the assessment of students' perception of the university climate in distance education settings. Also in such contexts, students establish relationships with classmates and teachers, and feel the atmosphere, the sense of belonging to an institution and to a community of learners. For teachers, however, it is difficult to understand how students perceive these dynamics. Therefore, the University Climate Questionnaire for Distance Education Contexts (UCliQ-DE), composed of 22 items, has been developed and validated through factorial analysis and reliability studies among a population of freshmen in an Italian BA program in Educational Sciences. It was concluded that the UCliQ-DE is a valid and reliable assessment tool, and that it yields five interpretable factors: the perception of the relationships among students, the sense of belonging to the academic community, the previous expectations about the online university climate, the perception of the relationships between students and teachers, and the awareness of the potential limits of online interactions.

KEYWORDS: University Climate, Distance Education, Psychometric Validation, Assessment Tool, Classroom Relationships.

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1. Introduction

What happens to the university climate when all activities are online? Can we still speak of a "climate" when students never meet in person? And, if a climate exists, what are the factors that contribute to its creation?

These are some of the questions we asked ourselves during the 2020-21 Covid-19 pandemic when we, like so many other university teachers, had to teach our lessons using screens instead of physical classrooms. We were not used to doing this, we felt the difficulty of understanding what was going on among our students, and we also empathized with the troubles of young adults who were home alone for extended periods, attending virtual lectures together with classmates they never met in person.

This was the situation encountered in institutions of higher education all across the globe during the pandemic, which we faced with open hearts and minds, hoping to return soon to our traditional ways of working. However, this is also the typical situation at distance-learning universities, which are here to stay, as it seems. We are therefore convinced that the dynamics of the university climate in distance education settings is a topic whose relevance will remain beyond this particular moment of time – if we believe in universities not as mere sites of instruction, but as places where people learn and live, build and maintain relationships, develop and grow.

Starting from these thoughts and our experience, we present here the validation of an instrument for assessing the university climate in distance education contexts. The rationale of this work, as we outline in the next section, is based on previous research on the nature of the university climate and its connection with academic achievements, negative behaviors, and a sense of community. In the ensuing sections, we then

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present the instrument we developed – including the research context and goals, the method and sample used, the statistical analyses conducted, and the results achieved – and prove its validity and reliability.

2. Assessing the university climate: state of the art

In the psychological and pedagogical literature, different but complementary definitions of "university climate" can be found. These definitions sometimes recall the research developed in the wider field of the school climate and underline distinctive nuances of the concept. For example, one of the most comprehensive definitions states that the university climate is a complex of «rules, trust, academic supports, personal and social relationships among classmates and between professors and students, and academic connectedness» (Sánchez et al., 2015, p. 390). Souza et al. (2018, p. 2073), instead, define the university climate as the way in which «university students perceive and feel about the social relations that occur in and out of the classroom». Other studies again consider the university climate as the interaction of four specific dimensions: «(i) the university historical legacy of inclusion/exclusion; (ii) the structural diversity or the capacity to include students representing various groups (race, ethnicities, religions, sexual orientations, disabilities); (iii) psychological climate, that is, the perceptions and attitudes between and within groups; and (iv) the behavioral climate which includes the formal or informal interactions between groups» (Souza et al., 2018, p. 2073).

The university climate is an important factor for the general growth of students and the development of both positive and negative behaviors. On the one hand, research has verified the effect of the university climate on academic achievements, students' wellbeing, self-esteem, sense of community, engagement, and the development of an adequate professional identity (Gunuc et al., 2022; Kurt et al., 2022; Machado et al., 2002; McMillan & Chavis, 1986; Rania et al., 2014; Rovai, 2002; Sánchez et al., 2015). Moreover, research on international students shows that their positive perceptions of the university climate improve their social integration and allow them to overcome «challenges related to discrimination, stereotype, and linguistic barriers» (Jean-Francois, 2019, p. 1071). On the other hand, the university climate has been shown to have effects on the development of inappropriate or dysfunctional behaviors, such as internet addiction, aggressive conduct, bullying, psychological distress, and academic dropout related to feelings of isolation (Casas et al., 2013; Conley et al., 2013; Li et al., 2016; Rovai, 2002).

Because of its importance in campus life, some instruments to assess the university climate have already been developed, each of them investigating specific dimensions of the construct. The three main examples of such instruments are the following:

- The *Classroom Social Climate Scale for Universities* (CSCS-U) by Sánchez et al. (2015), which studies three main factors: (i) the relationships among peers, (ii) the teachers' performance and the relationships between teachers and students, and (iii) the sense of belonging as a product of following the rules.
- The *Institutional and Psychosocial Campus Climate Inventory* (IPCCI) by Souza (2018), which analyses four factors in relation to cases of cyberbullying: teacher support, institutional readiness, newcomer adjustment during socialization, and students' feeling of wellbeing.
- The QSS-S version of the *Climate scale*, as modified by Santinello & Bertarelli (2002), which investigates ten main factors: relationships with peers, students' relationships with teachers, signs of physical and emotional expression, interest in studying, study method, parental expectations, self-esteem related to school tasks, institutional environment, future employability, and one's own social desirability.

None of these instruments, however, was specifically intended for studying the university climate in distance education contexts. Only one tool – the Classroom Community Scale by Rovai (2002) – partially lends itself to this particular purpose, but does not assess the university climate as a whole, as it exclusively measures the sense of community in relation to the learning achievement.

Due to the above reasons, and for the purpose of this study, we developed and validated a new assessment instrument, which is presented in this article. Among the many elements that, according to the reviewed literature, contribute to the university climate, we chose five main dimensions that were best suited for the purpose of our study: students' initial expectations regarding the climate that would be established throughout the semester via online tools; students' perceptions of their social interactions with peers; students' sense of belonging to the academic community; students' perceptions of the interactions between students and teachers; and students' awareness of the potential limits that online tools may have had on the university climate.

3. Context and aims of the research

Since March 2020, the Covid-19 pandemic has been spreading all over the world. Italy, and in particular Northern Italy, faced severe situations, which led to massive changes in all spheres of life. In line with the legislation in effect at the time, the bachelor program in Educational Sciences at the University of Parma went fully digital [The program in Educational Sciences (Scienze dell'educazione e dei processi formativi) is a

three-year bachelor program and belongs to the Class L-19 of the Italian national classification system for university programs. Its aim is to train future social and early childhood educators in out-of-school contexts. At the University of Parma, this program started in 2006 and, in May 2021, counts 1,133 enrolled students].

All activities that usually require the physical presence of groups of people (lectures, seminars, workshops, internships, exams, graduations, etc.) were held in virtual mode, mainly via two dedicated platforms: Microsoft Teams for videoconferencing, and a customized version of Moodle, called Elly, which was used for sending messages, sharing learning materials, managing group work, and conducting exams. In addition to these dedicated teaching tools, many members of the academic community used the existing social networks to overcome isolation. The University of Parma created special online communities (for example, by department) but, for the most part, it was the students themselves creating the informal groups they felt were needed.

In this context, and based on the scientific research in this field, we designed a small-scale study with the purpose of investigating the university climate among the freshmen of the program. We elaborated a specific instrument that was intended to assess students' perceptions of the university climate in a distance education setting. The choice to focus on freshmen originated from the fact that during the said period the first author was teaching a 60-hour course to first-year students. In addition, both authors were particularly interested in understanding the dynamics emerging among students who would never meet in person throughout the course.

The semester began on September 14, 2020, with 346 newly enrolled students in the program. During three online meetings, which were open to everybody, the newcomers were given information about university life, academic services, students' duties and possibilities. These meetings were held by several teachers of the program, with the aim of making themselves acquainted to the students.

During the fall semester, the students had to take four mandatory courses (plus an additional one for only half of the group):

- Theory of Education (*Pedagogia generale e sociale*), for 12 ECTS credits, taught by the first author of this article.
- History of popular and educational literature (*Storia della letteratura popolare e giovanile*) (6 ECTS credits).
- Literature (*Letteratura generale*) (6 ECTS credits).
- English language, level B1 (6 ECTS credits).
- Educational support to social disadvantage (*Interventi educativi per la marginalità e la devianza*) (6 ECTS credits), mandatory only for those students who had chosen this focus.

Teaching these courses was a major challenge for everyone involved because of the exclusive use of online tools and the large number of students, none of whom had previous college experience. Teachers were also acutely aware of the difficulties their students were facing, making the social transition from high school to university, being confined alone at home, and without the possibility to meet their classmates in person.

The course "Theory of Education", in the context of which the research was carried out, encompassed 60 hours of lessons given by the teacher, and 240 hours of private study by the students. The course consisted of three two-hour classes per week, and lasted ten weeks. It ran from September 14 until December 3, with an intermediate break of two weeks [Specific information on this course can be found on the institutional website of the University of Parma, at https://cdl-sepf.unipr.it/it/degreecourse/details/190554 (last accessed on April 7, 2022)].

With the specific audience and context in mind, the teacher organized the course as a learning environment made up of several fully integrated components, which allowed students to actively participate in the course, instead of being passive listeners of lectures. The learning environment was composed of the following elements:

- 30 live (synchronous) online lectures given by the teacher through Microsoft Teams. In each of these lectures, the teacher organized at least one short activating exercise, such as identifying the key aspects of the topic at hand, discussing a given subject in specifically created online groups of classmates, filling in a questionnaire, participating in online forums, and so on.
- A cycle of three live online lectures introducing the basic concepts of educational psychology (given by an expert).
- Online exercises and activities to be carried out in small groups of four to five students, which were randomly put together by Moodle. Over the ten weeks of the course and starting from week 2, when the groups were created, the teacher assigned four group activities. For two of them, groups were asked to write a paper; for the other two, they only had to discuss specific topics, based on an assigned list of questions and prompts.
- A series of handbooks and digital texts to be studied individually, guided by assigned exercises.
- Specific training, provided by teaching assistants, on academic writing during exams.

The course, as described above, received good evaluations from students who filled out the official course assessment questionnaire of the University of Parma (OPIS) [On May 21, 2021, the average score of the course was equal to 26,6/30 points, ranking fourth of the 33 courses assessed in the program (average score of the program= 24,3; N=229)].

4. Method

In the context described and for the reasons outlined above, we investigated the university climate among the students attending the aforementioned courses from home.

4.1 Research questions and hypothesis

This investigation was split into several research questions regarding: (a) students' perceptions of the university climate, its quality, and the dynamics that generated it; (b) the expectations students had, before the beginning of the semester, about the social climate they would experience; and (c) the actual interactions they had with classmates and teachers, both online and offline, if any. In addition, we also addressed the question whether it was possible to build a sufficiently reliable and valid online questionnaire to assess students' perception of the university climate in a situation of distance education.

As the first three questions can only be answered in a meaningful way if the last one is answered positively, we present here the results pertaining to the validity and reliability of the instrument we developed: the University Climate Questionnaire for Distance Education Contexts (UCliQ-DE). A detailed account of the remaining research findings will be presented elsewhere (Felini, Zobbi, in preparation).

Hence, the null hypothesis that we would like to exclude concerns the factorial structure of our questionnaire; in other words, we aim to falsify that the instrument is not able to validly and reliably assess five factors of students' perception of the university climate in contexts of distance education.

4.2 The University Climate Questionnaire for Distance Education Contexts (UCliQ-DE)

According to the relevant scientific literature, the university climate is a complex construct, composed of several elements, and its assessment therefore must respect this complexity. For this reason, an initial set of 31 items was developed, each of them followed by a Likert-type scale of possible responses from 1 to 10, from "absolutely not true" to "absolutely true". These 31 items were intended to operationalize five factors contributing to the students' perception of the university climate, namely:

1. The perception of the social interactions among peers (12 items = C1, C2, C3, C4, C5, C12, C13, C14, C15, C17, H1, H3). This factor refers to students' perceptions about social relationships among classmates in an online context: the possibility to create and maintain such relationships, their strength, the mutual roles created in them (e.g., friends or acquaintances), the benefit of the relationships for academic achievement, and the feeling that students can create relationships on their own, without help from the university (e.g., through the assistance of tutors) or from university-driven online social networks.
2. The sense of belonging to the academic community (4 items = D1, D2, D3, D4): this factor refers to students' perception of being part of a community of people, and to the importance that the experience in the Educational Sciences program at the University of Parma has in their lives.
3. The initial expectations regarding the climate that would be established during the semester via online tools (5 items = B1, B2, B3, B4, B5). This factor refers to the expectations and feelings students had, before the beginning of the semester, about what they would experience at university, in particular: curiosity vs. indifference, worry vs. confidence, openness vs. closedness to collaboration, inclination vs. disinclination to meet new people. In line with Qazi et al. (2017), we investigated the initial expectations as remembered at the moment of compiling the questionnaire.
4. The perception of the social interactions between students and teachers (3 items = C6, C7, C8). This factor refers to the students' perceptions of the possibility to create interactions with the teachers in an online context, and of the possibility to rely on the teachers.
5. The awareness of the potential limits that online interactions may have, also compared to those offline (7 items = C9, C10, C11, E1, E2, E3, E4). This factor refers to the students' perceptions of what can damage or jeopardize the university climate, especially regarding the perceived weaknesses of online communications, and the students' sense of inadequacy when interacting online.

As previously stated, with this study we would like to confirm or reject the outlined factorial structure hypothesized for the UCliQ-DE.

4.3 Participants

On November 17, 2020, we invited all freshmen of the said program in Education of the University of Parma to fill in the UCliQ-DE, and we closed the questionnaire platform on November 30. From a population of 346 enrolled students, 173 respondents (50%) participated in the study, of which 90.2% were female. 40.5% of respondents were between 18 and 19 years old; 28.9% were between 20 and 21; 18.5% between 22 and 30; and 12.2% were over 30 years old. The median age is represented by the age range of 20-21. The geographical distribution was wide: at the moment of compiling, 32.9% of the students found themselves in the province of Parma; 17.9% were in other parts of the region Emilia-Romagna; 41.1% in Northern Italy (Emilia-Romagna excluded); and 8.1% in Central and Southern Italy. The larger part of students attended the classes from their original residence, probably their family home: during the pandemic, only 6.9% of respondents moved to Parma to attend university.

As for their secondary education, 59.5% of respondents had received mainly general/non-vocational education in a *liceo*, 16.8% had attended technical high schools, and 23.1% vocational high schools. In terms of their previous knowledge of the core subjects of the program, 42.8% had attended high schools where education and social studies were taught (28.9% *Liceo di scienze umane*, 13.9% *Istituto professionale a indirizzo socio-sanitario o educativo*).

The larger part of the students had no social connections with each other before the beginning of the semester: 59.0% of them knew none of their classmates in advance, 31.8% knew only one or two, and 9.2% knew three classmates or more.

4.4 Plan of statistical analyses

For the development of the present study, the following statistical analyses were performed:

- Descriptive analysis (see Table 1).
- Pearson correlations (see Table 2).
- A complex of three exploratory factor analyses:
  - FA1) *Factor Analysis 1*, using the orthogonal varimax method on the total sample (see Table 3).
  - FA2) *Factor Analysis 2*, using the oblique promax method on the total sample (see Table 4).
  - FA3) *Factor Analysis 3*, adopting the cross-validation method (see Tables 5 and 6).
- Reliability studies through the calculation of Cronbach's coefficient.

5. Data analysis

Statistical analysis was conducted using SPSS statistical package version 27.0.

First, a descriptive analysis (Table 1) was performed for the total variables of the UCliQ-DE scale, considering the total sample. The univariate normal distribution was studied, and skewness and kurtosis values were corrected when they exceeded 1 in absolute value. After our interventions on the variables B1, B5, D2, and D3, only D2 was considered as not characterized by normal distribution.

Secondly, to avoid collinearity issues, Pearson correlations among variables (Table 2) were performed in the total sample for all variables of the UCliQ-DE scale. As a result, six variables with a very high correlation level (greater than 0.6) were excluded for excessive overloading, namely: C4, D1, E2, E4, C10, and H1.

Finally, a complex of three exploratory factor analyses was conducted using the principal component analysis (Di Franco & Marradi, 2003), and excluding the UCliQ-DE variables that had been removed through previous analyses. For the purpose of this study, a rotated orthogonal and oblique factor analysis (varimax and promax) loading over 0.29 – which accounted for approximately over 9% of the variance – was taken as large enough to indicate that the loading was salient (Rovai, 2002, p. 201).

Factor Analysis 1 (FA1) – The first factor analysis was conducted over the total sample. Both the Kaiser-Meyer-Olkin measure of sampling adequacy, with a value of .806, and Bartlett's sphericity test [χ^2 (300) = 1288.394, p<.000] indicated the suitability of the data. Three criteria were used to determine the number of factors to extract: the scree plot, the Kaiser-Gutman Rule, and the interpretability of the solution. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported.

Factors were rotated using the orthogonal varimax method. The factorial solution (Table 3) identified six factors that accounted for 65.2% of the total explained variance: the first factor (*the perception of the social interactions among peers*) accounted for 31.3% of the item variance; the second factor (*the sense of belonging to the academic community*) accounted for 9.3% of the item variance; the third factor (*the initial expectations regarding the climate*) accounted for 7.8% of the item variance; the fourth factor (*the perception of the social interactions between students and teachers*) accounted for 6.4% of the item variance; the fifth factor (*the awareness of the potential limits that online interactions have*) accounted for 5.4% of the item variance; and the sixth factor, consisting of only one item (C11), accounted for 5.1% of the item variance.

Factor Analysis 2 (FA2) – The second factor analysis was also conducted over the total sample. The same three criteria as in FA1 were used to determine the number of factors to extract. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported. This time, however, factors were rotated using the oblique promax method to consider correlation between the factors and to confirm the factorial structure. The factorial solution (Table 4) identified six factors that accounted for the same 65.2% of the total explained variance and, in general terms, the factorial structure was confirmed: no variables loaded on different factors than they did in FA1.

Factor Analysis 3 (FA3) – In order to confirm the previous results about the factorial structure, the last and final factor analysis was conducted by adopting the cross-validation method. The total sample was split randomly in two equal parts, and factors were rotated using the varimax method on the first subsample and the promax method on the second subsample, with the goal of validating the performed factorial solution on different samples (Barbaranelli, 2003, p. 146).

Factor Analysis 3, part 1 (FA3.1) – The first factor analysis was conducted over the first subsample, and the factors were rotated using the orthogonal varimax method. Both the Kaiser-Meyer-Olkin measure of

sampling adequacy, with a value of .770, and Bartlett's sphericity test [χ^2 (300) = 844.621, p<.000] indicated the suitability of the data also for the subsample. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported. The factorial solution (Table 5) identified six factors that accounted for 69.4% of the total explained variance: the first factor (*the perception of the social interactions among peers*) accounted for

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
B1	165	4	10	8,45	1,639	-,941	,189	,202	,376
B2	173	1	10	5,73	2,335	-,195	,185	-,505	,367
B3	173	1	10	6,76	2,233	-,504	,185	-,369	,367
B4	173	1	10	6,87	2,769	-,639	,185	-,653	,367
B5	168	2	10	7,87	2,058	-,853	,187	-,169	,373
C1	173	2	10	6,37	2,267	-,040	,185	-,802	,367
C2	173	1	10	6,04	2,368	-,543	,185	-,499	,367
C3	173	1	10	6,09	2,031	-,186	,185	-,531	,367
C4	173	1	10	5,87	2,423	-,207	,185	-,693	,367
C5	173	1	10	6,58	2,197	-,539	,185	-,201	,367
C6	173	1	10	6,23	2,080	-,305	,185	-,186	,367
C7	173	1	10	5,76	2,432	-,422	,185	-,638	,367
C8	173	2	10	7,57	1,750	-,771	,185	,649	,367
D1	173	1	10	6,17	2,550	-,462	,185	-,565	,367
D2	167	6	10	9,07	1,195	-,976	,188	-,236	,374
D3	173	1	10	6,96	2,410	-,676	,185	-,221	,367
D4	173	4	10	9,18	1,281	-1,797	,185	2,929	,367
E1	173	1	10	6,20	3,169	-,466	,185	-1,172	,367
E2	173	1	10	6,52	3,053	-,543	,185	-1,006	,367
E3	168	2	10	7,66	2,035	-,798	,187	-,103	,373
E4	173	1	10	7,18	2,348	-,915	,185	,339	,367
C9	173	1	10	5,26	2,432	-,060	,185	-,792	,367
C10	173	1	10	5,09	2,585	-,056	,185	-,967	,367
C11	173	1	10	6,06	2,358	-,244	,185	-,615	,367
C11	173	1	10	4,94	2,358	,244	,185	-,615	,367
C12	173	1	9	3,69	2,420	,429	,185	-1,147	,367
C13	173	1	10	6,21	2,629	-,416	,185	-,718	,367
C14	173	1	10	5,84	2,862	-,293	,185	-1,177	,367
C15	173	1	10	7,17	2,304	-,792	,185	-,006	,367
C17	173	1	10	6,24	2,088	-,389	,185	,003	,367
H1	173	1	10	6,60	2,515	-,587	,185	-,415	,367
H3	113	1	10	6,68	2,547	-,705	,227	-,276	,451
Valid N. (listwise)	106								

Table 1 - Descriptive statistics.

	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	E1	E2	E3	E4	C9	C10	C11	C12	C13	C14	C15	C17	H1	H3
B1	--																														
B2	,266**	--																													
B3	,376**	,451**	--																												
B4	,294**	,197**	,369**	--																											
B5	,338**	,232**	,359**	,450**	--																										
C1	,201**	,155*	,215**	,263**	,178*	--																									
C2	-,117	-,054	-,114	-,209**	-,001	-,485**	--																								
C3	,165*	,140*	,206**	,301**	,081	,697**	-,386**	--																							
C4	,183**	,155*	,231**	,373**	,141*	,686**	-,429**	,801**	--																						
C5	,167*	,083	,253**	,312**	,174*	,585**	-,349**	,644**	,700**	--																					
C6	,205**	,209**	,351**	,159*	,238**	,394**	-,142*	,473**	,422**	,428**	--																				
C7	-,038	-,171*	-,288**	-,054	-,113	-,196**	,234**	-,216**	-,183**	-,197**	-,600**	--																			
C8	,257**	,196**	,346**	,263**	,401**	,341**	-,028	,287**	,278**	,395**	,583**	-,284**	--																		
D1	,290**	,154*	,332**	,438**	,372**	,554**	-,343**	,554**	,528**	,514**	,373**	-,166*	,361**	--																	
D2	,436**	,174*	,324**	,160*	,378**	,230**	-,125	,117	,182**	,248**	,313**	-,183**	,463**	,287**	--																
D3	,246**	,210**	,314**	,366**	,403**	,466**	-,318**	,416**	,445**	,466**	,338**	-,106	,408**	,764**	,367**	--															
D4	,378**	,203**	,280**	,189**	,461**	,150*	-,071	,054	,029	,061	,185**	-,053	,347**	,328**	,642**	,383**	--														
E1	-,062	-,002	-,013	-,015	,069	-,052	,002	,133*	,070	,070	,036	-,062	-,037	,008	-,155*	-,015	-,039	--													
E2	-,063	-,013	-,001	-,046	,088	-,021	-,013	,145*	,092	,113	,026	-,073	-,047	,020	-,127	,012	,008	,891**	--												
E3	,140*	,063	,198**	,122	,282**	,098	-,109	,176*	,185**	,230**	,098	,037	,101	,180**	-,009	,263**	,170*	,552**	,638**	--											
E4	,061	,034	,191**	,146*	,196**	,071	-,010	,221**	,141*	,226**	,278**	-,234**	,184**	,184**	,009	,170*	,139*	,623**	,652**	,666**	--										
C9	-,002	,226**	,104	,241**	,150*	,442**	-,316**	,425**	,452**	,447**	,404**	-,304**	,270**	,440**	,170*	,458**	,210**	,149*	,163*	,122	,242**	--									
C10	,051	,202**	,096	,090	,070	,379**	-,186**	,331**	,333**	,359**	,374**	-,229**	,163*	,337**	,166*	,395**	,099	,060	,097	,062	,114	,770**	--								
C11	,042	-,016	-,112	-,046	,052	-,088	,220**	-,141*	-,096	-,264**	-,089	,153*	-,112	-,224**	-,145*	-,251**	-,092	-,004	-,010	,080	-,064	-,230**	-,241**	--							
C12	,192**	,265**	,183**	,367**	,342**	,421**	-,203**	,485**	,495**	,422**	,335**	-,092	,302**	,568**	,200**	,496**	,199**	,067	,036	,162*	,168*	,405**	,288**	-,092	--						
C13	,043	,048	,050	,151*	,140*	,250**	,019	,208**	,212**	,179**	,116	,043	,115	,161*	,033	,168*	,047	,117	,120	,065	,037	,200**	,153*	,066	,125	--					
C14	,036	,122	,140*	,223**	,273**	,444**	-,232**	,433**	,427**	,437**	,322**	-,128*	,282**	,510**	,231**	,399**	,259**	-,018	,017	,148*	,167*	,453**	,328**	-,036	,497**	,321**	--				
C15	,101	-,048	,165*	,303**	,297**	,442**	-,218**	,478**	,532**	,618**	,285**	-,106	,336**	,531**	,113	,496**	,068	,058	,092	,229**	,118	,372**	,278**	-,199**	,352**	,347**	,468**	--			
C17	,204**	,192**	,304**	,351**	,213**	,574**	-,379**	,584**	,575**	,560**	,412**	-,180**	,339**	,707**	,225**	,561**	,170*	,037	,051	,192**	,163*	,505**	,417**	-,176*	,491**	,287**	,437**	,503**	--		
H1	,281**	,176*	,276**	,472**	,383**	,461**	-,350**	,495**	,548**	,542**	,328**	-,115	,325**	,620**	,239**	,541**	,220**	,075	,140*	,288**	,213**	,444**	,372**	-,114	,563**	,199**	,477**	,535**	,621**	--	
H3	,351**	,258**	,339**	,481**	,434**	,499**	-,314**	,466**	,569**	,411**	,384**	-,132	,437**	,505**	,256**	,504**	,264**	-,083	-,069	,159*	,133	,428**	,283**	-,034	,574**	,260**	,441**	,539**	,538**	,808**	--

Table 2 - Pearson's correlations.

32.3% of the item variance; the second factor (*the sense of belonging to the academic community*) accounted for 11.3% of the item variance; the third factor (*the initial expectations regarding the climate*) accounted for 8.3% of the item variance; the fourth factor (*the perception of the social interactions between students and teachers*) accounted for 6.7% of the item variance; the fifth factor (*the awareness of the potential limits that online interactions have*) accounted for 5.9% of the item variance; and the sixth factor, consisting of two items (C11 and C13), accounted for 4.9% of the item variance. Overall, the factor structure was confirmed and only one item loaded on a different factor (C13 loaded on F6). We took these items into account for further considerations.

Factor Analysis 3, part 2 (FA3.2) – The second factor analysis was conducted over the second subsample, and factors were rotated using the oblique promax method. Both the Kaiser-Meyer-Olkin measure of sampling adequacy, with a value of .693, and Bartlett's sphericity test [χ^2 (300) = 655.714, p<.000] indicated the adequacy of the data, also for this subsample. However, values were less satisfactory than the previous ones. Both the scree plot and the Kaiser-Gutman Rule confirmed that the null hypothesis of one-dimensionality was not supported. The factorial solution (Table 6) identified eight factors that accounted for 76.1% of the total explained variance. In general, the factor structure was confirmed, but some items loaded on different factors, as follows. The first factor (*the sense of belonging to the academic community*), which accounted for 30.5% of the item variance, included items D2 and D4, but also items B1 and B5, which thus far loaded on the factor *Initial expectations regarding the climate*; the second factor (*the perception of the social interactions between students and teachers*), which accounted for 11.6% of the item variance, included three items – C1, C2, and C3 – which thus far were included in the factor *Perception of the social interactions among peers*, and excluded one item – C8 – that until now was included in this factor; the third factor, which accounted for 7.8% of the item variance, included some items that do not replicate the previous factorial structure – D4, C8, B2, C12. The fourth and the fifth factors, which accounted for 6.4% and 6.0% of the item variance, respectively, included items that until now loaded on the same factor *Perception of the social interactions among peers* (C12, C13, C15, C17 loading on F4, and C9, C14, D3, H3 loading on F5); the sixth factor (*the initial expectations regarding the climate*), which accounted for 5.3% of the item variance, included only two items instead of four, as in the previous factorial structure; the seventh factor, consisting of only one item (C11), accounted for 5.3% of the item variance; and the eighth factor (*the awareness of the potential limits that online interactions have*), which accounted for 4.4% of the item variance, confirmed its items (E1 and E3).

Given that one of the factorial analyses (FA3.2) did not confirm the results of the others, several reliability studies were performed to exclude the possibility of building different scales than the five listed below. For example, variables B5, E1 and E3, which also loaded together on a different factor, had a poor Cronbach's coefficient α (= .553). Similar results were obtained for B2, C4, C6, C7, and C8 (Cronbach's coefficient α = .619), and for C11 and C13 (Cronbach's coefficient α = .124).

In conclusion, considering all factor analyses and reliability studies performed, the following scales were defined:

1. *The perception of the social interactions among peers* (*scale 1*) consists of 11 items, namely: C1, C2_r, C3, C5, C9, C12, C13, C14, C15, C17, and D3. Cronbach's coefficient α = .877 indicates a good reliability.
2. *The sense of belonging to the academic community* (*scale 2*) consists of 3 items, namely: B5, D2, and D4. Cronbach's coefficient α = .669 indicates a fair reliability.
3. *The initial expectations regarding the climate* (*scale 3*) consists of 5 items, namely: B1, B2, B3, B4, and H3. Cronbach's coefficient α = .708 indicates a fair reliability.
4. *The perception of the social interactions between students and teachers* (*scale 4*) consists of 3 items, namely: C6, C7_r, and C8. Cronbach's coefficient α = .733 indicates a fair reliability. Item C8 was included in this factor because of three factor analyses: only FA3.2 showed it in a different factor, but it is known that the oblique rotation should not be taken into account if the orthogonal one gives a simplified structure of the factor (De Lillo et al., 2007, pp. 118-119).
5. *The awareness of the potential limits that online interactions have* (*scale 5*) consists of 2 items, namely: E1 and E3. Cronbach's coefficient α = .674 indicates an almost fair reliability.

6. Discussion

The study presents a conceptual framework for understanding the perception of the university climate, and the resulting effect on students' wellbeing and development. It also examines the validity and reliability of an instrument that can be used for assessing the university climate among students in distance education contexts. In the present study, UCliQ-DE was developed, refined, and field-tested in a distance education context with 173 freshmen of an Italian bachelor program in Education Sciences.

As a result of Pearson's correlations, factor analyses and reliability studies performed, the UCliQ-DE scale consists of 22 items, with five scales composing the questionnaire, as we had hypothesized.

The first scale, composed of eleven items (C1, C2_r, C3, C5, C9, C12, C13, C14, C15, C17, and D3), explains two different aspects of the *perception of the social interactions among peers*. The first one is related to the actual possibility that relationships among students can be created and maintained autonomously over time, or, on the contrary, are difficult to establish (items C1, C2_r, and C3). The second aspect is related to the quality of the relationships, and reports a component that is more connected with feelings, such as trust, support, empathy, and inclusion (items C5, C9, C12, C13, C14, C15, and D3). Item C17, which asks respondents to assess the university climate as they perceive it, also loads in this first scale. According to our interpretation, this means that the overall perception of the university climate is significantly related to the *perception of the social interactions among students* (indeed, the factor analysis shows that the first factor accounts for most of the item variance). An explanation may be needed regarding two further items: C9 (sense of capability of expressing oneself online) and D3 (feeling comfortable within the freshmen group). The loading of item C9, which was initially placed in the dimension related to *awareness of the potential limits that online interactions have*, shows that it explains better the socio-relational component of communication, rather than the limits that online interactions have. The loading of item D3, which was initially placed in the dimension related to the *sense of belonging to the academic community*, shows that it better explains the aspect of feeling comfortable in a group of peers, rather than the sense of belonging to the academic institution.

The second scale, which consists of three items (B5, D2, and D4), explains two complementary aspects of the *sense of belonging to the academic community*. The first aspect is related to the importance attached by the students to belonging to the BA program in Education Sciences, and the pride of being members of this community. The second aspect is related to the students' disposition to be connected, open, and sociable with their classmates.

The third scale, which we named *initial expectations regarding the climate*, consists of four items (B1, B2, B3, B4, and H3) and relates to students' recollection of their expectations and attitudes regarding the university climate before the beginning of their university experience in a distance learning environment. The scale reports the initial attitudes regarding social relationships (B1 and B2) and the distance education settings students would have to deal with (B3 and B4), as well as the perceived benefit of current relationships on future academic tasks to be carried out through group study (H3). The hypothesis underlying this scale is that students' expectations and attitudes are a significant factor in their perception of the university climate.

The fourth scale, which consists of three items (C6, C7, and C8) explains two different sides of the *perception of the social interactions between students and teachers*. As for peer relationships, the first aspect relates to the actual possibility that relationships between students and teachers can be created, or, on the contrary, are difficult to establish. The second aspect is related to the quality of the relationships. Item C8, in fact, reports students' self-assessed feelings of trust towards, and of being supported by, their teachers.

Items	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
The perception of the social interactions among peers (n=11)						
C1	.738					
C2	-.433					
C3	. 796					
C5	.727					
C9	.667					
C12	.758					
C13	.311					
C14	.660					
C15	.608					
C17	.766					
D3	.713					
The sense of belonging to the academic community (n =3)						
D2		.793				
D4		.861				
B5		.627				
The initial expectations regarding the climate (n=5)						
B1			.639			
B2			.614			
B3			.755			
B4			.527			
H3			.426			
The perception of the social interactions between students and teachers (n = 3)						
C6				.705		
C7				-.794		
C8				.424		
The awareness of the potential limits that online interactions have (n = 2)						
E1					.841	
E3					.838	
Sixth factor						
C11						.564

Table 3 - Factor analysis FA1.

Items	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
The perception of the social interactions among peers (n=11)						
C1	.734					
C2	-.436					
C3	. 853					
C5	.705					
C9	.687					
C12	.758					
C13	.383					
C14	.744					
C15	.611					
C17	.767					
D3	.727					
The sense of belonging to the academic community (n =3)						
D2		.820				
D4		.912				
B5		.586				
The initial expectations regarding the climate (n=5)						
B1			.655			
B2			.656			
B3			.827			
B4			.494			
H3			.386			
The perception of the social interactions between students and teachers (n = 3)						
C6				.667		
C7				-.823		
C8				.386		
The awareness of the potential limits that online interactions have (n = 2)						
E1					.872	
E3					.837	
Sixth factor						
C11						.539

Table 4 - Factor analysis FA2.

Items	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*
The perception of the social interactions among peers (n=10)						
C1	.812					
C2	-.602					
C3	. 841					
C5	.743					
C9	.753					
C12	.790					
C14	.640					
C15	.512					
C17	.820					
D3	.801					
The sense of belonging to the academic community (n =3)						
D2		.791				
D4		.814				
B5		.626				
The initial expectations regarding the climate (n=5)						
B1			.678			
B2			.699			
B3			.710			
B4			.603			
H3			.440			
The perception of the social interactions between students and teachers						
C6				.719		
C7				-.771		
C8				.358		
The awareness of the potential limits that online interactions						
E1					.868	
E3					.735	
Sixth factor						
C11						.847
C13						.393

Table 5 - Factor analysis FA3.1.

Items	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	*F8*
First factor (n=4)								
B1	.789							
B5	-.571							
D2	.812							
D4	.840							
Second factor (n =5)								
C1		.760						
C2		-.959						
C3		.605						
C6		.582						
C7		-.773						
Third factor (n=3)								
B2			1.017					
C8			.484					
C12			.697					
Fourth factor (n = 4)								
C5				.586				
C13				.903				
C15				.694				
C17				.317				
Fifth factor (n = 4)								
C9					.692			
C14					.567			
D3					.565			
H3					.319			
Sixth factor (n=2)								
B3						.402		
B4						.726		
Seventh factor (n=1)								
C11							.912	
Eighth factor (n=2)								
E1								.946
E3								.692

Table 6 - Factor analysis FA3.2.

Finally, the fifth scale, which consists of two items (E1and E2) *assesses the students' awareness of the potential limits that online interactions have*. The hypothesis is that such awareness (or the lack thereof) is a significant factor influencing students' perceptions of the university climate in distance education contexts as it can prevent (or create) false expectations and/or beliefs regarding the online climate in the university classroom.

Therefore, and according to the data presented here, it is possible to conclude that the UCliQ-DE instrument is valid and reliable, and that it assesses the complexity of factors composing students' perceptions of the university climate in contexts of distance education.

7. Conclusion

This article describes the development and validation of an assessment instrument. Data presented provide evidence of the validity and reliability of the UCliQ-DE, composed of 22 items related to five factors. This instrument is now available to be used for future research, and we are going to complete analysis of the data collected among freshmen of the Educational Sciences program at the University of Parma. A provisional examination of these data reveals interesting dynamics still to be better understood. In addition, this instrument – developed during a pandemic where students and teachers unexpectedly found themselves in a situation that required them to attend/conduct educational activities exclusively online – can also be used in distance education universities, where online activities are the norm. In this latter case, students' expectations will most likely differ from those of students who enrolled in a presence university and were forced to attend virtual classes against their will and choice. As the UCliQ-DE takes expectations into account, it can be useful to investigate not only the contrast between pandemic and normal times, but also the possible differences between the university climate in distance learning universities and traditional universities that occasionally use online tools.

Apart from the above benefits, the study also has some limitations. First, the sample consisted of a limited number of respondents, all from a single institution and program, and all users of the same e-Learning platforms (Microsoft Teams and Moodle). Therefore, caution should be used when generalizing results to students from other universities or programs, or to other forms or contexts of distance learning. In fact, researchers need to confirm scale reliability for any population or sample. Secondly, confirmatory factorial analysis could not be performed for this study because of the low number of cases. Thirdly, due to factorial analysis, some factors were assessed by only a small number of items: future revisions could improve the reliability of the tool.

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Full enforcement of e-Learning during first movement control operation of COVID-19 pandemic: are Malaysian university students ready?

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Abstract

E-Learning has been practising in many countries as one of the teaching and learning processes to enhance pedagogy. COVID-19 pandemic has made it compulsory for students to have virtual classes at full usage for the first time of Movement Control Operation (MCO) from 18 March 2020. Are Malaysian university students ready for e-Learning? Thus, this study aims at determining three variables of attitude, skills, and knowledge related to the e-Learning readiness in having the classes at their own home. A total of 425 questionnaires on Google form were distributed via WhatsApp. Descriptive statistics and inferential analysis of readiness are employed. The finding shows that attitude contributes the most to the student's readiness. There is no difference in respondents' e-Learning readiness between those who stay in rural or town. The majority of respondents are at a moderate level of readiness. This finding will give an insight into the Ministry of Higher Education to consider appropriate actions to ensure the teaching and learning for University learning are not disrupted due to the COVID-19 outbreak.

KEYWORDS: E-Learning, Readiness, Attitude, Skill, Knowledge.

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1. Introduction

The deadly and infectious disease Corona Virus also known as COVID-19, has profoundly influenced the worldwide economy. This fear resounds over the instruction segment all-inclusive. Fiascos and widespread COVID-19 can make a parcel of chaos and pressure; hence, there is essential to consider the innovation profoundly and with due tirelessness to adjust to these fears and anxieties amid such emergencies (Dhawan, 2020). The widespread COVID-19 flare-up constrained all schools and universities to be closed. The Ministry of Higher Education (MoHE) broadcasted that all public and private universities in Malaysia conduct online teaching and learning activities until December 2020 (Malaysian Ministry of Higher Education, 2020). So, students are forced to utilise e-Learning at full usage. The students and lecturers are battling to discover choices to bargain with this challenging circumstance (Rieley, 2020). Favale et al. (2020) emphasised an urgent need for academic institutions to plan smartly. It is unknown if the existing results become vacuous or yield sublinear dynamic regret (Cheng et al., 2019). Since this is an

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unprecedented phenomenon, many issues affect the learning process (Parkes et al., 2014). It is very pertinent for both lecturers and students to understand the current situation of learning. Hence, this study would like to probe students' readiness to fully enforce e-Learning during the first movement control operation of the COVID-19 pandemic.

1.1 E-learning Readiness

Readiness is a learning principle that affects learning (Horzum et al., 2015). E-Learning is one of the main alternatives to learning during the COVID-19 pandemic and the new standard period. Singh and Singh (2017) postulated that e-Learning is significant for the teachers to realise a need to move the students' attitude toward learning readiness in e-Learning by adjusting to technological difficulties, community, and synchronous preparation. Without proper e-Learning readiness, the desired outcome would be a failure (Anshari et al., 2016). E-Learning does not require students and teachers to gather in one place physically. It does not depend on the quality of teachers to deliver learning content but on the quality of digital learning sources and other didactic content. Recent years have seen a significant increase in research on the design and implementation of e-Learning. E-Learning can help students study more effectively. It can also be used in conjunction with the conventional technique. E-Learning also requires creativity among educators, and students alike can soar. During the recent COVID-19 epidemic, corporate and educational institutions' patterns shifted substantially from face-to-face learning and teaching to online learning and teaching (Abudaqa et al., 2021). Chung et al. (2020) found that respondents are generally ready for online learning in a recent study. However, Dietrich and colleagues. (2020) reported that some assumed that the sudden and abrupt change to online learning would consequence in poor transmission due to a lack of training, insufficient internet connection, and little preparation.

1.2 Attitude towards e-Learning

Today's students are digital natives, and they have grown up with technology. They are assumed to have a good grasp of technology. E-Learning appears to be based on the premise that students can learn automatically. Researchers have previously found that the level of student preparation for e-Learning is a crucial element of its implementation (Riwanda et al., 2020). As per Ullah et al. (2017), several studies demonstrated that e-Learning and its reception were broadly influenced by students' attributes, which were viewed as significant e-Learning factors in creating nations. Wang et al. (2001) revealed that students' views toward ICT utilization seem to affect their attitudes toward web-based learning. Zhu et al. (2013) found that the undergrad students, who favoured web-based learning strategy, indicated more significant levels of apparent fulfillment than the individuals who did not. Online learning attitude has a meaningful effect on online learning readiness (Herguner et al., 2020). They examined the impact of e-Learning attitudes on sports sciences students' online learning readiness during the renewal and coronavirus pandemic. They found out that there was a moderately significant and positive correlation between the online attitudes of Turkey's higher education sports sciences students and their online readiness. There is a positive relationship between advanced citizenship behaviours and e-Learning attitude. In addition, Gunnarsson (2001) and Suanpang (2007) uncovered the primary association between students' subject demeanour and their web-based learning attitudes when they took the online course. Also, it has been observed that students' negative anxiety due to the pandemic is reflected in their e-Learning processes. However, in any case, it generally appears that advanced citizenship behaviour computerised learning handle can be a positive reaction to the COVID-19 closure period (Akcil & Bastas, 2020). Husin and colleagues (2021) reiterated a requirement to form a decent online learning readiness by generating a positive online learning attitude.

1.3 Skill in e-Learning

Ebner et al. (2020) studied the concept of e-Learning readiness, confirming that ICT and technical skills are crucial. Singh and Singh (2017) proposed that skills are a blend of capacity, information, and experience that empowers a person to improve their presentation. Abilities are the foundation of what empowers people to be effective in their day-by-day exercises, be it work, interests, or instructive undertakings. Meanwhile, Bennett (2017) stated that effective e-Learning strategies could change this mindset by developing more profound learning skills because liquid learning advances students' basic intuition to participate in basic reasoning. The accentuation of students' exercises must change from uninvolved to dynamic learning. Tending to students from one point of convergence would not urge them to deconstruct the exercise standards for themselves. E-Learning fortifies this idea by broadening the study hall limits and empowering web backing and 24-hour access to instructive assets. Then, active interest strengthens the main topic as conventional learning paints core subjects with extremely wide brushstrokes. Widodo and colleagues (2020) suggested that student online readiness comes from the aspects of equipment capability, technology skills, self-directed learning skills, motivation, and perceived usefulness. In a similar vein, Rohayani (2015) carried out a literature review on factors for measuring e-Learning readiness in higher education and found that skills and attitudes are the most significant factors influencing e-Learning readiness.

1.4 Knowledge of e-Learning

The effect of mobile and wireless technology breakthroughs and popularity made e-Learning a new direction (Senthil Kumaran, 2015). The current generation must be very well-versed, and IT savvy in the technology to be in the mainstream of life, especially in education. As Downes (2005) pointed out, this trend has attracted the attention of several pundits, and these "digital natives" like internet users for their daily routines. Chatti and colleagues (2007) believed that experts and knowers are people with the necessary skill to accomplish better outcomes. Pappas (2016) documented that the information is one of the most significant blessings you can offer e-Learning to students. It permits them to defeat common hindrances, accomplishes their objectives, and satisfy their long-lasting dreams. Information is a fantastic thing that separates hindrances. Make nitty-gritty assignment breakdowns are general outlines that can improve appreciation. Be that as it may, e-Learning students ordinarily need a bit-by-bit manual to complete the undertaking. Analyse all aspects of the procedure to make an unmistakable and compact e-Learning instructional exercise for e-Learning students. In contrast, Alipio (2020) showed that most Filipino students are reluctant to participate in E-learning activities during this COVID-19 pandemic due to the lack of digital knowledge or skill, which eventually affects their academic performance. To sum up, based on the presented discussion, the online readiness framework is illustrated in Figure 1.

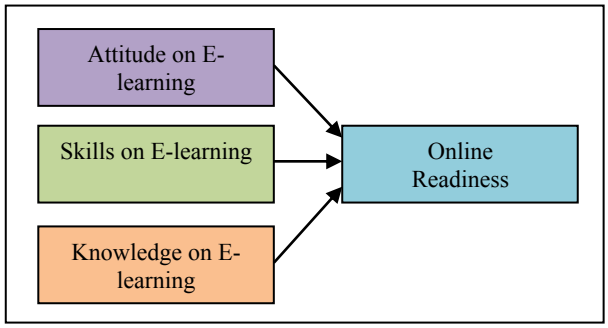

Figure 1 - Conceptual Framework.

2. Materials and Methodology

This study collected the data by using a survey questionnaire. The data was used to test students' attitudes, skills, and knowledge of their readiness to use e-Learning during the first MCO from 18 March to 31 March 2020. A survey questionnaire was uploaded to Google Form and distributed to public and private universities around Malaysia via the WhatsApp message application. The respondents circled their reactions to each question that best described their level of agreement with the statements. Out of the 500 distributed surveys, this study achieved 425 usable sets.

After data is collected, the data analysis is embarked with the descriptive analysis, T-test, and regression analysis. The descriptive study analysed the frequency of the demographic factors and e-Learning readiness. The T-test analysis was used to examine the differences between two groups of students from rural and urban areas. In contrast, regression analysis aims to determine the factors influencing e-Learning and the readiness of students.

2.1 The Instrument

The questionnaire is formulated based on specific research objectives. It is divided into five main parts: Section A comprises the demographic profile of the respondents. The other sections contain items related to dependent and independent variables. The set of questionnaires is formulated based on the chosen variables from the previous studies, which are e-Learning readiness (Tasir et al., 2006); attitude toward E-learning (Ullah et al., 2017); skills in e-Learning (Singh & Singh, 2017); and knowledge of e-Learning (Hansen, 2008). The respondents were asked to indicate their perceptions level on a 7-point Likert Scale, ranging from Strongly Disagree (1) to Strongly Agree (7). Finstad (2010) pointed out that 7-point scale Likert items are more appropriate for electronically transmitted and otherwise unsupervised usability questionnaires since they offer a more precise indicator of a participant's accurate assessment.

Table 1 depicted the reliability analysis that the Cronbach alpha value ranged from 0.814 to 0.903, indicating all variables' reliability is good.

Variables	Cronbach Alpha	No of Items
E-learning Readiness	.814	5
Attitude on E-learning	.940	5
Skills in E-learning	.933	5
Knowledge of E-learning	.903	5

Table 1 - Reliability Statistics.

3. Results

Altogether, this study distributed 500 questionnaires; and only 425 surveys (response rate is 85%) were returned for further analysis. Table 2 presents the demographic profile of university students – more female respondents (76.2%) than males (23.8%). The result shows that 383 respondents are understudies (90.1%) aged 19 to 24 years old. Nonetheless, there were 28 respondents (6.6%) from 25-29 years old and five students (1.2%) from 30-34 years old. At that point, the

equalisation of nine understudies 35-39 years old is (2.8%). The ethnic Malay understudies, who were the most noteworthy among the rest of e-Learning readiness, are 345 respondents (81.2%). In the interim, Indian respondents were 29 respondents (6.9%) from among university students. There are only five Chinese respondents (1.2%). In comparison, the Bumiputera respondents are 43 respondents (10.1%).

Next, the results show respondents' data from public universities (IPTA) and private (IPTS) universities in Malaysia. The majority of the respondents were from public universities, with almost 74.8% out of 425 students. From private universities, 197 (25.2%) of the overview took an interest in this review respondents from the e-Learning readiness. The majority of the respondents are doing a Degree program, as expressed in 304 understudies (71.5%). Be that as it may, 55 understudies (12.9%) reacted to appropriate polls from the recognition program—the Master and Ph.D. as expressed by just six understudies (1.4%). Moreover, 54 understudies (12.7%) reacted to establishments.

It delineates students' recurrence from arranging gave, which is increasingly respondent use Celcom line to web-based learning is 100 respondents with 23.5%. Be that as it may, 91 respondents (21.4%) used the Maxis line. Consequently, 89 respondents (20.9%) used U-Mobile just in case than Maxis. Notwithstanding, organise Digi just 57 respondents (13.4%) and 52 respondents utilising Telekom Malaysia is (12.2%). Thirty-six respondents (8.5%) utilise other systems to arrive at internet learning. Furthermore, the current respondent status of studies for full-time is higher (96%) than part-time (4%). The respondents must state their place during their e-Learning process, either in rural or town areas. The town is the most elevated respondent imprint of e-Learning status with 274 minds (64.5%) respondent player than provincial e-Learning 151 respondents with e-Learning (35.5%).

Other than that, respondents are from all states in Malaysia. The most noteworthy respondent comes from Selangor, with 157 respondents' minds (36.9%). Sarawak is the second most elevated respondent with 49 students (11.5%), and Perak with 22 respondents (5.2%). Terengganu and Pahang reported the same recurrence with 20 respondents (4.7%), while Kelantan and Kedah likewise the same recurrence with 25 respondents (5.9%). Further, respondents with e-Learning availability from Sabah and Pulau Pinang are similar with eight respondents (1.9%). Minority of the respondents are from Johor (4.9%), Wilayah Persekutuan (5.2%), Negeri Sembilan (3.8%), and Melaka (0.9%). The most minimal respondent is from Perlis, with just two respondents (0.5%). For the most exciting part, the majority of the respondents revealed that they like to learn using e-Learning (61.9%) compared to those who did not want to use it (38.1%).

Demographic Profile	Frequency	Percentage
Gender		
Male	101	23.8
Female	324	76.2
Age		
19-24 years	383	90.1
25-29 years	28	6.6
30-34 years	5	1.2
35-39 years	9	2.1
Ethic		
Malay	345	81.2
Indian	29	6.8
Chinese	5	1.2
Bumiputera	43	10.1
International	3	0.7
Type of University		
IPTA	318	74.8
IPTS	107	25.2
Educations level		
Foundations	54	12.7
Diploma	55	12.9
Degree	304	71.5
Master	6	1.4
PhD	6	1.4
Do you like to learn using online learning		
Yes	162	38.1
No	263	61.9
Network provided		
U-Mobile	89	20.9
Celcom	100	23.5
Maxis	91	21.4
Digi	57	13.4
Telekom Malaysia	52	12.2
Other	36	8.5
Current Status of studies		
Full time	408	96.0
Part-time	17	4.0
Your state that you are staying right now		
Perlis	2	0.5
Kedah	25	5.9
Selangor	157	36.9
Pulau Pinang	8	1.9
Kelantan	25	5.9
Terengganu	20	4.7
Pahang	20	4.7
Johor	21	4.9
Melaka	4	.9
Negeri Sembilan	16	3.8
Sabah	8	1.9
Sarawak	49	11.5
Perak	48	11.3
W. Persekutuan	22	5.2

Table 2 - Demographic Profile of Respondents.

3.1 Descriptive Statistics of e-Learning Readiness

Table 3 illustrates the highest mean of the e-Learning readiness variable. The item "I can manage my e-Learning time effectively" has the highest mean value with 4.08 (SD = 1.647), while the lowest mean is the item "I am willing to spend 8 to 10 hours a week on e-Learning, where the mean is 3.53 (SD = 1.735).

3.2 T-Test Analysis

Table 4 depicts the differences in e-Learning readiness between those who stay in rural and in town. The result shows no significant difference in the e-Learning readiness for both groups of students. Therefore, there is no difference between the locations of these respondents. Their e-Learning readiness is the same.

3.2 Regression Analysis

Table 5 reveals the factors influencing students' readiness with e-Learning in Malaysia during the First Movement Control Operation of the COVID-19 Pandemic. This table depicts that the largest beta value of the standardised coefficient is attitude e-Learning (0.409), followed by skills (0.295) and knowledge (0.150). All variables which consists of attitude on e-learning (p-value < .05), skills on e-Learning (p-value < .05), and knowledge on e-learning (p-value < .05) were positively influence student's readiness, it is statistically significant at 1% level. The R^2 value shows that 0.598 or 59.8% of the students' e-learning readiness can be explained by attitude toward e-Learning, skills in e-Learning, and knowledge of E-learning.

Figure 2 depicts the level of students' e-Learning readiness among 425 respondents. The result reveals 40 (9.4%) students with a scale of less than 2.00, which indicates low readiness. Further, the moderate level of readiness (scale between 2.01 and 3.00) has a high frequency of students, with 271 (63.8%) students. Finally, 114 (26.8%) students have a high level of readiness (scale between 3.01 and 4.00). Overall, this study reveals that most of the respondents are at a moderate level of readiness in using e-Learning.

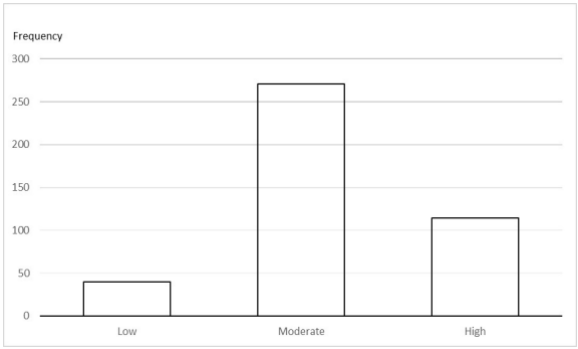

Figure 2 - Level of E-Learning Readiness.

	N	Mean	Std. Deviation
1. I can manage my e-Learning time effectively	425	4.08	1.527
2. I can interact with classmates using real-time communication tools.	425	4.39	1.583
3. I am willing to spend 8 to 10 hours a week on e-Learning.	425	3.53	1.735
4. I have a high frequency of network to access portal learning.	425	3.78	1.809
5. I can efficiently complete assignments within a set time frame.	425	4.07	1.686

Table 3 - Descriptive Statistics of e-Learning Readiness.

E-Learning Readiness	N	Mean	F	SIG
Rural	151	3.8185	1.836	.176
Town	274	4.0569		

Table 4 - T-test of Those Who Stay in Rural and Town toward e-Learning Readiness.

Variable	Standardised Coefficients Beta	t	Sig	R^2
Attitude on e-Learning	.409	9.125	.000**	0.598
Skills on e-Learning	.295	5.733	.000**	
Knowledge of e-Learning	.150	2.707	.007**	

Note: $p < 0.05$; $^{**}p < 0.01$

Table 5 - Multiple Regression Result.

4. Discussion and Conclusions

Students' attitudes, skills, and knowledge are crucial to test students' readiness in having e-Learning classes. The results showed only 38.1 percent of the respondents like to learn online, and more students (61.9%) do not want e-Learning. Instead, they prefer face-to-face. Probably they are more comfortable with traditional classes whereby they could ask any questions or clarification directly to the lecturers in the class. Somehow, this is the first and unprecedented phenomenon of the total usage of online learning. As time goes by, they will have time to get used to this new learning norm. Whether they stay in rural or town, their e-Learning readiness is the same. E-Learning has its advantages, such as linking from different resources in a few shifting formats and an effective method of having courses on the web. Due to its benefit and adaptability, the resources are accessible. Any place so long the internet connection is available.

Results showed that all the variables are influencing students' e-Learning readiness. Attitude plays the most prominent role. The skills and knowledge areas are necessary for e-Learning, where students can be knowledgeable and tend to communicate effectively during the learning process. It is no surprise that the findings showed that most of the respondents had a moderate level of e-Learning skills; after all, it is the first time MCO has ever happened before. The results could be different if the study is conducted during later stages of MCO, whereby everyone already gets used to MCO's idea and more knowledge and experience gathered along the way.

In conclusion, this study aims to test students' readiness to continue their e-Learning, especially in an emergency, such as a COVID-19 pandemic this year. All education industries must take steps to continue student education. The results show that all variables are important to e-Learning readiness. And attitude factor is the most crucial one in determining students' e-Learning readiness in having classes online. Behaviour is very influential in e-Learning, whether students can adapt or not. There are many challenges to have e-Learning faced by either the students or the lecturers themselves. Despite the need to have all the classes conducted online, the readiness level is still moderate during the first MCO. This study would be a good indicator for the lecturers and the policymakers in the Ministry of higher education to enhance the teaching preparedness to ensure the teaching and learning process runs smoothly and not to be disrupted during this COVID-19 pandemic. Life, teaching, and learning have to go on.

Datasets and Reproducibility

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

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Does teaching metacognitive skills through peer-conducted flipped classroom improve high school students' self-regulation?

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Abstract

Obtaining metacognitive skills is crucial for enhancing self-regulation. So, this quasi-experimental study aimed to assess the effect of teaching metacognition through peer-conducted flipped classroom on high school students' self-regulation. 107 students filled out Self-Regulation Questionnaire as the pre-test. Both control and intervention groups received a package of four-session multimedia e-content about metacognition during four weeks. Each week, the students in the intervention group participated in a face-to-face session during which peers handled the instruction, while participants in the control group had teacher conducted sessions. Finally, the same questionnaire was answered as the post-test. The results showed a significant increase from pre to post-test scores in the intervention group, in contrast to the control one with no significant increase. Between groups comparison of post-test scores resulted in a significant higher score in the intervention group. So, the findings showed the positive effect of teaching metacognition through this method on students' self-regulation.

KEYWORDS: Metacognition, Self-Regulation, Flipped Classroom, Peer Learning, High School.

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1. Introduction

1.1 Metacognition and self-regulated learning

The term metacognition implies thinking about thinking (Flavell, 1979) and addresses monitoring and controlling of cognitive processes like effective learning, rational thinking, comprehension and problem solving (Credé & Phillips, 2011; De Stasio & Di Chiacchio, 2015). Since metacognition is considered as one of the predictive factors for successful learning (Jaleel & Premachandran, 2016; Perry et al., 2018), some studies have focused on understanding the process of deploying metacognitive abilities by learners to control and adjust cognitive process. In fact, many aspects of learners' development, from academic skills to self-awareness, are affected by their level of metacognitive abilities, that is the extent they think about not only themselves, but also their assigned tasks and related contexts (Cleary & Chen, 2009). Effective learners are conscious of their own strengths and weaknesses and try to resolve the latter through being aware, possessing knowledge, and controlling of cognition. For this purpose, metacognitive self-regulatory tasks comprise of planning, monitoring and regulating. So, metacognition is supposed to be the crucial part of self-regulation (Pintrich & Zusho, 2002).

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Self-regulated learning (SRL) is defined as the process through which learners deploy and maintain cognition and behaviors that systematically help them in achieving learning goals (Zimmerman & Schunk, 2008). Self-regulated learners are active ones that are metacognitively, motivationally, and behaviorally focused on their own learning process (Wolters, 2003; Zimmerman & Schunk, 2008). These learners are familiar with various cognitive learning strategies, so that they are capable of choosing and regulating a proper strategy while performing a learning task (Asikcan & Saban, 2018; Geres-Smith et al., 2019). In other words, self-regulated learners reflect on their own cognitive process through monitoring their learning which helps them to adjust their learning behaviors in accordance with putative changes (Wolters, 2003). Moreover, SRL process consists of the following phases and their relevant sub processes:

- Forethought: goal setting, strategic planning, self-efficacy, learning goal orientation, and intrinsic interest in the task
- Performance: focusing on the learning task, using self-instruction, imagery, and self-monitoring
- Self-reflection: self-evaluation, attributions, and self-reactions (Zimmerman, 1998).

In contrast to proactive learners who are good at forethought and performance phases, reactive ones are able to self-reflect on their performed tasks which results in their better self-regulation as well (Zimmerman & Schunk, 2008). In other words, self-regulated learners are skillful in applying a wide range of cognitive strategies for performing their learning tasks. They can not only efficiently rehearse, organize and elaborate their learning, but also attain and keep knowledge in a structured manner (Zimmerman, 1998) and gain better academic achievement (Al Mulhim, 2021; Pintrich, 2004; Wang, Shannon & Ross, 2013).

1.2 Improving metacognitive and SRL skills

In order for learners to successfully achieve and apply metacognitive and SRL strategies, they need to be aware of the processes that are correlated with better educational performance (Bol & Garner, 2011; Pintrich & Zusho, 2002). In this way, they become able to apply appropriate strategies in their learning experiences (Zimmerman, 1998). In fact, metacognitive skills can be explicitly taught (Bae & Kwon, 2019; Kramarski & Mevarech, 2003; Voskamp et al., 2020) and different learner centered strategies could be used for teaching metacognition. In this regard, it is recommended to support secondary education students in order to obtain better SRL skills (Ramdass & Zimmerman, 2011; Voskamp et al., 2020) through not only explicitly teaching metacognitive strategies, but also providing the chance of learning them in groups. However, it is necessary to examine certain instructional strategies for this purpose (Dignath & Büttner, 2018).

Peer conducted flipped classroom, as a learner centered teaching strategy, could be applied for covering both the direct teaching of metacognition through multimedia contents, and group learning through face-to-face sessions that are led by peers.

1.3 Flipped classroom

Flipped classroom is considered as a student-centered strategy, in which traditional teaching-learning process is inversed (Avery et al., 2018; Elian & Hamaidi, 2018). In this method, teacher presents the information to the students before the class via technology tools such as recorded multimedia, social media, websites, educational games or a variety of open resources. Students are supposed to study these materials before the class. Then, the class time is devoted to a variety of learning activities that focus on problem solving and gaining deeper insight into the subject. Hence, the role of teacher is being a mediator and a motivator for helping the students to learn (Elian & Hamaidi, 2018; Valizadeh & Soltanpour, 2020).

This strategy enhances students' SRL, promotes their thinking skills, helps in treating their academic weaknesses (Elian & Hamaidi, 2018), results in higher academic achievement and motivation, improves metacognitive awareness (Al Mulhim, 2021; Kozikoğlu, 2019), and provides the chance for self-directed and collaborative learning. At the same time, it provides greater teacher-student interaction. Students experiencing flipped classroom are more prone to become autonomous and cooperative learners who are able to learn in collaboration with others (Avery et al., 2018). In fact, in addition to cognitive domain, flipped strategy promotes developing other skills like knowledge-gaining competency and communication skill as well (González-Gómez et al., 2016). Moreover, it is shown that students and teachers have positive viewpoints toward this strategy (Al Mulhim, 2021; Kozikoğlu, 2019).

The teaching contents in most flipped classroom researches were subjects like mathematics, science, biology, chemistry, information and communication technologies, educational technologies, programming, English learning, business administration, health sciences, social sciences, psychology and engineering-architecture courses (Kozikoğlu, 2019). No study was found examining teaching meta skills like metacognition using this strategy. On the other hand, although flipped classroom has been the focus of many studies during the recent years, limited researches were performed on high school students (Avery et al., 2018), Among the recent studies related to this level, a study showed the increase in academic achievement in students in science subject (Elian & Hamaidi, 2018). Another one was performed on seventh grade students in an English course that led to higher levels of students' engagement in the course activities (Ayçiçek & Yanpar Yelken, 2018).

As most evidence on flipped pedagogy is directed to the university level and it is gaining more interest in elementary and secondary school, it is suggested to perform researches at these levels to explore different

aspects of this strategy (Kozikoğlu, 2019). In addition, blending other approaches such as peer learning, with flipped pedagogy could be of interest for further research (Graziano, 2017).

1.4 Peer learning

One of the teaching methods mentioned in the literature as a proper technique for enhancing self-regulation is peer learning. In this teaching-learning strategy, groups of students work together to solve a problem, perform a task, or develop a product (Johnson et al., 1994). Generally, peers may have almost the same demographic characteristics such as being coeval or studying the same courses. They also play significant role in each other's development and behavior especially when they are adolescents. Hence, peer learning is an appropriate teaching strategy for providing the chance of better communication and adopting intended behaviors in a group. This strategy is demonstrated to be effective for attaining SRL skills in young students (Meusen-Beekman et al., 2015; Pintrich, 2004; Whitebread et al., 2007).

This approach concentrates on group learning rather than personal one (Ayçiçek & Yanpar Yelken, 2018). Hence, peer interaction is the main reason for successful cooperative learning through enhancement of cognitive understanding and engagement of students in teaching-learning process. This results in improving students' critical thinking, reasoning, problem-solving skills (Bilgin & Geban, 2006) and motivation through forcing students to be active and work together (Lim, 2014).

1.5 Aim of the study

The primary research question for this study was raised by two high school students who are among the authors of this article. They wanted to know how to help themselves and their classmates in order to learn school courses more effectively. Then, they started their search and became familiar with metacognition and SRL concepts and decided to perform a research project to find an effective way for improvement of those skills.

Considering the nature of filliped classroom and peer learning, the combination of these two approaches may be beneficial; as shown in a study performed on preservice teachers, in which participants reported that lessons delivered by peers through flipped pedagogy were interactive and fun and made them more enthusiastic about the subject (Graziano, 2017). In fact, applying peer learning in interactive sessions of flipped model could be of interest for further research. So, on one hand, we couldn't find any study investigating peer conducted flipped pedagogy on high school students; and on the other hand, no study was found assessing the effect of teaching metacognitive skills at this level through flipped classroom. So, this study aimed at assessing the effect of teaching metacognitive skills through peer-conducted flipped classroom on high school students' SRL.

2. Materials and Methods

2.1 Study design

This was a quasi-experimental study with pre and post-test design including intervention and control groups, performed in a high school within a four-month period. The ethical permission was obtained from school's authorities and the study was approved in School's Research Project Committee to be performed under the supervision of a mentor.

2.2 Participants

Participants were 107 tenth grade high school students. They were all identified as females who were studying the same curriculum in four classes. These four classes were randomly allocated to the intervention (two classes with 55 students) and the control (two classes with 52 students) groups.

2.3 Instrument

In this study, we used Self-Regulation Questionnaire developed in 2001 (Hong & O'Neil, 2001) that was validated for Persian language in 2013 (Borjalilu et al., 2013). The questionnaire consists of 34 items in the form of 4-point Likert scale questions ranging from 1 (almost never) to 4 (almost always). The Cronbach's alpha score was 0.87 for the total questionnaire.

2.4 Getting prepared

Those two students who raised the question for this research, started to learn metacognitive and SRL skills in order to become capable of teaching these concepts to their peers. For this purpose, they studied a concise course of "How to improve your learning by promoting metacognitive skills?" hold by an expert faculty member of the field.

2.5 Creating multimedia e-contents on metacognition

Then, those students recorded the voice of the above-mentioned course' instructor and created four multimedia e-contents using Articulate Storyline software, which were totally about 2 hours. They developed e-contents considering educational and technical standards of multimedia development under the supervision of a skilled instructional designer. The e-contents covered these topics: metacognition definition and its role in learning, learning process and practical strategies for enhancing metacognitive skills. The team used school's Learning Management System (LMS) to deliver the e-contents to the participants.

2.6 Design in the control group

Firstly, we started the research in the control group to avoid participants' contamination. The participants of this group responded to Self-Regulation Questionnaire as the pre-test. They received the above mentioned four

multimedia within a month (each week one topic) via the LMS. We encouraged and reminded them to study the contents for each week. At the end of each week, one of the school's teachers held a 40 to 60-minute face-to-face session to briefly review and discuss the topic, and answer students' questions. Finally, the participants filled out the questionnaire again two weeks after the end of the instruction.

2.7 Design in the intervention group

The participants in the intervention group filled out the Self-Regulation Questionnaire and then participated in a peer-conducted flipped classroom model. They received the multimedia via the LMS (each week one topic for one month), just the same as the control group. Then two of the researchers, the students, held 40 to 60-minute face-to-face classes in each week during which they started with a brief 5-minute review of the topic followed by discussion and question and answer. In these classes the participants reflected on their positive and negative learning experiences and discussed useful strategies to improve their learning. During the following week, the participants were encouraged to study the multimedia content and reflect more for the next session. Afterwards, the intervention group answered the post-test questionnaire two weeks after the end of the instruction.

Finally, the same instruction was delivered to the control group to follow ethical issues.

2.8 Data analysis

The data was analyzed using SPSS version 21.0 (IBM Corp., Armonk, N.Y., USA). Analysis included paired t-test, independent t-test and one-way analysis of variances (ANCOVA).

3. Results

3.1 Participant Characteristics

From 107 participants, 97 filled out both pre and post-tests (response rate = 90.65%). Table 1 shows the participants' age and total average mark of the previous semester in both intervention and control groups.

3.2 Main results

Table 2 shows a significant difference between the pre and post-test SRL mean scores in the intervention group (p-value<0.001). In contrast, no significant difference was found between these two scores in the control group (p-value =0.453).

Between group comparison of pre-test and post-test scores using independent t-test showed that although no significant difference was found between the pre-test scores (p-value =0.471), the mean score for the post-test in the intervention group was significantly higher than the control group (p-value =0.001) (Table 3). In addition to this analysis, considering the pre-test score as the covariant, the intervention and control groups as the independent variables and the post-test scores as the dependent variables, the difference of post-test scores between two groups still remained significant (Table 4).

4. Discussion and Conclusion

In this study, we instructed metacognitive skills to the tenth-grade high school students through peer-conducted flipped classroom and assessed its effect on participants' SRL. The results demonstrated that two weeks after the instruction, SRL was significantly higher in the intervention group compared to the control one. Furthermore, in contrast to the control group, a significant increase was found between pre and post-tests in the intervention group. This showed the effect of peer-conducted flipped classroom for teaching metacognitive skills on enhancing students' self-regulation.

The results in the intervention group were consistent with some studies that have focused on teaching metacognitive strategies for improving self-regulation (Harandi et al., 2013; Karaoğlan Yilmaz et al., 2018; Kostons et al., 2012). One of these studies was performed on secondary students who were trained to evaluate their own task performance and use this information for selecting a new one. This led to a more effective self-regulated learning (Bae & Kwon, 2019; Kostons et al., 2012).

In opposite to this consistency, the control group that received multimedia e-contents and participated in instructor-led sessions, showed no significant increase in SRL. This may be interpreted through paying attention to the instructional strategies. While studying multimedia is shown to have no effect on metacognition (Norman & Furnes, 2016), flipped classroom is proved to improve non-cognitive attitudes and competencies (González-Gómez et al., 2016). At the same time, peer instruction has the same goals of enhancing students' engagement and learning as in flipped classroom model. Each of these two strategies are shown to be flexible and effective. Hence, some evidence focusing on higher education has demonstrated that combining flipped model and peer learning leads to higher positive effects (Nerantzi, 2020; Rowley & Green, 2015). This is aligned with the results of this study which is performed on high school students.

In this study, peer conducted sessions provided the chance of students' engagement with the topic. Reviewing the literature supports the effect of peer learning in this study. In fact, peer learning has been used for enhancing metacognitive or SRL skills in some studies (King et al., 2018; Meusen-Beekman et al., 2015; Whitebread et al., 2007). In another study performed on high school students, the opportunity of working together for performing educational tasks resulted in higher SRL and learning achievement (Bol et al., 2012).

Group	Number	Age mean (SD)	Total average mark mean (SD)	p-value for total average mark
Control	50	16 (0.32)	17.5 (2.7)	0.775
Intervention	47	16 (0.37)	18.2 (3.5)	

Table 1 - Comparing age and total average mark between the control and intervention groups.

Group	Test	Number	Mean (SD)	t*	Sig. (2-tailed)
Control	Pre-test	50	2.85 (0.41)	-0.756	0.453
	Post-test	50	2.88 (0.45)		
Intervention	Pre-test	47	2.79 (0.35)	-6.283	0.000
	Post-test	47	3.17 (0.39)		

* Paired t-test

Table 2 - Within group comparison of the pre-test and post-test scores in the control and intervention groups.

Test	Group	Number	Mean (SD)	t*	Sig. (2-tailed)
Pre-test	Control	50	2.85 (0.41)	-0.724	0.471
	Intervention	47	2.79 (0.35)		
Post-test	Control	50	2.88 (0.44)	3.455	0.001
	Intervention	47	3.17 (0.39)		

* Independent t-test

Table 3 - Between groups comparison of the pre and post-test scores fpr the control and intervention groups.

Source	Type III Sum of Squares	Df	Mean Square	F*	Sig.
Type	2.606	1	2.606	21.348	.000

* One-way analysis of variances

Table 4 - Tests of Between-Subjects Effects.

Hence, when students become familiar with metacognitive hints through this teaching method, they have the chance of receiving feedback from their peers and consequently involve more in educational duties (Teng & Reynolds, 2019). In this way, the support they obtain while collaborating with their peers enhances their SRL skills (Hadwin et al., 2011). The results of this study showed the same and there was a significant improvement of SRL skills in the intervention group. In addition, comparing both groups demonstrated higher SRL skills in intervention group. On the other hand, a study performed on secondary students showed that shy students didn't ask questions from teachers in instructor-led flipped classes and preferred getting help from their classmates (Della Sciucca & Fochi, 2016). This can be another evidence supporting the results of this study.

The combination of these strategies in our study had some advantages. We overcame time limitation for holding face-to-face sessions during school working time for delivering lectures. E-contents were accessible for students all over the study period, so that they could study them at their own pace and intervals. On the other hand, this study had some limitations. The participants were all females and we didn't assess the long-term effect of the intervention. So, it is suggested to perform future studies on participants with more demographic variety and consider follow up post-tests in order to investigate the maintenance of SRL skills. Moreover, participants of this study self-reported their level of SRL skills that could be a source of bias. We recommend conducting studies in which SRL skills are observed more objectively.

In conclusion, since students' progress in all aspects of their education is an ultimate goal of any educational system, programs that aim to promote SRL skills should be delivered in order to train effective, responsible and competent learners. Therefore, teaching metacognitive skills to the students could be beneficial because it leads to the improvement in their SRL and learning achievement. (Norman & Furnes, 2016). In this regard, appropriate educational strategies play an important role. In this study, peer-conducted flipped model was shown to be an effective strategy of teaching metacognition for enhancing SRL in high school students.

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Effective triage training for nurses: comparison of face to face, pamphlet, and multimedia training

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Abstract

Emergency Severity Index version4 is the standard triage method in Iran. Effectiveness of training by lecture or e-Learning was investigated. But its effect on nurse performance in triage unit was not studied. The aim of this research is to study the impact of triage training by lecture, multimedia, and pamphlet on triage nurse performance and comparison of them. 21 triage nurses from three general hospitals in Kermanshah in three groups of 5, 6, and 10 persons were included. In each hospital only one method of training was introduced. Pre training variances of percentages of performance accuracy in three groups were homogeneous and pre training triage accuracy was similar in these groups. Post training performance was statistically improved in lecture group and multimedia group but in pamphlet group this improvement was not seen. According to study results multimedia training can be suggested as a good substitute for traditional lectures to improve triage nurse performance. Multimedia training offers the learner freedom to study in their preferred time and place and is more compatible to nurse shift work.

KEYWORDS: Multimedia Learning, Triage Performance, Nurse Education, e-Learning.

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1. Introduction

Triage means determining the severity of a patient's condition upon referral to the emergency department (ED). In other words, the first measure taken by the nurse for any patient upon entrance at the ED is triage (Gilboy, Tanabe, Travers, Rosenau & Eitel, 2005). A triage nurse is trained to act in accordance with a protocol, which categorizes the severity of patients' condition in formulated levels and, accordingly, outlines the next treatment step. This assignment shapes the treatment administered and the length of stay in the ED (Bijani, Torabizadeh, Rakhshan & Fararouei, 2018; Ebrahimi et al., 2016). The fourth edition of the Emergency Severity Index (ESI) is the triage method approved by the Iranian Ministry of Health and Medical Education (Gilboy et al., 2005). Nonetheless, what precludes health-care providers from receiving up-to-date training on a regular basis to keep abreast of the ceaseless flow of new information is the sheer volume of standard services which they deliver and constantly seek to improve upon (Martínez-Segura et al., 2017; Ruiz, Mintzer & Leipzig, 2006).

E-Learning is one of the most effective ways to address this inadequacy (Kamsin & Is, 2005; Ruiz et al., 2006). Although e-Learning comes with many a barrier and shortcoming such as the need for technological infrastructure, potential for inappropriate content, and cultural considerations, it cannot be simply dismissed

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insomuch as it offers a wide array of advantages such as the simplicity of access at any given time and place, flexibility, personalization of training, possibility of instant feedback and interaction, and comprehensive control and follow-up (Blake, 2009; David, Salleh, & Iahad, 2012; Kamsin & Is, 2005). Additionally, e-Learning confers an expansive and rapid dissemination of information based on various educational theories (Barteit et al., 2020; Ruiz et al., 2006; Uprichard, 2020). Periodical training of health-care professionals is both costly and time-consuming given its vast geographical expanse and the multiplicity of its medical centers, which is why the use of distance learning or web-based training could streamline health-care education and facilitates access to the necessary resources. Indeed, such methods can transfer information—based on various contents—to learners across the country rather than transfer a large number of educators' post training across the country (Barteit et al., 2020; Uprichard, 2020).

A nation-wide use of web-based educational methods in Iran, if designed and implemented properly, appears to promise not only an unceasing and unimpeded flow of information but also considerable cutbacks on costs, time, and manpower (Ghaeni & Abdehagh, 2010; Kamsin & Is, 2005; Pourghaznein, Sabeghi & Shariatinejad, 2015; Tabatabai, 2019).

Different studies showed that the previous investigations on non-attendance triage training have solely focused on the trainees' attitudes and knowledge at the expense of their actual performance on the ground (Cone & Murray, 2002; Gerdtz & Bucknall, 2001; Oredsson et al., 2011; Rådestad et al., 2016). Accordingly, we sought to evaluate the efficacy of triage training in enhancing triage nurses' performance in a real-life triage environment by comparing those having received face to face training and those having received non-attendance training via pamphlets and multimedia packages.

2. Materials and Methods

A multimedia package was prepared based on the face-to-face training curriculum of the standard triage training by the Iranian Ministry of Health and Medical Education. This package included voiced slides, featuring navigation options and graphics guides. Additionally, a one-page double sided educational pamphlet was designed based on the curriculum, explaining the main points of performing the triage through text and relevant images.

Three general hospitals – namely Imam Reza Hospital, Imam Khomeini Hospital, and Shohada Hospital – in the Iranian city of Kermanshah were selected for the present study. The choice of general hospitals was to ensure the homogeneity of the study population for a comparison of triage performance considering that nurses at the triage units of specialized hospitals normally encounter patients presenting with very specific categories of physical conditions. There were 6 triage nurses in Imam Reza Hospital, 5 in Imam Khomeini Hospital, and 10 in Shohada Hospital. Because refresher courses are mandatory for triage nurses, the current study recruited nurses on a retraining course.

A questionnaire was used to collect the nurses' demographic characteristics such as age and sex, as well as information regarding their work experience, triage experience, and number of previous training sessions. Thereafter, triage decisions made by each nurse in two randomly selected 6-hour working shifts were studied by collecting and numbering the triage sheets of these two shifts. Each triage sheet came with a checklist concerning the patients' condition upon entrance at the ED (e.g., vital signs), after triage (e.g., admission or non-admission), at admission, at discharge, and at follow-up, together with their outcome. The checklist was completed by ED specialists based on the patients' medical files, and it did not specify the names of the hospital and the triage nurse. Cases were excluded from the study if the patient still had not been triaged by the end of a working shift or the incompleteness or vagueness of the information recorded ruled out a proper assessment. A National Triage Committee-approved ED specialist assessed the accuracy or inaccuracy of the level determined by the triage nurse based on the patient's outcome checklist and triage sheet.

Via the random selection method, face to face training was provided in Imam Khomeini Hospital, multimedia training in Imam Reza Hospital, and pamphlet-based training in Shohada Hospital. The nurses in the face-to-face training group were allowed to participate in only one session; therefore, two sessions of face to face triage training were held in a 10-day period so as to avoid the possible concurrence of a working shift and one of the sessions. In this one-hour class, an emergency medicine specialist delivered a 20-minute lecture followed by reviewing some cases of triage and answering the nurses' questions. Meanwhile, the training pamphlets and the multimedia package were given to the nurses at Shohada Hospital and Imam Reza Hospital, respectively, without any specific instructions in terms of the study method. The access to the multimedia was provided through hospital's Learning Management System (LMS) which was routinely used for staff training. The participants of all three groups had the opportunity of asking their questions from the same emergency medicine specialist through email.

In this manner, by the end of the 10-day period, the triage nurses of the three centers had received training through three different methods. Two weeks after the training period, two working shifts were randomly allocated to each of the triage nurses and their triage sheets and checklists were subsequently collected for evaluation.

3. Results

10 women and 11 men, totally 21 triage nurses, participated in the study who performed 2062 and 2321 triages for patients referring to the EDs of the three hospitals in the pre-training and post-training phases respectively. We compared the accuracy of these triages. The level of significance was taken at 0.05 for all analyses.

Table 1 depicts the information on the age, work experience, triage experience, and previous training among the triage nurses.

Age, work experience, triage experience, and the number of previous training sessions in the three groups were compared using the χ^2 test and the independent *t*-test. There was no significant difference among the three groups in terms of any of the variables.

The performance accuracy percentages of triage in the three groups of participants before and after the training program and their comparisons using the paired *t*-test are presented in Table 2.

The results showed that face to face and multimedia training resulted in a statistically significant difference in the performance of the nurses after training, while this difference was not statistically significant in the pamphlet training group.

The Leven's test was employed to compare the percentages of performance accuracy before training among the three groups and its results revealed homogeneity of variance in the performance accuracy percentage of all the groups, indicating the applicability of one-way analysis of variance ($P = 0.510$). The one-way ANOVA showed that there was no significant difference vis-à-vis the mean performance accuracy percentage among the three groups before training ($P = 0.498$) (Table 3).

The Leven's test was re-applied to compare the percentages of performance accuracy after training among the three groups and its results demonstrated homogeneity of variance in the performance accuracy percentage of all the groups ($P = 0.347$) and ANOVA showed that there was a significant difference apropos the mean performance accuracy percentage among the three groups after training ($P = 0.004$) (Table 3).

The post hoc Tukey's test was used to determine the results of which of the study groups were responsible for this difference. This test showed that the difference was due to the dissimilarity in the mean performance accuracy percentage between the face to face and the pamphlet training groups (Table 4).

With the type of training considered an independent variable and the performance accuracy percentage after training a dependent variable and the effect of the results of the nurses' performance accuracy before the intervention eliminated as a covariance, analysis of covariance (ANCOVA) showed a significant difference among the three groups after the training (Table 5).

4. Discussion

Our evaluation of the pre-training triage performance of the nurses recruited and randomly allocated to face to face, multimedia, and pamphlet training groups in the present study showed no significant difference among the three groups. In addition, we assessed the nurses' performance accuracy and its relationship with training and found an improvement in the mean performance accuracy percentage following the training program (54.9% pre training vs 60.33% post training). Rahmati et al. (2013) in Shiraz evaluated the performance accuracy percentage of nurses using a questionnaire and reported rates of 48.9%, 59.8%, and 59.7% before face to face training, two days post training, and six weeks post training, correspondingly (Rahmati, Azmoon, Meibodi & Zare, 2013).

In the current study, while face to face and multimedia training significantly improved post-training performance ($P = 0.002$ and $P = 0.035$, respectively), pamphlet-based training failed to have a statistically significant effect ($P = 0.794$). Our Tukey test showed that the post-training performance in the face to face and multimedia methods was similar. In other words, these two training methods had a statistically comparable efficacy in improving the nurses' performance accuracy. This finding was reaffirmed when we performed ANCOVA and eliminated the effect of the first evaluation of the pre-training performance accuracy percentage.

Our literature review indicated that in-person and multimedia training have had similar effects. For instance, Issa et al. (2011) reported the positive role of in-person and multimedia training regarding shock (Issa et al., 2011). Elsewhere, Engum et al. (2003) compared the learning of a practical skill (intravenous catheter insertion) between two groups of multimedia and practical workshop groups and showed that the groups were comparable with respect to the practical skill (Engum, Jeffries & Fisher, 2003). In a questionnaire-based study by Rahmati et al. (2013) in Shiraz, in-person training had a significant role in enhancing the knowledge and performance of triage nurses. A study published in 2011 also showed that while both multimedia and in-person training methods increased the knowledge of nurses in triage, the in-person method was superior ($P = 0.001$). What is deserving of note, however, is that – unlike the present study – the previous studies did not evaluate this effect in a real triage environment and merely drew upon tests and questionnaires (Tadrisi, 2011).

We found that the use of pamphlets did not have a proven role in upgrading the triage nurses' performance. In contrast, a study in 2005 in India investigated the effects of lectures, pamphlets, and collaborative education on increasing knowledge about AIDS and indicated that pamphlets had a positive effect, although this impact was less pronounced than

Demographic distribution	Minimum	Maximum	Mean	SD
Age (year)	26	37	32.34	2.86
Work experience (year)	2	17	8.67	3.85
Triage experience (year)	0.5	10	2.69	2.13
Number of previous training sessions	1	6	3.09	1.58

Table 1. Distribution of age, work experience, triage experience, and number of previous training sessions.

Group		Mean	SD	t	Significance
Face to face	Before training	58.36	7.13	-6.79	0.002
	After training	71.68	5.10		
Multimedia	Before training	51.75	8.51	-2.872	0.035
	After training	63.63	6.94		
Pamphlet	Before training	54.21	10.18	0.629	0.794
	After training	52.68	11.40		

Table 2. Comparisons of the triage performance accuracy among the three groups before and after the training program.

Group	Performance accuracy percentage before training (%)	Performance accuracy percentage after training (%)
Multimedia	50.6	63
Pamphlet	54.3	53
Face to face	58.3	71
Significance	F = 0.725, *P* = 0.498	F = 71.69, *P* = 0.004

Table 3. Triage performance accuracy in three hospitals before and after the educational intervention.

Group 1	Group 2	Mean difference	Standard deviation	Significance
Face to face	Pamphlet	19	5.02	0.004
	Multimedia	8.04	5.55	0.338
Pamphlet	Face to face	-19	5.02	0.004
	Multimedia	-10.95	4.73	0.08
Multimedia	Face to face	-8.04	5.55	0.33
	Pamphlet	10.95	4.73	0.08

Table 4. Comparisons of the triage performance accuracy in the face to face, multimedia, and pamphlet training groups using the post hoc Tukey's test.

Source	Type III sum of squares	Degrees of freedom	Mean squares	F	Significance
Hospital	1332.65	2	666.32	7.67	0.004

Table 5. Comparisons of the triage performance among the three groups after the intervention using ANCOVA.

that of the other two methods (Singh, Garg, Mohapatra & Mishra, 2005). In a study by Emami et al. (2011), pamphlet-based training was effective in altering prescription writing and reducing customary mistakes by physicians. The discrepancy in results pertaining to the efficacy of pamphlet-based training may be explained by the possibility that the nurses in our study failed to read the pamphlets (Emami, Mohammadi, Mojtahedzadeh & Dehpour, 2011) (We did not investigate this possibility).

5. Conclusions

In light of the results of the present study and the aforementioned ones, we can conclude that the multimedia training method is comparable to the face-to-face training method in terms of reliability and efficacy in boosting the performance accuracy among triage nurses. Multimedia training may be a viable solution to the challenges in scheduling several classes at different hours and locations for nurses, who routinely work in shifts. In order to avoid contamination among the groups of study participants,

we opted for a non-random selection of nurses. Nonetheless, we randomly assigned the participants to the different education methods provided in the different hospitals. The reliability of our results may have been diminished by our low sample size. We would, therefore, suggest that future studies with true experimental research designs and larger sample sizes be undertaken in order to strengthen the reliability of the results.

6. Data Availability

The data that support the findings of this study are available, but restrictions apply to the availability, which were used under license for the current study. They are not publicly available but are available from the corresponding author upon reasonable request.

7. Conflicts of Interest

The authors declare that they have no conflicts of interest.

8. Acknowledgments

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The project-based method to promote competence-based education. A case study in teaching computer science in Italian secondary school

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Abstract

Many researchers and institutions in the field of education are striving to align the different levels of the education system to the growing needs and requirements of society. A meaningful part of these attempts has been concentrated on a systematic introduction of the competence-based education approach. Some countries adopted it and reshaped the school systems accordingly. Introduced in Italian secondary schools in 2010 by the Ministry for Education, the competence-based approach has been only partially adopted in classes. Our research aims at investigating solutions to support its adoption for teachers in Italian secondary schools. As student projects are frequently proposed in computer science classes, the project-based learning method was identified as a potential solution and investigated in an empirical study including two parts: (a) An action research training course on project-based learning; (b) A collective case-study involving six student projects. The empirical study highlighted some critical issues to be dealt with to foster the adoption of the competence-based teaching approach. Results confirmed a weak commitment of teachers to the competence-based approach, but also that exploiting student projects towards the project-based learning method may encourage teachers to adopt a competence-based approach, provided the projects are carefully designed and subsequently managed. To this end the paper offers a schema to check if a project is compliant with the project-based learning approach and some guidelines to support teachers in their activity during the student projects.

KEYWORDS: Competence-based education, Project-based learning, Active learning, Teaching method, Student project, Key competence, Subject-specific competence.

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1. Introduction

The competence-based approach to teaching has been supported by educational research (Winterton, 2009), and by international institutions.

Research has clarified that the concept of competence mainly refers to individual aspects and, as individual development takes place primarily at school, the concept of competence deserves to be respected as an important part of educational study (Weinert, 1999). At the same time, other researchers proposed a holistic model of competence, introducing a comprehensive vision of the competence-based approach (Delamare Le Deist & Winterton, 2005). International institutions have attempted to define the key competences necessary for a successful life and a well-functioning society (OECD, 2005). European institutions recommended member states to adopt the key competences defined in the European reference framework for lifelong learning (EU Parliament & Council of the EU, 2006), recently renewed by the Council of the European Union (Council of the EU, 2018), as well as advocating national strategies and a more comprehensive approach (Eurydice, 2012). An ongoing project for defining competences is that of IEEE (2021).

Nevertheless, the practical adoption of the Competence-Based approach to Education (CBE) has

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not been carried out homogeneously. Some countries have reshaped their school curricula in order to conform to it. Germany is one of these countries: in 2003 and 2004 educational standards were introduced, which defined the core learning outcomes in terms of competences for grade 4, and for the lower secondary education at grade 9 or 10 (Köller & Parchmann, 2012). The involved subjects were Biology, Chemistry, English, French, German, Mathematics, and Physics. For Computer Science (CS), a proposal for lower secondary education has also been published by the German Informatics Society in 2008 (Linck et al., 2013), and in the USA by the CS Teachers Association in 2011 and 2017, enforcing CS competences throughout primary and secondary schools. When the process of building a curriculum consistent with the competence's definition is put into place by educational institutions, it is referred to as the institutional way (see for example the case of Austria (Micheuz, 2016).

In Italy, the reform promoted by the MIUR (Ministry of Education - MIUR, 2010) prescribed the institutional adoption of the competence-based approach, subsequently introducing the lists of competences for technical schools (MIUR, 2012a) and for vocational schools (MIUR, 2012b). The learning outcomes for each discipline and different course years are defined in terms of competences, contents, and skills. However, the reform does not suggest any practical solution for integrating competences in the class (Ronchetti, 2017). As a consequence, schools and teachers have to design and create their own procedure for integrating these competences into their curricula.

The operationalisation of CBE, i.e. moving from theory to practice, is a complex procedure, and it is not popular in classes (Mulder, 2017; Bottani, 2007). This gap between an official requirement to use CBE and the actual situation prompted the present search for practical support for CS teachers in Italian secondary schools.

As student projects are frequently proposed in CS classes, the project-based learning (PBL) method (Kilpatrick, 1918; Kingston, 2018) was identified as a potential solution and investigated in an empirical study including two parts: (a) An action-research training course on project-based learning; (b) A collective case-study involving six student projects.

The goal of the action-research training course was to investigate how the application of the PBL method is driven by the CBE and motivating teachers to adopt this approach. Furthermore, we analysed student projects activities usually performed in schools to verify if they were compliant with PBL.

The empirical study is part of a large multi-year project on e-Learning methods and platforms, focusing on CBE. This paper describes the main results of the study. Related sub-projects are described to an extent that allows the reader to understand how the study addresses and answers the research question.

The structure of this paper includes the following sections. Section 2 defines the context, the research problem, the research question, and the research methods used to address the research question.

Section 3 describes the empirical study. Section 4 gives the results of the empirical study. In section 5, we draw the conclusion examining possible impact of the research and describe future implications and open questions.

2. Materials and Method

2.1 The context and the research problem

MIUR provided a formal and nationwide prescription of CBE for secondary schools. In order to understand if and how the CBE approach is adopted by secondary school teachers, we focused on the Trento province, in Northern Italy: a region having autonomy in the education system management.

Our research project used data and opinions collected from teachers by two sources. Firstly, the results of a project called eSchooling and meant to support teachers in the adoption of CBE (involving 120 teachers in two workshops, and 300 teachers in a survey) gave us the opportunity to look into teaching methodology and related issues (Chiozzi et al., 2015).

Secondly, in an initiative called "Conversation on the Competence-based approach to Education", we interviewed CS teachers to observe how accustomed they are to using the CBE approach and related terms (Giaffredo et al., 2017).

Data collected in these initiatives highlight some critical aspects. Teachers described the "lack" or "fuzziness" of the guidelines to the adoption of the competence-based approach, declaring also a low level of trust in the competence proponents (Giaffredo et al., 2015). Data also suggest that the institutional framework of the competences was scarcely used as a practical reference for teaching activities. Moreover, the formal definition of the set of competences issued by the MIUR does not make their use in the class compulsory. Hence, most teachers prefer not to adopt CBE at all, and as a result CBE is present in Italian secondary schools only in very limited way (Ronchetti, 2017).

2.2 The research question

CBE requires activating a learning process in which knowledge, skills, and abilities of the learners can be applied, developing competences according to the constructivism principles. Such a learning process can be activated by inductive teaching methods (Hazzan et al., 2011), which set up "experiences that induce students to construct knowledge for themselves, when necessary, adjusting or rejecting their prior beliefs and

misconceptions in light of the evidence provided by the experiences" (Prince & Felder, 2006, p. 125).

Our research aimed to discover solutions able to support the adoption of CBE for CS teachers in Italian secondary schools. During our interviews, all CS secondary school teachers claimed to use student projects in their classes because students are directly involved in the educational process: they are more interested and more active. Student projects share relevant aspects of the PBL.

Hence, we focused our study on the following research question: are CS secondary school teachers induced to adopt the CBE approach when they are applying the PBL method?

2.3 The research methods

In order to answer the research question, we planned and designed two empirical case studies.

The first one was an action-research course on the PBL planned for CS secondary school teachers. This kind of course aims to motivate the teachers in their direct action in classes, alternating the teachers' instruction and their activity with students (Cohen, 2007). In this way, the teachers receive an incentive to rapidly put into practice the main notions suggested during the instructional part of the course. At the beginning and at the end of the course we submitted a questionnaire on PBL and on CBE approach. It was designed to pick up on possible changes in attendees' teaching practices. During the course, attendees used a web platform called OPLÀ (Ronchetti & Valerio, 2016), aimed at supporting PBL activities in a CBE framework. OPLÀ supports teachers in planning, designing, and implementing different educational activities, including PBL activity. After the initial settings of basic data, including competences with related contents and skills, teachers can define their teaching activities. A sort of Gantt diagram can help the planning phase, with a choice of different time granularity. Focusing on PBL, the project could involve different teachers, whereas students from different classes could be grouped. A competence rubric details the quality level of the final product and can be defined for each of the competences chosen in the project. Assessment features include discipline-specific competences, chosen by teachers, and general competences, defined at school level.

The action-research course included three different kinds of activities:

- *Plenary meeting*, with the whole group of trainee teachers attending to short interventions or sharing experiences and ideas about student projects or the PBL method.
- *Individual project meeting*, in which the researcher met the teacher to observe and support planning, designing, and implementing the student projects.
- *Individual teacher on-line education, supported by the web platform*, which partially guides the trainee in the PBL activities.

The second case study was a collective study, in which we investigated student projects in technical secondary schools, observing teachers' activities, and conducting initial and final interviews. For over the six months we met the teachers in different situations, including individual meetings and their lessons in class or laboratory. Teacher interviews were individual even when different teachers were involved in the same project. We collected data and details on the project design: data related to competences to be developed by students during the project, and data about how students were going to be assessed. Since not all student projects were PBL compliant, we defined a schema with the characteristics needed by a project to be a PBL activity, and we applied the schema to the student projects.

We used a software system (a web platform) to document the PBL activities, for three reasons: the quantity of data to manage, the communication needs, and the need to have a consistent management of the educational work.

The initial phase of didactic design in the PBL activities dealt with identifying the competences for all involved disciplines and creating an explicit scale of competence achievements.

Data were available to teachers involved in the same PBL activity, and at the school's convenience all resources used or produced by a PBL activity could be shareable among all school's teachers.

Timetable and deadlines, as well as definitions of competences and related rubrics, needed to be consistent during the students' project implementation with what was planned in the design phase.

3. Results of the empirical study

3.1 The Action-research training course

In the first study, we designed and performed an action-research training course on PBL and CBE. The intention was to let the most learning-effective aspects of PBL emerge, and to find possible links to CS competences. The target were CS teachers, including those teachers who already planned to apply the PBL method in at least one class during the schoolyear. Seven CS teachers enrolled in the course. They worked in three different technical schools of two different sectors (economic and technological), offering a rich variety of pedagogical environments to observe.

As the course was on PBL, course attendees were asked to plan their activities for a project to be developed in class. Details on the project plans were collected during individual project meetings, as well as during visits to schools and classes involved, forming mixed teams of

teachers and researchers with focus on a single project. Mixed teams reflected on results, in order to plan the project steps and tune the activities to be implemented, realising the *self-reflective spiral* for each project. Individual projects were discussed also in group with all attendees, for a reflection on the various project issues.

We collected data at the beginning and at the end of the course, to investigate possible variations occurred after the action research course. To measure the impact of the training course, we introduced two tools: the mentioned OPLÀ web platform, designed and implemented as an on-line guide, and a worksheet called "Plan for a Project-based Activity" (PPA) (Giaffredo, 2018): an Italian reduced version of the Patton Project planner (Paul Hamlyn Foundation, 2012) meant to help planning and summarizing the plan. The sheet requires defining the learning goals, in terms of contents or skills, adding assessment criteria.

Of the twenty-eight learning goals gathered with the sheet, 15 related with contents and 13 with skills. Two blind evaluators teams, respectively of University of Milan and of University of Trento, checked the classification to validate it. Results highlighted problems in 4 out of the 15 content objectives, which had to be classified as skills (Giaffredo et al., 2017).

In another step of the learning activity, we checked if teachers changed their projects plan for future classes.

The milestones of the course were three plenary meetings. After a review of the most important aspects of the PBL method, in the first meeting we shared some characteristics of the student projects which the teachers were going to plan. The attendees filled in the PPA twice, related to the PBL activities delivered in the past, and to those to be delivered during the schoolyear, as required by the "action" component of the course. We also introduced the teachers to the use of OPLÀ, into which the plans for the projects were uploaded.

Four PBL activities were planned, all of them concerning software development. Details about them are reported elsewhere (Giaffredo, 2018).

In the second plenary meeting the main characteristics of the PBL activities were shared, and data collected in the first meeting were analysed. Some peer-critique techniques were introduced, inviting teachers to use them in their PBL classes.

The third meeting was a discussion related to the usefulness of the PBL activity. Using PPA we collected new data about the planning of PBL activity, focusing on future, possible activities to deliver to their classes.

Individual support was also available for trainees on demand. 5 out of the 7 teachers asked for such support. In other meetings we agreed on specific techniques to apply in classes. For example, the *gallery critique protocol* (Paul Hamlyn Foundation, 2012, p. 99) was applied to an activity. Some classes were observed, documenting the relevant steps, some of them by video recording. Teachers have been met individually or, more frequently, in pairs, when they were working in the same class and on the same project. Even though the planning feature of OPLÀ was not used during the course, some teachers accessed the platform as a guideline and as an inspiration for initial competence choices and rubrics.

Two PBL activities completed the design and the implementation phases: they were compared in the last plenary meeting.

3.2 The collective case study: Students projects

The collective case study had the goal to observe some student project activities in two secondary schools. Ten teachers proposed different student projects in six classes, involving 121 students. Classes had 17 to 24 students each. The projects lasted 6 months. Observed teachers used the OPLÀ platform.

Details about the projects are reported elsewhere (Giaffredo, 2018):

The projects were quite different in many aspects, as summarized in the following:

- The product to be realised, the final exhibition and the possible effects outside the schools.
- Contacts or feedback from the commissioner, in case of commissioned projects.
- Criteria used to form the working groups and the group assignment.
- Working methods and standards.
- Individual students' assessment.
- Researcher's presence during the projects.

All projects but one involved only the CS domain. Each project had the goal to develop a software application; one of them was a website. Out of these, all projects but one realised a custom product. Four projects were commissioned by different subjects, external to the school. The commissioners had frequent contacts with two classes; in the other two classes, the teachers directly kept contacts with the commissioner. Three of the commissioned projects were officially delivered in a public session, also attended by the researchers.

Working groups, divided into subgroups, were formed in four projects. In two cases the working groups were created by the teachers, in a third one each student decided which group to join, and in the last working groups were often reshuffled. In two projects, each working group had a leader.

Data analysis and design of two projects were developed with all the students of the class. Two projects had people documenting the class activities.

Objectives and deadlines were clearly defined in two projects. In one project, detailed assignments for sub-groups and individual students were given by the teachers. In two cases progress was reported and presented to the class by each working group, while in a third one it was directly monitored by the teachers,

and in another by each single student. In one project, the 3 group leaders had daily short meetings.

Standards were defined in three projects: in two cases they were related to the application forms; in another, students defined only the most useful development standard.

Teachers of three projects assessed the students only by direct observation. In one of them an assessment grid had been initially defined but was never used. In one project, both the self-evaluation of the learning diary and the student relation were used as input to assess the students. In a project three different assessment grids were defined and used: one for the short and individual presentations, one for the workload assignments and the homework and the last for the final presentations.

The researchers met the teachers and all classes several times. In two cases also the external commissioners were met.

Working on this study, we realised that the observed student projects were usually planned, designed, and implemented with limited attention to the formalisation of the various project steps. Similarly, projects paid little attention to the main characteristics of the PBL method. Consequently, we analysed to what extent these projects can be defined as PBL. To this goal we first defined a schema, and then we applied it to the projects.

From the criteria proposed in literature (Thomas, 2000; Paul Hamlyn Foundation, 2012) we extracted the main characteristics of a PBL activity. The set includes:

- organisational aspects, like plan and design;
- contents choice and learning design, instantiated in driving questions and learning goals, in a constructive investigation, and in the requirement of realism;
- an attitude to autonomy both required to the students and developed with them.

We made it more explicit by defining a series of requirements:

Plan and Design. A clear timeline has to be defined for the student project, and milestones have to be announced to students.

Centrality. Projects must focus on questions which are part of the curriculum, and questions must drive towards central concepts and principles of CS discipline.

Definition of learning goals. Curriculum content and skills which students will learn in the project need a formal definition.

Assessment of learning goals. This includes self-assessment by the students; school assessment, usually done by the teachers; external assessment, by people outside the school, e.g., citizens, professionals, experts.

Constructive investigation. Students have to actively be involved in "doing with understanding" (Barron et al., 1998), also called learning when or by doing.

Realism. Projects must simulate a realistic activity, primarily engaging students in obtaining a product required or useful to someone.

Autonomy. Students are required to show products of their projects. Exhibitions are usually planned. A successful exhibition is a proof of autonomy.

The requirements set has been consolidated into a schema (Table 1).

plan and design		
driving questions and learning goals	centrality	
	learning goals definition	
	learning goals assessment	self-assessment
		assessment by school
		external assessment
constructive investigation		
realism		
autonomy		

Table 1- Criteria for a student project to be considered PBL

Such schema has then been applied to the six student projects to measure their PBL level (Giaffredo et al., 2018), as summarized in Table 2. The more a project conforms to the criteria, the more it can be considered PBL, with the following evaluations:

- A, highly conforming to criterion
- B, conforming
- C, poorly conforming
- N, not conforming.

			1	**2**	**3**	**4**	**5**	**6**
plan and design			*C*	*C*	*N*	*B*	*C*	*C*
driving questions and learning goals	centrality		*A*	*A*	*A*	*C*	*A*	*A*
	learning goals definition		*C*	*C*	*C*	*A*	*C*	*C*
	learning goals assessment	self-assessment	*N*	*C*	*N*	*N*	*B*	*N*
		school assessment	*C*	*C*	*B*	*N*	*N*	*B*
		external assessment	*C*	*C*	*C*	*C*	*C*	*C*
constructive investigation			*A*	*A*	*A*	*A*	*A*	*A*
realism			*A*	*A*	*A*	*A*	*A*	*B*
autonomy			*B*	*B*	*B*	*B*	*A*	*B*

Table 2 - PBL characteristics of the six student projects

As we can observe, only project 2 does not present non-conformity.

4. Discussion

Our two studies investigated the possible presence of a positive impact of the application of the PBL method on the adoption of CBE. The focus was on CS secondary school teachers in Italy.

4.1 The action-research training course

The results confirmed several issues: fuzziness in definitions of the set of competences; lack in teachers' competence vocabulary; limited adoption of CBE approach.

The result of fuzziness is not new. A study published in 2013 claims that even scholarly definitions of set of competences are often unclear (Magenheim et al., 2013). Similarly, institutional definitions of competences can also be unclear. As a consequence, this generates a lack of vocabulary on competences, as confirmed also by blind evaluation on plans produced by teachers in our training course.

4.2 The collective case-study

The second study focused on a collective case study, involving six student projects. Except for one project, all student projects conform to the characteristics of plan and design, centrality, and learning goals definition. Only one project had a written plan or a design. The other five projects focused on main principles of the discipline, highly conforming to the centrality criterion, but with a poor definition of learning goals.

Learning goals were poorly assessed, except for project 5 with self-assessment, and projects 3 and 6 with an assessment by the teachers.

External assessment was implicitly applied to the projects presented to the public (projects 1, 2 and 3).

The best results were achieved for the last three criteria: realism, constructive investigation and – even if to a lesser extent – autonomy.

Overall, if we were to assign a score between 0 and 3 for N to A, all projects would score between 15 and 17 out of 27, showing that their adherence to PBL was rather weak.

4.3 Comparison of the two approaches

Our two studies performed different but complementary research activities. On the one hand, they were different in impact on teachers' behaviour. The training course included sharing some basic principles with teachers, then supporting them in their practical application in classes. For this reason, a goal of the course was to modify the way the teachers practice PBL, helping them to pay attention to CBE.

With the collective case study, on the contrary, we did not try either to modify or to interfere with teachers applying the PBL in their teaching. It was an opportunity for us to observe the process in action: we did not offer any suggestions, interacting with teachers only to collect data for the research, with no intentional consequences on teachers' training.

On the other hand, the two studies provided comparable results, seen from different viewpoints. Both studies confirmed that in PBL activities teachers are especially careful to survey the social competences and meta-competences, also called transversal competences, of their students. In both studies, teachers highlighted that PBL activities support students in developing also competences other than CS competences.

The direct observation in class and the evaluation of final products provided teachers of first study with the elements, which gave them a useful basis to assess students. The PBL activity represented a useful opportunity for all students and was very positive for some of them. Teachers did not report any negative aspects, whereas they highlighted various positive ones: motivation, autonomy, enthusiasm, and no defeatism. Participating in the creation of a real product was intriguing for all students.

Teachers of the second study developed six student projects. We did not force teachers to strictly use the PBL method. As the application of our schema revealed, all student projects included the main characteristics of the PBL method, but the definition of learning goals was poor, and the assessment focused mainly on transversal competences rather than on CS competences. With such a weak attention to assessment, we cannot claim that the analysed projects were fully PBL. In summary, attention to development of transversal competences seems to be a result of student project activities. At the same time, more attention must be given to the definition of learning goals and on assessment.

5. Conclusions

Official indications push towards CBE, but this approach is scarcely adopted by Italian teachers. This limited adoption has been the research problem we addressed. We aimed at finding solutions to support the adoption of the CBE approach to education for CS teachers in Italian secondary schools. Our working hypothesis was that PBL can help achieving CBE.

Our preliminary evaluation confirmed a weak commitment by the teachers in the competence-based approach. Hence, we acted on two plans: in one study, we organized an action research based on a training course for teachers on PBL finalized to CBE, which we designed and implemented. In a second study, run in parallel, we observed a group of different teachers and their students while they were running students' projects as a teaching method. In this second case, we wanted to ascertain if these projects were compliant

with the PBL guidelines, and if they favoured the introduction of CBE.

Both studies reported a weak *induction-effect* from PBL activities to the CBE approach, even though some teachers showed to be interested in applying project tools to the CS competences. A problem that emerged is that project plans are usually scarcely formalised, and that student projects are not fully PBL-compliant. To address the question of the PBL-compliance, we built a schema to measure how student projects are PBL. We applied the schema to six student projects, confirming a poor plan and design formalisation, which also revealed a poor definition of the learning goals in the student projects. Our hypothesis to be further investigated is that a more formalised student project could better induce teachers to adopt the CBE approach.

Our two studies offered different investigation contexts. Action research course attendees shared some basic knowledge, principles and reflection. On the other hand, teachers of different student projects in the second case study did not plan shared activities. The course pushed teachers to enrich their PBL activities with some aspects of CBE approach, while the second study was limited to observation, without interference. To measure the impact of the action research course, we asked teachers to provide two PBL activities plans: plans of past activities, in the first meeting; plans for future activities, in the last meeting. We collected comparable data submitting the same worksheet, which requires to define the PBL activity learning goals and to identify contents and skills separately. In the final plan teachers paid more attention both to the definition of the learning goals, including social competence, and to the assessment criteria, also adding a test based on finding and fixing errors in a piece of software. One teacher included a rubric with the criteria to assess competences and skills of the students. In the last meeting we collected data from two PBL plans.

Three teachers accessed the basic functionalities of the OPLÀ platform, sharing materials and documents, but did not use those which allow managing project planning, creating rubrics for competences and products, and assessing competence. In such conditions, support systems can only have a limited impact on educational activities.

Overall, the involved teachers were keen to compare their experiences and they willingly brought the perspective of their own work into the research. Taking part in the training on PBL, they shared techniques and approaches to design and direct the activities in class. They were able to reflect on their teaching approaches, both past and present. Some of them said that they would be more confident in using teaching support systems introduced during the research. This in turn can help to support CBE.

As a result of the second study, in which we observed the project teaching in classes, we can confirm that the application of the PBL method could effectively drive the learning process, helping teachers to monitor students' activities. This could have a meaningful *induction-effect* from student projects to CBE.

CS teachers use student projects with their pupils, even though activities are not always compliant to the PBL method. Sometimes, student projects might suffer from lack of design and planning. In this case, support systems would have a limited impact on educational activities. Furthermore, some student projects do not focus on the specific competences of the CS discipline, neither by design nor in assessment. Nevertheless, we observed that student projects encourage teachers to assess social competences and meta-competences, also called transversal competences. The reason is probably that during projects students are engaged in group activities, an environment suitable to develop and observe social competences.

The schema we developed to measure the PBL characteristics of a student project could be used as a tool to support the design of student projects, helping teachers to clearly include the definition of some convenient milestones. In the first phase, teachers could apply the schema to analyse their previous student projects from the point of view of PBL. This could help them understanding which parts of the project plan need a better formalisation, achieving a clearer learning design for their future projects. This might be a way to drive an explicit adoption of the CBE approach. To contextualise results of our study, future research could compare Italian approach to CBE to European country that integrate it in the school curricula.

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