



Re-imagining the Distributed Nature of Learner Engagement in Computer-Supported Collaborative Learning Contexts in the Post-pandemic Era

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Abstract. Learner engagement has become more fragmented and distributed than ever before due to the challenging and unpredictable circumstances amidst the pandemic. Social isolation, mobility restrictions, and the emergency transition to online education have influenced students' emotions, thoughts, and actions. The purpose of this study is to explore the factors that impacted learner engagement over time during the pandemic; to investigate students' perceptions on the role of social technology during remote education; and to capture students' reflections distilled through their recent and ongoing experiences with online learning. The findings from three exploratory case studies conducted during the pandemic with undergraduate students are collectively analysed and discussed. Four main themes emerged following a holistic, comparative data analysis: the distributed nature of learner engagement; the impact of the pandemic on the affective, behavioural, and cognitive dimensions of engagement within computer-supported collaborative learning contexts; the multifaceted and contradictory roles of social media and social technology while learning under lockdown; and finally, the lessons learnt and visions of students for learning in the post-pandemic era. The findings can inform the pedagogical design of inclusive, seamless, and accessible learning environments embracing social technology towards reactivating learner engagement.

Keywords: Learner engagement · Computer-supported collaborative learning · Undergraduate students · Social technology · Social media · Pedagogical design

1 Introduction and Motivation to the Research

The consequences of Covid-19 outbreak have undoubtedly challenged many aspects of modern life. Educational systems have witnessed unprecedented disruptions (Marinoni and van't Land 2020; Vijayan 2021) leading educational institutions to suspend their operations or rapidly shift from conventional, classroom-based teaching and learning to online education (Dhawan 2020; Hodges et al. 2020; Kara 2021; Veluvali and Suriseti 2022; Vijayan 2021; Vlachopoulos 2020). Within higher education, the persistence and

extent of the pandemic's consequences have compelled both students and educators to re-establish their discontinuous social interactions, fill the gaps caused by fragmented learning experiences, and reflect on social, family, and ethical values.

Although Covid-19 pandemic may have not been the solitary driver for recent technological developments, the measures for social distancing and restricted mobility – which were enforced for restricting the impact of the pandemic – have certainly speeded up the exploitation of social technologies in personal, educational, and professional contexts alike. The role of social media, collaborative platforms, learning management systems (LMS), and mobile apps has been instrumental in ensuring educational institutions continue functioning and supporting teachers and students during the rapid, imposed, and unplanned shift to online education (Dhawan 2020; Engelbrecht et al. 2020; Hodges et al. 2020; Marinoni and van't Land 2020; Muñoz-Carril et al. 2021; Piki 2020; Veluvali and Suriseti 2022; Vlachopoulos 2020). This exploitation has been particularly evident within higher education (Abu Elnasr et al. 2020; García-Peñalvo et al. 2021; Marinoni and van't Land 2020; Muñoz-Carril et al. 2021; Piki 2020). Without the utilisation of these technologies, it would not have been possible for universities to respond quickly and constructively to the unfolding disruptions. Still, despite the acceleration in the uptake of social technologies, their role and the impact on learner engagement and students' academic performance has been explored to a limited extent (Piki 2020; Abu Elnasr et al. 2020). Similarly, while the scale at which online teaching has been deployed at all levels of education has been unprecedented, the theoretical and empirical exploration of online teaching pedagogies has been limited (Vijayan 2021). These empirical gaps have attracted researchers' attention in recent months.

Personal experiences further fuelled the motivation for performing research on learner engagement during the shift to online education. Observing the variation in student engagement, and the sharp decline in student participation, following the emergency transition to online teaching, compared to the engagement and participation of the same groups of students a few days before the initial lockdown (in the first quarter of 2020), instigated a set of exploratory research questions towards investigating the reasons behind these variations, and how students experienced this transition from their point of view. Given the novelty of the situation at the time, there was limited empirical research into students' perspectives, feelings, and experiences, and on the role that social, mobile, and collaborative technology played during the emergency shift to remote education. Therefore, a case study was designed to address these nascent research questions. While a vast number of research studies has been published on teaching and learning since the outburst of Covid-19 pandemic, the fact that its consequences are ongoing invites further empirical research for understanding students' perspectives both during the emergency transition to online education in higher education and throughout successive isolation periods. Hence, guided by the initial findings, two additional case studies were deployed to explore and compare the impact of the pandemic on learning and engagement over time, across subjects, and between different modes of study (full-time and part-time students).

In addition to the empirical gaps, there exists a methodological discrepancy in the wider research into pedagogical design and the educational applications of digital and social technology. Research quality metrics often favour objectivist over interpretivist

approaches (Twining et al. 2017). As a result, many studies focus on evaluating specific technological interventions in a particular learning milieu or aim to capture quantitative data on student engagement and satisfaction (Muñoz-Carril et al. 2021; Wang et al. 2022). Conducting exploratory case studies in higher education can contribute to existing literature and instructional practice and help fill the identified empirical and methodological gaps.

The overarching purpose of this research is to conscientiously portray students' voices, viewpoints, and reflections on their learning experiences during Covid-19 pandemic, understand the factors that enabled or weakened their engagement over time and in different subjects, and finally explore the role of social and collaborative technology during remote education. Listening to 'student voice' creates a channel through which to understand how students experience a situation and why certain aspects are important to them, which has implications for educational quality and student performance (Grebennikova and Shah 2013; Kahu et al. 2020; Wang et al. 2022). Hence, students' perceptions and insights should not be neglected in the post-pandemic efforts towards reframing the educational system and re-establishing inclusive, accessible, and engaging teaching and learning environments.

The paper is organised as follows: Sect. 2 synthesises related literature and provides the background to the research. Section 3 presents the methodology and research design. Section 4 describes the key findings and overarching themes extracted from the case studies conducted. Finally, Sect. 5 synthesises the research insights towards re-imagining the distributed nature of learner engagement in computer-supported collaborative learning (CSCL) contexts in the post-pandemic era.

2 Background Research and Related Work

Prior to delving into the exploration of student perspectives, it is vital to study relevant literature, including previous empirical work and educational theory (Twining et al. 2017). This section synthesises research and empirical work that has informed the study of learner engagement with CSCL contexts before and during the pandemic.

2.1 Learner Engagement in Computer-Mediated Learning Contexts

Learner engagement is a complex and multifaceted concept (Ainley 2004), characterised by qualities such as vigour (high levels of intellectual effort, energy, and mental resilience during learning), dedication (strong involvement, active participation, inspiration and challenge), and absorption (being fully concentrated and deeply engrossed in learning) (Schaufeli et al. 2002). High degrees of engagement and motivation subsequently impact retention, understanding, and academic achievement (Hughes 2012). The 'Distributed Engagement Theory' (Piki 2012) portrays learner engagement in CSCL environments as a multi-dimensional concept, embracing emotional, behavioural, and intellectual constructs which are dynamically affected by a distributed collection of personal, social, group-level, and other situational factors. When this theory was originally proposed about a decade ago (Piki 2012) the aim was to understand the nature of learner engagement and capture the multifaceted enablers and barriers that dynamically interact and

shape learner engagement to inform pedagogical design. Many aspects have changed since then (innovative collaboration tools and emerging social technologies have become readily available; virtual, mixed, and augmented learning environments are flourishing; the educational milieu has been greatly disrupted due to the pandemic), yet the primary aim remains the same in new research ventures.

Learner engagement has been increasingly attracting the interest of educators, instructors, and scholars in the pursuit of innovative pedagogies that respond to changes in the society (Ferguson et al. 2019). These efforts aim towards establishing rewarding learning activities, motivational assessment strategies, and student-centric and inclusive knowledge delivery methods (Piki 2017) catering to the needs of diverse learners (Veluvali and Suriseti 2022). Nevertheless, in recent months, the negative impact of the pandemic has been evident, and counter-engaging expressions such as boredom, anxiety, stress, and mental health issues are commonly featured in recent literature (Kara 2021; Vijayan 2021; Wang et al. 2022). The rapid and imposed changes which forced students to switch from the familiar learning environment to an unfamiliar, isolated situation, not only elevated student anxiety, uncertainty and distress but also negatively impacted their learning experiences, level of concentration, and degree of participation during online lectures (Piki 2020; Piki et al. 2022). The prolonged negative impact of the pandemic has reignited interest into the range of personal, pedagogical, technological, and social factors influencing students' engagement and satisfaction. Recent studies explore the aspects that impact learner engagement in online learning (Kara 2021; Wang et al. 2022) and CSCL contexts (Ma et al. 2020; Muñoz-Carril et al. 2021), as well as the role that social media played in engaging learners during remote education (Abu Elnasr et al. 2020; Piki 2020; Piki et al. 2022).

A keyword search using Scopus interdisciplinary abstract and citation database (Scopus Elsevier 2022) performed on January 31st, 2022, revealed that the number of papers discussing 'learner engagement' increased by more than four times between the years 2011 and 2021 (Fig. 1). Searching within the results demonstrated a similar trend for 'learner engagement and online learning' and 'learner engagement and online learning and social media'. Examining the number of new publications per year for the latter combination of key terms also revealed that the yearly count of papers was 2,5 times greater in 2020 compared to 2019, and almost doubled in 2021 compared to 2020 (Fig. 2). The novelty of the situation caused by the pandemic unsurprisingly launched new hypotheses and research questions driving scientific and exploratory research in the broader educational literature. Moreover, several academic journals and conferences dedicated special issues and thematic sessions, respectively, encouraging scholars to study the impact of Covid-19 pandemic on education. Naturally, a vast number of researchers started exploring the social, emotional, pedagogical, and technological disruptions caused by Covid-19 pandemic and their impact on teaching and learning (Muñoz-Carril et al. 2021; Vijayan 2021; Wang et al. 2022). With the crisis still unfolding, researchers have been eagerly sharing research findings on the strengths, weaknesses, opportunities, and challenges presented to students, educators, school leaders, and institutions through online teaching and learning (Aucejo et al. 2020; Dhawan 2020; Muñoz-Carril et al. 2021; Toquero 2020); the solutions and technological interventions being employed to engage learners (Piki et al. 2022); and the knowledge gleaned and lessons learned during this

unprecedented period (Vijayan 2021). Research studies have been conducted at all educational levels, including higher education (Abu Elnasr et al. 2020; Cassibba et al. 2021; García-Peñalvo et al. 2021; Kara 2021; Marinoni and van't Land 2020; Muñoz-Carril et al. 2021; Piki 2020; Piki et al. 2022; Toquero 2020; Tractenberg 2021).

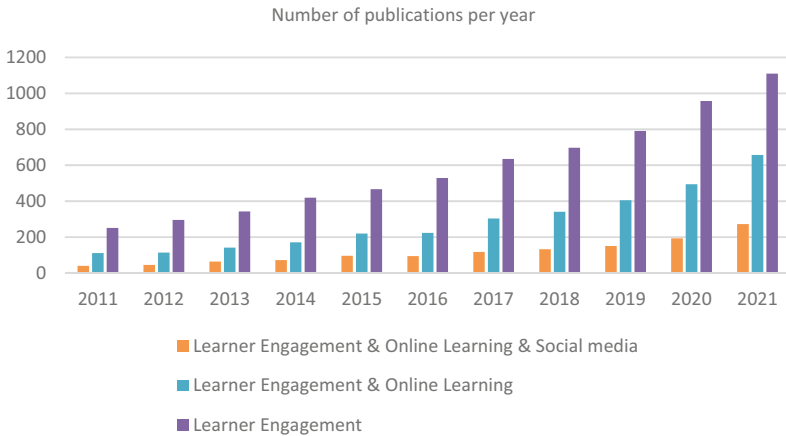


Fig. 1. Number of publications per year on ‘Learner Engagement’ and related search terms between 2011 and 2021. The search was performed on Scopus (Scopus Elsevier 2022).

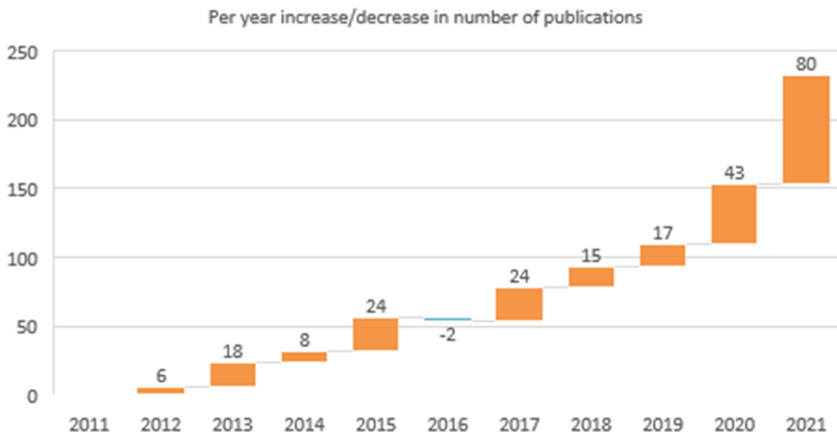


Fig. 2. Increase/decrease in number of new publications per year for the search terms ‘Learner Engagement & Online Learning & Social media’. The search was performed on Scopus (Scopus Elsevier 2022).

While the continuous increase in the number of papers exploring learner engagement and related concepts is evidently illustrated in the column graph (Fig. 1) and the waterfall chart (Fig. 2) above, a recent topic modelling study (Vijayan 2021) revealed that student engagement, social media, and computer-based learning are amongst the least utilised keywords in the broader research area on teaching during Covid-19.

Figure 3 shows a subset of the keywords captured by the study. This observation suggests that there is a need for more empirical research focusing specifically on these concepts. Additionally, although higher education appears to be amongst the top three keywords featured in the articles analysed (Vijayan 2021), undergraduate education has received fewer mentions. Hence, conducting more studies at this level of education can enrich existing literature and help develop teaching and learning practices which specifically apply to undergraduate students, both full-time and part-time, studying in a range of subject areas.

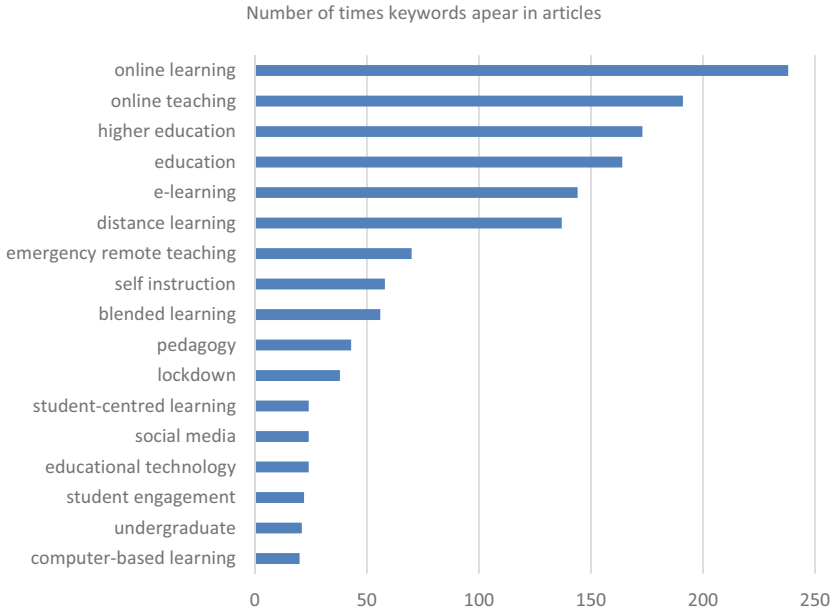


Fig. 3. Subset of common author-provided keywords (adapted from Vijayan 2021).

Furthermore, many papers focus on depicting the status quo from the perspectives of educators and school leaders, concentrating on the institutional and technological efforts undertaken to reframe and stabilise the education system following the disruptions caused by the pandemic. There is an ongoing discussion on an underlying paradigm shift in the education sector (Mehla et al. 2021) and a research interest towards identifying effective ways for delivering education online during a crisis (Dhawan 2020). At the same time, exploring students' experiences, perceptions, and expectations, understanding what affects their engagement and how they respond to various technologies and social interactions can also make valuable contributions and inform pedagogical design, theory, and practice (Aucejo et al. 2020; Muñoz-Carril et al. 2021; Piki 2020). The following section discusses key trends in the technologies used for learning.

2.2 Trends in Social, Mobile, and Collaborative Technologies for Learning

The role of social, mobile, and collaborative technology has been instrumental in ensuring learners and educators remain connected, both during the emergency transition to online learning (Hodges et al. 2020; Kara 2021; Piki 2020), and during subsequent periods of isolation which occurred in response to the national lockdowns and stringent governmental measures enforced around the world. Still, the core mobile, collaborative, educational, games-based, and social technologies which were embraced during this period have been around for a long time, and certainly pre-existed the pandemic. The ubiquity of mobile devices and the seamless integration of mobile technology into everyday tasks (Schindler et al. 2017) has long been shaping the way we communicate and collaborate, and the means through which information (and often misinformation) is diffused. The advent of social networking sites and social media mobile apps has evidently transformed the way we virtually socialise, interact, and keep in touch with family, friends, and the world around us.

Within education, various attempts have been made in recent years to incorporate social technology towards promoting motivation and learner engagement – ranging from web-based applications like blogs (Mansouri and Piki 2016), to educational games (Adams 2019; Behl et al. 2022; Krouska et al. 2021), massive open online courses (MOOC) and LMS (Veluvali and Suriseti 2022), social media and social networking sites (Abu Elnasr et al. 2020; Camus et al. 2016; Clements 2015; Hamid et al. 2015; Piki 2020), and multi-user virtual environments (Nisiotis and Kleanthous 2019). Still, until recently, the educational sector has been lacking behind thriving technological innovations (Gandhi et al. 2016). Within higher education this presents an oxymoron: on one hand, the majority of students and academics already own personal mobile devices and adeptly use collaboration platforms and social media apps to communicate, collaborate, and interact, while on the other hand, the role of these social technologies as channels for learning and educational purposes is not yet fully realised. There are many reasons this phenomenon can be attributed to, ranging from rigid institutional procedures at universities (Schindler et al. 2017), to educators being reluctant to incorporate these channels in their instructional approach due to lack of practical expertise (often leading to insecurity and apprehension not to be chastened in front of their students), concerns about the time and effort required to set up and seamlessly blend CSCL tasks within the established curriculum, as well as uncertainties on whether technology can indeed improve students' academic performance and learning outcomes (Gikas and Grant 2013; Schindler et al. 2017).

Beyond the barriers that keep CSCL practices from being realised to their full extent, there is a substantial amount of research demonstrating that utilising mobile, collaborative, and social technology, presents genuine opportunities for: (i) engaging learners into new knowledge construction through collaborative learning activities in physical, mobile, and virtual worlds alike (Ally and Tsinakos 2014; Gikas and Grant 2013; Muñoz-Carril et al. 2021; Nisiotis and Kleanthous 2020; Piki 2014; Piki 2017; Schindler et al. 2017; Tsinakos and Ally 2013); (ii) offering authentic and context-aware learning opportunities through mobile learning (Ally and Tsinakos 2014; Mottiwalla 2007; Sharples et al. 2007; Tsinakos and Ally 2013); (iii) promoting learner engagement through educational gamification (Adams 2019; Behl et al. 2022), mobile games-based learning

(mGBL) approaches (Krouska et al. 2021), and immersive learning experiences both in the classroom and online (Nisiotis and Kleanthous 2020; Nisiotis et al. 2017); (iv) blending formal and informal learning contexts (Gikas and Grant 2013; Schindler et al. 2017; Sharples et al. 2007); and (v) inspiring learners to take ownership of their learning by blending self-directed learning with learning which is continuous, seamless, inclusive, and accessible from virtually everywhere (Ally and Tsinakos 2014; Tsinakos and Ally 2013; Mottiwalla 2007; Nisiotis et al. 2017; Veluvali and Suriseti 2022). Capitalising on these opportunities and leveraging the unique characteristics and educational capabilities of mobile, collaborative, and social technologies can contribute towards re-imagining learner engagement. Nevertheless, what has led to the increased uptake of these tools extends beyond their technological affordances and engaging capabilities. In fact, during lockdowns and self-isolation periods, social technologies and collaborative platforms were not embraced solely as supplementary tools for engaging users and improving the learning outcomes. Technology was no longer a complementary tool for learning – it was the only means through which students could reach each other, their teachers, and the learning content. Under these unprecedented circumstances, online education is no more an alternative option, it becomes a necessity (Dhawan 2020).

During Covid-19 pandemic, institutions embraced communication and collaboration platforms (such as Microsoft Teams, Zoom, GoToMeeting, Skype, Google Meet, etc.) which offer a range of capabilities including shared workspaces, instant messaging and videoconferencing capabilities, file storage, screen sharing, video-recording, and attendance monitoring amongst other integrated functionality. The pandemic also accelerated the use of mobile applications in education, including mobile games (Krouska et al. 2021) and social media mobile apps (Piki 2020; Abu Elnasr et al. 2020). Social media broadly refer to Internet-enabled applications that allow the creation and exchange of user generated content while also creating a sense of community (Gikas and Grant 2013). Social media and social technologies extent the capabilities of mobile devices and have the capacity to enable interactions and collaborative activities both between students, and among educators and students, fading out the line between formal and informal learning activities (Camus et al. 2016; Mansouri and Piki 2016; Schindler et al. 2017). Nonetheless, it is also commonly argued in the literature that the application of any technology or tool needs to be appropriately structured, personalised, meaningful, and have a clear purpose in order to engage learners, be conducive to learning, and contribute towards achieving the desirable learning outcomes. This has been argued for social media (Abu Elnasr et al. 2020; Gikas and Grant 2013), educational gamification (Adams 2019; Behl et al. 2022; Piki 2020), and CSCL approaches in general (Ma et al. 2020; Muñoz-Carril et al. 2021; Piki 2012; Piki 2017; Schindler et al. 2017).

For universities which already had collaboration platforms in place, the transition to a fully online mode was logistically straightforward. Nevertheless, it was still deemed necessary to educate both students and academics on the technological capabilities of these platforms, and the conventional practices, social rules, and nuances pertaining to online educational communications. The ways technology was utilised after Covid-19 related measures were enforced, goes beyond the typical uses educators and students were accustomed to. Some educators were better prepared than others and quickly incorporated the newest features of mobile, social, and collaborative technologies into their teaching,

formative feedback, and assessment approaches. Similarly, some students started utilising the state-of-the-art in mobile computing for learning, studying, and interacting with peers and lecturers. The rapid, emergency transition to online learning, however, meant that in many cases there was insufficient time for adjustment leading to a variability in the approaches used by different educators in the same institution (Piki 2020; Piki et al. 2022). Furthermore, institutions had to make impromptu decisions about practical aspects such as whether the lecturers' and students' web camera should be on or off during the lectures, whether to proceed with synchronous or asynchronous delivery of the lectures, whether or not to record the lectures and make the recordings available to students, the protocol regarding office hours and other routine issues suddenly had to be re-negotiated taking into account General Data Protection Regulations (GDPR), technological readiness, and health-related measures. This created an unstable situation which inevitably affected students' engagement and motivation (Piki 2020). It has long been established that students learn and engage differently during remote education compared to learning in a conventional classroom. These differences are evident in the ways students interact socially with their lecturers and their peers, and in the way they engage with the learning content and approach their learning in general (Bolliger and Martin 2018; Gikas and Grant 2013; Ma et al. 2020; Martin and Bolliger 2018; Molinillo et al. 2018; Schindler et al. 2017; Wang et al. 2022; Xie et al. 2019). With the consequences of the pandemic still unfolding, the role of social, mobile, and collaborative technologies is not yet fully realised. This widens the avenues for exploring how students perceive the opportunistic and interventional uses of technology for teaching and learning during the pandemic.

3 Research Methodology

3.1 Study Context and Research Participants

Empirical data was gathered through three exploratory studies conducted at a Higher Education Institution (HEI). The study participants were undergraduate students, studying in a range of subjects (including computing, finance and accounting, business administration, mathematics, economics, and marketing). Both female and male students participated in all studies. Teaching at the selected HEI is traditionally carried out face-to-face. Hence, neither communication platforms nor procedures for distance learning were in place before the first Covid-19 lockdown. This created a genuine opportunity for exploring the stories and voices of students and appreciating how they experienced the emergency transition to remote education. The first case study was conducted between April-May 2020 adopting an inductive, exploratory approach. This leading study illuminated both the positive experiences and frustrations undergraduate students faced while studying remotely, and how this affected their engagement and academic performance specifically with mathematics and other practical, applied modules. The study also shed light on the role of social media during the lockdown (Piki 2020). The second study was conducted in July 2020 and the goal was to capture the impact of the emergency transition to online education on students' experiences and the implications pertinent to mathematics education. The focus for this study was inspired by initial findings indicating that learner engagement was more severely affected in practical modules such as

mathematics. Finally, a third study was performed approximately one year later, in June 2021, with the purpose to corroborate initial findings and observe prominent changes and persistent themes in students' perspectives over time and during a planned rather than an emergency transition to online learning, notwithstanding the successive lockdowns and other impacts the pandemic had on student life (Piki et al. 2022). Further to the formerly published findings (Piki 2020; Piki et al. 2022), the present study collectively analyses the gathered insights and discusses the aggregated findings aiming to highlight persistent themes that re-emerged over time, across subjects, and affected both part-time and full-time undergraduate students. Furthermore, this study critically examines the empirical findings in light of recently published research outcomes.

3.2 Data Collection Methods and Comparative Meta-analysis

In the initial study the in-depth perspectives of forty-three undergraduate students (22 female and 21 male students) were gathered through thorough, semi-structured interviews (Piki 2020). The sample included both full-time and part-time students (37 and 6, respectively). Each interview lasted approximately one hour and all interviews were audio- or video-recorded which facilitated both the discussion flow during the interview and the subsequent transcription process. Although an interview agenda was utilised to ensure the consistency across interviews, discussions encouraged openness and additional questions and probes were utilised to encourage deepening on issues raised by the students. This ensured that students felt comfortable to share and discuss their experiences, feelings, and thoughts. Creating a trusting space is essential for researchers to build a richer understanding of students' perceptions (Kahu et al. 2020). Data gathering and analysis were interleaved, and additional interviews were arranged until newly gathered data was no longer revealing new patterns or themes and saturation was achieved (Twining et al. 2017). Preliminary analysis involved reading transcripts and playing-back interview recordings, leading into the identification of emerging themes and recurring patterns. Colour-coding facilitated the identification of relationships between themes and through thematic analysis relevant ideas were grouped into thematic categories (Clarke and Braun 2017).

In the second and third studies, focus groups were organised (eight and five focus groups respectively). The sample was focused and purposeful, capitalising on the insights gained in the leading study. Consequently, the invited participants were undergraduate students who were registered on mathematics modules at the time the research was conducted. A total of twenty-eight students participated (19 female and 9 male students) in a total of thirteen focus groups. A semi-structured approach was utilised – aligned with the initial case study – allowing students to lead the discussion to issues that mattered to them. The rationale behind performing focus groups was to generate further insights on collective views promoted through facilitated, casual encounters amongst the participants (Gill et al. 2008; Krueger 2014; Patton 1990). The group dynamics and peer relations facilitated the flow of the discussion and engaged students into higher-order reflections which helped to yield deeper student insights, challenges, feelings, expectations, and overall experiences following the disruptions in their studies (and their lives, in general) due to Covid-19. Furthermore, a collaborative analytical approach was followed utilising techniques like keeping reflective diaries, maintaining joint research logs

of emerging themes and codes, systematic researcher debriefing sessions for refining the emergent thematic categories and removing redundancies, and ultimately, an overarching analytical stage for eliminating researcher bias and achieving triangulation of the findings (Piki et al. 2022).

Following the analysis of each study and considering relevant literature published in the broader field of education in recent months, it was deemed necessary to proceed with a more critical, overarching interpretation and juxtaposition of the prominent findings. This holistic meta-analysis revealed four main themes which are discussed next.

4 Discussion of Key Research Findings

The main themes which emerged following the holistic data analysis are: the distributed nature of learner engagement; the impact of the pandemic on the emotional, cognitive and behavioural dimensions of engagement in CSCL contexts; the multifaceted and contradictory roles of social media and social technology while learning under lockdown; and finally, the lessons learnt and visions of students for learning in the post-pandemic era.

4.1 The Distributed Nature of Learner Engagement

The way students articulated their experiences during the pandemic indicates that their engagement with learning activities (both synchronous and asynchronous) was influenced by a dynamic combination of factors. The stories, feelings, and perceptions students voiced provided rich insights indicating that learner engagement is distributed across personal, pedagogical, social, group-level, and technological facets. This reinforces the notion that “learner engagement does not appear to be a stable, trait-like characteristic of the individual; rather it may shift and change according to a number of factors” (Piki 2012). Furthermore, students described how their learner engagement and degree of participation changed over time (before vs. during the pandemic; emergency transition to online education vs. subsequent lockdown periods); between places (classroom-based vs. online learning); and across process dimensions (monotonous, one-way instructional approach vs. interactive, responsive, empathetic educational strategy). In addition to time, space, and process, students also explained they engaged differently across different modules. During the holistic analysis this variation in learner engagement was attributed to the complex interplay between five factors.

First, personal characteristics and individual preferences, earlier experiences with computer-mediated learning, the inclination towards particular subjects, and other individual facets inevitably impacted the way students engaged and their overall level of satisfaction (Muñoz-Carril et al. 2021). Personality, selected approaches to studying and learning, familiarity and prior experiences with the tools and technologies employed, also affected the degree of student participation. Many students felt the need to express the adverse feelings of uneasiness, boredom, and anxiety they experienced during this unprecedented period. Students also explained how these feelings impacted their concentration, the degree of participation in the online lectures, and ultimately their overall academic performance. Recent studies also discuss the mediating role that personal

learner characteristics and academic emotions play in learning engagement, particularly in online learning settings (Kara 2021; Molinillo et al. 2018; Wang et al. 2022). Nevertheless, there were a few students who explained that, after recovering from the initial anxiety they encountered due to the emergency transition to remote learning, they recognised some positive learning outcomes which, on-reflection, made them feel stronger and more well-prepared for the future. This ‘upskilling’ included strategies to self-regulate their learning, multi-tasking skills, as well as learning how to act and behave during synchronous online communications.

Second, pedagogical aspects, such as the nature of the curriculum (theoretical or practical) and the interactions with the learning content also affect learner engagement (Wang et al. 2022). In the studied context students explained that they found it particularly challenging to stay concentrated during the online lectures and follow the lecturer’s line of thought in practical subjects such as mathematics (Piki et al. 2022). Similar findings regarding the subject of mathematics are also discussed in the literature (Aucejo et al. 2020; Barlovits et al. 2021; Cassibba et al. 2021). Other pedagogical factors such as the teaching style, the lecturer’s approach during and in-between online lectures (formal, rigid vs. informal, caring), and the overall attitude of the lecturer had a great impact on how undergraduate students engaged in particular modules. As the literature confirms (Ferguson et al. 2019; Muñoz-Carril et al. 2021; Hernández-Sellés et al. 2019), educators play a significant role, not merely for content delivery and knowledge dissemination, but most importantly for supporting and guiding students, acting as facilitators in the learning process. Furthermore, the inconsistency in instructional approaches used among different lecturers, as well as institutional decisions regarding video-recording the online lectures were also linked with decline in learner engagement and overall academic performance (Piki 2020). Regarding the latter, students explained that as non-native English speakers, they did not feel confident to interrupt the lecturer to ask questions or contribute to interactive discussions while the lecture was recorded. This eventually made students feel emotionally and cognitively disconnected since this changed the natural flow of interaction they were accustomed to during traditional, face-to-face instruction (Piki 2020). At the same time, the HEI did not have a definite policy regarding joining lecturers with the web-camera on, thus with a few exceptions all students joined with their web-cameras off. As a result, lecturers did not have a visual while teaching and there was no direct way to know if students were following through or whether they were struggling with a certain concept or exercise. This contradicted students’ habitual learning process where the lecturer can easily notice if there are questions or requests from students. This further fragmented the interactions between students and lecturers and among students as well (Piki 2020). On the positive side, on many occasions, students highlighted the empathy, compassionate attitude, responsiveness, and emotional support from some of their lecturers. An appealing finding was the fact that many students would join the online lectures merely as a respectful response to their lecturers’ supportive attitude, even though they would not always contribute or participate actively during the lecture (Piki et al. 2022).

Third, social aspects affected learner engagement more than any other facet during Covid-19 pandemic. The imposed measures for social isolation and the negative consequences of the pandemic brought disruptions across all societal axes. Families, friends,

peers, co-workers, students, and teachers had to find new ways to interact, communicate, collaborate, and keep in touch. The ongoing changes greatly impacted the psychology and wellbeing of young adults. The impact was more intense in the words of full-time students and students who were not working in parallel to their studies and hence were more isolated, whereas students who were working full-time or part-time viewed their experiences more holistically. Beyond the technical and practical barriers students had to overcome, the real challenge was that they were experiencing the transition to remote learning while in isolation and under restricted mobility measures (Piki 2020). It was this twinned experience that really inhibited their level of concentration, raised feelings of anxiety, fatigue, and tiredness, which altogether weakened their engagement with learning. The vast majority of students explained that over time they were experiencing these feelings more intensely. Recent literature has been refocusing on these negative feelings which emerged heavily during the pandemic (Kara 2021; Vijayan 2021; Wang et al. 2022). A key finding that emerged during the comparative analysis phase was that over time and on contemplation, many students truly appreciated the role of family bonds, and social values like caring for each other, and lifting each other's motivation up during periods of increased distress. Some students even admitted they would quit without the psychological support from their parents and family members (Piki et al. 2022). This finding raises important social implications as we emerge out the pandemic, such as the need to leverage emotional intelligence, re-establish broken social and family bonds, and redefine ethical and social values.

Four, group-level dynamics and peer relations also impacted student engagement. Some students recounted that during the lockdowns they developed stronger bonds with their peers compared to the pre-Covid period. Social media played a key role in establishing and supporting students' study groups by helping students keep track of their learning activities and fill the gap generated due to the lack of face-to-face contact time. Students who formed or joined a study group appeared to be more engaged during the lectures and generally more positive and energetic during distance learning, compared to students who were more isolated or did not try to connect with their peers. Constructive interactions among learners are commonly associated with positive academic emotions, learning self-efficacy, and higher levels of learner engagement, within online and CSCL learning contexts (Ma et al. 2020; Molinillo et al. 2018; Wang et al. 2022). Beyond the informal, social interactions among learners this finding re-emphasises the pedagogical implications of collaborative learning in general.

Finally, the technologies and tools utilised by different lecturers also had considerable impact on how students engaged. This included the means for delivering the lectures (i.e., the official educational platform selected by the HEI), technological interventions created by the lecturers to facilitate the feedback process and instruction (Piki 2020), as well as the social technologies employed by lecturers to provide more informal and immediate responses and ongoing feedback to their students (Piki 2020). In fact, the role of social media and social technologies during online teaching and learning was instrumental and was captured as one of the key themes, discussed below. When taken collectively, the set of personal, pedagogical, social, group, and technological factors that emerged in the studied context capture the distributed character of learner engagement.

4.2 Affective, Behavioural, and Cognitive Dimensions of Learner Engagement

The findings from the holistic meta-analysis appear to reconfirm the multidimensional nature of the learner engagement (Piki 2012; Piki 2014) encompassing affective, behavioural, and cognitive dimensions, which can be collectively referred to as the ‘ABC structure of learner engagement’. In all three studies, students were inquired about how they experienced learning during the pandemic, what changed in the way they studied, compared to the usual way they were approaching their learning at higher or secondary level, and what were the main challenges and opportunities presented to them during this unparalleled situation, amongst other questions. Students explained how social isolation and restricted mobility negatively affected their aptitude to intellectually connect with their learning during the emergency transition to online learning and after successive lockdowns, the inability to concentrate and sustain their focus for a long period of time while looking at a screen, and the impact on their understanding and retention. Similarly, students’ responses during the interviews and focus groups were rich in expressions of feelings ranging from frustration, annoyance, and boredom, to anxiety, uncertainty for the future, and stress. The array of (mostly negative and undesirable) emotions students experienced while learning under lockdown (joining online lectures, self-studying, or studying with peers in groups), was leading them towards passive, disengaged approaches which eventually impacted their academic performance, thus further sustaining the loop of negative emotions. Additionally, students expressed their experiences through sharing stories and incidents illustrating their actions, reactions, and behaviour during the online lectures (e.g., admitting they were cooking, eating, or sleeping during their lectures) and how they generally behaved as a response to the novel and challenging situations presented to them. The affective, behavioural, and cognitive dimensions of learner engagement appeared to be inextricably interwoven in the ways students expressed their perceptions, perspectives, and experiences. The multidimensional nature of engagement and the mediating role it plays in CSCL contexts is also discussed in recent literature (Kara 2021; Ma et al. 2020; Molinillo et al. 2018; Muñoz-Carril et al. 2021; Piki 2012; Piki 2017; Wang et al. 2022).

4.3 The Role of Social Technology While Learning Under Lockdown

The role of social media and social technology while learning under lockdown was multifaceted and contradictory. On one hand social media mobile apps (such as Messenger, Viber, and Facebook) had a significant contribution in supporting student learning and nurturing learner engagement during the lockdowns and helped students virtually circumvent the social restrictions enforced due to the pandemic. These tools provided an informal means through which students reached out to their peers and lecturers alike. Informality was discussed as one of the key ‘qualities’ of social media in terms of their learning capacity. Students explained they considered it less intimidating, quicker, and more natural and direct to contact their lecturers on Messenger simply sending a photo of their written answer, rather than having to type a formal email and attach their solutions. This encouraged students and helped them feel more comfortable to ask questions and seek formative feedback, which in turn facilitated their learning process (Abu Elnasr et al. 2020; Piki 2020). Communication through social media was highly appreciated

by part-time students, as well as students with family and work obligations. Students in these groups explained that without their mobile devices and social media it would be impossible to stay connected with their learning tasks, peers and lecturers while maintaining their work-life balance amidst the crisis.

While overall social media contributed to student engagement, on the other hand they were considered by many students as a major distraction, both for the duration of the live online lectures and during self-study. Chatting on social media often distracted students for a long period of time hence impacting their concentration, level of participation, and overall academic performance. Furthermore, the flexibility and ubiquity of mobile and social technology, along with the lack of strict procedures for students to have the web-cameras on during the online lectures, meant it was impossible for lecturers to monitor student participation closely, and students could easily get away with simply joining the session through their mobile phones but without really engaging. Overall, however, the positive attributes of social technologies and social media surpassed the limitations, and largely helped students while learning remotely. Relevant literature also suggests that social media can enrich interactions with fellow students and lecturers and create a sense of belonging within a community (Bahati 2015; Bowman and Akcaoglu 2014; Camus et al. 2016; Clements 2015; Naghdipour and Eldridge 2016). These interactions constitute a viable channel for increasing and sustaining learner engagement in periods of social isolation.

4.4 Lessons Learnt and Visions for Learning in the Post-pandemic Era

Students appeared very direct and explicit about how they envision their future learning endeavours. Across all three studies, most students declared their preference for traditional, face-to-face, classroom-based instruction rather than distance education. This is aligned with recent studies (Gierdowski 2019). One of the key reasons for this was the fact that face-to-face instruction provides an effortless and natural learning process, which students consider as ideal particularly for practical subjects such as mathematics (Piki et al. 2022). Although this was by far the preferred way, students acknowledged that an online, virtual environment could also support remote learning as long as it could offer a seamless simulation of the whiteboard so they could watch their lecturer's writings clearly and synchronously while the lecturer is solving exercises step-by-step on the whiteboard live, but at the same time being able to watch their lecturer's facial expressions and body gestures. Essentially, students emphasised the need for a seamless, multimodal, and natural learning environment, which would make them feel involved and comfortable to ask for clarifications during the lecture or as the solution proceeds, be encouraged to contribute to the development of the solution and be able to do so actively and effortlessly. Although a few students also discussed the need for higher education to leverage augmented reality and virtual learning environments, the majority focused on lectures that 'simply work', with no connectivity hassles, technical quality or compatibility issues. Another emergent suggestion raised was that breaks are important, and that there should be ways to recreate 'social breaks' in online and virtual environments. Regarding the lessons learnt, the most remarkable was the students' appreciation of the value of family bonds, and the important role that their parents' encouragement

played in remaining focused on their target goals. Similarly, students valued the psychological support, empathy, and mutual understanding from lecturers and peers alike. These lessons constitute some of the restricted positive outcomes reported during this challenging period.

5 Conclusion

The purpose of this study was to explore the factors that impacted learner engagement over time amidst the pandemic; to investigate students' perceptions on the role of social technology during remote education; and to capture students' reflections distilled through their recent and ongoing experiences with online learning. The findings from a holistic, meta-analysis of three exploratory case studies conducted during the pandemic with undergraduate students are discussed and synthesised. The gathered insights do not only accentuate the need to study and instigate learner engagement in current CSCL endeavours, but also re-emphasise the 'distributed nature' of learner engagement indicating that learner engagement is not a trait-like characteristic confined to an individual learner; rather, it is amalgamated through the complex interplay of personal, pedagogical, social, group-level, and technological factors. Beyond realising the role of social, mobile, and collaborative technologies, the unprecedented scale at which online teaching and learning has been studied since Covid-19 outbreak had significant beneficial outcomes. Firstly, understanding the impact of the pandemic on teaching and learning through the eyes and voices of students raised the level of awareness on the significance of making social and mobile technology more inclusive, seamless, and accessible. Secondly, research outputs have contributed to the upskilling of both students and teachers, in all levels of education. Thirdly, the unfolding Covid-19 crisis has enabled us to contemplate on the value of family and social bonds, and brought to the foreground social values, empathy, and emotional intelligence, which are often neglected in educational practices. Finally, while the full extent of the students' envisioned adaptations and the realisation of the long-term impact of this ever-changing situation on our mental health, well-being, and engagement is yet to be fully realised, the pandemic has certainly motivated the adoption of mobile, social, and collaborative technologies which are anticipated to continue playing a major role in higher education as we enter a new normal.

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