INNOVATIONS IN EDUCATION: THEORETICAL INSIGHTS INTO ONLINE COLLABORATIVE LEARNING.

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Abstract: The rapid evolution of information technology and telecommunications has been revolutionizing in a wide array of important ways traditional teaching methodologies. This has led to the creation of an avoidable necessity for the adoption of novel educational practices that are sufficiently well-aligned with these irreversible, mega shifts. In response to this challenge, this study has endeavoured to explore the myriad principles and practices underpinning online collaborative learning (OCL), the defining hallmark of which is the constant support of the sustainable growth of knowledge and skills through social construction without face-to-face contact. By reviewing scholarly publications on online collaborative learning, the research scrutinizes a range of current practices and identifies relevant trends, issues, and challenges. In the same vein, the present paper highlights the necessity of intentional design and adaptation to the digital environment to foster effective collaboration and engagement. To meet these needs and guide education in this era of technology, the research lays special emphasis upon the significance of employing the pertinent 21st-century theories, such as online collaborative learning theory. The findings reveal, amongst an array of other things, that online collaborative learning has the potential to boost academic achievement and develop essential skills for the ultimate objective of accomplishing cultural as well as overall human development.

Keywords: Constructivism; digital age; Online Collaborative Learning; online learning; 21st-century theories.

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1. Introduction

In the 21st century, effective collaboration and strong social skills are rated among the essential skills for attaining success, making it crucial to cultivate these abilities early on. Collaborative learning, "a teaching strategy where teams of two or more students work together on tasks to maximize learning" (Wandberg & Rohwer, 2010, p. 210), offers a powerful tool to help learners develop these skills, refine their personalities and enhance their ability to communicate ideas more effectively and effortlessly. This approach leverages group dynamics to foster problem-solving, critical thinking, communication, and creativity; its ultimate end-goal is the proper preparation of participants for triumphantly cope with the various professional and personal challenges they are prone to encounter in their life span. Numerous studies have consistently affirmed the effectiveness of collaborative learning in enhancing students' academic achievements and skill development in traditional classroom settings.

Over the last decade or so, the education landscape has witnessed a plethora of profound adjustments and has been remarkably reshaped by the rapid and unstoppable evolution of modern technology. With the emergence of social networks and digital platforms as primary means of connection, pedagogical practices have adapted to incorporate these technological advancements (Arno, 2012; Lan, 2020). This shift has led to the emergence of a multitude of innovative and transformational methods in the realm of learning and teaching. This has been most peculiarly present in online environment settings, where collaborative learning continues to play a pivotal role. Collaboration "has often been defined as the 'heart and soul' of online courses, or for that matter, any course that bases its theoretical foundation in constructivism" (Palloff & Pratt, 2005, p. 6). Online collaboration is "just about everything that students engage in online, from participation on discussion boards to working in small groups" (Palloff & Pratt, 2005, p. xi). Online collaboration enables learners and educators alike to break free from the many and varied, learning-hindering constraints characteristic of traditional papers and projects, fostering thereby a deeper learning experience through their collaborative efforts. These environments offer richly diversified opportunities for collaborative knowledge building. This is often attained through peer-to-peer dialogue. Operating synchronously or asynchronously, they facilitate real-time or delayed communication and integrate a diversity of electronic tools, such as group chats, forums, wikis, and blogs to enhance transparency and collaboration.

Collaboration in online spaces, however, is bound to give rise to baffling challenges, requiring learners to acquire new skills and navigate coordination costs, conflicts, and equitable value distribution in multi-stakeholder environments. It also demands careful planning, implementation, monitoring, and evaluation. We have attempted throughout this paper to provide a comprehensive coverage of a constellation of collaboration issues in the digital age, delving into both the opportunities and challenges. To more thoroughly address these issues and enhance our understanding of online collaborative learning, the following research questions are explored:

1. How does online collaborative learning impact students' engagement and overall academic achievement?

2. What are the best practices and strategies identified from successful case studies and empirical research on online collaborative learning?

3. What are the most recurrent challenges and limitations which are routinely associated with online collaborative learning, and what are the solution pathways that recent studies have put forward for minimizing their adverse impacts?

2. Literature Review

2.1 The Evolution and History of Online Learning.

Online learning is deemed the most advanced form of distance education/learning (Moore *&* Kearsley*,* 2012) According to Merriam-Webster Online Dictionary (2020), online learning is "a method of study where teachers and students do not meet in a classroom but use the internet, e-mail, mail, etc., to have classes". It is a process in which learners get access to different information sources in an entirely computer-generated environment rather than being physically present in the classroom. "In line with the general aim of education*,* distance education employs all available media, methods and techniques to enable learners access needed information at a distance" (Biao, 2012, p. 31). Biao (2012) maintained that an important characteristic of distance learning is its use of different types of media, print, electronic and virtual, to facilitate the learning process as much as possible.

Altany (2009, p. 690) asserted that distance learning is "now associated with online learning using digital technologies, but it goes back to learning by rudimentary means of correspondence between someone with something to teach and those with a desire or need to learn". It is a complete and utter fallacy to believe that distance learning is novel, 21-century manifestation of learning. As a matter of fact, distance learning has been available for a long time; it dates as far back as the 18th century; its evolution began with print-based correspondence study in the USA when lectures were conducted by exchange of letters. It was introduced by the American entrepreneur Caleb Phillipps in Boston who used to send several weekly lessons to learners across the United States (Farnsworth & Bevis, 2006). On March 20, 1728, Caleb Phillipps Teacher of the New Method of Short Hand advertised in the newspaper "Boston Gazette" that any "Persons in the Country desirous to learn this Art, may by having the several lessons sent weekly to them, be as perfectly instructed as those that live in Boston" (Kentor, 2015, p. 23 & Holmberg, 1986; in Farnsworth & Bevis; 2006, p. 6). This advertisement created learning opportunities and offered shorthand lessons for any learner in the United States who is keen to learn without the need to physically attend classes in Boston.

In the mid-19th century, correspondence courses began to develop and spread more widely across various European and North American countries, including Great Britain, France, Germany, and the United States (Nagy, 2015). Holmberg (in Kentor, 2015) argued that the origins of modern distance learning can be traced back to 1840 when Isaac Pitman began presenting shorthand lessons through the post office mails in England. Pitman used to send texts on postcards to his students, asking them to transcribe and return them by post for correction. Thus, the beginnings of distance learning involved rudimentary tools, like parcel post, which later expanded to include radio, television, and eventually online education as communication technology advanced. This evolution shows a steady shift from early correspondence methods to real-time online learning where learners and teachers can now engage in live video lessons on platforms like Google Meet or Zoom. These online courses provide learners with opportunities for face-to-face interaction or, for those who are shy or silent, the option to communicate via chat. The evolution phases online learning has gone through can perhaps be more conspicuously depicted by the following figure.
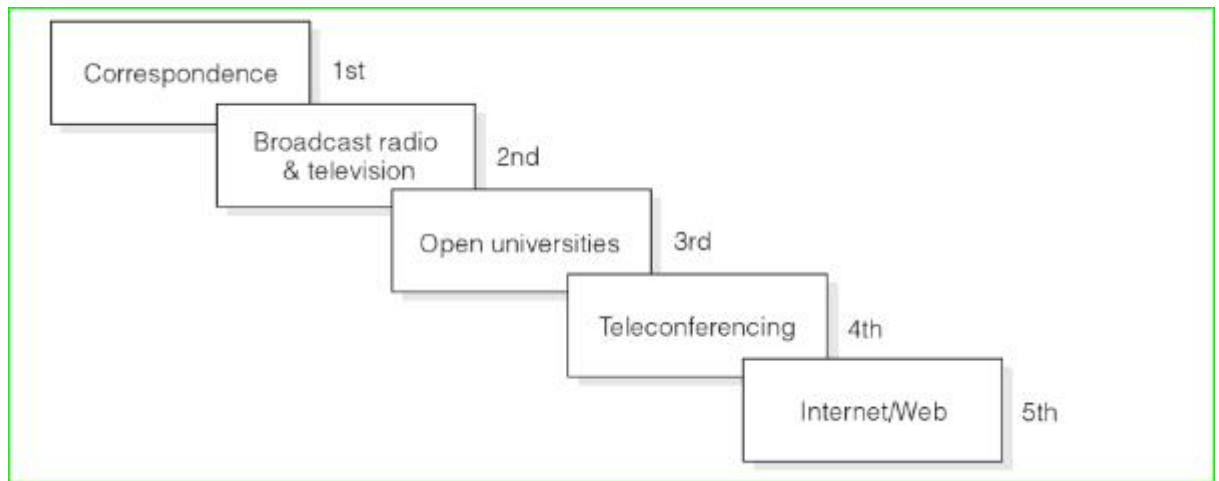
Figure.1-_Generation of Distance Learning_

(_Moore & Kearsley_, 2012, P. 24)

As has been pointed out above, educational technology has steadily evolved, moving from the initial introduction of computers and the internet into the adoption of increasingly sophisticated digital tools. The Coronavirus pandemic, however, acted as a powerful catalyst, leading to a dramatic acceleration of this progression. Platforms like Zoom, Google Meet, and Microsoft Teams became indispensable for live online classes, driving adoption rates to unprecedented levels (Boring, 2024; Berbar, 2020). Learning management systems (LMS), such as Google Classroom and Canvas, further enhanced communication and resource management, playing a crucial role in enabling the rapid shift to remote education. This transition offered sturdier reasons for the pressing need for effective digital tools to support both educators and students to perform more productively in an entirely virtual environment. Furthermore, the pandemic spurred the development of educational applications like Kahoot, Duolingo, and Remind, which more fruitfully addressed inclusivity issues and expanded accommodations for learners (Boring, 2024). As UNESCO (2020) observed that, "the COVID-19 pandemic pushed education from schools to educational technologies at a pace and scale with no historical precedent". This shift not only transformed, virtually beyond recognition, many of the existing, mainstream teaching practices but also underscored the critical role of technology in promoting educational experiences. Emerging technologies, such as artificial intelligence, virtual reality, and augmented reality, are expected to play a more irreplaceably salient role in creating immersive and interactive learning experiences in the future (Boring, 2024), signaling the commencement of a new set of transformative shifts in educational approaches.

2.2. Definition of Online Learning

Various scholars have adopted different definitions of online learning; however, it is generally understood as a broad term that refers to "the environment in which the learning takes place, the modality through which the learning is accessed, and the learning that is delivered only through technology" (Benson, 2002; Carliner, 2004; Conrad, 2002, as cited in Aksu et al., 2022, p. 134). "To be online implies a state of connectivity, typically through a device such as a computer that is connected to the internet or an organization's intranet" (Shepherd et al., 2011, p.6). For Ally (2004a, in Ally, 2009), online learning is a learning process where learners use the internet to access the different academic products solely through interaction with the content, the instructor, and the other learners. In addition, Bates (2019) argued that when we transition teaching to an online format, we change the learning environment. Consequently, we shift from discussing teaching methods, which can be

consistent in both in-person and online settings, to focusing on design models. In these models, the teaching method is intentionally adapted to go hand in hand with the various components of the online learning environment. It is worthy of mention at this juncture of our paper that, in the context of this research, we have opted for the adoption of Aksu et al.'s (2022) definition of online learning. They described online learning as "a formal learning process that is communicated completely or partially through technology in which learners and the educator are not necessarily in the same physical location but interact synchronously (in real time) or asynchronously (not in real time) through technology" (p.134).

Online courses delivery covers both synchronous and asynchronous forms of interaction. Synchronous is a real-time learning/teaching form. This denotes that both the teacher and the learners are online and interact with each other using web conferencing software. In asynchronous forms, on the other hand, there is no set time to meet, but there are deadlines. Maina, Wagacha, and Oboko (2017, p.1034) contend that synchronous learning "can only be used in programs like chatrooms, instant messages, video conferencing programs and other real time message exchanger programs". These classes resemble to a great extent face-to-face classroom experiences. Synchronous learning is considered a beneficial learning style since students receive instant feedback: if a student asks a question or makes a comment, they can get their questions answered on the spot by their teacher or one of their classmates. Furthermore, in this mode of instruction, learners can simultaneously work together on the same projects (Peterson's. 2010).

In asynchronous learning, communication between learners and instructors does not happen in real-time. Instead, it relies on technology and the internet, enabling participants to access and engage with the material at different times rather than all at once. This may include email, message boards, and pre-recorded video lectures (Peterson's, 2010). Asynchronous learning has the added advantage of furnishing learners with the opportunity to access their lectures anywhere and anytime. According to Shepherd, Green, and Sampson (2011), the advantages of asynchronous learning include self-pacing and freedom over when and for how long to learn. Additionally, Aksu, et al. (2022) stated that asynchronous instruction is a learner-centred teaching method that allows students "to have the freedom to meet course learning objectives at a more flexible pace, preferred time, and from any location" (p. 134).

Synchronous and asynchronous learning have pros and cons each. Hence, it is highly recommended to include both techniques in a course to ensure more and better benefits from each learning form and to meet different learners' needs, preferences, expectations and styles. As Shepherd, Green, and Sampson (2011) noted, a learning intervention often benefits from a mix of synchronous and asynchronous elements: some may need to be face-to-face, while others are more efficiently conducted online. In other words, a blended solution is often the most effective.

3. General Overview of Collaboration Learning

Research on collaborative learning is grounded in the principles of social constructivism, which "emphasizes the collaborative process among people and their connections to culture and society" (Habbal et al., 2023, p. 103). Social constructivism, established by the Russian psychologist Vygotsky, casts light on the crucial role of social interaction in developing children's basic perceptions and gradually acquiring more complex mental functions (Aubrey & Riley, 2023; Zajda, 2023; Lower-Hoppe et al., 2021). Within the territories of this framework, the interplay of language, culture, and social interaction is rated wholly indispensable for cognitive development (Lower-Hoppe et al., 2021; Kozulin et al., 2003). Vygotsky (1978) emphasized that children are surrounded by sociocultural contexts which influence their development through interaction with others. In other words, "Language is acquired by social interaction, so our thought processes are rooted in social interaction"

(Leinster, 2006, p. 98). Social interaction leads to ongoing changes in children's thoughts and behaviours, which vary according to their culture (Vygotsky, 1978). Moreover, Vygotsky (1978) contended that the signs and symbols derived from the sociocultural environment, which help us understand our world, become essential elements of human cognitive development. He asserted that "Any function in the child's cultural development appears twice, or on two planes. First, it appears on the social plane, and then on the psychological plane. First, it appears between people as an inter-psychological category, and then within the child as an intra-psychological category" (Vygotsky, 1978, p. 57). These principles of social constructivism and the role of social interaction in cognitive development form the theoretical foundation for understanding the potential of collaborative learning in educational settings.

In the learning and teaching processes, the concept of collaboration is of paramount importance. Each learner assumes a central role within the group, actively contributing to shared objectives and responsibilities. This active engagement not only fosters individual accountability but also has the ability to "(1) promote the active construction of knowledge, (2) model the real world i.e., work place fostering group and project management skills, and (3) address a students' needs for social interaction and sense of belonging" (Haythornrhwaite, 2006, in Downing and Holtz, 2008, p. 100). Collaboration, therefore, becomes not merely a strategy but a fundamental ethos, driving collective progress and fostering a supportive learning environment. Additionally, the effective use of collaborative learning has been shown to boost students' motivation, since collective assessment encourages students to collaborate and support one another (Johnson & Johnson, 2009). Collaborative learning also fosters critical thinking skills, as students collaborate to establish meaningful connections between prior and new knowledge, thereby facilitating the learning process (Dillenbourg, 1999). In short, "Collaboration forms the foundation of a learning community online. It brings students together to support the learning of each member of the group while promoting creativity and critical thinking" (Palloff & Pratt; 2005, p. xi).

The teacher, in their own part, plays a vital role in this collaborative learning process, serving as a guide and facilitator within the zone of proximal development (ZPD), where their guidance is essential for students' learning (Vygotsky, 1978). The teacher's responsibilities include building and maintaining positive group dynamics through encouragement, support, and conflict resolution, ensuring cohesive group functioning towards shared objectives. Conversely, self-centred roles can disrupt group harmony by diverting focus from collective goals to individual interests. Teachers must navigate these dynamics effectively when guiding students in group activities, ensuring alignment between each member's contributions and the task's objectives. The group size can significantly impact collaborative learning, with leadership playing a key role. This can be more clearly visible in larger groups (Johnson & Johnson, 2009). Therefore, it is indubitably crucial to consider the task's nature and the students' specific needs and abilities when attempting to determine the optimal group size for collaborative learning activities, ensuring a seamless transition between these critical aspects of group dynamics and learning effectiveness.

3.1 Online Collaborative Learning (OCL)

The rise of new technologies, coupled with the challenges posed by the COVID-19 pandemic, has transformed classroom instruction in a number of important ways. One of the most notable shifts is the widespread adoption of online learning, which has become a central approach for both educators and students. In this evolving landscape, there is an increased interest in the effectiveness of collaborative learning methods, known for enhancing students' motivation, reducing anxiety, and promoting a positive learning environment. However, the success of these methods in traditional, in-person classrooms now requires adaptation to

virtual spaces. According to Palloff and Pratt (2005), "Collaboration forms the foundation of a learning community online. It brings students together to support the learning of each member of the group while promoting creativity and critical thinking" (p. xi). Online learning environments offer numerous opportunities to enhance collaboration, enabling synchronous and asynchronous interactions that go far beyond what is possible in traditional settings. These virtual spaces have become essential across various fields, including education, business, medicine, and marketing (Heiphetz & Woodill, 2010). Pardo et al. (2014) asserted that features such as ease of use, collaborative capabilities, and immersive 3D elements foster greater involvement, making these environments particularly engaging. Furthermore, Jonassen et al. (2003) emphasized that technology supports meaningful learning when it engages students in constructing knowledge, fostering dialogue, encouraging articulation, promoting collaboration, and enabling reflection. In this context, online collaborative learning stands out as a truly powerful pedagogical tool that enhances students' engagement, motivation, and skill development in the digital age.

The widespread adoption of constructivist principles in online learning, grounded in social constructionism, has underscored the growing importance of collaboration, which emphasizes the collaborative process of knowledge construction. McGaw and Evans (2021) explained that online collaborative learning is "a blend of constructivism within the environment of the internet, providing a model of learning in which students are encouraged and supported to work together to create knowledge" (p. 49). Similarly, Palloff and Pratt (2005) noted that "collaboration has often been defined as the 'heart and soul' of an online course or, for that matter, any course that bases its theoretical framework in constructivism" (p. 60). These perspectives highlight how the online setting facilitates collective knowledge building among students, drawing on their diverse experiences.

Expanding on this idea, Harasim (2012) described online collaborative learning as "educational applications that emphasize collaborative discourse and knowledge building mediated by the internet; learners work together online to identify and advance issues of understanding, applying their new insights and analytical tools to solve problems, construct plans, or develop explanations for phenomena" (p. 88). This approach is characterized by its grounding in constructivist principles, the use of the internet to foster collective knowledge construction, and the emphasis on collaborative discourse and problem-solving among students. According to Harasim (2012), OCL is based on peer discourse informed by the processes and resources of the knowledge community, facilitated by the instructor as the representative of that community. In this regard, Moore and Kearsley (2012) asserted that "effective teaching at a distance depends on a deep understanding of the nature of interaction and how to facilitate interaction through technologically transmitted communications" (p. 132). Thus, the success of online collaborative learning relies heavily on the strategic facilitation of interaction and discourse within a constructivist framework.

3.2 Online Collaborative Learning Theory (OCL)

To more effectively integrate technology into education, it is crucial to combine it with appropriate learning theories. While existing theories, like social constructivism and cognitivism remain relevant, developing online learning models that align with contemporary theories and 21st-century goals has become increasingly vital. This integration ensures that technology enhances the learning experience rather than merely facilitating it. Scholars working on these online learning models use frameworks such as Moore's Interaction Theory (1989) (IT), Garrison et al.'s (2000) Online Learning Theory(CoL), Siemens' (2004) Connectivism Theory of Online Learning (CTOL), and Harasim's (2012) Online Collaborative Learning Theory(OCL) (Galdames & Charbonneau-Gowdy, 2023). These

theories emphasize social interaction and collaboration, prioritizing collective learning experiences over individualism (Galdames & Charbonneau-Gowdy, 2023). By integrating these theories, educators can better address the demands of 21st-century education, fostering a more engaged, community-driven approach where collective knowledge construction takes precedence over individual efforts.

One of the key learning theories for the 21st century, rooted in technology, is Online Collaborative Learning (OCL), developed by Harasim (2012) (Galdames & Charbonneau-Gowdy, 2023; Altowairiki, 2021; Harasim, 2012). OCL builds on the integration of technology and contemporary learning theories, emerging as a significant framework for the digital age. It is widely recognized as a new learning theory that emphasizes "collaborative learning, knowledge building, and internet use as means to reshape formal, nonformal, and informal education for the knowledge age. OCL responds to 21st-century knowledge age requirements and provides a theoretical framework to guide the transformations in instructional design" (Harasim, 2012, p. 81). Thus, OCL integrates learning, collaboration, and the utilization of technology. According to Harasim, this theory "emphasizes the augmentation of human agency and knowledge, rather than its reduction or replacement by artificial intelligence" (2017, p. 106). The theory, likewise, cater for the needs and opportunities of the knowledge age. In this era of knowledge creation, our learning theories and practices must evolve beyond traditional didactic and active learning methods in such a way that they can empower learners to become creators of knowledge (Harasim, 2012).

The Online Collaborative Learning (OCL) process, or knowledge construction through discourse in a group, is made up of three clear-cut phases: Idea Generating, Idea Organizing, and Intellectual Convergence. Idea Generating focuses primarily on brainstorming to produce a wide range of ideas, promoting divergent thinking. In the Idea Organizing phase, participants cluster and evaluate these ideas, and attempt to identify the strongest ones, marking the beginning of convergent thinking. Intellectual Convergence is the final phase, and is hallmarked fundamentally by the fact that shared understanding and consensus are achieved, typically resulting in co-produced outputs such as solutions, designs, or theories. This collaborative process, emphasizing creativity and intellectual convergence, aligns with the theories propounded by Bruffee and Roschelle. OCL pedagogy, which encompasses these phases, is integrated into all educational levels and enriches activities like online seminars and group work. It promotes conceptual change and intellectual development through the stages outlined by Harasim (2017). Initially, students brainstorm diverse perspectives, then organize and analyze these ideas, leading to a shared understanding. Learning results in applied knowledge through real-world applications, with the process of generating, organizing, and synthesizing ideas continuing at deeper levels. Teachers play a crucial role in OCL by actively engaging with learners, guiding them in the language and practices of the knowledge community, and fostering ongoing improvement (Harasim, 2012, 2017). Harasim presents a diagram to illustrate this process:
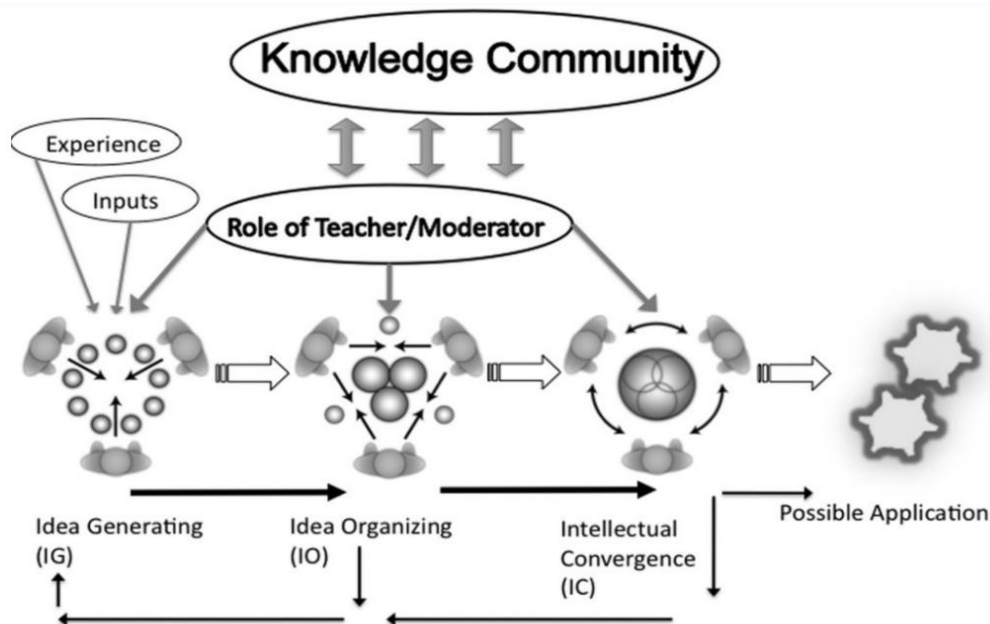
Figure.2- *Harasim's pedagogy of group discussion*

(Harasim, 2017, p. 95)

Understanding the nature of online technologies is indispensably necessary for effective online learning, as they play distinct roles in facilitating either learning tasks or learning processes. Online tools, such as search engines and educational websites, aid specific tasks but do not inherently support collaborative learning. Conversely, online learning environments, like Zoom and Microsoft Teams, provide shared spaces for meaningful interaction and collaboration, essential for the Online Collaborative Learning (OCL) process (Harasim, 2017). These environments pave the way for students to readily negotiate meaning and engage in deep, ongoing discussions, thereby enhancing the learning experience.

4. Exploring the Dynamics of Online Collaborative Learning: Insights and Practical Applications

It is becoming increasingly important to analyze the strengths and limitations of online learning pedagogies to determine which principles and practices are most effective for learners. As a result, various research works have been carried out to explore this area. Among the studies on online learning, many underscore the importance of "social presence," showing that a strong sense of community and connection among learners can improve both learning outcomes and overall satisfaction (Palloff & Pratt, 2010). Building on this, research on online collaborative learning emphasizes its potential to foster students' engagement, enhance motivation, and develop critical thinking skills in virtual environments. These studies offer valuable insights into how collaborative methods can be effectively integrated into online education to maximize students' success.

Online collaborative learning is a complex process that involves not just learners, instructors, and content but a whole system of interactions. Recent research by Altowairiki (2021) explored these dynamics. It disclosed, amongst an array of other things, that effective online collaborative learning unquestionably calls for thoughtful preparation, facilitation, and assessment. Altowairiki (2021) found that social, pedagogical, and technical supports are crucial for fostering meaningful collaboration. She emphasized the importance of instructors in preparing and guiding learners, maintaining an active presence, and creating a trusting environment. Additionally, clear expectations and collaborative skills are essential for active

participation. The study also underscored the importance of both formative and summative assessments for evaluating the product and process of collaboration. Altowairiki (2021) concluded that thoroughly understanding the various components of online collaborative learning environment and its pedagogical practices is crucial for meaningful learning experiences.

The concept of online collaborative learning as a complex system requiring serious and thoughtful preparation, discussed by Altowairiki (2021), aligns with the findings of Palacios-Núñez and Deroncele-Acosta (2021). Their research, which analyzed the state of online collaborative learning during the COVID-19 pandemic, stressed that implementing innovative methodologies should be a deliberate and reflective process. The co-authors argued that effective online collaborative learning depends largely upon a managerial-mediator role for teachers and a leadership role for students, reflecting pedagogical autonomy in the classroom. This balance is essential for ensuring effectiveness in virtual environments and achieving relevant learning outcomes, ultimately contributing in hugely significant ways to the ultimate development of global and ethical citizenship (Palacios-Núñez & Deroncele-Acosta, 2021).

Focusing on the impact of the pandemic on educational practices, the study by Sun et al. (2024) sought out to investigate the effectiveness of online collaborative learning (OCL) within a computer-supported collaborative learning (CSCL) framework by comparing student performance during and after this period. Utilizing a quasi-experimental design, the study analyzed two cohorts of university students, totaling 45 participants, over a 12-week course. During the pandemic, the course was delivered entirely online, utilizing the available digital tools to facilitate collaborative activities. In contrast, the post-pandemic phase employed a face-to-face CSCL approach. The primary aim behind this was to assess whether the levels of conceptual understanding, engagement, and behavioural patterns varied between the two settings. Through quantitative analysis and lag-sequential analysis, the researchers examined similarities and differences in students' learning behaviours across both contexts. The findings revealed that both cohorts achieved similar levels of conceptual understanding, indicating the effectiveness of the online CSCL environment. However, students in the post-pandemic, face-to-face setting demonstrated significantly higher engagement in CSCL activities, highlighting the importance of designing effective CSCL environments that incorporate student-centred activities, guided scripts, prompts, and scaffolding. These results underscore the adaptability of CSCL frameworks and the potential of OCL to enhance learning outcomes in diverse educational contexts.

Another study conducted by Li (2023) focused on the impact of online collaborative writing on improving writing performance, motivation, and self-efficacy among Chinese EFL learners. The research involved 58 participants from a language school in mainland China. They were divided into an experimental group utilizing Tencent Docs for collaborative writing tasks, and a control group receiving traditional classroom instruction. Over 13 weeks, the study employed a variety of writing tasks, along with motivation and self-efficacy scales, to gather comprehensive data. The results indicated that the experimental group exhibited significantly greater improvements in writing performance, motivation, and self-efficacy compared to their counterparts, illustrating the potential of Tencent Docs to enhance the learning experience and writing capabilities of EFL learners. Li (2023) emphasized that integrating online tools, such as Tencent Docs, can greatly enrich collaborative writing instruction, offering valuable insights for language educators aiming to improve students' outcomes. The platform's features, which facilitate real-time editing and peer feedback, align with existing research that highlights the advantages of online collaborative tools in fostering deeper engagement among EFL learners (Rahimi & Fathi, 2022). Furthermore,

Shayakhmetova et al. (2020) argued that real-time collaboration enhances students' engagement in the writing process, a crucial element in developing effective writing skills. This study reinforces the transformative potential of online platforms like Tencent Docs in collaborative writing instruction, enabling EFL learners to refine their skills through meaningful peer interactions and real-time collaboration.

Moreover, a plethora of research studies have explored the effects of online collaborative learning on students' achievement and engagement, highlighting the new and rewarding additions it brings to the table compared to traditional learning. In this context, Ana Liza Villano Gaad (2022) conducted a study on physical science students, applying collaborative online learning (OCL) to improve achievement through structured OCL tools and activities. To achieve this, she employed several innovative strategies that fostered collaboration and engagement among students:

- **OCL-Based Lesson Plans:** These plans provided a structured framework aligned with educational standards and clear learning objectives. Weekly lessons included both synchronous and asynchronous sessions.

- **Learning Activity Sheets (LAS):** Google Docs was used for **Think-Pair-Share activities**, where students first reflected individually before collaborating with a partner to discuss and refine their ideas. LAS were shared via Google Classroom, facilitating remote collaboration in real-time.

- **Synchronous and Asynchronous Sessions:** Synchronous sessions involved teacher-led discussions, while asynchronous sessions allowed students to work together remotely. Students presented their work using **Padlet**, an online board that supported whole-class participation.

- **Feedback and Evaluation:** Students completed evaluations via Google Forms to assess understanding, and post-tests and engagement questionnaires were deployed to gauge the effectiveness of OCL. Materials were continuously refined based on experts' and students' feedback.

These strategic applications not only led to significant improvements in students' achievement but also created a dynamic and engaging learning environment that emphasized the power of collaboration in education. Gaad (2022) reported that students developed a better understanding and retained knowledge better thanks to additional explanations and diverse viewpoints from partners, resulting in more critical thinking. Pair discussions helped learners retain information better, and their scores substantially increased. In terms of learners' engagement, Gaad (2022) explained in her article that the common sub-themes evident in the student-participant responses were cooperation, interest, and participation. Interestingly, most participants preferred working in pairs over individual activities, as their partners provided additional explanations. "This method taught me to be more confident in sharing my ideas" one of the research participants reported (Gaad, 2022). Gaad (2022) added that using the Google Docs Think-Pair-Share technique in online collaborative learning is a viable method for assisting students in becoming more involved and engaged in learning.

Baanqud et al. (2020) conducted a study investigating the impact of cloud-supported collaborative learning on students' engagement, knowledge sharing, reflective thinking, and cognitive presence. The research involved 150 postgraduate students who collaborated in small groups over two months, utilizing Google Drive and Google Sheets to perform advanced mathematical calculations and share relevant course materials. These activities were designed to foster knowledge sharing and reflective thinking as students engaged in discussions about course-related topics while collaboratively editing shared files. Instructors

managed and monitored the collaborative tasks, leveraging Google Drive's features to facilitate simultaneous editing and track students' participation through the platform's "Revision history." A notable outcome of the research was that "the cloud environment is able to foster the development of students' knowledge while learning how to collaborate online" (Baanqud et al., 2020). Overall, this research offers valuably unmissable insights into how cloud-supported collaborative tools can facilitate active discussions, sharing, and editing of learning resources, ultimately contributing to knowledge construction in higher education settings (see Figure 3).
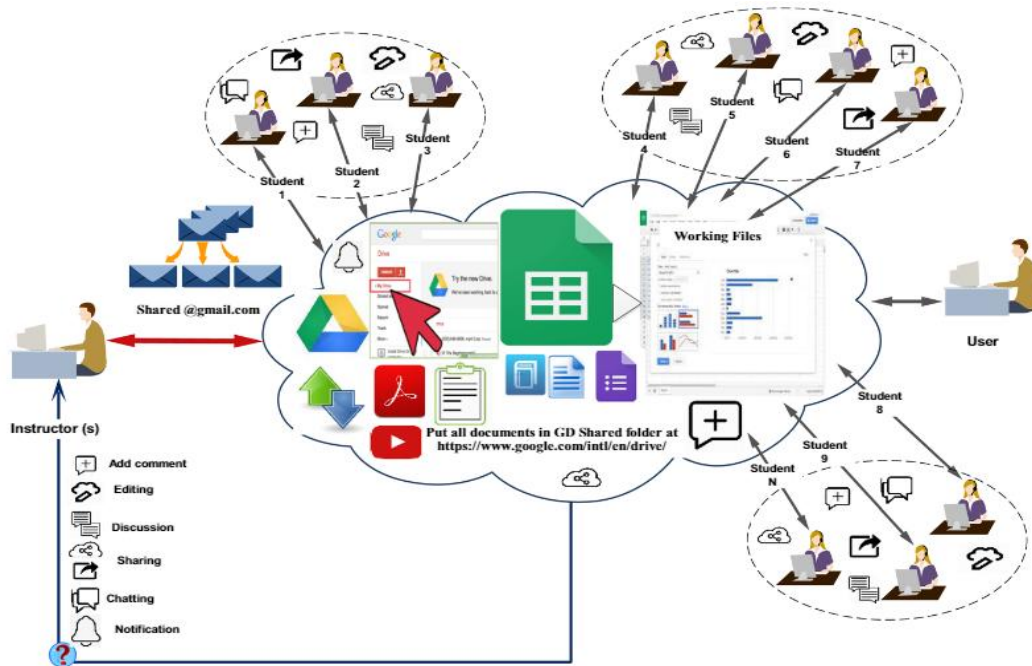

Figure.3- *An Illustration of the Collaborative Learning Activity in Google Drive*

(Adapted from Baanqud et al., 2020, p. 7)

Chatterjee and Correia (2020) investigated the relationship holding between students' attitudes towards online collaborative learning and their sense of community in fully online courses at a large Midwestern research university. To facilitate students' interaction, various collaborative tools, such as Google Docs, wikis, blogs, and discussion boards, were drawn upon. The researchers employed a combined questionnaire, adapted from the Sense of Virtual Community Scale and the Online Cooperative Learning Application Scale, to measure both attitudes towards collaboration and sense of community. The obtained results revealed the existence of positive correlation between the two, with a stronger connection observed among graduate students. A positive attitude towards collaborative learning was linked to a higher sense of community, emphasizing the value of incorporating collaborative activities into online courses. This not only enhances learning experiences but also increases students' satisfaction and engagement in e-learning environments.

In conclusion, recent studies have illustrated that online collaborative learning, a product of technological advancements, involves highly complex and adequately thoughtful planning. This approach has been shown to improve academic achievements, augment engagement, and enhance students' sense of community compared to traditional learning methods.

5. Online Collaborative Learning Issues and Concerns

In the rapidly evolving landscape of online education, several issues and concerns must be addressed to optimize the effectiveness of online collaborative learning. Needless to say, designing effective collaborative activities in an online environment requires more intentional planning on account of the integration of technology. This renders the role of instructors even more critical (Barkley et al., 2014; Kopp and Mandl, 2011). Furthermore, online collaborative learning not only demands highly skilled and knowledgeable instructors but also imposes a multitude of constraints on the number of learners each instructor can effectively oversee (Bates, 2019).

One of the ongoing, mind-boggling challenges is the accurate determination of the optimal group size for online collaborative instruction. Small groups of 2 to 4 students usually perform better due to increased responsibility, a deeper understanding of group members, and improved coordination. However, when groups have fewer than four members, they may lack the diversity needed to represent a wide range of learning characteristics. On the other hand, larger groups offer a broader pool of talent and experience, yet as group size goes up, the likelihood of active participation decreases, potentially leading to dominance by certain members (Maina, et al., 2017). This delicate balance underscores the need for further research to establish the ideal group size.

Another persistent, significant challenge resides in assessing online collaborative learning. Aligning assessments with learning design can be immeasurably complex (Yu et al., 2023). As Garrison (2006, in Yu et al., 2023) suggested, formative assessments benefit from high levels of participation, but summative assessments can undermine collaboration due to variations in individual contributions, such as unequal distribution of work, differing difficulty levels of assigned tasks, and challenges in verifying participation. Thus, ensuring participation and responsibility in group work is essential for successful virtual collaboration (Kopp & Mandl, 2011, p. 19).

Instructor readiness and training, along with managing workload and preventing burnout, can also significantly impact the success of online collaborative learning. A study by An et al. (2008, in Yu et al., 2023) identified several factors that can hinder collaborative learning, including lack of individual accountability, virtual communication challenges, technology issues, unclear directions, different time zones, absence of leadership, and insufficient consensus-building skills.

Lastly, the effectiveness of online collaborative learning hinges on the technology and internet infrastructure available. As noted by Muuro, Wagacha, Oboko, et al. (2014 in Maina, Wagacha, & Oboko, 2017, p. 1041), the challenges invariably associated with online collaborative learning can vary significantly depending on the e-learning technology used, the availability of infrastructure, like the internet and computers, and the choice of Learning Management Systems (LMS) in higher education institutions. This highlights the critical role that robust technology and infrastructure play in ensuring that online collaborative learning experiences are both effective and accessible.

6. Conclusion

Technology has been steadily reshaping the educational system, with learners now more engaged with the virtual world and social media. This shift necessitates new teaching and learning theories and methods to more satisfactorily meet the actual and emerging 21st-century skills, such as teamwork, collaborative learning, and networking. Emphasis is now placed on digital literacy skills that focus on process rather than just content.

Online collaborative learning has witnessed colossal expansion over the last ten years or so, becoming a widely adopted educational approach. It is supported by various tools, including emails, computer conferencing, and synchronous platforms, like chat and groupware. The literature highlights a range of benefits of online, networked collaborative learning, including enhanced flexibility and accessibility, increased opportunities for communication and interaction, and the potential for learners to develop empathy and explore diverse perspectives

The paper concludes that technology has the potential to greatly enhance collaborative learning. However, to achieve this, instructors ought to more seriously consider learners' characteristics, educational frameworks, and grouping methods when designing collaborative online learning. Success in promoting students' learning depends on the pedagogical use of digital resources. This highlights the need for professional education for teachers to prepare generations to embrace and sustain technology-enhanced learning. Teachers must also carefully select technology tools like Google Docs, discussion boards, and social networks, ensuring they properly align with the targeted learning objectives to effectively support collaboration.

Online environments offer a vivid setting where learners can collaborate in real contexts, share experiences, and negotiate feedback, creating a more accurate mental model of collaborative tasks. Importantly, the aim of online collaborative learning is not to replace the teacher but to enhance communication between teachers and learners. Technology should support and improve this interaction, fostering knowledge construction through social discourse. Ongoing research continues to explore this novel collaborative environment, revealing new insights into the nature of learners' interaction and collaboration, contributing to more effective educational practices in real-world contexts.

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