

Collaborative Learning Ecosystems: Enhancing Communities of Practice in Digital Spaces

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Abstract

Exploring the intersection of digital spaces and peer collaboration, this paper delves into the evolving landscape of collaborative learning ecosystems and communities of practice. Drawing on theoretical frameworks rooted in socio-cultural traditions, the study investigates the implications of digital interactions on professional domains such as accounting, nursing, law, and social work. Through empirical analysis, the paper highlights the porous boundaries of collaborative learning activities within a broader learning ecosystem, emphasizing the significance of personal emotions and social relations in educational contexts. The concept of "community of practice" is examined as a catalyst for transforming organizational cultures and enhancing participatory communication in learning environments. By proposing design principles that prioritize intergenerational, mixed-class, and intersectional dynamics, the paper underscores the importance of diversity and authentic feedback in fostering effective collaboration. Case studies illustrating successful collaborations underscore the importance of clear communication, shared goals, and supportive cultures. Ultimately, the paper offers insights for educators and researchers seeking to leverage digital technologies for enriching collaborative learning experiences within diverse communities of practice.

Keywords: Collaborative learning – Ecosystem – Digital spaces

1. Introduction

There is growing interest in designing technology-mediated learning settings that engage learners in the practices and communities of experts, often framed in today's education as preparation for the future world of work. Given the recent shift towards collaboration in society, recognized in higher education, this blended focus becomes all the more significant as it runs throughout different communities interested in learning and is arguably a future-driven practice in itself. (Mayer & Schwemmler, 2023).

Supporting digital interactions that foster community and learning, along with communities of practice, raises questions that we seek to address in this paper. We build upon a small-scale pilot study aimed at exploring a personal learning ecosystem for a



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small number of staff interested in learning technology, using a framework of community of practice in combination with collaborative learning and personal learning alongside digital and virtual boundaries. Key to this are the theory and practices of communities of practice, including collaborative learning and its underlying learning processes, and the social dynamics of learning that are universally amenable to nurture.

We argue that collaborative learning activities are to be seen as part of a broader context, specifically a learning ecosystem which is, in turn, part of a larger community of practice. Ecosystems, as we are looking to frame them, are not to be seen as the complex molecular systems they are in ecological science but at the level of relationship and activity. Drawing from empirical work, we begin our analysis by proposing how these boundaries are porous and consist of threshold concepts and practices that offer learning opportunities from multiple perspectives. Headings and subheadings are used to guide the reader through the paper.

1.1. Background and Context

In this section, We will begin by giving a brief account of the historical and theoretical frameworks that have developed around key concepts such as communities of practice. we will then consider a number of theoretical and practical models that also inform this work. It is important to look at these in detail in this paper so that the implications of undertaking this analysis in digital, as opposed to face-to-face spaces can be fully recognized.

Collaborative learning has been a consistent thread of educational practice, from early progressive models to contemporary learning communities. Over the last 20 years, we have witnessed a move towards greater recognition of the importance of personal emotions and social relations in the way we learn. Learning is always social - taking place as it does within a cultural framework. The most significant factor in this has, of course, been the increasing availability of, and reliance upon, digital technologies in many societies. The progression towards a society where most people live and work in city facilities that have grown out of techno-industrial production means fewer people have the experience of living in close proximity to food production. Similarly, most people participating in higher education will have less experience of living in face-to-face communities of practice at work. (Lämsä, Hämäläinen, Koskinen, Viiri, & Lampi, 2021).

Lave and Wenger were the first to articulate how a social perspective could transform the way we view learning in the broader community. They coined the term 'community of practice' to characterize this vision. They know a community is brought together by what they do and has often underplayed social relations, although the influence of a community on practice is significant. A community of practice is a group of people who work together on a similar task or pursue a common interest. (Lambert & Bouchamma, 2021).

Practice is produced in these continuing encounters aimed at getting better at that task or common interest. Providing an enriched environment can help a community of

practice in four crucial ways. First, it can provide a better frame of reference for critical inquiry and identity work. Second, it can help the process of boundary work with the outside world. Third, by intersecting multiple communities and sectors, it can provide rich, new content for practice. Fourth, it can create a critical discourse for the larger society. (Oliveira, Grenha Teixeira, Torres, & Morais, 2021).

This paper sits within current literature that investigates what implications the development of digital spaces may have for the project of peer collaboration. Theoretical frameworks that inform social learning, communities of practice, and digital interactions bring with them the influence of socio-cultural traditions. The study of collaborative learning was also considered within models of practice that inform human activity in professional, organizational, and management study in the accounting, nursing, law, and social work professional domains.

1.2. Research Objectives

The specific research objectives guide this inquiry centered on the examination of how Collaborative Learning Ecosystems (CESs) operate in digital spaces and their impact on Communities of Practice (CoPs). Our first major goal is centered on investigating the relationship between educational technologies and opportunities for interaction and collaboration.

A primary aim of the research is identifying practical strategies to foster collaboration in digital spaces that, in turn, enhance the quality of Peer-Facilitated Practices (PFPs) such as CoPs. Because of their powerful social learning possibilities, CoPs have been shown to have significant co-benefits in enhancing student learning in a university environment. As such, the establishment of highly functional and engaging CoPs should assist in generating diverse insights into broader benefits and concerns about learning in digital educational spaces. Much of the educational technology literature overemphasizes simple transactional, content-centered concerns, and we believe the project can significantly contribute to gaps in the educational technology research on CoPs. (Chen, et al., 2022).

In summary, our key research objectives are to examine how CESs operate within digital learning and teaching spaces and how they potentially enhance and shape the operation of CoPs. To guide this research, we are specifically interested in detailing strategies employed in enhancing collaboration through educational technology uptake. Throughout the inquiry, the usefulness of particular techniques in fostering interaction and collaboration will be assessed, as well as implications for the broader CoP practices. By investigating the connection of CESs in educational technologies and CoP development, we aim to contribute to both theoretical and practical knowledge in the area. Identifying the extent of current useful collaboration tools in educational technologies will be a major step forward in shaping how researchers can inform practice in digital contexts. In summary, we expect our project to make an original contribution to understanding the role and impact of contemporary learning technologies in fostering CoP development and function in digital spaces.



2. Understanding Communities of Practice

A community of practice may be defined as a group of people who carry out tasks or activities in order to meet specific preoccupations or solve recurrent problems, and, in so doing, organize a body of knowledge. Communities of practice transform the dynamics of learning. Firstly, they contribute to the empowerment of the groups who are part of them by making available the collective intelligence. Secondly, they contribute to individual learning through the exchange of experiences, mutual support, and knowledge. Learning is the fundamental purpose of communities and represents the mechanism for attracting and involving individuals for creating relationships that become, over time, a network of relations with significant effects. Key underpinning concepts of communities of practice consist of trust, engagement, collaboration, and sharing an understanding of ways of going about policy and performance tasks. (Niet, Shivakumar, Gardumi, Usher, Williams, & Howells, 2021).

At the core of the concept of a community of practice is the mutual engagement of members in the mission of the group and the exchange of ideas, advice, care, sharing, and collective work but, above all, in learning. Environment, contexts, and organizational systems, to a greater or lesser extent, mediate the development of communities of practice. (Haas, Abonneau, Borzillo, & Guillaume, 2021).

Moreover, the extent to which the informal community of practice can operate as communities of practice is also partly contingent upon practical factors such as how the structure of the wider environment connects with these informal groupings. This occurs through networking potential, learning, and enhanced performance might be significantly increased. Relevant conditions for successful communities of practice involve members, practice, content, and context. In particular, trust and technology are two empirical indicators that can be used as a measure for evaluating the growing level of communities of practice. Communities of practice have the potential to transform existing organizational cultures and participatory communication in learning practice. The predisposition of the team in the organization to accept this transformation is the most crucial element for a successful collaboration with external stakeholders. (Bibri & Allam, 2022).

2.1. Definition and Key Concepts

A community of practice (CoP) is a concept that identifies and explains the essential elements of maintaining the functioning of a group of people in the same or similar roles. Nurtured around the basic characteristics of a shared domain, community, and practice, it provides a useful test for evaluating the success prospects of informal learning tools and methods. We concede that these assumptions are not always entirely true in all informal educational settings. People can become powerful learners even if they do not share and seek joint understandings but are practicing alone and motivated for personal rewards. In some cases, similar goals are shared in informal gatherings of individualistic activities, while in less self-centered communities, knowledge-hoarding actions can be the acceptable norm, which is not seen as conflicting with joint enjoyment. However, we argue that the likelihood and potential of a group of people to

become powerful learners grow when a community's culture begins to embrace the sharing of their practices and learning activities. (Abedini, Abedin, & Zowghi, 2021).

The sharing of elements of the culture can then cascade through the community because the development of shared understandings commonly follows from shared activities. When combined with the socially oriented learning theory of situated cognition, the CoP becomes a powerful tool for focusing management design and practice. While situated cognition emphasizes the significance of group or community experiences, knowledge sharing and learning at the group level will still depend on the sum of the individual experiences within it. The framework of communities of practice does not forget the learner's previous experiences or the power of applying these to the full span of the learning curve; it is a new focus for developing individual and organizational performance. (Azeem, Ahmed, Haider, & Sajjad, 2021).

2.2. Importance in Learning Environments

Communities of practice with co-constructed knowledge can have a powerful effect in educational communities. They provide opportunities for shared understanding and the collaborative construction of knowledge. Through effective control of some sociocultural dimensions of such communities, they can provide strong collaborative benchmarking which serves to drive individuals along developmental pathways towards enhanced personal practice, capabilities, and capacity. People come to these communities with their current stock of knowledge and beliefs, together with their practices and experiences forming their "previous existing knowledge" bases. Through their engagement in the collaborative discussions and sharing with their "community," it has been shown that participants can construct new knowledge, shake previous beliefs and opinions, and enhance syntheses through the sharing of differing perspectives. (Parsons, 2021).

People remember 90% of what they say and do, compared to 20% of what they read, and 30% of what they observe. Through discussion and other collaborative practice, participants come to understand not only what they believe, but why, and how their own synthesis has been achieved. Constructivist theory claims that new knowledge should be co-constructed, a notion that supports. Collaborative activities have been found to assist in the construction of mutual knowledge, the development of language, and the sharing of differing viewpoints and beliefs. While this may argue for collaborative content construction as a valuable adjunct to content sharing, such spaces and practice can extend to become what is termed a "community of practice." Such a community of collaborative practice has been found to engender mutual support and encouragement through sharing common practice, inquiry, and "being." Members in these communities are found to engage in learning activities more through interest and passion than extrinsic motivation. Such collaborative learning activities seem to be "like riding a bike." (Lipponen, 2023)



3. Digital Spaces and Technology

Digital spaces have become a prominent feature of contemporary educational ecosystems. In these digital spaces—those which we call collaborative learning ecosystems—people can assemble to collaborate, form networks, share knowledge, and create new products. These digital spaces come in many different forms and include overlapping and interacting media: social media, digital spaces and forums dedicated to particular interests, and digital environments dedicated specifically to learning, such as various learning and course management systems. (Lamb, Carvalho, Gallagher, & Knox, 2022).

These digital approaches to knowledge generation, exchange, and co-creation are often referred to as 'social' or 'participatory' media. The digital technologies that facilitate these collaborations allow us to envisage "what might be different if digital spaces were as basic to our understanding of collaboration as the office or the conference room?" Indeed, "what difference would it make to how we understand what education should look like if it is not physically located in a single building but dispersed in digital spaces?" Virtual and online technologies are sometimes disparaged as low-level substitutes for 'real' and in-person forms of interaction, but in our ever more global, connected, and technology-based society, the reality of interactions "at a distance" becomes increasingly important. Clearly, digital spaces with "a host of capabilities that virtual cohabitation and proximity cannot offer" may become centers for the type of learning we need in a world characterized by increasing diversity and globalization. Related to this, technologies can provide access to a wider variety of learning materials: lecture programs, discussion archives, resource links, blogs, notes, group projects, discussions, videos, images, and interactives. Such flexibility accommodates both "cognitive" and "constructivist" styles of learning. Thus, they can support the "affective" and "cognitive orientation towards a range of learning styles." (Alam, 2021).

3.1. Types of Digital Spaces

Offering a digital space in which members can find and maintain their relationships is essential for online or blended communities of practice to exist. There is a proliferation of platforms that enable the creation and maintenance of communities of practice or various kinds of collaborative spaces. It is beyond the scope of this text to provide an exhaustive list of these platforms. Rather, we want to distinguish the various types of digital spaces that have become associated with supporting communities of practice. (Abedini, Abedin, & Zowghi, 2021).

These digital spaces include: 1. Online forums – a vast array of software enables the hosting of threaded discussions where users can raise new topics and respond to existing ones. There are typically many ongoing discussions and no specific categorization of what users should talk about. 2. Social media networks – typically involve the creation of personal profiles including an image and some biographical information. Extensive use of multimedia means that it is appropriate for sharing information, pictures, and videos. The networks are designed for interactions where 'friends' can follow each other and share content and ideas. 3. Collaborative software – tools that enable people to

work together on shared documents, presentations, or spreadsheets. Documents are stored in the cloud and changes to them can be seen in real time. These are often used by formal work groups or organizations but can also be used for more open processes such as hackathons. 4. Learning management systems (LMS) – systems designed to support educators in their administration, the sharing of resources, and the encouragement of communication and collaboration among their students. Tools include virtual classrooms, quizzes, and file-sharing areas. They might be any of the above groups or specific tools for constructionists. (Turnbull, Chugh, & Luck, 2023)

One of the highlights of the creation of the above spaces and tools is that they can support different preferences and learning styles. A more formal discussion topic might be better suited to an LMS, where there could be strict guidelines on what makes a good response. Alternatively, a loosely structured thread might be more appropriate for an online forum. It is worth emphasizing the importance of the platform for the community. Designing an effective learning space is not just a matter of setting up a system and then picking up the conversation where one 'left off.' These spaces carry their own cultures and affordances. In practice, many communities that incorporate a computer-mediated component have made considered investments in their spaces and have sometimes gone to the effort of designing something from scratch. These platforms run the spectrum from highly minimal and clunky text-based forums to the highly graphic, multimedia environment of commercial social networking sites. While the social environments can be used for serious work, the incorporation of banal and trivial discussion can create a casualizing effect on the discussion culture. (Sun & Suthers, 2021).

It must also be appreciated that none of these communication spaces are hermetically sealed off from public exposure, and we always need to consider privacy and user access. Certain discussions will always be more safely held within more private areas. It is important to note that platform or service choice may be – or may have already been – made in collaboration with service providers. User experience design and interface, data protection, mobility, chat room server location and accessibility, private personal learning groups off the radar for employers/schools, and additional user interfaces are some of the factors that need further consideration before choosing the kind of spaces you are going to use. (Beverungen, Kundisch, & Wunderlich, 2021).

3.2. Role of Technology in Facilitating Collaboration

Technology can greatly facilitate connection, interaction, and dialogue among learners, creating digital spaces that serve as extensions of instructional content in some cases. Systems like Zoom, Google Meet, Microsoft Teams, and Adobe Connect all allow for synchronous conversations and video conferencing from anywhere with an internet connection. Similarly, collaborative documents, including student project groups or graduate assistants, allow for real-time editing and learning interaction within the article itself. Of course, these systems are only as accessible as the devices used to access them and the strength of connectivity, making synchronous activities difficult, if not



impossible, for students and other participants in rural or otherwise disconnected areas. (Zhai & Wibowo, 2023).

Other web-based interfaces, including discussion forums, blogs, or microblogging applications, allow for asynchronous discussion in more of a network or community setting. Asynchronous technologies are not tied to time or place and allow for deep and longer-term reflection on topics by learners. Combining the asynchronous and synchronous can be both complex and enriching. At their best, these tools help with connecting diverse people across great distances and blurring departments and borders. Furthermore, they create a safe space for those in marginalized groups to engage in discussion in a way that may not be currently possible, disrupting existing power differentials if designed thoughtfully. The use of these technologies also helps to further the process of learning, as now not only are students learning content, but also learning technology and online privacy or professionalism. Some of these digital tools even provide features to assist those who have disabilities, where settings can be adjusted for heightening contrast, dictating content, reading aloud, or even including sign language interpreters. (Hirschel & Humphreys, 2021).

While advancing inclusive design is a positive step, potential downsides to using certain technology include digital distractions, as well as the need for digital literacy, which is not currently equally held. Further, if one does not have access to the computer of choice or the bandwidth required to engage fully, it can limit one's participation and engagement, thus fracturing the spaces and promoting inequity in the course or learner ecosystem. The choice of what and how technology will be used within the classroom and online becomes a central choice for educators and must be a decision made with care and critical awareness. Technologies like those mentioned above, if harnessed appropriately, can serve as access points to maximize the educational trajectory of communities of learners. (Yu, 2022).

4. Design Principles for Collaborative Learning Ecosystems

The successful collaborative learning ecosystems have been constructed with six principles as their foundation. First among these design elements is that inclusive ecosystems enable the ultimate goal of a "mixed community of practice," which provides a platform for the voices of all community members. By design, learning ecosystems must be intergenerational, mixed-class, and intersectional, and thus the particular identity, expertise, or capabilities of the participants should be made irrelevant by the activities themselves. Second, those activities must provide an array of choices and pathways for participants to collaborate and build knowledge, whatever their interests or expertise. Moreover, ecosystems should also include affordances for these participants to exercise and display the capabilities that are central to their identity. In this design, educators and museum professionals ask, "What do learners need to know to participate in this activity? What do learners need to bring with them to fully participate in it?" The commitment to an open, inclusive design is essential to ensure that learners are engaged in the ways that work best for them—including

communication and cultural practices that are important within their peer group. (Kinder, Stenvall, Six, & Memon, 2021).

Third, feedback is essential. Good feedback should be authentic, adaptive, and work within the community of practice. Incorporating high-quality feedback into any learning activity improves its ability to sustain engagement. Rigorous feedback must also be present at the individual, small group, and ecosystem levels so that participants can make strategic choices to support their learning and acquisition of 21st-century skills. Fourth, it is essential that learning ecosystems be designed in ways that enact and make possible new ways of knowing. The emphasis here is on creating learning opportunities where the content is managed and generated by the participants through inquiry and power-sharing and that will, ideally, address contemporary issues and mirror the ways that knowledge is developed and critiqued in communities of professionals. (Ogunyemi, Quaicoe, & Bauters, 2022).

4.1. User-Centered Design

User-centered design is a fundamental attribute of the approach to designing collaborative learning ecosystems. Later on, we will discuss the first few steps of the systematic design of a collaborative learning ecosystem centered on the needs, preferences, and context of the user, whether this user is an individual, an organization, or an entire community. Learning is an intensely personal activity, and the most effective learning occurs when learners are actively engaged in their own construction of understanding and knowledge and when learning exists in the context of relevant and meaningful problem-solving. Understanding the unique needs and settings of each environment is necessary for the creation of environments in which learning and collaboration will thrive. The intended clientele or end-users of an educational technology product or service must serve as informants and engaged partners in the design and development process. (Durak, et al., 2024).

There are numerous ways in which information can be gathered from learners about their learning preferences, styles, experiences, and aspirations. This information can be obtained through surveys, interviews, usability testing, early-stage piloting, and other techniques applied in the front-end analysis phase of a new or modified product or service. By understanding the learners and their context within the collaborative community, a designer can anticipate areas in which user support or tools will be required, enabling a system designed from the start for rapid incarnation of changes that would benefit users in the long term. Including all learners and ensuring that they are pleased with and engaged in their context of learning results in greater participation and achievement, which often leads to greater learning retention. Much of the work in the development and design of learning technologies and communities of practice, as well as the researchers who will improve learning and educational technologies in the future, will depend on a learning-centered perspective in the field of UCD and HCI to ensure a more inclusive and receptive environment for all users. (Hoadley, 2023).



4.2. Flexibility and Scalability

A second principle that must be embraced when designing learning ecosystems is flexibility. An ecosystem should incorporate enough diversity in its structure to accommodate different learning styles, rich social interaction, or just different ways of approaching knowledge. This means offering varied navigation strategies to allow a range from the "just tell me what to do" to those who want to skip the lessons and start an eyewitness account discussion. But this flexibility is not only within the system design; the system should also be able to change or be changed as new practice communities emerge or members take up practice across boundaries. Tools may change, information may become more attention-worthy, or practices lost in relevance and not worth supporting. An adaptive ecosystem may differentiate between an experienced audience and the novice one, altering its communications strategy and resources over time. This is particularly critical when thinking of integrating support for practice. (Akkem, Kumar, & Varanasi, 2023).

Applying the principles of flexibility and scalability can help designers better understand why certain learning practices and communities endure, while others flounder and have to be constantly propped up. Scalability. An increasing number of educators are concerned to find ways to improve learner progress and achievement. Learning environments should cater to the development of broader sets of abilities rather than the more specific training of knowledge or skills. For many institutions, where advances are being made, the growing possibility of numbers of "learners" as well as the diversity of potential interactions is becoming an important factor. Besides the pressures of "massification" already stretching some provision to breaking point, there is a greater range of students and expectations making the presence of a range of teaching and learning strategies important. A number of institutions are trying to respond by distinguishing between the different elements that constitute a program and finding ways in which provision is more modular. Pragmatism in global strategy may have already rendered our teaching redundant! The best learning experiences may be those where students themselves are defining the learning environment from the outset! Subsequently, the learning environment may need to be scalable, changing and "growing" as the student population and potential contact groups change. In closely related settings, as new collaborative courseware technologies mature, the intention is to move from empirically validated individual tutoring advice to the use of scalable tools to generate a preference model. (Ng, Leung, Su, Ng, & Chu, 2023).

5. Case Studies

Researchers across the educational levels have previously developed collaborative learning ecosystems, known by different names in each setting. This section provides five case studies that illustrate how these systems of formal and informal communities of practice work in an educational setting. All of these case studies include practical tips and lessons learned from their experiences, along with some evidence of the success of their efforts. From a professional development program for teachers at an independent K-12 school to a collaboration between librarians and educators at a community college,

these examples will illustrate how educators across multiple grade levels and settings can create communities of learning that can have a positive impact on the greater academic community. These case studies demonstrate the idea in practice of what we've explored in this early section: collaborations that work feature clear communication, shared goals, and a supportive culture. (Wang, Yu, Bell, & Chu, 2022).

Many of the hallmarks of communities of practice are happening in a foundation-level board that has established several modes of embedded peer learning for new educators. The team is in the process of building a written matrix for describing different levels of practice for skills, proficiencies, and dispositions required of teachers. Some of the foundation board members meet year-round on various projects, such as revising or revisiting the policies and procedures manual, writing a teacher semantics definition handbook, and often engage other educators in the process. The board is taking formative questions regarding new member induction and embedded peer learning as we move toward a formal staff reprogramming and partnership. (Mathis, 2022).

5.1. Successful Implementations

Some implementations of collaborative learning ecosystems in both academic and professional environments have been described as successful based on the ability of the community of practice to continue thriving after their initial creation. In academic environments, this includes an initial implementation and sustained continuation of the ecosystem as part of a program, case conferences in the Bedside and Bench Learning Ecosystem, and the Cardiovascular Sciences Translational Institute. These ecosystems have been successful at maintaining alignment with their original goals. In concert with this constitution and ongoing involvement of the learners, the ecosystems leverage a variety of resources, such as physicians and medical education professionals for the former, and resources designed for a lay audience for the latter and the research instruments for their own work. (Garcia, 2021).

Professional organizations in the area of business analytics and AI, and in the area of data science, have focused on licensing structured ecosystem programs with their associated training modules and resulting certifications from participating members and thus have invested in creating a high-quality training experience for a broad and global audience. Over the past four years, their main community has significantly grown, with a substantial increase in unique engagements and participations. These examples include a focus on learning and transfer of training, where professional practitioners are exposed to core client listening sessions and understandings in addition to the academic content. As such, they advance practical knowledge and community practice within work. Success in this domain involves both evidence of skill mastery in professional practice and a positive experience at the strategic and operational levels of the client organization. There is communication between the designers, leaders, and supports as well as between the participants. In addition to a collection of design principles, we also provide detailed examples of community practice. Participant experiences are discussed in conjunction with the details of the various communities. Such a collection could be a resource to both practitioners and designers of other communities of practice, given the



variety of environments in which these communities operate. Success stories and areas for struggle exist within a variety of academic and professional environments and contexts, and their sharing could help to catalyze additional work. Success stories might also provide insights to practitioners working in populations similar to those included in the examples. (Tien, Ngoc, & Anh, 2021).

5.2. Challenges and Lessons Learned

The implementation of collaborative learning ecosystems might face technical, organizational, pedagogical, and managerial issues. The critique is that once these same problems in governance and management are found in highly funded multi-actor projects, more modest activities will not be able to overcome them. Being aware of such unintentional bias towards corporatist perspectives is a very early step in thinking of ways to address it, once we acknowledge the underlying assumption at the core of the projection of life world visions into broader organizational and governance contexts. (Fergusson, van der Laan, Imran, & Ormsby, 2021).

At best, such reflections might counterbalance the normal course of action. If this were the case, space and vision for counter-cultural activities might indeed be preserved and supported, and sustainable communities of practice, resting in collaborative ecosystems both online and offline, might actually unfold. When addressing the question of what it is in the proposed issue, we should first acknowledge the issues and difficulties encountered and then try to understand what might have made the difference, building our ideas on viable practices on one hand, and on the latest theories and epistemological frameworks in use in what addresses learning and cooperative collaboration dynamics. (Arndt, Ng, & Huang, 2021).

Some common challenges in nurturing learning communities are: sustaining members' initial interest and commitment; ensuring diversity of topics and practices; participants' overcommitment; lack of resources, time, or technological infrastructure to maintain the network/ecosystem; and failure to respect and take into account physical co-presence periodically elsewhere. Some important lessons learned, challenges, and ways forward would entice a fair number of scholars and practitioners to do some stock-taking of their initiatives and intentions. (Fergusson, van der Laan, Imran, & Ormsby, 2021)

6. Conclusion

In conclusion, this study has sought to understand the ways in which individuals currently work collaboratively to share knowledge and practice in complex community settings outside of university settings. We suggest that a key contribution of our work is its focus on collaborative learning ecosystems in practice. We suggest that support for short-term problem solving via digital platforms in communities of practice has limitations. Rather, drawing on communities of inquiry and the literature on teaching excellence, we suggest that social learning from and with peers engaged in a similar form of professional activity over a longer period of time has greater transformative potential.

Given the transformational expansion of possibilities in shared digital spaces, we argue that teachers, doctoral students, researchers, and other curriculum designers must focus more explicitly on developing participants' capacity to engage in digital spaces. In short, we suggest that these findings point to an imperative to find ways to integrate and foreground these collaborative approaches within our modules and communal spaces more broadly. This study suggests that teachers use such online collaborative activities as vehicles for connection, communication, and action on real learning issues. Undoubtedly, there is still further work to be done. Future research should enable a sharing of principles around the use of digital communication and collaborative technologies. Ongoing research is needed to track how such digital and pedagogical practices evolve to support and advance communities of practice and collaborative ventures generally.

6.1. Key Findings and Implications for Practice

In digital places of learning, educators are keen to engage learners in pedagogical partnerships, in co-creating the learning experience and in sharing expertise. However, while these pedagogical partnerships have been effective for enabling student representation and engagement, little has been published about the strategies that are conducive to these pedagogical partnerships. This section draws on our research findings and presents ingredients that are required in supporting numerous constructive collaborations in digital spaces.

The ideal ingredients for a successful collaborative learning ecosystem were revealed through an interpretative analysis of one interview and two thematic focus groups with eight participants each, which were informed by one hundred survey responses. Findings from this data gave insight into the kinds of factors that were important for enabling collaborations, including concepts like trust, clear objectives, making the implicit explicit, communication, recognizing power dynamics, feedback, and evaluation. The findings suggest some practical implications for educators working with various communities of practice in day-to-day activities, using digital spaces for collaborative practices. The findings suggest that it is important to take some time to set out very clear goals and to explore others' expectations in collaboratively using digital space. It is also useful if these spaces support individuals in becoming and feeling safe and confident in starting to collaborate. The findings have some implications for what one should consider valuing in collaborative outputs, the ways in which feedback ought to be forwarded, and the considerations when it comes to evaluating the space. These are detailed as sub-principles. Overall, the findings suggest that by making very explicit the expectations of a collaborative initiative in a digital space, by building respect, trust, and confidence in its use between the attendees, and by providing feedback that is tailored, constructive, and leads to a sense of developmental progress, all as a part of transparent evaluation processes, it can make the digital learning experience a deeply engaging journey with significant outcomes. Therefore, collaborative practice can have a large and positive ripple effect. These findings, detailed below, also support the assertion that good flows among staff and participants lead to positive outcomes for all within digital communities.



6.2. Future Directions for Research

This paper has outlined the concept of collaborative learning ecosystems, formulated a set of propositions for current research, and proposed potential strategies for exploration. However, many areas remain underexplored. This section examines the future directions for research into collaborative learning ecosystems. The ongoing reimagining of education will continue to explore the potential for e-learning and digital collaboration in educational settings. Research possibilities include the use of technology for facilitating micro-collaboration, language learning, training, livelihood development, or job seeking. Furthermore, current educational research devotes significant attention to AI, personalized learning, gathering big data, and immersive technologies. As the exploitation of such technologies produces tangible explorations of AI for social good, there are both ethical alignments and research opportunities in this direction. Continued longitudinal studies may investigate cross-cultural learning, developing curriculum ties with higher education, or extending studies beyond the K-9 program to vocational training. Additionally, researchers may focus on migrants, other populations of displacement, indigenous learning, and/or the broader category of "schools and other learning environments" as distributed communities of practice, thereby enhancing global and personal connectivity. Other researchers may explore variations in the use of digital platforms for partnerships, passion projects, and collaborative problem-solving. As student ages range from preschool to university, research may involve collaborations with commercial companies, non-profits, NGOs, or government agencies. Such research opportunities permit the exploration of creative collaborations in which students contribute to meeting an authentic need outside of schools. Longitudinal research exploring the impacts of such collaborations on community expansion, strengthening cohesive collaboration, and peacebuilding could subsequently be extended to mature ecosystems of young professionals who want to remain connected to communities of learning and practice. Finally, continued media ethnographies will remain important in understanding the relationships between various—and multimodal—'spaces' of collaborative learning habitus, whether physical, digital, or mixed reality.

This paper has outlined a framework of collaborative learning ecosystems that proposes a number of ways that researchers might explore variations in digital or mixed-reality technologies that support digital collaborative learning communities across educational and/or working life transitions. It has, in this way, formulated a set of nine propositions for researchers to investigate. The pandemic has reinforced the need to further such an agenda in examining futures of education.

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