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# Human Factors in New Personal Learning Ecosystems: Challenges, Ethical Issues, and Opportunities

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**Abstract.** This paper highlights over a decade of research on emerging technologies and learning innovation by the National Research Council, starting in 2008 with Personal Learning Environments (PLEs), connectivist-type MOOCs (cMOOCs) and more recently, new learning ecosystems. Late breaking research on human factors involved in critical learning on an open network will highlight participants' experiences in a recent cMOOC on distributed learning technologies - E-Learning 3.0. Human factors research is essential in identifying the types of support structures needed to create a place or community where people feel comfortable, trusted, and valued, as part of critical learning on an open network. Gaps and limitations in current research and development efforts in the area of new learning ecosystems are addressed as well as future areas of research worth exploring.

**Keywords:** Personal Learning Environments; PLEs; cMOOCs; Connectivism; Learning ecosystems; Human factors.

## 1 Introduction

The National Research Council has been conducting research on emerging technologies and learning innovation since 2008, starting with Personal Learning Environments (PLEs), connectivist-type MOOCs (cMOOCs) and more recently, new learning ecosystems. A decade of research has identified important gaps, especially around the types of support mechanisms required by learners to be successful in these new open and accessible learning environments.

New learning technologies are emerging outside formal education, and academics and technologists are experimenting with these in formal and informal settings. Personal Learning Environments (PLEs) are part of the new learning ecosystem landscape, offering a wide range of open and accessible learning opportunities to learners across the world. A PLE is define as a single user's e-learning system that allows collaboration with other users and teachers who use other PLEs and/or Virtual Learning Environments and contain 'productivity' applications that facilitate the owner's learning activities, and are generally under the user's control as to use and personalisation [1]. PLEs are usually conceived of as open systems that are concerned with the coordination of connections made by the learner across a wide range of open systems [2]. MOOCs are included in PLE design efforts: as a massive multi-user environments, with open and distributed content that encourages cooperative learning, fully online delivery, and the packaging of these as an online course [3]. Novel technologies have prompted a new era of information abundance, far beyond the era of information scarcity and inaccessibility [4].

Tenets of emergent theories of knowledge and learning, such as connectivism, argue that online social networks can help interpret and validate information [5,6,7]. They promote a learning organization whereby there is not a body of knowledge to be transferred from educator to learner, and where learning does not take place in a single environment. Rather, it is distributed across the Web and people's engagement with it constitutes learning [7]. cMOOCs are 'based on a philosophy of connectivism and networking' [8] and 'are defined by a participative pedagogical model'[6].

Key principles of learning in networks [9,10] are: distributed platforms, autonomy, diversity, openness, and connectivity. Downes and Siemens (conveners of the first cMOOC in 2008, CCK08) have described four key MOOC activities as: aggregation (filtering, selecting, and gathering personally meaningful information); remixing (interpreting the aggregated information and bringing to it personal perspectives and insights); repurposing

(refashioning the information to suit personal purposes); and feeding forward (sharing the newly fashioned information with and learning from other participants) [11].

It is now possible for self-directed learners to participate informally in learning events on open online networks, such as in Massive Open Online Courses. In order to develop empowering learning environments that foster active learning, designers and developers of such environments first need to understand the factors that influence people's attitudes, intentions and behaviours. They must also understand the prerequisites for people to thrive in such environments in order to create favourable components and conditions, to encourage agency and autonomy to participate wholeheartedly.

# 2 Background

## 2.1 Human Factors in Self-Directed Learning

Recognizing the challenges posed by innovations in Web-based learning, learning technologists have started developing structures to support autonomous learners in the negotiation of this new and ever-changing learning landscape. The creation of a place where people feel comfortable, trusted, and valued is the crux to engaging learners in an online environment [11]. The task would be to move towards a space that aggregates content and imagine it as a community, a place where dialogue happens, where people feel comfortable, and interactions and content can be accessed and engaged with easily: a place where the personal meets the social with the specific purpose of the development of ideas and of learning. In a learning environment characterized by change, the tools and application recommended to learners and the connections to others and resources are vitally important to create meaningful learning experiences. The flow of learning in a learning environment that supports learner self-direction on online networks, as is the case in cMOOCs, has been visualized in Fig 1 [12].

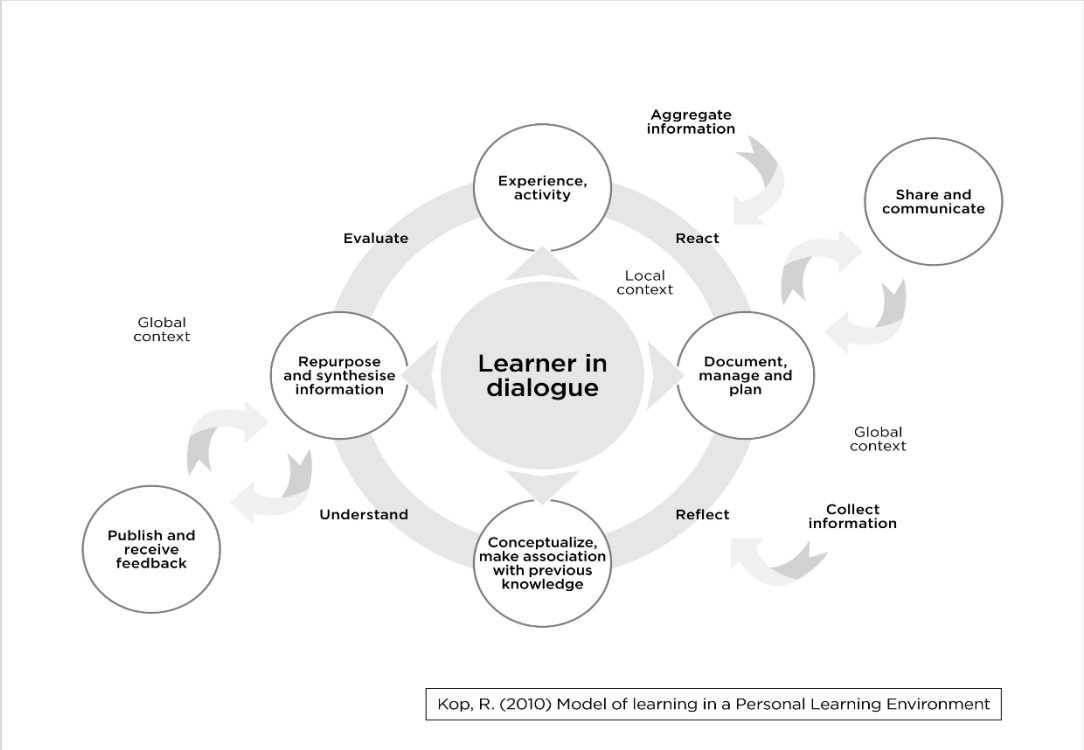


**Fig. 1.** Model of learning in a Personal Learning Environment

## 2.2 Disruptive pedagogy

Connectivist MOOCs have been described as being pedagogically disruptive [13] and this can have a significant impact on participant learning experiences and their sense of personal identity. Connectivism is based on the idea that knowledge is essentially the set of connections in a network, and that learning therefore is the process of creating and shaping those networks. E-Learning 3.0—a cMOOC on the topic of 'Distributed Learning Technology' was offered from October 18 to December 17 2018. The course lasted nine weeks and each week covered a different

topic, as follows: Data, Cloud, Graph, Identify, Resources, Community, Experience and Agency, as illustrated in Fig 2.

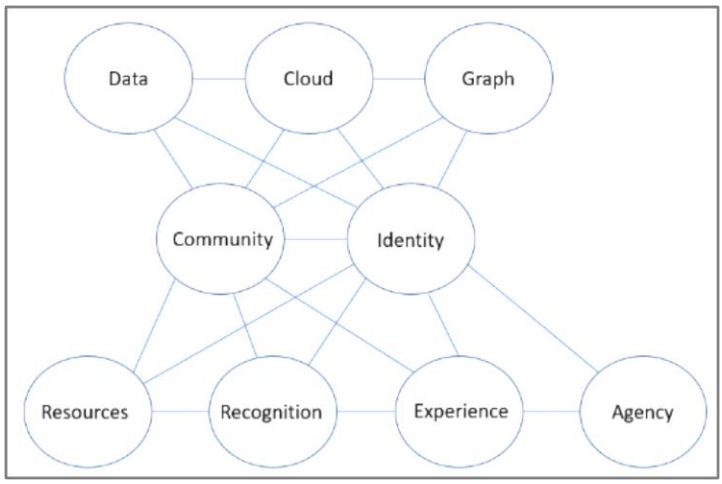


**Fig. 2.** E-Learning 3.0 topics

Features of the course included: synchronous and asynchronous videos, course events and feeds. The gRSShopper application [14] and the Daily newsletter derived from it, facilitated resource aggregation and information dissemination relevant to the MOOC. gRSShopper has been a central tool across several MOOCs, helping learners to map the terrain of the conversation without telling them where to go specifically. Aggregation of independent points of view is one of the key mechanisms to cultivating and harnessing the wisdom of the crowd. As part of a pedagogically disruptive learning experience, the course instructor expressed the following:

> *"You might be thinking: this course looks too difficult, too technical, or too high level. This will be true for everyone, even me. But the course is structured so you can focus on what's interesting and accessible for you, and you can ignore the rest."*[15].

Table 1 describes components of the course, including the course philosophy, technology, media and education.

**Table 1.** Components of the course.

| | |
|---|---|
| Philosophy | What are the underlying concepts, systems and ethics? |
| Technology | What applications and systems will address this topic? |
| Media | What do we create and how do we communicate? |
| Education | What are the processes of learning, inference and discovery? |

### 2.3 New ethics and privacy issues in networked environments

Increasingly, information about individual learners and their online behaviors are now made available and harvested from their participation in MOOCs, which makes it possible to do these types of analyses. However, researchers need to carefully consider the ethical implications related to how personal learning data is collected, analyzed, and reported. The complexity of researching networked learning has been highlighted along challenges of human agency and the multitude of issues involved, such as the dynamics of the network, power-relations on the network, and the amount of content generated [16]. It might also mean that qualitative analysis in addition to quantitative analyses are necessary to obtain meaningful answers to research questions. Effective analysis would require a multi-method approach and would need to address new ethics and privacy issues.

Every researcher has to consider the ethical implications of the chosen methods of obtaining the data for a study and the use made of it. Sometimes obtaining data is a matter of accessing statistics or documents. When human subjects are involved in the research, careful consideration of the level of informed consent by participants is also required. It has been argued that gaining informed consent is problematic if it is not clear what the participant is consenting to and where "participation begins and ends" [17, p. 53]. Several ethical issues were raised in the literature, of which misuse of data and privacy issues were the most important. Researchers caution that data could pose a threat to subjects when misused, or used for different purposes than what it was supplied for [18,19]. Researchers should at least anonymize data in order to respect privacy issues [18,19,20].

It has also been suggested by network researchers that people should have the choice to opt in or opt out of the use of their data. If someone is not aware that the data is being collected or how it will be used, he/she has no real opportunity to consent or withhold consent for its collection and use. This invisible data gathering is common on the Web [18] and highlights new decisions and issues related to ethics that researchers will have to address. Ultimately, researchers have a responsibility to carefully consider the context of their research, and also the process that takes place between observing, collecting and analyzing "Big Data"; data that is left by traces of activities that might not at all be related to the visible participation of learners [20].

## 3 Research Methodology

A survey was conducted in the context of the E-Learning 3.0 course in order to collect feedback from participants on their experiences within the MOOC, their background as well as information about their participation in the course, including their preferred modes of interacting within the MOOC, learning activities they participated in, as well as privacy and trust concerns. Links to the survey were sent to the email addresses of those who signed up for the course newsletter. The course instructor also mentioned the survey in two of the course videos as well as in a tweet.

General statistics were also collected through the gRSShopper aggregator as follows: newsletter subscriptions (177), harvested feeds (15), with the number of unique visitors to the E-Learning 3.0 course website reaching 3000. A total of 39 participants completed the survey, which contained demographic questions as well as questions related to general interest in the course, privacy and trust and preferred modes of interaction. The results of the survey are presented in the next section.

## 4 Survey Findings

### 4.1 Demographics

The majority of participants in the survey were well educated (76% master's or professional degree; 16% doctorates) and from an older demographic (65% were 55+). A majority of participants were male (65%), had a high degree of IT proficiency (68% professional), with significant experience in online learning (58% with 11+ years involvement in online learning). Participants also had a high level of experience in MOOCs, with 95% reporting previous involvement in MOOCs.

### 4.2 Privacy and Trust

Even though all participants had concerns over privacy online in general, most (66%) survey respondents did not read the privacy policy for the MOOC. Some report not seeing it (the link is listed on the course outline) while most noted that they didn't have time or they trusted the course creator and didn't see the need to read the policy.

This could be connected with the idea of the creation of a community—in fact, one of the weekly topics (of 9 in total), was that of community, and 22/39 participants identified community as a topic of interest. The term community also came up in quite a few of the text responses where participants were asked to share their thoughts and experiences on the MOOC. "It's good to 'see' old familiar faces again, and be able to interact with them (people I connected with in some way in CCK11 and other cMOOCs of the era") (R20). The facilitator of the MOOC is indeed a part of the MOOC community and a friendly face, which created trust between him and the MOOC participants. When a connectivist course is working well, one can see a cycle of content and creativity that begins to feed on itself with people in the course reading, collecting, creating, and sharing. One of the survey questions asked participants to identify their preferred modes of interacting within the MOOC. Details regarding participants' preferred modes of interaction are presented in the next section.

### 4.3 Preferred Modes of Interacting within the MOOC

Most of the participants responded that they read the daily newsletter and watched the videos on a regular basis. There was also moderate participation reported in the social media aspects of the MOOC. Blogging attracted the least amount of participation, with 39% of survey respondents reporting never blogging. (see Fig. 3).

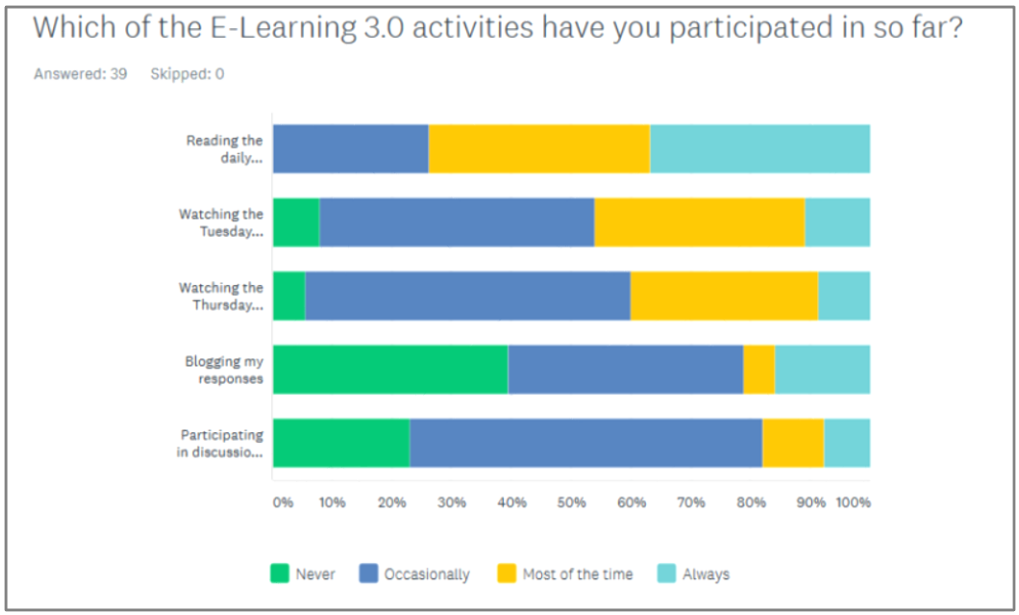


**Fig 3.** Preferred mode of interaction in the E-Learning 3.0 MOOC

Still, blogging was one of the most popular modes of interaction, with many participants choosing to read blog posts by their peers. Blogging and social means of interaction were mentioned with greater frequency by participants as their preferred mode of interaction. The importance of synchronous and asynchronous means of interacting were highlighted in the text responses of the survey. As one participant pointed out:

> *"I'm a free range learner and like to take my own route through a course, often checking out related resources and ideas along the way. But I do appreciate the sense of a shared experience that synchronous components of a course creates […] it's the surprising, sometimes disconcerting and shocking discoveries in a rich, deep, multilayered, unplanned environment that makes the experience memorable and, perhaps transformational." (R24).*

Others pointed out the utility of accessing resources after the fact, stating preference for "Twitter and blog to blog because of the asynchronicity aspect. I love "the daily" because if I didn't get an email with the resource I'd most likely put the "course" even further back on the backburner." (R20). "Asynchronously, because the time zone of live events takes place in the middle of my night. I very much appreciate learning about the gRSShopper software and seeing how the course is mounted and use the concepts, if not the software itself, in my own course". (R39).

And others pointed out their appreciation for including multiple means of interaction, noting that "There isn't 'one' [preferred mode] they contribute in unique ways to the whole experience." (R1).

When asked to share their thoughts and experiences on the MOOC the terms community, open and interaction were frequently mentioned (see Fig. 3). Certainly the users written responses to the preferred modes of interaction speak to this theme of openness and interaction within a community. When asked to share their thoughts and experiences on the MOOC the terms community open and interaction frequently mentioned. Many thanked the MOOC producer for the opportunity for gathering the community and the facilitation of their interactions. Several participants called for more interaction, especially during the live sessions, and perhaps some webinars where the MOOC participants could have the opportunity to interact with each other synchronously to complement the asynchronous interactions. One common issue mentioned was that of time constraints, with several participants indicating intent to follow up on course material after the official end of the course.

> *"I wish I could have contributed more and engaged with others more. But, for me, these courses never really end. It's a bit like knowing that you can drop into your favourite bar or cafe anytime and know that you will find good people and good conversations there. No one expects you to turn up every day or at pre-determined times. And it's OK if you're away for a while. You'll just have more news to share on your next visit. A MOOC isn't like listening to a finished symphony, it's more like warming up in the pit with everyone else. It's improvised jazz." (R24)*

## 5 Conclusions and discussion

Working across distributed platforms allows learners considerable autonomy, but also requires the associated technical, navigation, and critical thinking skills. For newcomers to MOOCs, the experience may be difficult and disorienting. Fostering and encouraging learner autonomy is an essential part of the learning process and design but the constraints on autonomy must be recognized as part of the human factors involved in critical learning on an open network. The type of support structures needed to create a place or community where people feel comfortable, trusted, and valued, and can access and interact with resources and each other remains fertile ground for research in human factors in computer systems. The notion of what it means to learn in a new learning ecosystem continues to expand, with opportunities for individuals to manage their own learning, improve on their competencies, add a new skill set for career advancement or pursue learning for personal enjoyment.

Current research and development efforts in new personal learning ecosystems include powerful data-driven visualizations aimed at providing valuable and meaningful feedback to learners based on trace data of their learning activities, machine-learning techniques to personalize the learning, learning analytics, recommender systems, big data and educational data mining applications, as well as the provision of safeguards for data protection and privacy in a complex networked environment. Specifically, research in the area of AI and data-based learning systems such as recommender systems will help learners filter information and online social interactions, but the challenge also lies in the human factors that make people want to participate in a course and learn.

With the advent of social media and opportunities to connect people on a massive scale, we have now entered a new era of communication and trust. Learners, participants, and consumers of technologies should be encouraged to make informed decisions about what they share, who they share with, and what might be the potential risks and benefits in contributing and participating. Transparency as well as sound data privacy, security, and trust practices by those producing new technologies and learning environments are now a priority.

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