Ecological Perspectives on Creating and Sustaining Open Learning Environments

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Abstract
Open, online learning has captured the public imagination, and issues about how open education will evolve are becoming vital to understand. We outline how creating and sustaining open education requires substantial, coordinated work on the part of members. Then we highlight how ecological models of groups and organizations can help researchers examine how open education platforms can arise and develop into robust learning communities over time.

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Online Learning; Massively Open Online Courses; Ecological Frameworks; CSCW; CSCL.

ACM Classification Keywords
K.3.1. Computer uses in education.

Introduction
The proliferation of open education resources (OER) and social computing platforms has driven increasing demand and use of open online platforms for learning [9]. High profile examples of these new learning environments include massively open online courses (MOOCs) delivered through ventures such as Coursera and EdX and user-generated education platforms such as the Peer 2 Peer University (P2PU). Now, more than

ever, there is a vital need to integrate theoretical perspectives from diverse fields to understand how individuals come to collaborate around OERs to create new learning environments. Open learning is a natural area where integration of CSCW and Education research can make a clear and needed contribution.

Open social computing platforms are a unique context for learning because of the degree to which learner participation is voluntary and informal. Any educational setting – whether it is a course in a traditional institution, a peer-learning team, an online study group, a question and answer forum, or a course in an emerging MOOC platform – requires thoughtful design, planning, and implementation. Yet, creating these structures as viable learning environments is neither trivial nor certain.

In this position paper, we integrate theories from online communities, organization science, and learning research to propose an *ecological perspective* to understand the challenge of creating and maintaining open learning environments. We first argue that creating and maintaining functional open learning contexts itself requires *cooperative work* on the part of individuals. Processes of computer supported cooperative work (CSCW) are integral to the creation of robust computer supported collaborative learning (CSCL); something that is often forgotten in discussions of new venues and models of education. We then explain how ecological models, drawn from studies of organizations and online communities, can shed light on the work of creating viable open learning environments.

Open Education Requires Cooperative Work

Creating and maintaining groups, organizations, and events is work. For example, people must be recruited to participate. Interactions must be facilitated, managed, and sometimes stopped. Infrastructure must be created and maintained. Information must be articulated, curated, and distributed. Norms must be articulated and reinforced. While these activities may not always be recognized as formal "work", they all must be performed, and doing so requires effort. Whether in an online discussion forum, a distributed project team, Wikipedia project team, or social networking site, someone must expend the effort to do the work of creating and maintaining the socio-technical environment itself [2].

In the CSCL literature, researchers have examined small group interactions and how distributed learners come to collaboratively build knowledge through local interactions [e.g. 7, 8, 10]. These studies have typically considered existing groups, brought together through formal class requirements or for the purposes of a study. However, in open informal environments significant effort is required to bring learners together, keep them engaged, and maintain productive learning collaborations.

Learning structures are often taken as givens. Courses are created and run by teachers. Study groups exist because of explicit assignments given to students. Project teams are assigned and function as independent units. Who ensures that these structures are created and sustained in open, voluntary learning environments? While scholars have begun to examine the consequences of these types of learning environments, less attention has been given to the

problem of developing and maintaining these arrangements within open environments where they must compete for participants' time and attention.

Ecological Perspectives on Open Learning Environments

How do learners decide to create, join, engage in, and complete open online courses? These are critical issues for anyone interested in supporting online learning. Ecological models of organizations and teams offer an important way of understanding how courses, groups, and teams develop in online learning platforms.

Organizational ecology is a theoretical approach built on the premise that organizations are "entities" which compete with one another for scarce, critical resources [4]. For example, skilled personnel, money, raw materials, and customers are needed for organizations to survive and succeed. These resources are in limited supply, and organizations must compete with one another for these resources. Organizational ecology posits that the processes and structure of this competition are significant factors in the development and behavior of organizations.

Recent research has begun to apply organization ecology ideas to online contexts such as discussion communities, open source projects, and innovation communities. Butler and Wang [3] and Wang, Ren, and Butler [11] find that online communities compete for members' time and attention. Members who divide their attention across multiple groups have less capacity to contribute to any one group [6]. As a result the relationship between groups is a significant factor in community participation and activity.

An ecological perspective suggests that courses and learning groups in open, online environments must also compete for limited learner resources. Groups, courses, and teams within educational contexts function when they are able to successfully compete for students' and instructors' time and attention. Course design, learner participation, and instructor interaction are factors that influence whether learners decide to devote time, attention, and content [1]. Likewise, learners who sign up for multiple courses in open learning platforms will have less time, attention, and cognitive resources to devote to any one course. Ecological factors – with a specific focus on resource constraints – are likely to have major impacts on whether learners choose to create educational materials, lead courses, enroll in classes, interact with peers, and ultimately persist in their voluntary, online learning.

Another well established, and relevant, result from organizational ecology is that the organizational viability is related to the number of competing entities in a curvilinear fashion [5]. Being one among few in a competitive space is a precarious position because the niche will lack legitimacy, visibility, and critical mass of resources. Conversely, a group that exists within a crowded niche will face heavy competition and find it difficult to distinguish itself from others. Yet, entities that occupy niches in which there are some, but not too many, competitors have the best chance of surviving. Thus, a group's viability is related in a curvilinear fashion to the number of groups it competes with.

Similar dynamics are likely to apply to open, online education environments. Online study groups operating in a context where study groups are not the norm will need to expend more effort to recruit participants and

keep them engaged. As the number of study groups in a platform such as P2PU increases, the number of learners who can contribute to these groups will grow. However, at some point the number of available groups will outstrip the available time, attention, and content that learners can actively contribute, leading to greater failure rates within the population of study groups in the platform. An ecological approach suggests that in addition to traditional approaches of instructional design focused on the learner, creation of successful, viable learning environments also requires that competitive dynamics be considered.

Even more fundamentally, bringing ecological approaches to bear on the design of open learning environments reinforces the idea that creating effective online learning communities requires cooperative, coordinated work. Maintaining a group, course, or team that remains viable long enough to be a site of meaningful learning requires knowledge of the larger environment. While the myth of "build it and they will come" continues unabated (most recently in the context of high profile MOOC platforms), it remains critical to understand how open learning environments are created, the ecological system within which they exist, and the constraints (e.g. physical, cognitive, social, cultural) under which they function

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