

Open Education in the Wild: The Dynamics of Course Production in the Peer 2 Peer University

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ABSTRACT

The Peer 2 Peer University (P2PU) is an online, open education platform where any user can create a course, contribute content, or join an existing course as a learner. P2PU represents an experiment in organizing the production of entirely user-generated, open education. However, the open model of P2PU rests on the critical assumption that members can successfully coordinate and produce a sufficient supply of courses and motivate others to join in. In this paper, we use log data from P2PU to describe the dynamics of organizers – members who try to produce and launch open courses – and explore the factors related to their ability to successfully create courses on this open platform. We find that a critical predictor of successful course development is quickly finding like-minded organizers to collaborate with, suggesting that creating new education *systems* based on open, social computing platforms requires facilitation of key aspects of social coordination beyond providing platform and content resources.

Author Keywords

Open learning; open education; social computing; computer supported cooperative work.

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces - Interaction styles.

General Terms

Human Factors; Design.

INTRODUCTION

The combination of the Internet and social computing platforms has engendered new forms of user-generated collaboration and production [27]. Crowdsourcing platforms aggregate contributions from individuals to enable scientific data collection and new discoveries through citizen science [32]. Open source software projects

demonstrate how technical infrastructure and open license policies can be combined to create communities within which individuals can create, share, and remix code to create new software applications [11].

These technological components – social computing platforms, widely available Internet and mobile infrastructures, and open licenses – combined with a participatory culture of open sharing and production have also been implemented to address critical education challenges. The Open Education movement has largely focused on creating and disseminating open education resources (OERs) such as lesson content, curriculum, and learning tools [19,25,30]. Open learning platforms have recently garnered widespread attention as potential ways to deliver education. And while they vary significantly in their degree and conceptualization of “open”, massive open online course (MOOC) platforms (e.g. Coursera, edX, Udacity etc.) where formal institutions such as universities create and deliver educational content to users have significantly increased in popularity and visibility [24].

Less well known are experiments in user-generated approaches that attempt to leverage social computing platforms to broaden participation in education. More than just increasing access, these efforts seek to use open, collaborative platforms to increase the size and scale of the community that is creating and providing educational content and experiences. The Peer 2 Peer University (P2PU) is one example of an organization that is experimenting with fostering learner-generated, peer-to-peer education. On P2PU’s platform anyone can register as a member, create a course, contribute content, or join an existing course as a learner. This approach has the effect of opening up opportunities for both the use and creation of materials and courses.

However, for open platforms such as P2PU to function effectively, members must produce quality courses, contribute content, join courses, and participate actively to keep courses alive [10]. On the one hand, this need is similar to other online communities and social computing systems which are dependent on participants for content and support [9]. However, open education platforms require more from their participant populations than simple provision of incremental content, active participation, or transactional social support. For these platforms to function,

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CSCW '15, March 14–18, 2015, Vancouver, BC, Canada.

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some member must take on the more extensive role of course organizers. In this study, we explore an issue that is critical to P2PU, and open education platforms more generally: understanding the experiences of organizers – or members who attempt to design and launch courses – to better support a supply of courses for the community.

In the following, we first articulate how this practical issue is also an interesting theoretical question of how to design and facilitate the computer supported cooperative work to orchestrate the necessary support for new *systems* of education delivery. Formal education institutions have complex sociotechnical systems to coordinate the work of providing education at societal scale. These systems include mechanisms such as policies that require and motivate student activity; infrastructure such as schools and classrooms; and the training and employment of compensated, certified, professionals such as teachers and administrators. User-driven, open education platforms are an emerging test bed to experiment with new ways to coordinate this work of orchestrating education at scale.

Second, we describe our analysis of log data from P2PU to explore the 3,028 members who have collectively attempted to create 3,347 courses over the history of the platform. Within this universe of potential courses, 426 courses ($\approx 12\%$) were successfully launched on P2PU. In the presented analysis we examine how factors such as organizer experience, instructional design training, and peer collaboration relate to the likelihood of successful course production. Finally, we articulate design guidelines for the sociotechnical supports that are needed to guide the education production critical to open education systems, and suggest implications for future research.

RELATED WORK

Open education is one instantiation of the larger open movement. Others include citizen science, which leverages technology platforms to promote virtual collaboration between scientists and the general public [29,32], open source software projects that use technical platforms to manage the creation of openly available software [11], and popularly known platforms such as Wikipedia that coordinate individuals to create collective information repositories on global scale [8,12].

Adopting similar ideas and technical infrastructures, open education proponents worked to facilitate sharing and dissemination of open educational resources (OER) such as curriculum and learning tools. Early examples, such as the OpenCourseware initiative at MIT and Open Learning Initiative at Carnegie Mellon [1], have focused on freely disseminating syllabi and curriculum from university settings. Most recently, open education has received renewed interest with the growing availability of MOOCs. The current popular notion of MOOCs are free online courses, created by universities or affiliated organization, and delivered with high enrollment numbers through online platforms such as Coursera or edX. However, the original

notion of a MOOC was not an institutionally driven delivery system, but rather a strategy to organize people online to share information and learn about a topic through a learner-generated process [23]. Different terms (such as xMOOC vs. cMOOC) have emerged to describe these differences in institutionally driven versus user-generated approaches for delivering educational experiences [3].

While these different approaches to open education undoubtedly have implications for students and learning [4,5,6], they also significantly change how the work of creating materials is performed. Open education platforms where technical and social infrastructures allow, at least theoretically, anyone to participate in the production of OERs, alter the roles, incentives, structures, and processes that underlie the provision of education content and experiences. Hence, the design and creation of these platforms is critically dependent on a strong understanding of the dynamics of production in open education environments.

Coordinating Cooperative Work: Policies, Infrastructure, and Social Participation

Although it hasn't been the focus of prior studies of open education platforms, existing research on other open communities has considered how policies, infrastructure, and social factors intersect to influence how members coordinate and perform work. These notions inform our understanding of the challenges associated with fostering production of open education resources. Butler, Joyce, and Pike [8] illuminate how an open platform such as Wikipedia is guided by policies that play various roles such as coordinating user behavior, developing meaning and identity for members, and providing signals for both members and outsiders about what is important in the community. Even within a class of open communities, the different intents and goals of a given community will likely shape user behavior and production. For example, Wiggins and Crowston [32] show how within citizen science projects there are very different goals in a given project, ranging from promoting Action, Conservation, Virtual Collaboration, or Education.

Policy signals guide member actions, shape how individuals govern themselves, and set norms that form the social and cultural setting of an online community [2,12,21]. Open licenses are another type of policy that allows individuals to create and disseminate artifacts (such as software code) for others to openly inspect, reuse, modify, and redistribute. Such policies have enabled a wide variety of collaborative production in areas such as software [11] and OERs [19].

In addition to a foundation of policy is a technological infrastructure. One clear innovation of social computing is the availability of technological platforms needed to broaden participation in a given activity. Wikipedia rests upon a technological platform where anyone can edit a webpage. From this simple, but powerful mechanism,

organizations and individuals can create a broad array of collaborative interaction and production mechanisms [8]. Citizen science projects utilize technology to lower the floor for participation, so that individuals who may be hobbyists can collect observations (e.g. eBird), anyone with an interest in playing a video game can contribute to scientific research (e.g. FoldIt), or interested individuals can curate information (e.g. Encyclopedia of Life) [29]. Open source software development is enabled by collaborative platforms such as Sourceforge and Github that allow individuals and teams to easily share code, fork projects, and coordinate distributed activity [11].

The combination of open licenses, online communities, and technology has created situations where individuals can easily produce artifacts with technological tools and freely disseminate and collaborate around these artifacts. This idea of a participatory culture [16] has spread to the realm of education in various ways. For example, children can learn to code using programming environments such as Scratch, and upload, share, and remix these artifacts in their online communities [28]. In addition, the Open Education movement rests on the idea that anyone can create educational resources and share them widely [19,25,30].

Online communities research has shown that this vision of technology-mediated social participation is difficult to facilitate [26]. The vast majority of individuals never participate in a given online community and a small subset of members typically account for a substantial portion of site activity. These issues also arise in open online communities and researchers have examined how factors such as motivation to participate in citizen science activities predicts participation [29]. Prior research has shown that strategies to facilitate social interaction such as welcoming newcomers, coordinating and requesting actions to direct activity, and encouraging members to signal their identification with the community, are important to develop and sustain online communities [7,20]. This past research lays a foundation to help understand the unique issues facing an open education community such as P2PU.

P2PU and the Idiosyncrasies of Coordinating Education

Just as policy, infrastructure, and social participation help frame understanding of open, online communities, these factors also characterize education *systems*. For example, the United States public education system functions by combining policies, infrastructure, and teaching and learning practices. Policies such as mandatory attendance for youth under the age of 18 ensure some level of participation. Educational standards that spell out what students should learn, and in which grade levels, guide curriculum. Infrastructure and institutions organize a system of states, school districts, schools, and classrooms to orchestrate the delivery of educational materials and experiences. Colleges and universities create teacher education programs to train and certify professionals in skills such as instructional design and teaching strategies.

This framing helps to illuminate how P2PU is both an open, online community and an attempt at redesigning an education system. Issues of policy, infrastructure, and social participation also shape the interactions on the P2PU platform. The name Peer 2 Peer University communicates a foundational goal of promoting learner-generated, peer-to-peer education. This mission influences decisions about technology design. P2PU is built on a platform that allows anyone (not just designated teachers or other certified professionals) to design and launch courses, and permits anyone to join existing courses. All content in P2PU is shared under an entirely open, Creative Commons license. Technological features, open licenses, and the values of the open education movement combine to enable a platform like P2PU.

However, developing and sustaining this type of education system requires cooperative work that, for many who have experienced formal education, is largely ignored [10]. Someone needs to create courses, motivate others to join in, understand teaching strategies to guide learners along and engender participation, and design ways for learners to collaborate [4,17].

When one begins to understand these systemic issues, the particular challenges of open education production also become clear. The level of specialized knowledge required to design and launch a course is high. For example, one might need training in instructional design to organize the sequence of activities to effectively guide a novice learner through a topic. Course organizers need to grasp how to recruit and motivate other peers to join the course [17]. They also need to understand how to guide discussion and participation to sustain engagement [4]. In P2PU, anyone can create or join a course from a technological standpoint. However, there are open issues about how to help anyone facilitate and sustain vibrant learning groups. Research from educational psychologists and cognitive scientists cast doubts on whether novice learners are capable of understanding a topic area that they, by definition, know little about [18]. Similarly, there are open questions as to whether learners can generate their own learning experiences in an effective way. However, other experiments such as participatory MOOCs suggest that social computing platforms could aid in helping learners create their own learning paths [23].

Given this understanding of P2PU as both an online community and education system, we set out to examine a critical issue that has been a main area of interest to both P2PU, and more generally to online community researchers: the experience of organizers in creating courses for the community. Prior research on P2PU found that while 2,034 courses were started by organizers, only 368 courses were ever completed and launched publicly (about 18%) [3]. Such studies of P2PU have identified potential issues such as the small percentage of courses that ever successfully launch, but have not explored what factors

might explain these patterns in any depth. We build on this prior work with an updated P2PU log dataset and delve deeper into the factors that may explain the successful launching of courses in the platform. In particular, we examine the following exploratory research questions:

R1: How do P2PU course organizers engage with the P2PU platform?

R2: What factors are correlated with the successful launching of courses in P2PU?

In R2, we specifically examine three hypotheses that are informed by the prior literature in online communities and salient aspects of P2PU's history over the past few years. First, online communities research suggests that the prior experience of participants in interacting with the online community plays a role in their future interactions [20]. In the context of P2PU, we examine whether the prior experience of organizers is correlated with the likelihood that they will successfully launch a course in the future:

H1: An organizer's prior experience including (a) how long they have been a member of P2PU, (b) how many courses they attempted to organize in the past, and (c) how many courses they participated in the past, will be correlated with the likelihood of successfully launching a course in the future.

For our second hypothesis, we drew upon knowledge of P2PU's history based on participant observation and informal discussion with P2PU's founders. P2PU was long aware of the issue of helping more organizers launch courses in order to sustain the community. In their efforts to help alleviate the high level of instructional design knowledge needed to create courses, they created their own initial course entitled "How do I Make a P2PU Course?" that guided new members in how to design participatory, peer-to-peer learning experiences. We utilized data that tracked when organizers took this instructional design course (if ever) to explore the following hypothesis:

H2: Organizers who took the P2PU Instructional Design course will be more likely to successfully launch a future course.

Finally, as noted earlier, a strong community mission for P2PU is to encourage and facilitate peer-to-peer, collaborative learning. Thus, the technology platform and interface allowed for multiple members to join together and collaboratively create courses. We were interested in exploring whether those organizers who decided to collaborate were more likely to successfully launch their courses than those members who worked alone:

H3: Organizers who worked with others to create courses will be more likely to successfully launch a course.

METHODOLOGY

To examine these questions, we obtained a MySQL database dump from P2PU that contained the entire

database backend for the online platform from the appearance of the first course in March 2011 to September 2013. We wrote SQL scripts to extract and transform this raw data into a dataset suitable for statistical analysis. Specifically, our research questions examine the relationship between organizers and courses and we constructed a panel dataset that included the entire universe of courses started in P2PU over time, linked to the organizer of that course. Thus, the longitudinal, panel dataset includes multiple rows for a course, if that course had multiple organizers. We also collapsed this dataset by organizer in descriptive analyses that focused at the organizer level (see below).

Variables

Given the longitudinal, multidimensional nature of the dataset (e.g. course, organizer, time), we wrote scripts to extract and combine data from multiple database tables including *projects*, *users*, and *course* tables in the MySQL database. Scripts compared time-stamps of activity across tables to generate several variables with a time component. The following variables were used to create an analysis dataset that consisted of a set of records for each valid course / organizer pair:

Course ID: This was a unique ID that represented each course in the database. Of special note is a quirky detail of the P2PU database. In prior research on P2PU [3] course information was stored in a set of *projects* tables. Our dataset utilizes a more recent version of the P2PU database, and due to a redesign of the platform, new courses were represented in a new set of tables labeled *courses*. We wrote scripts to extract data from both the old course history (in *projects* tables) and the recent courses history (in the *courses* tables) to include the entire universe of courses in P2PU.

Launched: This binary flag indicated whether a given course was successfully designed and launched to the public in P2PU. This attribute was constructed from a combination of attributes in the *courses* and *projects* tables.

Organizer ID: This unique ID identified each member of P2PU who attempted to organize a course.

Weeks Elapsed since Joining P2PU: This variable utilized information about when the organizer first registered for P2PU and the date that they commenced creation of a given course. The time elapsed between these two dates was converted to weeks, and represents how long a given organizer was an active member of P2PU.

Prior Courses Organized: Using time-stamped information about course creation, this variable is a count of how many courses the organizer attempted to create **prior** to starting design of this current course (successfully launched or not).

	Mean	Standard Deviation	Min	Median	75 th Percentile	Max
Courses Started	1.41	2.32	1.0	1.0	1.0	66.0
Courses Launched	0.37	1.28	0.0	0.0	0.0	24.0
Weeks Between Signup and 1 st Course	5.87	18.79	0.0	0.0	0.16	178.63
Weeks Between Signup and last Course	7.89	23.17	0.0	0.0	0.67	179.80
Took Instructional Design Course at any point	0.05	0.21	0.0	--	--	1.0
Took Instructional Design Course Before creating another course	0.02	0.14	0.0	--	--	1.0
Number of others collaborated with on a course	6.66	18.89	1.0	1.0	1.0	98.0
Classes Participated Prior	0.29	1.28	0.0	0.0	0.0	25.0

N = 3,028

Table 1: Descriptive Statistics on All Potential Organizers in P2PU

Prior Courses Participated In: Using time-stamped information about course participation, this variable is a count of how many courses the organizer joined as a participant **prior** to starting design of the focal course.

Took Instructional Design: Using time-stamped information about course participation, this variable indicated whether the organizer took the P2PU instructional design course **prior** to starting design of the focal course.

Multiple Organizers: This binary flag indicated whether the focal course in the record had more than 1 organizer associated with it.

Organizer Count: This variable is a count of how many organizers were associated with the focal course.

Course Category: This variable indicated what type of course this was: study group, course, challenge, or new course. This variable was used as a control variable to account for the particular, idiosyncratic history of courses in P2PU.

In the beginning, P2PU encouraged individuals to create “study groups” and later changed the name of this structure to “courses”. These courses were removed and closed after the group finished its activities and dispersed. P2PU then created a new course type “challenges” to represent courses that remained on the site persistently for anyone to take. A notable detail is that challenges came about around the same time as a few high-profile P2PU initiatives, such as a partnership with Mozilla to create a series of web development courses. Finally, “new courses” are challenges/courses that were created in P2PU recently as of February 2013. There is no substantive difference in these courses, but P2PU developers decided to store these courses in a separate table given other site redesign decisions. Study

groups, courses, and challenges represent both idiosyncratic design changes in the history of the P2PU platform, and also unobserved factors related to the “eras” of P2PU’s development. For example, it may be the case that challenges were more likely to be launched, but not due to any substantive reason except that the challenges course type came about at the same time as high profile initiatives such as Mozilla’s web development courses. By including course type as a control variable, we are able to control for some unobserved factors in P2PU’s evolution.

Analysis

To explore R1, we first present descriptive statistics for both organizers and courses in P2PU to glean insight into the characteristics, experiences, and dynamics of course organizers on the P2PU platform. To examine R2, we ran a logistic regression model predicting the probability that a given course was launched successfully (Launched) predicted by:

- (a) Prior organizer experience – weeks as a member, prior courses organized, and prior course participated in
- (b) Whether the organizer took the P2PU instructional design course prior to starting creation of a respective course
- (c) Whether the organizer was part of a collaborative group that was designing the course together, or worked alone
- (d) How many organizers were associated with the course
- (e) Control Variable for type of course category for the course: study group, course, challenge, or new course

	Mean	Standard Deviation	Min	Median	75 th Percentile	Max
Courses Started	2.18	4.04	1.0	1.0	2.0	66.0
Courses Launched	1.59	2.25	1.0	1.0	1.0	24.0
Weeks Between Signup and 1 st Course	14.52	26.87	0.0	1.0	16.69	178.63
Weeks Between Signup and last Course	21.85	36.12	0.0	3.48	28.63	179.80
Took Instructional Design Course at any point	0.07	0.26	0.0	--	--	1.0
Took Instructional Design Course Before creating another course	0.04	0.17	0.0	--	--	1.0
Number of others collaborated with on a course	24.04	33.40	1.0	6.0	59.0	98.0
Classes Participated Prior	0.82	1.95	0.0	0.0	0.75	16.0

N = 711

Table 2: Descriptive Statistics on Organizers in P2PU Who Launched at Least 1 Course

The logistic model was used because the dependent variable (course launched) is binary. Using this model allows us to assess the observed impact of different factors on the probability of a course being successfully launched. The independent variables correspond to the three hypotheses we explore in the study. We note the inclusion of a fixed effect for multiple organizers (0/1 indicating whether a course had multiple organizers). When set to 0, we are examining the subset of courses that have a sole organizer (organizer count = 1). When set to 1, the analysis is examining the subset of courses that have an organizer count above 1.

FINDINGS

There were over 56,065 registered members in the P2PU community and 12,453 who returned to the site at least once after their initial registration visit. A smaller subset of 3,028 members ever began to organize a course and collectively this group attempted to create 3,347 courses over the history of P2PU. Of this universe of potential courses, 426 courses were completed and launched publicly on the site (about 12%). Table 1 provides descriptive statistics for the P2PU members who ever attempted to create a course (i.e. potential course organizers) (n = 3,028), and Table 2 describes the subset of members who successfully launched at least one course (n = 711).

Examining Table 1, we see notable characteristics of P2PU members who are potential course organizers. The variable Weeks Between Signup and 1st Course represents how long a member took between registering in P2PU and attempting to create their first course. The majority of members (at least 75%) attempted to create a course within 1 day of creating accounts in P2PU. At the 75th percentile, members took 1.12 days between registering for the site and attempting to create their first course. Furthermore, the vast

majority of would-be organizers never participated in any courses before attempting to create their own course. Only about 5% of all potential organizers ever enrolled in the P2PU instructional design course, and only 2% took this course *before* creating a future course. Conversely, this statistic suggests that 3% took the instructional design course after attempting prior courses, and never created a future course thereafter.

These indicators suggest a particular dynamic for potential course organizers. It appears that these members join P2PU with an existing intent to create a course and jumpstart a learning group. Almost immediately after signing up for the community, they attempt to create a course. They do not participate in prior courses, and few took the P2PU instructional design course prior to attempting to start their own course design. Subsequently, the majority of courses were begun but never completely designed and launched publicly.

The experiences of course organizers that successfully launched at least one course were markedly different (see Table 2). Of the 3,028 members who attempted to start courses, 711 were successful in launching (about 24%). On average, these organizers attempted to start 2.18 courses and successfully launched 1.59. Half of all of these organizers (median) spent 1 week on the platform between first signing up and attempting to design their first course. At the 75th percentile, organizers took about 17 weeks in between signing up and joining their first course as an organizer.

A higher percentage of successful organizers took the P2PU instructional design course (7%, and 4% of whom took the instructional design course before creating a future course) and they were more apt to collaborate with peers to launch courses. The median number of peers that a successful

	B	S.E.	P-value	Odds Ratio
Weeks Elapsed since Joining P2PU	0.007	0.002	0.00	1.01
Prior Courses Organized	0.013	0.007	0.09	1.01
Prior Courses Participated In	0.07	0.02	0.01	1.07
Took Instructional Design	-0.17	0.20	0.40	0.845
Multiple Organizers	2.30	0.13	0.00	11.01
Organizer Count	0.12	0.02	0.00	1.12
Course Category ^a				
Course	0.01	0.14	0.95	1.01
Challenge	0.66	0.13	0.00	1.93
(New) Course	0.05	0.14	0.73	1.05

Dependent Variable: Launched (0/)
N = 4,262 Pseudo R² = 0.42
^a Reference category = study group

Table 3: Logistic Regression Results Predicting Probability that a Course was Launched

organizer collaborated with was 6 people (Table 2). This contrasting profile suggests that successful organizers in P2PU spent more time on the platform between initial sign up and first attempt at a course. This time could be spent learning about the community, understanding how to best participate, or developing relationships with other members.

What Factors are Associated with Successful Course Launches?

The results of the logistic regression model are presented in Table 3. Our first hypothesis explored whether aspects of prior experience for organizers were related to the probability that they would launch a course successfully in the future. We expected that gaining prior experience on the platform would be positively associated with the probability of successfully launching a course in the future. In addition, our descriptive analysis of organizers suggested that successful organizers spent considerable more time on the platform prior to starting to create their own course.

Contrary to our expectations, and studies of other online communities, we found mixed results for prior experience. While weeks elapsed between signup on P2PU and the start of a course design (Weeks Elapsed) was a statistically significant variable, the relationship was very small (Odds

Ratio = 1.01). Furthermore, experience with starting creation of prior courses (Prior Courses Organized) was not significantly associated with the probability of successfully launching a future course. The one significant experience variable was whether an organizer had participated (as a learner) in prior courses (Prior Courses Participated In). For each course that an organizer participated in the past, the odds that they would successfully launch a future course were 7% greater.

The second hypothesis examined whether participation in P2PU's instructional design course (Took Instructional Design) was correlated with the probability of successful, future course launch. Here we, and P2PU developers, expected that an instructional design course would have a positive relationship to the probability that organizers would successfully launch a course in the future. Contrary to our expectations and those of P2PU developers, taking this course had no significant relationship with the odds of launching a future course for organizers. Merely offering content, in the form of an introductory course, does not seem to be an effective intervention to promote course development in P2PU. Other factors are likely needed and we delve deeper into potential design needs in the following section.

Our third hypothesis suggested that collaborating with other peers in P2PU would be correlated with a higher likelihood of launching courses. The findings show that these variables had the strongest relationship to successful course launches (Table 3). For example, the odds of successfully launching a course were approximately *11 times greater* if the course had more than one course organizer (Multiple Organizers). Within the population of courses that had more than 1 organizer, the findings also suggest that for each additional organizer that collaborated on creating a course (Organizer Count), the odds that the course would be launched increased by 12% (Odds Ratio = 1.12).

DESIGN CONSIDERATIONS AND LIMITATIONS

Taken together, this analysis begins to identify some critical processes that may be salient for P2PU, and other learner-driven, open education platforms that are trying to promote production of OER and learning experiences online. In P2PU, members who become organizers register with at least a general intent to create courses. Most organizers attempt to create a course within a day of joining the community and the majority of these members fail in this activity. However, our findings suggest two design considerations for P2PU. We find that "successful" organizers tend to wait several days or a week before attempting their first course design. In addition, our findings point to specific ways that P2PU could encourage members to utilize this time between signup and starting one's course design. The most significant factors related to the probability of successful course launching were taking other courses and collaborating with other organizers. These patterns suggest that encouraging members to

participate in other courses to gain experience, and finding like-minded peers to collaborate with, would be effective ways to promote course launching.

The findings also illuminate the affordances and limitations of open platforms. The combination of open licenses, a social computing platform that allows any member to create and produce, and the mission and values of open education that are instantiated in P2PU, creates a platform that encourages broad participation. Many individuals (over 3,000) attempted to participate in a highly complex task (designing courses for others) and this is a testament to the opportunities afforded in open communities. In reflecting on these findings, P2PU developer Dirk Uys commented to us that “Course creation has always been very easy and at the forefront [of the interface]. I think this resulted in lots of people creating a course simply to see what it is like.” [31].

In response to the broadened participation, and low success rate of course launching, enabled by the P2PU platform, the developers created a formal instructional design course to help members. Contrary to our, and P2PU’s, expectations the formal instructional design course that P2PU offered to new members had no correlation with successful course launching. These findings suggest that more than providing content and platform resources, careful thinking is required to better understand the social processes that are required to onboard, or acculturate, new members to truly understand how to organize and facilitate open, peer-to-peer learning. Some of this acculturation may likely happen by participating in already existing courses and observing how these learning groups function (Prior Courses Participated In), and also occurs effectively if a new member can find like-minded collaborators to create courses together.

There are several limitations of our analysis that also highlight the need for further research. First, if designing open educational experiences requires a high-level of expertise, it is likely the case that some organizers already possess instructional design training while others do not. Our regression models could not account for this factor and figuring out ways to capture this factor from digital trace data would be a needed step forward in future studies. Second, our analyses illuminated interesting relationships to successful course launching that were sometimes contradictory to our expectations. For example, the formal instructional design courses did not relate to course launching, and only particular forms of prior experience (e.g. taking courses and collaborating with others) were correlated with a higher probability of successful course organizing. However, descriptive studies are needed to better understand why these patterns may be important or how these processes play out in practice. Such limitations are common in studies that can only utilize trace data of already existing platforms [15]. Future qualitative studies of P2PU would be particularly helpful to understand the intricacies of organizers’ experiences and pinpoint

particular design interventions that would improve the supply of peer-generated learning.

While qualitative analysis was beyond the scope of this study, P2PU had conducted its own interviews with 11 successful course organizers as part of their own past design efforts. Their data confirm our findings and provide initial insight into some of the mechanisms that may be important for production of user-generated, open education [13]. For example, P2PU found that their most successful course organizers often took 2 weeks or more to develop courses, and that this task was intensive and required multiple iterations of design. In addition, successful organizers often had to collaborate with many other peers in co-designing courses given the complexity of this task. Taken together, our findings show that for future open education communities it is important to (a) utilize technologies, open infrastructures, and open policies to *allow* for wide participation, but (b) we need to draw lessons from research in both education and CSCW to focus on the critical social learning and acculturation practices that might enhance production in these platforms.

CONCLUSIONS

This study makes several contributions toward understanding the design and facilitation of open education communities such as P2PU. First, we show the importance of delineating how an open education platform such as P2PU is similar to other open, online communities but differ in critical ways. P2PU is built from a technical, policy, and social infrastructure that broadens participation in an activity, and in this vein is similar to other open communities. Open licenses, a social computing platform, and identification with the open education movement combine to enable P2PU as a community.

However, a key difference is the type and complexity of activity that is needed for P2PU to flourish. In Wikipedia or other information repositories such as Stack Exchange, the system functions by asking members to contribute facts or information (if they know them). In P2PU, the community can only function if individuals commit the needed time and energy to design courses and peer-learning experiences for others. The level of instructional design skills and personal commitment needed to produce educational experiences for others is non-trivial.

Haythornthwaite’s [14] characterization of online peer production communities as light vs. heavyweight is a useful way to understand the factors critical to an open education community such as P2PU. Lightweight models of production can rely on micro-participation from many unconnected members. Heavyweight models require deeper commitment, collaboration, and interdependence between members in order to enable production. Our exploration into P2PU reminds us that producing education is fundamentally a heavyweight endeavor.

Second, our analysis builds from an understanding of this type of peer production model to clarify some critical design needs. If producing education is a heavyweight endeavor, our findings show that content-driven interventions (e.g. creating a course about instructional design) are not enough. P2PU will need to encourage potential course organizers to gain *specific experiences* by taking prior courses and connect with other *collaborators* when they begin creating their own courses.

Future studies are needed to unpack the local processes involved in peer-production of open education. Scholars of open education note that the field has done considerable work in defining open licenses, infrastructure, and creating systems to enable open production of OERs. However, research is now needed to understand how to implement these infrastructures and make use of OERs in effective ways to facilitate actual learning practices [19,25]. Research in CSCW and online communities is particularly helpful in this regard. Prior studies of online communities articulate how individuals can welcome others, acculturate new members, direct tasks, and coordinate social processes [9,12,14,20,21,26]. In addition, online communities researchers have also shown how interfaces and platform features help in acculturating members or directing behavior [2,22], or how policies and other structuring artifacts help create norms of online community interaction [8,21]. These dynamics are likely to be vital in efforts to help peers develop relationships, form teams, and build the requisite level of trust, interdependence, and commitment to engage in the production of open education. Future research is needed that can transfer and link online communities findings to the peer production model of open education.

Lessons could be drawn from research in formal education systems. For example, formal education settings have teacher education programs, a diverse array of degrees, systems of professional development, and complex academic disciplines and communities to train, acculturate, and develop educators (e.g. professors, teachers, teaching assistants etc.). There is a wide body of research literature to support different approaches and clearly articulate the intricacies of teaching and learning. However, it is an open question whether recreating these structures in open, online communities will yield the desired results of vibrant, learner-generated platforms. P2PU's attempt to create a relatively formal instructional design course showed little correlation with course organizers' success. However, CSCW researchers and open education practitioners may find ways to re-appropriate formal models of training and production that make sense in online communities. Future work that articulates unique designs and re-designs of education models would be particularly impactful.

Open education is an area where disparate fields of CSCW and education are uniquely positioned to inform one another and fill in critical gaps of understanding ranging from (1) the design and implementation of online

communities, peer production systems, and open movements to (2) the intricacies of education production, teaching, and learning. This paper begins to build such bridges by considering peer production in an open, education platform, P2PU. As online learning and open education evolve, there will be a continuing need to develop theories of technology mediated social participation [26] as they relate to creating and facilitating learning. These theories must move beyond simple models of posting educational content for others to consume. Instead, future research is needed that build upon what we know about online organizing, socializing, and relationship development and link these findings to theories about how to train, acculturate, and facilitate collaboration between individuals as they create educational experiences, teach, and learn in open communities.

ACKNOWLEDGEMENTS

We thank Dirk Uys, Vanessa Gennarelli, Philipp Schmidt, and everyone at P2PU for their help with this research. This material is based upon work supported by the National Science Foundation under Award #1257347. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or P2PU.

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