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The Handbook of Peer Production

Chapter 15 – P2P Learning

Panayotis Antoniadis, NetHood, Switzerland

Alekos Pantazis, Tallinn University of Technology, Estonia

1. Introduction

There are numerous terms referring to horizontal and collaborative learning processes and methodologies, including peer learning, p2p learning, cooperative learning, collaborative learning, connected learning, networked learning, experiential learning, self-organized learning, project/problem-based learning, DIY learning, informal learning, social learning, situated learning, connected learning, critical pedagogy, radical pedagogy, hacker pedagogy, hip-hop pedagogy, horizontal pedagogy, post-pedagogy, andragogy, peeragogy, democratic education, progressive education, open education, direct education, popular education, free education, freedom schools, free schools, deschooling, and more. While all of these terms refer in one way or another to the same ideal, the granting of more independence and freedom to learners, they can differ significantly when it comes to the learning situation for which they were devised and thus are most relevant for. Perhaps the most important difference concerns the age of the learners, which allows for different assumptions regarding agency and self-determination (e.g., between children vs. adults). Other important differentiating assumptions concern the type of knowledge (e.g., explicit vs. tacit) and the overall sociocultural context (e.g., Global North vs. Global South). Finally, technology has given rise to new possibilities extending existing terms and concepts or even introducing new ones.

We use the term peer-to-peer (p2p) to describe such processes, thus making an explicit reference to technological p2p systems. The reason is that technology is being portrayed today as a key actor for the democratization of education (Benkler, 2006; Cronin, 2019; Knox, 2016; Williamson, 2015) and we believe that it is critical to better understand how technological tools can support p2p learning processes and the more or less hidden power asymmetries that lie behind the design and management of digital platforms themselves.

The term p2p was invented in the early 2000s (Oram, 2001) with the appearance of Napster, a p2p file sharing application that revolutionized online content sharing. It instigated a big shift toward the decentralization of the Internet at many levels, but also toward stricter policies on copyright infringement. Computers at the edge of the networks were (re-)imagined as “peers” performing identical functions, instead of “clients” connecting to powerful “servers.” Napster itself was not a truly p2p application in the sense that it depended heavily on a central server for indexing and searching content. It was only the actual transfer of content that was happening directly from edge computer to edge computer, without the mediation of a central server. What is interesting for our comparative work on p2p learning, is that the engineering analogy with p2p systems helps to see clearly how centralization and power asymmetries are often more or less “hidden” and can appear in different dimensions of a system.

When applied to learning, the concept of peer-to-peer can also evoke many different interpretations and systemic challenges. For example, there are many cases where p2p learning and knowledge production methodologies could be established by a powerful entity in regards to a subordinate group, such as the employees of a company. More subtle influences and power structures could also exist in deliberately horizontal groups for various reasons, like a strong personality influencing a learning group in a certain direction, or a digital platform promoting certain types of activities rather than others.

At a higher level, there are numerous cultural, political, social, and other power structures that significantly influence learning. From the very early days of formalized, and conservative, education systems there have been liberating forces toward more “progressive” education, like those described in Rousseau’s famous *Emile*; and later by famous progressive educators such as Pestalozzi, Montessori, and Steiner who celebrated the individuality of children and their capacity to learn, stressed the role of family life and the wider society, but

also of nature and impulses, and in general the importance of knowledge “beyond words.” As noted by education historian John Howlett (2013) “Rousseau’s Emile grows up in an environment designed, manipulated, and controlled entirely by the tutor.” This pattern acknowledging the liberating features of p2p learning approaches toward one dimension of learning but stressing power imbalances in others, will frequently be observed in this chapter.

It is important to stress that this long thread of innovation around progressive education concerns mostly child-centered education. For adult learners, much less has been written and formalized. Andragogy (Knowles, 1980) is perhaps the closest concept to the idea of a p2p learning group, and Plato’s “Symposium” one of the first documented peer learning processes between adults. To structure the discussion, we have chosen three important dimensions of learning to refer to while analyzing various examples of methodologies, tools, and practices.

1) *Curriculum selection*: the choice of the learning objectives of an intentional or unintentional learning group.

2) *Learning process*: the different roles and interactions between different actors involved in the learning project, and their evolution over time.

3) *Knowledge abstraction*: the production of knowledge in the form of encyclopedic entries, tutorials, guidelines, tools, methodologies, and patterns.

Note that there is already a lot of existing work aiming to summarize, classify, or analyze learning processes, which often focus on one or two of these dimensions (Topping, 2005; Wegner, 1991). Some of these high-level analyses are contextualized, like the education system in the US (Giroux, 2011; Monchinski, 2008) or Sweden (Laginder et al., 2013). Others address the technological dimension (Deimann, 2016; Williamson, 2015), while others focus more on political aspects (Haworth, 2012; Means, 2014).

There is also a body of literature on peer production, peer-to-peer and the commons. Benkler (2006) has coined the term “commons-based peer production” and discussed different areas of peer production. Bauwens, Kostakis, and Pazaitis (2019) have explicitly linked the term peer-to-peer with the commons, envisioning a societal transformation based on commons-based peer production and producing thorough research and concrete proposals.

While our analysis will be based on work carried out in different educational settings and contexts, our main focus and contribution will be on intentional adult learning groups. We highlight four specific projects, which share an important characteristic - they are examples of p2p learning processes that include face-to-face interactions:

- Two digital platforms, the P2P University (P2PU) and Openki.net, for creating and supporting self-organized learning groups in localities.
- Two physical spaces, the Tzoumakers rural makerspace in Greece and L200, a central self-organized space in Zurich, Switzerland.

In the following, we introduce the three learning dimensions we previously identified (Sections 2, 3, and 4) analyzing critically a selection of existing approaches in terms of visible or hidden power asymmetries. In Section 5 we analyze the underlying infrastructure, digital and physical, needed to support p2p learning projects. Section 6 concludes the chapter with a discussion on the need for a continuous struggle for democratic governance and empowerment, for which one of the most important tools is “reflection in action.”

2. Curriculum Selection

There are different actors, such as the state, the family, the market, the community, that affect in different ways what people choose to learn, while their powerful influence is not always visible. For example, Ivan Illich (1971) warns us that “Everywhere the hidden

curriculum of schooling initiates the citizen to the myth that bureaucracies guided by scientific knowledge are efficient and benevolent.”

Making, therefore, such choices more consciously and more independently should be part of the essence of p2p learning. However, entering the terms “p2p learning” in an online search engine brings up among the top results a whitepaper by the Versal Group which sees (2016) p2p learning as a means to “help your organization transition into a ‘learning organization’; become more agile and competitive; heighten collaboration and productivity” (p. 2), focusing on narrow potential benefits for a specific company which of course is the one to determine the topic of learning for its employees. This is in contrast with, for example, *P2P University (P2PU)*’s wider value-driven vision aiming to create “a rich learning environment in which everyone simultaneously teaches and learns, acts and observes, speaks and listens”, empowering “individuals to achieve something greater than they could have on their own” (P2PU, n.d., p. 5).

In his seminal work, the *Pedagogy of the Oppressed*, educator and philosopher Paulo Freire (2014 [1970]) has clearly set out as his mission toward a more participatory curriculum selection process: “How can the oppressed, as divided, unauthentic beings, participate in developing the pedagogy of their liberation?” (p. 48). However, Firth and Robinson (2017) challenge such “pedagogies of moulding,” and criticize patronizing educational processes with “goals” or “missions” that aim to transform learners “in a direction desired by the knowing subject [...] conceived as necessary to meet social goals, to produce a particular kind of ethical subject, or to help the learner ‘succeed’ relative to social criteria.” (p. 57). In his last book *Pedagogy of Freedom*, Paulo Freire (1998) defends the role of the educator when protecting the freedom of the students. In his own words: “Freedom is not the absence of limits. What I have always sought is to live the tension, the contradiction, between authority and freedom so as to maintain respect for both. To separate them is to provoke the

infraction of one or the other” (Freire, 1998, p. 99). The fields of critical pedagogy and radical pedagogy, among others, address in depth such questions of power in terms of the object of learning.

Especially for adult education, technology can play a key role for empowering learners in their curriculum selection. For example, there are today online tools to implement the vision of the “learning webs” by Ivan Illich (1971), long time before the Internet, which included “Peer-Matching – a communications network which permits persons to describe the learning activity in which they wish to engage, in the hope of finding a partner for the inquiry” (p. 56). Digital platforms like P2PU and Openki.net are precisely designed to play the role of a modern learning web by facilitating, among others, the creation of ad-hoc learning groups around different topics of interest.

The basic frame developed by P2PU through the overall narrative and design details of the platform is that there is a huge amount of knowledge available on the Internet, on various online learning platforms like Coursera, Khan Academy, and the like. Then the so-called “learning circles” is presented as a tool that can help groups to decide together what to learn from this wealth of knowledge and to help each other achieve their common learning objectives using p2p learning methodologies (Figure 1).



We are all teachers and learners

Come join us on our [community forum](#).

Topic	Category	Users	Replies	Views	Activity
Facilitation Praxis Call - Wednesday January 29	Community Calls		0	446	a month
Examples of learning circle promotional videos	Promotion and outreach		0	160	a month
Learning Circles at Community Colleges	North America		1	169	a month
2019 Project Update	Pittsburgh IMLS		1	263	2 months
MOOC Report 2019	Recommended Reading		1	255	3 months
Facilitation Praxis Call - Wednesday February 26	Community Calls		0	214	6 days

Figure 1. P2P University community forum <p2pu.org> stresses the duality between teaching and learning, “we are all teachers and learners” (accessed: 3 March, 2020)

Learning circles are imagined as groups of people meeting once a week for 6-8 weeks; the facilitator, who does not have to be a domain expert, is central for bringing the group together. In terms of selecting the actual content, special guidance is offered through the *P2PU Facilitator Handbook*. P2PU (n.d.) directly addresses a candidate facilitator of a new course: “What knowledge gaps exist in your community? Who do you expect to attend? What do you like to learn?” (p. 8). To facilitate the collective process of creating learning circles, P2PU maintains a database of online learning resources. As P2PU’s Chief of Staff Grif Peterson (personal communication, November 2019) explains: “The goal is not to be a search engine of every online course, but a community-curated tool of high-quality free and open access materials,” which is not static but always open for the addition of existing courses or the creation of new ones.

Openki.net is a project based in Zurich with similar objectives, which has developed over more than eight years a custom free and open source platform. The Openki platform

looks more like a search engine than a forum, as in the case of P2PU. The goal is to create an attractive online place where people build their learning groups and learn things that are not necessarily already available as online courses. One of its novelties is that the platform is designed in a way to strongly encourage the creation of courses in the platform by those that just want to learn rather than those that have the capacity to teach or would like to play the role of the facilitator. Literally, a bottom-up learning group creation process. When such a project grows significantly, however, the need for filtering will become more and more apparent. Then an important source of power becomes indeed the prioritization of certain learning topics over others, or even excluding those judged as inappropriate (Figure 2).

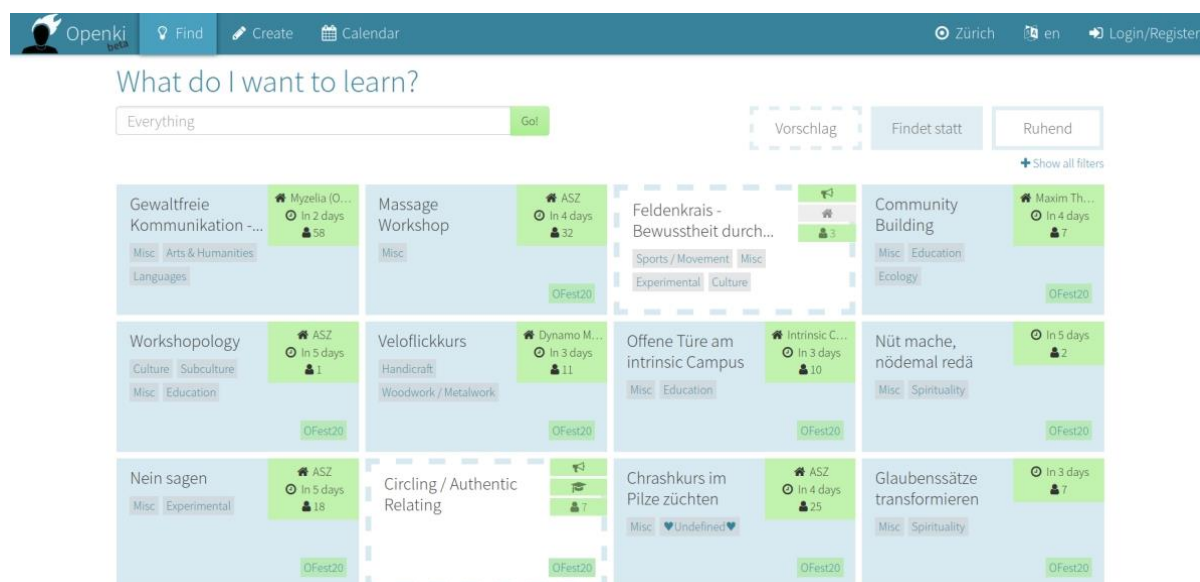


Figure 2. The Openki.net home page in the Zurich region, encouraging the visitors to think “what do I [really] want to learn?” (accessed, March 3rd, 2020)

What is interesting about both P2PU and Openki is that they put in place technological tools for facilitating face-to-face interactions instead of strictly online learning processes like MOOCs (Knox, 2016). This type of “blended learning” is very important to guarantee that p2p learning processes are really democratic and can form defenses against powerful actors

like the mass media, which can create “hidden curricula” and influence significantly seemingly free choices. As Dewey (1927) stated “Democracy must begin at home, and its home is the neighborly community.” (p. 213)

Study circles in Sweden is another project that shares this local perspective of creating p2p learning groups (Laginder et al., 2013). However, no special care is taken to facilitate the creation and organization of such groups, which were traditionally formed in the workplace. Today group formation is left to the participants, and special institutions provide support to already formed groups. Funding is an ambivalent dimension, which on the one hand significantly stimulates such processes but also adds an important power element to the overall structure.

For learning projects that narrow down the learning scope, as participatory design/making projects do, there is also a lot of room for selecting the actual object of learning, or better learning-by-doing, as in the case of the “*Tzoumakers*” project. Tzoumakers is a rural makerspace initiated by the *P2P Lab* research collective. More specifically, Tzoumakers connects small-scale farmers with similar communities around the globe with the aim of collaboratively designing and manufacturing open source tools for their everyday life and work. The choice of tools is up to them, inspired by like-minded people (e.g. practitioners from *L’Atelier Paysan* community in France) working together with the locals to translate their needs into solutions and their solutions into tools. In the case of Tzoumakers, it is interesting that the facilitation team has no expertise concerning the technical aspects of the making process, but their main task is to develop methodologies regarding the process and to codify the knowledge produced to make it easily applicable and replicable.

3. Learning Process

Assume now that a group has been formed and has selected, democratically or not, a topic to be learnt in collaboration. How is the learning process to be organized, in what way, and to what extent could it be described as “peer-to-peer”?

3.1 Roles

There are different roles in a learning process, those of Learner/Student/Participant and Teacher/Mentor/Expert/Facilitator being the most prominent in terms of function, but most importantly, when one explores the p2pness of a learning process, in terms of the interactions and power relationships between them. On the learning side, an interesting analysis and comparison of the words “learner” vs. “student” by Biesta (2010) considers the word “student” as more empowering since students gain themselves, through study, the necessary knowledge and the teacher only needs to encourage them to use their own skills, an “ignorant schoolmaster” (Rancière, 1991). Biesta proposes the term “speaker” to signify an active agent in the learning process who not only listens but also speaks. We chose the word “learner,” as “student” is connected to traditional education and to the “classroom.” The term “speaker” is a qualitative term and it is actually our objective to explore settings, methodologies, and technologies that enable learners to become “speakers.”

On the teaching side, the key question is to what extent an expert, a teacher, or a mentor is actually needed in a p2p learning process. Illich (1971) observes that skilled experts are not necessary the most suitable actors for transferring their knowledge. This knowledge and/or the observed real life activities of experts could be considered instead as useful “sources” of information, which a p2p learning group can process independently with the support of a facilitator who might have no knowledge of the subject itself but can help the group to perform the learning task in collaboration suggested in the “facilitator handbook” by P2PU (n.d.), among many others similar toolkits. In the context of p2p learning, a mentor

could be seen as a knowledgeable facilitator who aims more to inspire and empower than to “teach” in the traditional sense, close to the image of Paolo Freire as described above.

In the vocabulary of the P2P University, “content” is an additional core element expressing already developed online learning material which could act as an “expert source” of learning for a p2p group. Openki.net explicitly names more “operational” roles for an Openki course, like the host or organizer, and ongoing development of the platform aims to introduce even more predefined or customized roles like the note-taker, researcher, communicator, and more. The Peeragogy Handbook (Corneli et al., 2016) provides a long list of such potential roles in peer-learning projects: “Team Member, Manager, Leader, Reviewer, Editor, Author, Content Creator, Presenter, Designer, Graphic Artist, Technologist, Participant, Coordinator, Planner, Mediator, Moderator, Facilitator, Proponent, Advocate, Representative, Contributor, Activist.” (p. 17)

Of course, many roles are possible depending on the specific topic and the context, and do not have to stay fixed. A learning group can start with an expert taking the key role of mentor, but along the way the learning process could be gradually more empowering for the rest of the group so as to feel ready to take the mentor role in the same or different groups. The learning methodology could also explicitly give the teacher role to the learners as an effective way to learn.

In the Tzoumakers makerspace (Figure 3), the participatory making of designed global and manufactured local tools entails a variety of roles from “external experts” invited to a hackathon and local experienced craftsmen to “facilitators,” local designers, programmers and coordinators of an event. Moreover, the local community often draws ideas from the designs of tools that other communities worldwide have shared freely via the Internet. Codified knowledge in the form of freely distributed mechanical design or a

YouTube video inspires and teaches a distant community in various p2p ways to build actual tools, improving their everyday life.



Figure 3. A moment at the Tzoumakers.gr makerspace depicting the friendly relationship between local experts and community members toward building common experiences and exchanging knowledge. Photo: Nicolas Garnier.

There are often important roles that are not particularly visible in the actual learning process, like that of a funding body which can significantly influence the formation of groups and the topic of learning. The case of study circles in Sweden is very characteristic in this respect, “an activity whose charter is ‘free and voluntary’ but which, for its very existence, depends on state subsidy” (Laginder et al. 2013, p.19). In Tzoumakers, funding plays a delicate role since it usually places the initiators and facilitators of the process in a powerful position. For example, participatory action research entails both orienting and observing the whole process at the same time, but the opinion of the group that injected most of the funding for the

realization of the project, indubitably weighs more. The equilibrium in such circumstances should and can be found most often through developing mutual trust.

P2p learning processes can also take place between “groups” rather than individuals, as in interdisciplinary or transdisciplinary research, and mutual learning or knowledge exchange programs (Boehm et al., 2017; Healey & Upton, 2010; INURA, 1999). Such roles are always representational, in the sense that the groups that engage in the interaction represent a bigger group, a discipline, a traditional practice in a certain country, etc. NetHood Zurich, for example, has acted as a facilitator for knowledge exchange and transdisciplinary research on various areas of commoning through a series of EU projects, namely, COMPARE (2015), MAZI (2016-2019), and netCommons (2016-2019), which all met in the design of a new collective space in Zurich, *L200*, co-founded by NetHood and now run without any external support (Figure 4). The ability to engage in an action research project without external dependencies is a particularly luxurious situation both for the researcher and activist roles, which allows experimentation with a structured *laissez-faire* methodology of participatory design (Apostol & Antoniadis, forthcoming), which does not pose any constraints on the use of the space, except for a strict rule of non-domination of the identity of the space.

3.2 Interactions

Moving from the different roles that peers can assume in a learning process to the actual enacted relationships and interactions that take place during the process itself, there is a wide variety of learning methodologies to consider. These methodologies follow in principle the “learning as participation” instead of the “learning as acquisition” metaphor formulated by Sfard (1998), which assumes that “learning is more akin to apprenticeship” instead of considering the mind as “a container to be filled through knowledge and learning.”

There are many variations depending on the quality of the relationship both for “links” between actors assuming some sort of hierarchy, like between learners and experts. For example, Paolo Freire was in his classroom an uncontestable authority, but was guiding his students toward autonomy. And even when the students are children, there are ways to transform the learning process into a more empowering experience (Howlett, 2013).

Similarly, even in the most horizontal models there are often inherent asymmetries of knowledge, skills, and position, and it might be more harmful than beneficial if they are not acknowledged from the start (Freeman, 2013). Often in groups, it is more difficult to deal with informal hierarchies than with clearly stated ones. But “dealing” does not mean eliminating special roles, since they are often necessary, but making sure that such roles are not exclusive, concealed or authoritarian.

The most “traditional” p2p learning methodologies are clearly hierarchical in that a strong figure (teacher, instructor, mentor) is leading the process and the focus is on the benefits of encouraging peer interactions among the learners. In short, the main idea is that students can learn better the object of learning (the content) when they help each other in groups or when they are brought in the position of the teacher, being asked to explain the content freshly learned to others as if they were the teacher. Peer instruction, Peer Tutoring, Cooperative Learning, Collaborative Learning, Learning by Teaching, all fall into this

category and when one reads the corresponding definitions it is hard to perceive what differentiates them.

When there is no expert, nor a powerful authority to dictate the process, a facilitator could help peers to reach a certain learning goal and make sure that they do not only “learn” but they also “speak” (Biesta, 2010). Going back to our technical p2p file sharing systems, they do not only “download” content, but they also “upload.”

Experiential learning (Dewey, 1997; Kohonen, 2012; Kolb, 2015) is an example of a methodology that promotes p2p interactions and a participatory approach to learning. Experiential learning focuses on a specific collective activity or experience, whose outcome is not a priori defined. Learning-by-doing, active participation and experimentation are the main pillars of this approach. Kolb’s circle proposes a cycle of multiple phases for reflective observation, a rotation between abstract conceptualization, active experimentation, concrete experience and reflective observation (Kolb, 2015, p. 4). Thus, Kolb’s circle drags up the experienced learning from the subconscious to the conscious level, making learning accessible and taking experiential learning one step further. The role of facilitators is then to design the common experience, the moments of reflective observation, and the conceptualization process. One of their key tasks is to balance the excitement of the collective action and the need for self-reflection and deeper understanding.

In other patterns of p2p learning interactions, such as the simple sharing of personal experiences in a group, facilitators need to make sure that all voices are heard and respected. For example, “Consciousness-raising (CR) groups,” an example of a “pedagogy without moulding” (see Section 2), are defined by Firth and Robinson (2017) as “voluntary, usually women-only, regular discussion groups” the collective learning process includes the “recounting and interpreting the experiences of participants, generally by presenting

members' experiences around a defined topic and then drawing out similarities and structural relations to the oppression of women.” (p. 66).

Another pattern of p2p learning is the existence of an intermediate object, like the so-called *boundary object*, a term coined by Star and Griesemer (1989) to mean a shared space, a common object “both plastic enough to adapt to the local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (p. 393). These different groups are often referred to as “social worlds” and the basic assumption is that “consensus is not necessary for cooperation nor for the successful conduct of work” (p. 388). Facilitation in this case is more demanding and requires the balance of power asymmetries that are often hidden, the lack of a common (disciplinary) language, and time constraints, among others (Apostol & Antoniadis, forthcoming).

All the above examples of methodologies and patterns of p2p interactions make sense independently of technology, which significantly affects the content of learning and identities of the learners and their “way of thinking” (Williamson, 2015). But it also affects the process itself, giving rise to new patterns of interactions such as the so-called connected or networked learning, which take place in dedicated online educational environments, including Massive Open Online Courses (MOOCs) and many other learning digital platforms, or “in the wild,” through participation in social media platforms and a wide variety of online groups and communities. The Internet has become a global educational platform, which on the one hand empowers people, giving them access to information and knowledge, but on the other leaves learners alone: self-learners find themselves decontextualized and in effect powerless.

4. Knowledge Abstraction

It is not difficult to argue that how knowledge is abstracted, documented, and represented plays a key role in how it will be consumed, integrated and further produced. There are different forms of knowledge, others more explicit (knowing that) and others more tacit (knowing how). Texts, songs, drawings, images, graphics, films, formulas, recipes, social norms, institutions, laws, tools, patterns, blueprints, objects, statutes, machines, language itself, are all abstractions of knowledge produced and developed over the history of human civilization. It is very often the case that learning groups base their common seeking of knowledge on existing books, or online information. But learning also produces knowledge along the way, even for very technical topics. It might not develop further the actual theory, for example, but could reveal new ways to learn about it, interesting associations, interpretations, and more.

Focusing on such groups, or “communities of practice,” Wegner (1991) uses an extended interpretation of the term “reification” to describe knowledge as a simplification of practice like “abstractions, tools, stories, terms, and concepts that reify something of that practice in a congealed form” (p. 61), stressing that, another key concept, participation “is essential to repairing the potential misalignments inherent in reification” (p. 64). His learning theory puts a high emphasis on the duality between participation and reification, without going into very much depth on how reification actually takes place, and who is responsible for producing the abstractions of knowledge developed over time in a community of practice.

Traditionally, it was a key actor, the author, the scientist, the educator, the designer, the politician, the priest, the artist, the planner, the architect, who was responsible for collecting information, observing, and reifying the collective social learning processes. It was dependent on the special qualities of this actor to what extent the final result was representative of the collective, whose only involvement in the abstraction process was to

judge the way “their representative” has analyzed, interpreted and eventually reified, their individual contributions to the common pool of knowledge, through their participation in everyday life. The easier it is for someone to contribute to this common pool of knowledge the more critical it becomes to have democratic evaluation mechanisms in place to filter the available subject to different constraints, like cost (e.g., printing), space (e.g., the size of a library), or attention (e.g. the time required to process content). To this end, the peer review system in science is an example of a sophisticated peer evaluation mechanism between “authors” whose numerous variations showcase both the importance and difficulty of the task (Tennant et al., 2017).

Digital technology has made such peer evaluation processes of all types more and more expressive and accessible. Now derivative works, adaptations, or memes get created at a very fast pace, a process that is largely facilitated by the creative commons license. Multi-layered evaluation systems, where reviewers are also evaluated, are easy to implement, like the innovative online reputation-based review system of the Slashdot platform. Moreover, all types of knowledge abstractions can gain reputation and visibility (but unfortunately not credibility) by being “viewed,” “liked,” “voted,” or “shared.” Perhaps the most dangerous misconception regarding the digital platforms that mediate such p2p learning and evaluation processes is that they are neutral in their design and people are free to “like” and “share” what they want. The reality is that such platforms hide many biases that are far from “random” but very carefully engineered toward manipulating their users according to the commercial and political objectives of the corporations that run them (Antoniadis, 2018).

Advanced digital tools allow also for modes of peer production of knowledge which are unique in history, like the co-creation of a single learning object, through collaborative editing, designing, making, coding. Clearly, Wikipedia is the flagship p2p project in this context, an online encyclopedia edited freely by thousands of Internet users who produced

millions of articles (Haider & Sundin, this volume). Tkacz (2015) provides a very comprehensive analysis of how Wikipedia's principles generate certain "frames" and "statements," which promote some views over others about which types of knowledge are legitimate, acting as a source of power in the conflict resolution process "from which the authority of commands can be established ('This is an encyclopedia, therefore Wikipedia Art must be deleted')" (Tkacz, 2015, p. 85). Casemajor et al. (2019) provide another example through which they argue convincingly that the very design of Wikipedia, assuming its content is unconditionally "open," "categorized," and unidimensional, promotes a Western mindset that is not compatible with indigenous culture.

The question then arises: why should someone insist on using Wikipedia and not simply create another platform based on the wiki technology with appropriate design and rules? The term "forking" has been established in the software programming world to describe this possibility, which often plays the role of a "liberogenic" device (Tkacz, 2015, p.136). The truth is that projects like Wikipedia cannot be easily forked in their entirety but it is perfectly possible to do so for similar smaller scale projects, and there are many examples of successful "forks" in the digital world like LibreOffice, NextCloud, and many Linux variants. But the choice to fork Wikipedia is not merely a technical one, as it is in the case of "stand-alone" systems like LibreOffice or Linux. Wikipedia is a socio-political system whose value goes beyond the personal consumption of knowledge. Indeed, the desire for one's perspective to be represented in a system like Wikipedia, could be attributed to the visibility and credibility of such a project. If it is on Wikipedia, there is a high chance that someone has read and potentially reviewed an entry. However, such globalized and unidimensional knowledge is by design limited and de-contextualized, and is more relevant to explicit than tacit knowledge.

One of the motivations behind our selected case studies was to bring back the focus to localities, and to help create learning processes that not only consume globalized knowledge but also produce local knowledge. For this it is important to add the “knowledge abstraction” part explicitly in the activities of p2p learning groups such as a recent open call the Tzoumakers space circulated to its members and supporters to build methodologies for documenting the design of the tools designed and constructed in the lab. This action is part of the “design global, manufacture local” (Kostakis et. al., 2015; Kostakis et. al., 2016) mode of commons-based peer production where groups or individuals freely collaborate to design tools, share the knowledge as a global commons while building them locally with local conditions in mind.

It is only when the right balance between consuming global knowledge and co-creating local knowledge is maintained that many of the hidden power asymmetries can be reduced and learners become speakers. For this, platforms like P2PU and Openki should consider integrating in their design functionalities and processes that encourage collective knowledge abstraction, not only of the content itself but also of the p2p learning processes required for its appropriation and further development.

To this end, design blueprints, DIY toolkits, F/OSS software and patterns are very important knowledge abstraction devices that can help to create a balance between the global and the local. They could be seen as flexible seeds, developed as configurable prototypes or patterns at the global level through international networks of p2p learning, which then need to be carefully customized and planted in the local environment. As Christopher Alexander (1979) introduces his “pattern languages” in architecture,

“It is the process which creates the organism---and it must be so. No thing which lives can possibly be made in any other way. If you want to make a living flower, you don’t build it physically, with tweezers, cell by cell. You grow it from the seed.”

What makes things complicated in the case of learning is that it is not only the knowledge seeds that need to be designed in a way to be easily appropriated by local communities but also the “ground” where such seeds can grow, the underlying digital and physical infrastructure.

5. Learning Infrastructures

5.1 Digital infrastructure

Digital technologies have an impact on different aspects of human life, including of course education. All three dimensions of the learning process discussed above can be facilitated with the use of digital platforms of different types. The more powerful these digital platforms become in storing, processing, and filtering information, the less critical appears to become the role of the teacher, the educator, the facilitator.

But as more power is moving from traditional actors to digital platforms, the more important it becomes to question how these platforms work and who owns, who designs and who controls them. There is an abundant literature on the serious threats caused by the increasing dependence on digital technology, especially when it is big corporations that shape its functionality and exploit the immense amount of behavioral data produced toward commercial and political objectives. For example, Cronin (2019) warns us that “the suppression of privacy lies at the heart of the business models of most digital and social media platforms—which rely directly on the appropriation of data for profit”. Most importantly, “many of the tools and platforms we use to engage in social connection and open educational practices have bias and inequality built into them—they are designed to allow and encourage forms of participation, and prevent others”.

The e-book edited by Williamson (2014) again provides a comprehensive analysis of the critical role that software code plays in shaping educational processes, among others, and

the hidden and dangerous biases that an algorithmic treatment of education, as manifested through “learning analytics,” “automated learning” and other “smart” educational platforms, can impose on “users”. The big question is, what can we do? How can we engage deeply with the reality of the Internet and the digital platforms running on it?

At the software level, Free and Open Source Software (F/OSS) provide a credible alternative to corporate platforms and offers significant flexibility for democratic appropriation and the adaptation of existing tools to serve local needs; what is called “infrastructuring” in the field of participatory design (Ehn, 2008). There are also specialized platforms that can facilitate asynchronous collaboration for digital creations (e.g., GitHub, GitLab). Such platforms are based on the experience of p2p digital collaboration, integrating features and practices that enhance the capability of communities to carry collaborative projects.

Openki.net is a platform built with exactly these issues in mind. Similarly, as noted by Grif Peterson (personal communication, November, 2019), P2PU initially considered the use of MeetUp but this option was rejected because there were doubts that the project could scale on its own terms if depending on such a platform. So, the P2PU team built their own tool for event management and a complimentary API. This offered to the learning circle communities a ready-to-go solution for running learning circles, without giving up the flexibility for people who are looking for a self-hosted solution.

Notice that software is only a part of the infrastructure required to run a digital platform. Community Networks (Dulong de Rosnay et al., 2019; see also Shaffer, this volume) are examples of networking infrastructure, including routers, antennas, and servers, which are owned and managed by local communities as a commons. Antoniadis (2018) proposes the concept of the “organic Internet” to describe such infrastructure, stressing its capacity to be installed and deployed where the community using the corresponding software

services is actually located. What is crucial in this scenario is that the co-creation of the digital platforms designed to support p2p learning processes is itself a very emancipatory learning process about how the Internet works and why digital sovereignty is linked to fundamental human rights.

5.2 Physical infrastructure

Formal education includes in general a very well-defined space where learning activities take place, the classroom. Peer learning processes of the type described in this chapter also need spaces where people can meet to create learning groups, organize their learning processes, interact, etc. The design and governance of those spaces also play a key role in the process, and they can also be more or less “peer-to-peer”, or in this context commons-based.

The P2PU has developed a strong collaboration with public libraries, which are natural locations for learning activities, although mostly imagined as solitary places for study. More dedicated spaces for p2p learning around making and innovation are makerspaces, hackerspaces, or fablabs (i.e. fabrication laboratories). There is a wide range of people that you can meet in these places: architects, designers, engineers, programmers but also woodworkers, machinists, hobbyists, or just curious individuals. All of them engage in the process of learning by doing, often helping and collaborating to develop an idea into an actual physical or digital artefact (Sheridan et. al., 2014; see also Boeva & Troxler, this volume).

While the most prominent aspect in makerspaces is the final artefact, the social connections and interactions that frame the making and learning experiences are of equal importance (Telhan et al., 2016), but in general the corresponding processes that lead to these experiences are neither predefined or regulated (Halverson et al., 2014). As Blikstein and Worsley (2016) mention, “novices coming into a maker lab need a considerable amount of

onboarding and facilitation before they can start ‘hacking’ and learning by themselves” (p. 71). However, in reality preconceptions on social groups that are not considered “technology people” (ibid.) often lead to self-exclusion and indeed well-educated, affluent, white males are by far the main actors (Halverson et al., 2014).

In general, governance rules can play a key role in sustaining the participatory spirit. In the case of the Tzoumakers project, space rules are formed from both the local rural community, the P2P Lab research collective that initiated this project, the local municipality that offers the building and, for the first years, from the Interreg EU project that funds a number of its activities. Does this reflect on the learning processes that take place? Of course, it does as p2pness consists of a mixture of typologies involving learners, facilitators and experts in a space that incorporates functional characteristics from all the formal or informal bodies that constitute this special makerspace.

Notice that in the case of makerspaces, the p2p learning process is always anchored in the space itself which serves as the focal point for the corresponding community of practice. The same holds in the case of learning circles that in most cases are anchored in libraries. In the case of Openki.net the matchmaking platform is the focal point and physical space is seen as a flexible infrastructure which can be offered by one of the participants. The idea that p2p learning activities can take place in any urban space, indoors or outdoors, as part of everyday life, significantly increases the target audience and the overall impact. Seen from this perspective, L200 is a collective space in Zurich, which tries to combine these two perspectives. On the one hand, L200 is a very central space that acts as a focal point, between a wide community of citizens that participate in its governance as a commons and in its sustainability through cost sharing. On the other hand, it explicitly avoids creating a specific identity for the activities through a sustained effort to make the space as inclusive as possible, open to always new and unexpected uses. Placing the question “What is this?” prominently in

the space's facade reminds everyone that failing to keep the space neutral and open to all types of usages would be against its main goal. The L200 project is also interesting because it is perceived as a hybrid (digital and physical) space designed as a prototype whose success depends on its ability to replicate (its core identity, even its name and URL is defined by its location, Langstrasse200.ch). Through such design choices the message is clear that “forking” is not considered as an “exit strategy” that helps to build “consensus,” but as a necessary step for transforming p2p learning into an everyday activity.

6. Conclusion

In times when digital technology has been promoted by industry and governments as a game changer for enabling p2p learning beyond borders and constraints (Benkler, 2006; Cronin, 2019; Deimann & Peters, 2016; Knox, 2016; Williamson, 2015), we highlight the irreplaceable role of face-to-face interactions and the conditions under which technologies can empower participants. Although technology still has an important role to play, it brings many threats and more layers of power imbalances, in addition to race, gender, culture, class, location, sexuality and other structural inequalities. When all these are analyzed in detail, the concept of peer-to-peer looks more like a utopian than a realistic goal. But instead of getting paralyzed by the impossibility of a truly egalitarian and p2p way to learn together, we advocate for a continuous effort to engage with p2p learning in everyday life, in the “neighborly community,” even when this seems extremely difficult. The aim is to use technology as a means and as a complement, not as an end. For example, local communities can co-produce global knowledge, share it openly and thus empower other communities to adequately adapt and address their needs without imposing external values on them. Our selected case studies are examples of the type of tools and institutions that we believe can help in this direction.

We would add to this toolbox of p2p learning “reflection in action” which acknowledges our “capacity for reflection on our intuitive knowing in the midst of action and, sometimes uses this capacity to cope with the unique, uncertain, and conflicted situations of practice” (Schön, 1983, pp. viii-ix). Pettit (2006) argues similarly that “understanding and addressing power, calls for more innovative learning processes, [...] the conceptual and rational re-evaluation of one’s assumed perspective [...] making sense of one’s experiences of power, and of realizing one’s capacity to shift power.” Ending then with a self-reflection exercise, we would like to highlight the fact that works like the *Handbook of Peer Production*, full of arguments and analyses on the benefits of openness and collaboration, is distributed behind a paywall. Of course, there are no easy solutions. But perhaps we should take a moment to think about why people like us, criticizing the current publishing industry, do not find a more open and p2p way to publish our work and still be respected in our professional circles.

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