

Towards a Federated Framework for Designing Federated Courses

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/version 15 Sept 2010/

Abstracts

The self-organization of humanity as a self-aware, global metabeing, and its collective intelligence, is the only solution to the world problematique, defined as the combination of two factors:

"The interconnected and interacting issues of all types, which affect the becoming of life in the global ecosystem.

The uncontrollable and interacting circumstances of all types, which constrain the timely and effective resolution of these issues." (Wikipedia)

The massive and dynamic cooperation of all concerned parties required to meet the problematique is constrained by the fragmentation of relevant knowledge. In these conditions, knowledge federation is a much-needed enabler of augmenting and using the collective wisdom (CI for the common good) of the self-organizing global mind.

These notes introduce two social learning theories, connectivist and wildfire learning, and issues related to federating them for a design of federated courses. The structure of the paper consists of the following 9 sections. Only the first 7 are included in the current draft.

1. Motivation and Contexts
2. Social Theory of Learning
3. Biomimicry-inspired Learning Theories
4. Connectivism
5. Wildfire Learning
6. Crowd-Accelerated Innovation
7. Federating Social Learning Theories
8. Process Design Methodologies
9. Course Development Patterns
10. Issues for Further Research

1. Motivation and Contexts

The motivation of writing this paper is to create a few nodes in the ecosystem of knowledge contributing to:

- the pedagogy of federated courses and the methodology of designing them
- structures and processes that support lifelong learning
- new perspectives on organizational learning, knowledge management, and communities of practice
- social learning as pre-requisite to a learning society

2. Social Theory of Learning

The "social theory of learning" view represents a different scope than the theories of social learning. The first connects KF research with a larger, society-level and evolutionary *theories* and contexts, in which learning and education happen. The second connects KF research with the *praxis*, and specifically, with the issues of how education adapts to the new learning needs of people and society in the 21st century.

The exploration of a social theory of learning has to precede the theories of social learning, because the scope of the first can illuminate issues, and help identifying gaps, in the second. The social theory of learning developed by Etienne Wenger has a scope that sheds light on the emergence of such trends as the "*horizontalization of learning*" and "*partialization of learning imperatives* ." Understanding of both of them contributes to the design thinking about federated courses.

Horizontalization of learning : a shift in our a view of knowledge communication that emphasizes less the vertical relationship between a producer and a recipient and more horizontal interactions required for the negotiation of mutual relevance.

Partialization of learning imperatives : the complexity of knowledge domains creates relationships of interdependence so that learning increasingly means being part of broader systems and learning to participate productively rather than mastering everything oneself." (Wenger 2004)

We will come back to and draw on the horizontalization and partialization trends, and the dimensions of the "curriculum of meaningfulness," when addressing the high level requirements of federated course design informed by them.

Wenger's theory postulates a "curriculum of meaningfulness," of which he identified the following 7 dimensions. We quote all of them because each can serve as guidepost to federated course design and generative starting points to the design

conversation. These dimensions of the learning experience seem to be transformative, which is just the kind of learning that we can expect people taking federated courses will be ready and asking for.

"Experience of localized depth. Going deep into some learning, into the practice of a specific community and get a good sense of what full membership is. Experience learning with others in the context of a community. Get far enough to experience peer-to-peer learning with masters of the practice.

Experience of boundary crossing. Interaction across a boundary through engagement in a shared task that forces cross-boundary negotiation.

Experience of time depth. Reach an experience of “flow” by being fully present and creative in an activity.

Experience of time dislocation. Engage in a substantial contact with a different generation as a vista onto history or onto the future.

Experience of cultural dislocation. Immersion in a different culture with a different discourse of the self.

Experience of agency and power. Make a personal difference somewhere; not necessarily a great success in abstract terms; have an effect on the world that is experienced as personally significant.

Experience of scale. This may be the most difficult to imagine and to achieve in practice. Hence its place last. Gain an appreciation of a full learning system in which one is personally involved by traversing the fractal at multiple levels of scale. Learn to find the community structure. Understand in as direct a way as possible how the levels constitute each other and how the various functions are effective across these levels (performance, governance, institutionalization, social fabric, personal trajectories)." (Wenger, 2004)

Wenger's social theory of learning has the individual's perspective in its center of gravity, and analyzes social trends as context to better understand his/her learning needs. There's a need and possibility to develop a more integral theory that would be "bi-focal:" including in its core both the individual and the society as evolving systems. Building such theory will be essential to accelerate the development of large-scale social learning practices needed to spread knowledge relevant to the world problematique.

3. Biomimicry-inspired Learning Theories

The design and delivery of federated courses, as any breakthrough innovation, will face non-trivial challenges. To tame them, we will turn for guidance and inspiration to the design principles and strategies of nature and her 3.8 billion years of brilliant track record in ecosystem design.

We hold the course design task in the broader perspective of designing biomimicry-inspired knowledge, social and technical ecosystems to augment collective intelligence in human communities at increasing scale. Our study of biomimicry led us to discover ways, in which the common features of biological and social complex adaptive systems can provide guidance to augment collective intelligence in the latter, based on biological patterns worth repurposing.

"Biomimicry follows Life's Principles. Life's Principles instruct us to: build from the bottom up, self-assemble, optimize rather than maximize, use free energy, cross-pollinate, embrace diversity, adapt and evolve, use life-friendly materials and processes, engage in symbiotic relationships, and enhance the bio-sphere. By following the principles life uses, you can create products and processes that are well adapted to life on earth." (Biomimicry Guild)

Biomimicry has been used primarily in industrial design and the development of new materials, based biological patterns worth repurposing. As biomimicry expands from product and process design as application areas, to affect the design of social, knowledge, and technological ecosystems, the question becomes: What can we learn from nature's ecosystems, which would provide useful metaphors and models to the design of federated courses as social ecosystems?

To start exploring that question, we will review current issues in two social learning frameworks: connectivism and wildfire learning.

4. Connectivism

4.1 What it is

"Connections are to learning as atoms are to the physical world..." (George Siemens)

Connectivism is a learning theory or "only" a pedagogical view, depending whether we consider the position of his proponents or critics, who argue that "learning theories should deal with the instructional level (how people learn) but that connectivism addresses the curriculum level (what is learned and why it is learned)." Connectivism (learning theory). In: Wikipedia.

There are various definitions in the literature of what is a learning theory. However, even on the basis of the one above, we tend to class connectivism both as a

learning theory, *and* a pedagogical view because the "how" (learning patterns) became intricately interwoven with the "what" (curriculum) and "why" (motivation). That closely coupled interdependence is due to the impact of the new means of learning and teaching, which turns the learning community into part of the curriculum, as well as the inventor of learning patterns and a stronger enhancer of motivation than it was in the classic classroom situations.

"Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning... is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. Connectivism is driven by the understanding that decisions are based on rapidly altering foundations. New information is continually being acquired. The ability to draw distinctions between important and unimportant information is vital." (Siemens, 2005)

In the context of networked learning, of which connectivist learning is a specific case, the ultimate decision about what is important to learn rests with the individual learner. However, her ability to make future-responsive decisions is largely dependent on the aliveness of her relationships in the network and her ability to read on her radar screen what is important to it.

In a sense, KF researchers *are* networked learners and the story of writing this paper illustrates my point. Out of a dozen or so questions I have about connectivism, I picked those to study and illuminate, where I thought my contribution could make a difference to the collective learning of the workshop. So my decision about what is important was strongly influenced by my perception of what can further the dialogue in the community.

4.2 Rhizomatic education: community as curriculum

One of the philosophical roots of connectivism is in the postmodernist theory characterized by skepticism towards any global cultural narrative. As such, it may have a low level of appreciation of any concerted effort aiming at matching the unprecedented challenges of the world problematique with a new level of global-scale collective intelligence, of which KF can become an enabling condition. That shouldn't prevent us from engaging postmodern educational theories, transcending their limitations and building on their achievements where they can serve the needs of federated course design. Below, I provide some examples for the later.

"A botanical metaphor, first posited by Deleuze and Guattari in *A Thousand Plateaus* (1987), may offer a more flexible conception of knowledge for the information age: the rhizome. A rhizomatic plant has no center and no defined boundary; rather, it is made up of a number of semi-independent nodes, each of which is capable of growing and spreading on its own, bounded only by the limits of its habitat." (Cormier 2008b).

The limits of habitat for a federated course are the (hopefully negotiable) institutional requirements of the institution offering the course whether for-credit or not. Within those limits, the *rhizomatic* organization of a *federated* course may seem to be an oxymoron but it is not. The skillful combination of the two approaches can be accomplished, using polyscopic design methodology (Karabeg, 2003), wherein they represent two different but compatible scopes of the design.

"It's a connection of intertwined roots underground, with big leafy stalks that pop up wherever it might be convenient to grab the sunlight. There's no precise centre, no 'central' plant that you can kill to get rid of it all... just a network of leaves and roots that suck up nutrients where available and deliver them to the rest through whichever root/stalk is nearby. It's an incredible survivor and very much has a mind of it's own. Those weeds that you see here are what you'd pull out of about a cubic foot of soil... maybe less." (Cormier, 2008a).

Fig. 1. A cubic foot of rhizome

"Knowledge seekers in cutting-edge fields are increasingly finding that ongoing appraisal of new developments is most effectively achieved through the participatory and negotiated experience of rhizomatic community engagement. Through involvement in multiple communities where new information is being assimilated and tested, educators can begin to apprehend the moving target that is knowledge in the modern learning environment." (Cormier, 2008b)

We construct our professional identity through belonging to various communities of practice. That multi-membership belonging is an especially important trait when it comes to the designers and participants of federated courses. Our professional life and ways of developing and using knowledge provide us with an existential base and a close-to-chest example of spontaneous albeit naïve knowledge federation. Observing how we federate knowledge in our practice and comparing our notes about it can be both a community-forming exercise, and a teachable/demonstrable moment in the course.

4.3 Principles of connectivism

The tenets of connectivism are outlined in a George Siemens seminal paper of 2005. Here we recap the ones that seem to be the most directly relevant to the design of federated courses.

"Learning is a process of connecting specialized nodes or information sources... Nurturing and maintaining connections is needed to facilitate continual learning." (Siemens, 2005)

In our view, learning is upgrading our mental models of reality, which can be served by discovering or creating patterns that connect those nodes. If learning *is* connecting, in that sense, then the federated course should provide the learners with ample opportunities to map nodes and links, as well as to observe and interpret the emerging connections.

"Ability to see connections between fields, ideas, and concepts is a core skill."
(Siemens, 2005)

More than a skill, it is a complex and compound ability comprised of at least 8 similarly complex competences that we'll outline in the "Mental Modeling" section. Since that ability is central to our success with KF, for any federated course about KF it would be sensible to include distinctions, tools, and methods for enhancing the learners' mental modeling ability.

In the next sections, we'll examine some relevant patterns of enrollment, teaching and learning in connectivism.

4.4 Enrollment

Open Online Course

One of the favorite and most publicized enrollment model in connectivist education is the "open online course" (OOC) "considered to be a special type of OER [open education resource], which solves the problem of the lack of interaction that is typical of most OER initiatives. While OERs are merely content, OOCs are live courses, which include direct participation of teachers and rich and valuable interaction among participants." (Fini 2009)

Neither OER, nor OOC is addressing the scope that KF inhabits, namely to bring together sources of knowledge that pertain to a subject and coherently organize them. Yet, OOC seems to be an appropriate enrollment model for federated courses as well because its open character would let the learners create and access the larger pool of collective intelligence needed for a KF leaning agenda than what would be possible under more traditional, academic-only enrollment.

Massive Open Online Course

A special case of OOC is the Massive Open Online Course (MOOC), where the very large number of learners change some of the course's characteristics, including what is provided by the instructors and what the learners themselves are supposed to provide for themselves.

The MOOC that attracted the largest enrollment so far was the "Connectivism and Connective Knowledge" credit course offered by George Siemens and Stephen

Downes in 2008 at the University of Manitoba, which was also offered for free to any person interested.

"We believe that the connectivist model employed in this course might offer a unique approach to the problem of scalability. We could not, nor did we try, to provision everything that was needed for 2200 students. Rather, we created conditions, and encouragements, where participants would provide additional resources for themselves. The role of the instructors and facilitators is essential in this model, but this role is not to provide solutions but rather to establish a basic structure." (Downes, 2009)

The carefully documented lessons learned from that course can be a useful source of information about some aspects of infrastructure and teacher/learner relationship in Massive Open Online Courses, should a federated course open itself to the challenge and opportunity of large-scale enrollment.

4.5 Curriculum

"Though there may be a central theme or structure offered by the facilitators, there is no particular body of knowledge or information expected to be acquired by learners; rather, learning occurs as a result of interaction and participation in the distributed community, completion of authentic tasks within that environment, and the growth and development of the learner's own capacities as a consequence. The course design, therefore, is that essentially of a community of learners who are learning to learn." (PLENK10 Consent Form)

The "no curriculum" structure of the course in question, which I have signed up to, still has 10 weekly themes and corresponding resources and two web-conference sessions per week. What is different from a content-driven e-learning course is, mainly, the large extent, in which learners must be self-directed to succeed in the connectivist learning environment. It is well suited to professional learning networks and communities of practice but we don't expect it replacing more traditional forms of education anytime soon.

"Courses provide context that makes us more 'disciplined' than we would be by ourselves: pushing to learn things we would never consider important, doing assignments to articulate silent ideas or connect loose ends, initiating brainstormings that should lead to some tangible results and not only random thoughts. Courses provide structure to make learning about complex things easier." (Efimova, 2003)

Depending on the target audience of the federated course, its curriculum design and pedagogy have to take into account how much its participants are anticipated to be self-directed learners vs. needing more guidance to the choice of materials to study.

4.6 Connectivist learning patterns

Connectivist courses are, typically, based on four main patterns of learning activity labeled as Aggregate, Remix, Repurpose and Feed Forward. They will also serve learners of federated courses, along with a number of other activities outlined in "pedagogy patterns" the section. The most recent, detailed description of these activities is in the "How this course works section" of a new course. (Downes, S.: How This Course Works)

Aggregation is about the learners' picking and choosing content of interest to them from a large volume of heterogeneous content sources provided by the instructors. In the context of a KF course, this pattern would work only if accompanied by guidance information about the federation process, to which the aggregation should add value.

Remixing refers to the learners' keeping track of what they accessed, by some kind of private or public record of it, which can be a Word file, a blog, a del.icio.us entry, a wiki page, a forum post, or even a series of tweets. The heterogeneous nature of the wide variety of possible recording formats and media fosters the use of what the learners feel the most comfortable with. However, it is much less conducive to KF than the use of a Community Knowledge Garden or any other form of a Dynamic Knowledge Repository.

Repurposing is the label chosen for the learners' creating something with the materials they accessed and listed, using the tools demonstrated by the instructors. The "Aggregate-Remix-Repurpose" cycle is consistent with the "reversed e-lecture" concept that we presented to the *Program on Social & Organizational Learning* at George Mason University, in 1997, in the syllabus of a suggested learning expedition into "Collaborative meaning-making in virtual communities:"

1. Instructor "seeds" the knowledge ecosystem with initial content, a large number of carefully selected online references relevant to the students' chosen inquiry-focusing questions.
2. Building on their finds, students develop their own e-lectures, in solo or with colleagues. Unlike a conventional e-lecture posted by the instructor, this "reversed e-lecture" will be comprised of: (a) a large set of quotes from a wide variety of sources, pertinent to the territories and goals of the suggested hypertextual learning expedition, and (b) invitations to the students to discover and identify web-like patterns of meaningful connections in the seed content
3. Students post their lectures. Students share their discoveries by: (a) posting their e-lectures that contain hyper-trails and webs of quotes, that they built in the knowledge ecosystem, complete with their annotations and commentaries, and (b) engaging in conversation about them.

4. Instructor provides a menu of focusing questions; Students choose and organize themselves for collaborative inquiry. The focusing questions will be provided from the perspective of evolutionary social science and "emergence" frameworks. They will be oriented towards 'real world' applications of the students' findings. The instructor will make available, through the expedition's web pages, a small, initial set of electronic and conceptual tools and methods for collaborative meaning making.

5. Students gather around an electronic campfire of the virtual base camp to share the "bounty." The "bounty" is the meaning (new purpose) emerging from the network of conversation that made up the Expedition.

The "reverse lecture" process design above that, in 1997, was still out of line even with an innovative academic program's "collaborative learning" orientation is also an example of the "Learning Expedition" course design pattern that we'll introduce in more details later. However, only three years later it was already recognized: "Students, acting as co-initiators and organizers of their knowledge acquisition, have more profound learning experiences than are possible through conventional teaching approaches." (Scharmer & Käufer, 2000)

Feeding forward is providing the repurposed materials, including the learner's reflection about them, to other learners (current and future) and the world at large. It is an optional activity but encouraged in the course syllabus.

In a federated course about KF the "feeding forward" pattern would need to be generalized as to learn federation by doing, and demonstrated by the teachers. It would require going beyond the folksonomy-style tagging of the learner created materials as they are entered in the Community Knowledge Garden. It would also require teaching in the course the combined use of taxonomy and folksonomy to make navigation and retrieval a more effective, efficient, and enjoyable experience.

4.7 Assessment and accreditation issues

(to expand in the final paper)

4.8 Managerial implications of connectivist learning

(to expand in the final paper)

5. Wildfire Learning

Connectivism is not the only approach to social learning that builds on botanical metaphors. A close but noteworthy cousin of it is what's known as "wildfire learning" inspired by the work of Yrjö Engeström. Writing about the mycorrhizae, he described it and his reason for differentiating it from the rhizome as the key metaphor of his social learning theory, as follows.

5.1 The mycorrhizae metaphor

"I use it much in the same general sense in which Deleuze and Guattari (1987) proposed the concept of 'rhizome'. They wanted to highlight the importance of horizontal and multidirectional connections in human lives, in contrast to the dominant vertical, tree-like images of hierarchy. Originally a biological concept, rhizome refers to a horizontal underground stem, such as found in many ferns, where only the leaves may stick up into the air. As such, I find the implications of 'rhizome' too limited. I am more interested in the invisible organic texture underneath visible fungi. Such a formation is called 'mycorrhizae' (see Allen, 1991, Sharma & Johri, 2002). It is a symbiotic association between a fungus and the roots or rhizoids of a plant... Mycorrhizae can be dormant for a long time and then get active and live again, like 'wildfire'." (Engeström, 2007a)

Fig. 2. Mycorrhizae symbiosis

[insert: <http://www.flickr.com/photos/31606095@N03/4368117935/in/set-72157608691158147/> photo credit: RossMosie]

If the plant represents the vertical dimension, or the "tree-like images of hierarchy" and the mycorrhizae as the "invisible organic texture underneath visible fungi," then their symbiosis suggests interesting possibilities for the combinations of formal and informal learning, organizations and communities or networks.

We experience the dormant mycorrhizae each time when we stumble upon a passionate online exchange that happened a couple of years ago, then died down for whatever reasons, and inspired, we add our contribution that reignites the conversations with the same or different participants. Enabled by http, rss, and other connectivity protocols, such re-activated conversations can, indeed, spread like the wildfire, particularly if the conditions for spontaneous combustions are present. (Pör, 2010)

The wildfire-like re-ignition of dormant webs of conversations doesn't depend only the chance-like stumble upon by a re-activator. For that to happen and the subject to go viral, it has to hit a nerve in the collective nervous system of the netizens, their loosely coupled conversations.

How the mycorrhizae is a useful metaphor for (wildfire-style) social learning? In a presentation, Engeström answered that question with these points:

- "• Symbiotic association between a fungus and the roots or rhizoids of a plant
- Grow through and within the substrate, on which they are feeding
- Have a very large surface area compared to their volume, but no single center
- Difficult if not impossible to bound and close, yet not indefinite or elusive
- Very hard to kill, but also vulnerable

- May lie dormant for lengthy periods, then generate again • vibrant visible structures when the conditions are right
- Made up of heterogeneous participants working symbiotically, thriving on mutually beneficial or also exploitative partnerships" (Engeström, 2007b)

Knowledge federation, the systemic build-up of all relevant knowledge pertinent to a subject, will benefit from the power of mycorrhizae if it finds a way to marry the seeming opposites the uncontrollable creative energies of wildfire-like mycorrhizae communities and the architectural structures and processes needed to make relevant knowledge easily findable and navigable. The key to that, we assume, is in the polyscopic methodology of the design. We will come back to this question in the section on Designing for Emergence: the art of sustaining a dynamic balance of deliberative design and self-organizing emergence.

5.2 Wildfire activities

Wildfire activities can be characterized by the following 10 traits (compiled from the writings and presentations by Yrjö Engeström:

- **Mycorrhizae communities** blaze embodied and lived cognitive **trails** and social bonds that make the terrains knowable and livable, using the mechanism of **stigmergy**. (<http://en.wikipedia.org/wiki/Stigmergy>) Activities that seem to cease in a given location may reappear somewhere else.
- **Swarming** crosses boundaries and ties knots between actors operating in fractured and often poorly charted **terrains**.
- **Multi-directional pulsation** refers to star-like patterns of movement where the participants disperse outward to pursue their various trails and to expand the scope of the mycorrhizae, but also return and come together in various ways to contribute to the forging of the runaway object.”
- **Collectively constructed concepts** stabilize the trails and may serve as platforms for expansive restructuring of the activity.
- Actors experience **high-stake personal involvement** , risks and critical conflicts, and shifts of identity.
- Co-configuration is negotiated by **knotworking** — tying and untying knots. Collaboration between partners is vital but takes shape without rigid predetermined rules or central authority... Such a formation typically does not have strictly defined criteria of membership. But its members can be identified by their **activism** .
- Combining **quick** improvisational adaptation **and long-term** design occur in real-time.

- **Holoptic monitoring** [the visibility of all parts of the whole to each other] is oriented toward gaining a global view of events while engaged in intense local action.

- A mycorrhizae formation resembles the ‘‘**flow architecture**’ described by Knorr-Cetina (2003, p. 8) as ‘‘a reflexive form of coordination that is flat (non-hierarchical) in character while at the same time being based on a comprehensive summary view of things – the reflected and projected global context and transaction system.

- **Runaway objects** typically have the potential to escalate and expand up to a global scale of influence. They are objects that are poorly under anybody’s control and have far-reaching unexpected side effects.... They can also be powerfully emancipatory objects that open up radically new possibilities of development and well-being, as exemplified by the Linux operating system... (Engeström, 2007, 2009) (- boldface added - GP)

5.3 The SocialLearn Project

Open University in the UK has been experimenting with incorporating some elements of wildfire learning in formal academic education. In his update on OU’s SocialLearn project, Simon Buckingham Shum introduced it as ‘‘learning that motivates digital support for shareable, improvable, conceptual artifacts.’’ The KMI at OU, in collaboration with Google and the Drupal community, is prototyping a technical platform that is intended to support wildfire learning.

What is an equally promising development is the beginning outline for the pedagogical framework that can be tested on that prototype. It is taking into account such constructs of wildfire learning as inquiry, trails, history, consolidation, argument, landmarks, places and exploration.

Fig. 3. Wildfire strategy in the SocialLearn project

[insert Shum’s 5-min video clip on the SocialLearn Project Update, 13:47 to 19:00
<http://www.open.ac.uk/blogs/sociallearn/2010/04/07/sociallearn-update/>]

The SocialLearn Project’s pedagogical framework builds on such educational primitives as learners and educators engaging in:

1. asking and answering questions, posting a supportive or challenging comments, and adding resources to enhance contributions,
2. building a learning path to help answer a question, by: adding resources to enhance any step, adding activities to build/assess learning, adding reflection points to help consolidate learning, forging new paths from existing paths, forging meaningful connections between any question, step, and path

The resulting network of conceptual artifacts is encapsulated by this diagram:

Fig. 4. Mediating social artifacts for sensemaking

Adding learners to that the network of concepts, Shum was pointing to a socio-semantic space and approaching it from the direction of the conceptual/semantic space.

Fig. 5. Socio-semantic networks
(Shum, 2010)

The same space can be also described in terms of two layers of our Innovation Architecture outlined in the section with the same title, which integrates a social, knowledge and a technical layers. The Innovation Architecture can accommodate and build on Shum's social-conceptual network, and we propose it as way to frame the work needed to create a Community Knowledge Garden to meet the needs of the federated course for a modern-day version of Engelbart's Dynamic Knowledge Repository.

When educational technologists look at wildfire activities, they tend to ask, what tool set we need to develop to make that happen online? It's a good question but the response would have a longer shelf-life if it was preceded by some other questions that course designers, learning community facilitators, and knowledge gardeners may ask about infusing social learning with wildfire principles and practices. For instance, the ones listed in 6.2.

6. Crowd-Accelerated Innovation

6.1 Turning up three dials: crowd, light, desire

There's a new social learning theory is emerging, as we speak, based on the social learning practices of the global Technology, Education, Design (TED) community. We call it "Crowd-Accelerated Innovation" theory, using the term introduced by Chris Anderson, the principal Curator of TED. The essence of its "crowd - light - desire" model of globe-spanning learning collaboration is presented in the following quotes and images from Anderson's video talk.

"There are just three things you need for this thing to kick into gear. You can think of them as three dials on a giant wheel. You turn up the dials, the wheel starts to turn."
(Anderson, 2010)

Fig. 6. Three dials of Crowd-Accelerated Innovation

"And the first thing you need is ... a crowd, a group of people who share a common interest. The bigger the crowd, the more potential innovators there are. That's important, but actually most people in the crowd occupy these other roles. They're creating the ecosystem from which innovation emerges. (Anderson, 2010)

Fig. 7. Roles in the improvement/learning/innovation ecosystem

More than a faceless "crowd," the TED ecosystem is a global community that organized hundreds of local and regional TED conferences organized in more than 80 countries, besides the annual, official TED events attended by 1000s of participants from a very wide diversity of disciplines and cultures. The common values of that community is seeking a deeper understanding of the world, and wanting to turn that understanding into a better future for us all.

What is remarkable in the crowd-accelerated learning is the importance of various roles played in its ecosystem. The roles repertory and nomenclature are still evolving but, besides the roles shown in Fig. 7, there are already some that can be discerned as played by a growing number of learners, such as: conference organizers/hosts/facilitators, connectors, and amplifiers. We can understand them better by looking at them from a conceptual framework for online identity roles (Miemis, 2010).

Fig. 8. Map of online identity roles

Some of those roles are also present in and around TED events, others will predictably gain more weight as the community is getting better connected to its parts through online means. The further study of various functional roles in the learning ecosystem of crowd-accelerated innovation will contribute to our understanding of this new type of division of labor in other social learning modes as well. Unlike the classic division of material labor that defines social actors by their fixed roles, this new distribution of roles is self-assigned and fluid.

"The second thing you need is light. You need clear, open visibility of what the best people in that crowd are capable of, because that is how you will learn how you will be empowered to participate. And third, you need desire. You know, innovation's hard work. It's based on hundreds of hours of research, of practice. Absent desire, not going to happen." (Anderson, 2010)

The second "dial" that this approach is turning up, light, is a metaphor for holoptic quality of the learning ecosystem, in which learners can see each other and the whole of the ecosystem. A holoptical space is a space in which each participant gets a live perception of the 'Whole.' Each player, thanks to his/her experience and expertise, relates to this "Whole" in order to adjust his/her actions and coordinate them with others' moves. (Noubel)

For its successful functioning, each social learning system has to be holoptic but provides affordances for that, in a varying degree. Connectivist courses, typically, provide the learners with good indexes, navigation structures, and other learning aids to see the whole of the initial content and each other, and aim at but struggle with making the large volume a learner-generated content visible to all. Wildfire learning is also characterized by holoptic monitoring that implies learners "gaining a global

view of events while engaged in intense local action" (Engeström, 2007a).

Turning up the "light" dial, increasing the global visibility of knowledge and practices worth replicating, in the system of crowd-accelerated innovation, is enabled in the cycles of skills improvement and innovation by people watching web video. It is illustrated with the story of Li'l Demon, a 6-yr old, who ignited a revolution in free-style solo dancing:

Fig 9. Li'l Demon's "Step Up Your Game" video 01:07 to 02:27
<http://www.youtube.com/watch?v=X6Zo53M0lcY>

"Dancers have created a whole global laboratory online. Kids in Japan are taking moves from a YouTube video created in Detroit, building on it within days and releasing a new video, while teenagers in California taking the Japanese video and remixing it to create a whole new dance style." (Jonathan Chu)
http://www.ted.com/talks/chris_anderson_how_web_video_powers_global_innovation.html

Those dancers are an ad-hoc, on-the-fly community of practice that spans continents. Their members are held together by the practice and their passion to improve it; not unlike the medieval guilds, except that nobody is excluded, aspirants don't have to travel to far away lands to find a master, and the secret of the craft is wide open to anyone who can visit the TED site to pick a video from a collection of over 700 or watch it on YouTube.

6.2 Is Crowd-accelerated innovation a social learning *theory*?

The scope we choose to look at the world will define what we can see. What is the scope worth choosing when we ask, where to look for components to federate in a conceptual framework for designing federated courses? One of the possible scopes comes from the distinction "theory." In pedagogical and other scientific contexts, it refers to "a comprehensive explanation of an important feature of nature supported by facts gathered over time." (US [National Academy of Sciences](#), 2005)

Examining whether and how crowd-accelerated innovation is, indeed, a social learning *theory*, we can assess its suitability as candidate for federation in the conceptual and methodological framework for federated course design.

In summative manner, the "crowd - light - desire" model and its explanation do provide a comprehensive explanation of an important feature of the nature of social learning taking place in the global TED community. That explanation is not only comprehensive but, in Chris Anderson's presentation, expressed with beauty, eloquence, drama, suspense, dynamism, and engaging stories, qualities that are typically associated more with the arts than theory building.

We consider his presentation about crowd-accelerated innovation a case of polyscopic

information, a postulate of which "stands for the 'artistic' value of information. It says that we need to apply the criteria which are traditionally reserved for art and literature to all information." (Karabeg, 2004)

Including crowd-accelerated innovation as a social learning theory in federating those theories in the framework of course design, we can enhance its polyscopic character. Much more research will be needed to do that in integrity with regard to both the polyscopic design methodology and the three social learning theories we introduced in this paper.

"It is also suggested how art and science are combined: Art expresses the high-level views, science justifies them. Art gives information a perspective, science gives it credibility and precision." (Karabeg, 2000)

The "three dials" of crowd-accelerated innovation provide a high-level view of how social learning is taking place in the TED community, and a perspective to look at it. Its credibility and precision as a social learning theory is there, in the potential of a community action research that would deepen our knowledge about that phenomenon and provide the community with actionable theoretical insights.

Finally, another characteristics of theories is that they allow scientists to make predictions about as yet unobserved phenomena. Let's explore that aspect of the "crowd-accelerated innovation" concept.

"The system is self-fueling. It's the crowd that shines the light and fuels the desire, but the light and desire are a lethal one-two combination that attracts new people to the crowd. So, this is a model that pretty much any organization could use to try and nurture its own cycle of crowd-accelerated innovation. Invite the crowd, let in the light, dial up the desire. (Anderson, 2010)

The self-fueling cycle of social learning powered by shared video and resources on the Web represents a *self-reinforcing* feedback loop, i.e. the community is creating visibility and fuels the desire to participate and, in turn, they attract more people to the community. Currently, that dynamics is constrained by the fact that is TED is still largely a one-to many event, which can generate only a much slower rate of development than its intended next stage, when it will go many-to-many, engaging much more the power of local TED communities and the local-to-global-to-local dynamics.

In that stage, it is predictable that the conditions for wildfire learning and its "runaway object" will appear. We know that "positive feedbacks do not have to lead to a runaway effect, as the [gain](#) is not always sufficient." (Wikipedia, Runaway greenhouse effect) However, the many-to-many stage of TED's evolution will necessarily include the use of more social media-based communication and collaboration tools, making also possible Massive Open Online Course offered by and for TEDsters. At that point, the gain caused by feedback loop will, most likely, trigger the runaway effect.

7. Federating Social Learning Theories

How can we federate the various social learning theories into a framework that can to guide the design of federated courses? Not a simple question given that KF is not yet a well-rounded theory with an associated methodological base, so using it for collecting and organizing pedagogical approaches that can benefit the design of federated courses would be a double challenge. This paper will not meet it but, at least, it will scope out some issues for preparing the terrain, on which a subsequent collaborative inquire conducted with a team effort may succeed.

7.1 Strong and weak social learning

All learning is social but when we talk about social learning we mean something more specific in a sense of a weak and a strong case. *Weak social learning* occurs in communities or networks of learners, *strong social learning* is a result of communities or networks that learns. In the first case, we talk about a *collection of intelligences*, where the individual is using the shared resources for the benefit of his own learning and development. In the second case, we talk about *collective intelligence*, where the result aimed for is not only individual but group or social development, as well.

Strong social learning is a co-creative quest for meeting problems or opportunities that affect a group or society, which requires collective sensing, intuition, meaning making, and other qualities of collective intelligence. " Intelligence refers to the main cognitive powers: perception, action planning and coordination, memory, imagination and hypothesis generation, inquisitiveness and learning abilities. The expression 'collective intelligence' designates the cognitive powers of a group." (Lévy 2003)

Strong social learning improves all of the above at the collective level, but cannot happen without weak social learning also occurring and benefitting the individuals. Only then will they develop the sense of 'ownership' of the learning process and its results, which is required for self-organizing action. That's why we explore in the next sections some of the social learning theories focused on the individuals and the connections among them, rather than the learning by whole systems.

Having said that, it is also important to emphasize that the best chance for a federated course to yield multiple outcomes is if it draws on and federates both versions of social learning.

7.2 Holding a "federated course design" lens to connectivist and wildfire learning

When educational technologists look at wildfire activities, they tend to ask, what tool set we need to develop to make that happen online? It's a good question but the response would have a longer shelf-life if it was preceded by some other questions that course designers, learning community facilitators, and knowledge gardeners may ask about infusing social learning with wildfire principles and practices, such as:

- Can a course still be *designed* if the learners are self-organizing **mycorrhizae**

communities ? In what sense would it still be a *course* ? How can the institutional context of a university marry and support the leading edge of social learning innovation?

- How can proven "social process" technologies (e.g.: Appreciative Inquiry, the art cultivating communities of practice, Delphi Survey, World Café, Theory U) strengthen **swarming** that crosses boundaries?
- If the typical learning movement in mycorrhizae communities **is** expansive swarming engagement with **multi-directional pulsations** , then what factors would help community members returning to a knot and carrying their discoveries in their digital backpack, to rapidly and successfully execute a simple set of sense-making and pattern-identifying exercises?
- What happens at the points of transition between a network architecture (connectivism) and a flow architecture (wildfire) of **learning process coordination** ? What challenges could be anticipated if we wanted to create a porous interface between them?
- What methods of software-embedded attention training can help **quick** improvisational adaptation **and long-term** perspective practiced concurrently?
- Under the conditions of "complexity multiplied by urgency" (Engelbart), what social, epistemological, and technological factors foster or hinder the capacity of all learners in the ecosystem to see each other and the whole (**holoptic monitoring**), and to "gain a global view of events while engaged in intense local action" (Engeström, 2007a)?
- Given the heterogeneous nature of the wide variety of recording formats and media fosters that learners can use in connectivist courses, what federating architectures, tools, methods and practices would make **remixing** them in a federated course not only possible but also scalable and optimized for **repurposing** ?
- Can the social value generated by the **feeding forward** cycle create economic value to make sustainable the infrastructure, knowledge mapping and gardening, and facilitation services that self-organizing learning communities may need? Those questions were inspired by two social learning theories: connectivism and wildfire. The systemic exploration of the questions and their underlying assumptions in the context of federated course design will pave the way to federating the two theories in action.

7.3 Designing for emergence: the role of living centers

Designing for emergence is the art of creating a dynamic balance of deliberate design and self-organizing emergence. Social learning frameworks tend to emphasize bottom-up, self-organizing construction of the learning experience, which is at odds with the pedagogical and organizational culture of most educational institutions. That

is a creative tension waiting to be resolved and turned into breakthrough design that is federating the principles and practices of deliberative design and self-organizing emergence. We turn to science to gain new insights about how to do that.

"Bottom-up construction ... can be massively parallel, because the objects construct themselves... While bottom-up approaches have been extremely useful in biology, they haven't played as significant a role in technology, because we don't have a great grasp on how to design systems that build themselves... To understand how complexity can be programmed into bottom-up molecular fabrication processes, Winfree and his colleagues study and understand the processes--or algorithms--that generate organization not just in computers but also in the natural world... The DNA tiles will only form crystals if the process gets started by a seed, upon which they can grow." (DNA Self-Assembly)

What will be the equivalent to those seed crystals in the reconciliation of the connectivist or wildfire-like self-organization of learning communities with the skillful, deliberate design of educational programs?

One approach that holds some elements of the answer comes from Open University's socio-conceptual framework and its educational primitives, the simple, "atomic" acts, from which complex, shared learning processes may self-organize. A research collaboration between the KF initiative the OU's SocialLearn Project could be mutually beneficial, providing the first with an enabling tech platform and wildfire inspired pedagogy, and the second with direct access to advanced tools and methods for large-scale collective intelligence, as they emerge.

Another way to look at what can reconcile the creative tension between design and emergence is through the lens of what Christopher Alexander calls a *living center*. "The primary entities of which the wholeness structure is built are centers, centers that become activated in the space as a result of the configuration as a whole. Centers typically have different levels of strength or coherence. The coherence of a configuration is caused by relationships among centers... The life that a center has is a function of the configuration of centers that surround it and of the degree of life that these surrounding centers have. In slightly different language, a living center is a center which is unusually dense in other living centers." (Alexander, 2009)

Alexander's pioneering work on pattern language in architecture inspired pattern language initiatives in many other disciplines and social practices, including KF. However, the very heart of that work, his "living center" distinction remained elusive to most of them. The limits of this paper cannot do justice to the importance of the collaborative inquiry needed to discover how that distinction can open new possibilities for KF as a post-disciplinary theory and practice. What we intend to do in the next paragraphs is to start exploring the possibility and implication of repurposing it in the context of the designing for the emergence of wholeness in social and educational structures, and more, specifically, in the design of a federated course.

"The hypothesis is that *it is the "wholeness" of the given environmental reality which*

brings latent centers to life, and which each living center enhances . The wholeness always preserves the centers that are already strong, and, for some reason, it always strengthens and enhances latent centers in remarkably similar ways..." (van Eerden, 2010)

It is the very same thing that happens also when the trails of over 20 researchers lead to a workshop in Dubrovnik, where they knot a tie on a shared conceptual object, knowledge federation. The center that is already strong among them is the shared interest in the KF meme, whatever it means to each. The latent centers are where smaller knots of shared interest are tied by smaller groups of them, as they discover common scopes. They were latent but existing, real, even before they meet or read each other's papers. It is the emergent field of KF, as shared reality, which brings those latent centers alive.

As living centers, the small and larger knots can mutually enhance each other. Their relationship with the terrain as whole and the neighboring knots will nourish those centers as spaces of potential, when multiple perspectives from at least two persons are focused on them. When inspired by what they found in the various center, members of the workshop community may turn some of them into an ad hoc, temporary, or ongoing learning/research partnering.

The research community as an example shows that growing socio-technical systems out from living centers does not start with detailing them out from a master plan, but simply, giving room and creating conditions for the life-giving forces to manifest, which are our already present as the participants' attention, creative passion, and urge to learn and create value. What does that mean for reconciling the creative tension between design and emergence, as we try to federate the connectivist and wildfire social learning frameworks in the process of designing federated courses?

The full meaning of the "living center" distinction for educational design practice can reveal itself only in that practice. What seems already clear is this: The path to course design needs to start with the self-organization of a small team committed to the prototyping process and ready to embark on the design journey without a master plan. Theory U, also labeled as a "social technology for learning from the future as it emerges," is particularly well suited as a methodology for that kind of prototyping and we'll introduce its application to course design later.

8. Process Design Methodologies (to expand in the final paper)

8.1 Innovation Architecture

8.2 Theory U

9. Course Development Patterns (to expand in the final paper)

9.1 Organizational patterns

9.2 Federation patterns

9.3 Pedagogy patterns

- 9.4 Role patterns
- 9.5 Collaboration patterns
- 9.6 Collective intelligence patterns
- 9.7 Patterns of required affordances

10. Issues for Further Research (to expand in the final paper)

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