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Fostering Sociability in Learning Networks through Ad-Hoc Transient Communities

Peter B. Sloep

OTEC, Open Universiteit Nederland
Valkenburgerweg 177, 6401 DL, Heerlen, Netherlands peter.sloep@ou.nl

Abstract. Lifelong learners somehow need to fulfil their competence development needs. Traditionally, this has been done mainly in formal settings. However, this paper argues from the assumption that non-formal educational settings are much better suited; particularly, so if a *Learning Network* is used to provide a social environment in which to embed learning opportunities. A Learning Network is not nor consists of communities from the outset; its community-like nature should emerge from the interactions of its inhabitants and evolve over time. How can this be done? Although learners might have several long-term motives to engage socially, the paper notes that little is known about their short-term motives. The notion of ad-hoc transient communities is then introduced as a promising mechanism to drive the emergence and evolution of social behaviour in Learning Networks. Subsequently, various theoretical notions for why such communities can provide the short-term motives sought, are discussed. A short discussion of future areas for research closes the paper.

Keywords. Lifelong learning; non-formal learning; sociability; Learning Network; Ad-Hoc Transient Community

1 Introduction

1.1 Formal and non-formal learning

Current research into learning focuses largely on learners who are members of a cohort, have submitted themselves to a curricular translation of their learning needs, and let their learning activities be organised by an educational institution. This kind of *formal learning* is particularly relevant for the initial education of young people. However, much if not most learning is carried out by individuals, in non-curricular settings, professionally in the context of the corporation or institution they work with, or privately, in the context of the particular interests they pursue. The advent of the knowledge society, with its emphasis on continuous development and self-

responsibility, will only lead to a further shift away from formal learning, towards *non-formal learning* [11, 14, 17, 31, 41].¹

For a variety of reasons, the point of departure for the study of non-formal learning should be the individual's employability concerns, translated into personal competence development needs [44]. The study of non-formal learning should not take it for granted that there are cohorts and curricula, nor should it assume that non-formal learners subscribe to the services of a single educational service provider, such as is the case when studying ('enrolling') with our received educational institutions. To make this novel setting for non-formal learning more precise, I introduce the notion of a *Learning Network*. This I stipulate to be a learning environment that has been designed to aid non-formal learners in fulfilling their competence development needs [28]. How a Learning Networks supports and even promotes non-formal learning in some domain is the subject of the present paper. I will focus on but two aspects in particular:

1. Why would learners in a Learning Network organise themselves in community-like groupings in the first place?
2. How should Learning Networks be designed to foster this kind of self-organisation?

The paper is very much a theoretical exercise, it covers work still in progress. Therefore, the discussion will be poor in empirical findings and rich in plans and expectations.

Two more caveats are in order before setting off. Portraying Learning Networks as particularly relevant to non-formal learning, may suggest they have no bearing on formal learning. This would be too hasty a conclusion. In formal education, particularly in vocational formal learning, attempts are being made to move away from the traditional supply-driven model with its emphasis on cohorts of students that have been synchronised in their development and on curricula that homogenise students' learning paths and goals, in favour of a move towards a demand-driven model, which embraces non-formal learning, does away with cohorts and curricula and treats learners as individuals, with, in terms of their capabilities, individual histories and goals [3]. Unfortunately, much of our current expertise is with the supply-driven model. So promoting a demand-driven model requires a rethinking of much conventional wisdom. This pertains to many of our traditional pedagogical assumptions, but also to organisational aspects and to the business models that underpin non-formal learning. Thinking in terms of Learning Networks thus allows us to break away from conventional wisdom, precisely because several of the traditional assumptions that one surreptitiously makes, are abandoned or at least questioned. It is because of this unconventional attitude that thinking in terms of Learning Networks

¹ Please note that terminology is not standard. Many use informal learning to denote what I here call non-formal learning (*cf.* [10, 39]).

may uncover lessons for formal learning that would never have been learnt when staying in the ‘conventional’ mode.

Even more pertinently, thinking in terms of Learning Networks also holds lessons for lifelong learning. The notion of lifelong learning covers someone’s entire educational career, from ‘cradle to grave’; it thus covers both initial education, which is usually formal, and post-initial education, which may be formal or non-formal. Admittedly without detailing the arguments, I claim here that the interests of lifelong learners are most adequately served by the provision of non-formal learning opportunities [36, 39, 43, 45].

1.2 Learning Networks defined

A Learning Network I stipulatively define as a particular kind of *online, social network* that is *designed to support non-formal learning in a particular domain*. Presumably, non-formal learners who participate in a particular Learning Network do so because they are interested in a particular topic, professionally or privately. Crucially, such a topic or domain is assumed to be individuated by the existence of a comprehensive *competence map*. A particular instance of a Learning Network thus exhibits a particular, unique competence map and as a consequence of that covers a particular domain. Any online group of people who share a particular interest would qualify for inclusion in a Learning Network. Examples would be online groups of non-professional music composers, parents of hyperactive children or diabetes patients but also Linux specialists or environmental scientists who go online to seek and share knowledge. Clearly, for such groups to become a Learning Network in the sense discussed here a competence map would have to be drawn up first [27, 28].

Typically, the interests of a particular non-formal learner are quite specific. They not only pertain to the domain in question, but also are likely to target specific subordinate regions in it. I therefore assume that, apart from their navigating the same competence map, non-formal learners do not necessarily have much in common. Indeed, they are unlikely even to know of each other’s existence other than by accident. One may therefore safely assume that in an incipient Learning Network no community-like structures are in place which would foster collaboration between its inhabitants. A Learning Network is not a special kind of community by definition. It could however, as a matter of contingent fact, develop community-like characteristics but these are expected to emerge and evolve during its lifetime only [40].

2 The Need to Collaborate

Formal learners are guided from beginning to end, from admission to diploma, by the structure that the curriculum provides. Moreover, at each step in their journey through

the curriculum, they are watched over by staff who teach them what they need to learn, who answer their questions, content-bound or school-related, who assess their progress, etc. There's no reason to expect that non-formal learners would not have similar needs; indeed, their repertoire of needs could well be more extensive. How can these be catered for in a Learning Network, devoted to non-formal learning?

2.1 The Need for Mutual Learner Support

Consider the following example. While studying a module², a learner may be confronted with a content-bound question she cannot resolve herself. Trivial, factual questions of the who, what, where, when kind may be resolved by seeking recourse to a search engine, Wikipedia, etc. How will this non-formal learner's question be answered? Something similar goes for questions of a procedural kind (How do I have my modules certified?) and meta-cognitive questions (How do I best organise my studies in a Learning Network setting?).

Non-formal learners will also have additional needs, which are completely alien to formal learners. Being individual learners, they will already have acquired particular competences and there will be others they will want to acquire. To whom do I apply for accreditation of my existing competences?, How can I most efficiently arrive at my goal competences?, What learning activities are the most effective for me?, are typically questions of a non-formal learner. In formal learning this problem does not arise, as the school takes decisions on them out off the learners' hands when designing the curriculum.

Furthermore, in the context of a Learning Network, various content providers may be active, each of whom could provide text-based modules. A particular competence may thus be acquired through a variety of modules. Such modules would be equivalent with respect to the competences one may obtain through them, but differ in, for example, pedagogy, staff support provided, price, etc. So one particular competence path is likely to map onto various paths through the set of modules. A learner needs to know what path suits him or her best. The very question of how a competence development path maps into a set of modules doesn't arise in the context of formal learning. By devising a curriculum, the question has been resolved beforehand.

² The notion of a 'module' introduced here may be somewhat problematic. Are there such things as modules in non-formal learning? To the extent that non-formal learning is social learning, there aren't as it consists of people sharing knowledge. However not all non-formal learning will be of this kind. I assume that much knowledge in a Learning Network will be available as texts, in their original form or pedagogically enhanced. Such texts may be carved up in units, haphazardly for the natural ones, judiciously for the pedagogically enhanced ones. To such units I refer when I use the term 'module' here.

These kinds of questions need to be addressed and answered by the Learning Network. If it doesn't, it will rapidly lose its learners. Hiring staff is not an option, that would not sit well with the philosophy of a Learning Network [27]. Also, for reasons not to be detailed here, it would also rapidly become prohibitively costly (see [2, 16]). The Network needs to provide intelligent learner support services to deal with this issue. Such services can come in two basic flavours. Both make recommendations to individual learners based upon questions, explicitly asked by them or implicit in the situation they are in. The first makes recommendations based upon an analysis of the collective, average behaviour of peers that have thus far inhabited the Learning Network. This average behaviour is based upon filtering and collating the personal histories of peer learners [22]. Although this is a valid and valuable kind of service, I will ignore it in this paper. The second kind does not take collective actions but personal experience as its starting point. The premise underlying it is that peers who have been in situations similar to that of an advice-seeking learner, would themselves be in a good position to provide advice. The service in question would match the advice-seeking learner with peers who, in view of their past performance, should be able to answer his question. This second kind of recommendation I want to elaborate on. It is interesting because, in spite of its obvious value to the advice-seeking learner, it prompts the question of why learners in the Learning Network in question would invest time and energy in helping advice-seeking learners by providing answers to their questions.

2.2 Why help peers, the long-term perspective

There is ample evidence that collaboration and a social setting significantly improve learning effectiveness. By collaborating with others, learners cast off their initial isolation, make use of their collective intelligence, motivate and enlighten each other and thus improve their learning outcomes [1, 5, 7, 8, 24, 38]. Some will say they have become part of a community of learning [57]. So it is in their long-term interest to collaborate. In educational circles, this is a familiar argument, which goes back to the ideas Vygotski [50] or even Dewey, in 1916 [13]. Arguments of this kind have kindled the emergence of the research field of Computer-Supported Collaborative Learning. Although not necessarily so, this field very much adheres to traditional, formal learning, which makes it less relevant for our purposes here [23]. The underlying rationale, that social learning benefits learning effectiveness, unreservedly applies here too, though.

More recent insights point to another reason why it would be ultimately beneficial for a learner to collaborate with others. For a moment, look upon a Learning Network as a network for knowledge sharing. This makes sense as learners who collaborate with others not only consume explicit knowledge held in documents but also use their

fellow learners as sources of implicit knowledge [32]. If this knowledge exchange extends beyond the educational realm into their professional life, a Learning Network *qua* knowledge sharing community may thus turn into a community of practice. Or, more adequately, the communities of learning the Learning Network consists of may acquire characteristics of communities of practice [6, 33, 52]. As argued, typically learners in a Learning Network combine their need to learn with the necessity to work. Indeed, their learning needs often derive from their occupation. So there is every reason to expect that the communities that arise in the Learning Network will acquire this dual nature of a community of learning and a community of practice [6, 31]. This then would be a powerful motivating factor for learners to ‘go out’ meet and work with their fellow Learning Network citizens.

A completely different reason for why a learner should provide help to his or her peers is that it can be a valuable experience of and in itself. One also learns from explaining issues to others, particularly if the non-trivial issues are at stake that we assume to be at stake [15, 18, 20, 26, 54]. Obviously, jogging someone’s memory by ‘explaining’ that it was Vincent van Gogh, not Paul Gauguin, who cut off his own ear, hardly is an educating experience. But this is different for questions that do not concern ‘trivia’, questions that cannot be answered by exploring Wikipedia or searching with Google. Such non-trivial questions require mental effort to answer, and it is precisely this effort that deepens the insight of the answer provider [*cf.* Chapter 7 of 29].

Unfortunately, for all their appeal, these explanations for why it is in the ultimate interest of learners in a Learning Network to collaborate, fail to explain why some learner in some specific situation would spring into action to help someone who presumably is a total stranger. Helping requires an investment of time and the long-term benefits we just discussed might never materialise. If, for example, the person one has helped leaves the Network or assumes a different identity, direct reciprocation of the act of providing help becomes impossible, as does fruitful future collaboration. Indeed, suppose some learner (say, Dave) would never answer any questions but would not hesitate to ask questions to others, for example to Carol, who readily provides an answer. The strategy that a learner such as Dave follows is much more rewarding than the strategies followed by learners such as Carol. For Dave collects all the benefits without himself losing any time helping others. Carol does enjoy the same benefits, when others help her, but from these benefits her investment made to help others needs to be detracted. So both Dave and Carol gain, but Carol less so than Dave. Realising this, any rational learner, the argument goes, would follow Dave’s strategy. But this of course means that, in the end, nobody provides any help to others anymore. The net result is that all are worse off than was Carol. The situation described here conforms to the classical problem of the Prisoner’s Dilemma [4, 34]. The overall optimal strategy of helping each other only works if all co-operate willingly, such as Carol, and nobody defects. But unfortunately, the long-term benefits of co-operation never materialise because in the short run the most rewarding strategy

is not to collaborate. How can this situation be avoided, as clearly, collaboration is a keen asset to the whole idea of organising non-formal learning in the context of a Learning Network?

3 Community formation, design for collaboration

I'll conduct the discussion on how to overcome the problem caused by the Prisoners Dilemma in two parts. First, I'll digress a bit and look for mechanisms by which peer-support as a form of collaboration may be implemented in Learning Networks (3.1). This will help getting a feel for the conditions under which the Prisoners Dilemma needs to be resolved. Then, in section 3.2, I will explore solutions and the design rules that follow from them. Solutions range from an exploration of the conditions that would undercut the Prisoners Dilemma's applicability to an investigation of conditions that would positively affects learners' willingness to help out each other.

3.1 A case: Ad-Hoc Transient Communities for Peer Tutoring

While studying a module, learners will at some point have content-bound questions. As I already noted, trivial questions of the when, where, what and who-kind may easily be resolved using Wikipedia, Google and the like (on boosting the reliability of such services, see [9]). Non-trivial questions of the how- and why-kind can only be resolved by involving an expert, as they require understanding at a deeper level. As argued already, relying on teachers to act as experts rapidly becomes prohibitively expensive, as indeed turns out to be the case in much formal, online learning [12, 16]. Relying on fellow learners to act as peer tutors then is a plausible strategy [25]. Van Rosmalen developed a tool for finding suitable peers and an environment in which the question-answering could be completed [48]. It relies on the availability of i) learner dossiers ('e-portfolios'), which document what modules a learner has completed inside the Learning Network; and ii) a text corpus that encompasses all the modules that are available in the Learning Network. This text corpus is indexed through Latent Semantic Analysis, and regular updates of the index are made [30, 46].

When a learner asks a question, it is first processed against the index of module texts. This leads to a list of text fragments, say at paragraph level, ranked for their similarity to the question. These fragments are then used to identify peers who have studied the modules in question. Through an algorithm that takes calendar data, past load and something similar to Vygotski's *zone of proximal development* into account, a number of peers are invited to collaboratively answer the question, using a wiki. The wiki is seeded with the original question and the highest-ranking text fragments; the learners - question-asker and peer-experts - are asked jointly to find a satisfactory answer to the question. The availability of the text fragments helps them formulate an

answer quickly, thus lowering the threshold for participation. The Moodle learning environment (<http://www.moodle.org>) was used to implement the tool [49].

After fine-tuning and prototype testing on experts, an experiment was carried out with real learners. Although a genuine Learning Network was not in place, care was taken to emulate it as well as possible. The experiment involved about 100 students, who followed an introductory course on ‘internet basics’, in which they had enrolled on their own accord. The ‘course’ lasted for 8 weeks and consisted of 11 modules. Each module contained a quiz, which was used to assess the students’ mastery of the module. The group of students was split up in two halves, the one acting as a control for the other. In the experimental group, LSA was used to match peer-learners with questions, in the control group, peer-learners were matched randomly. The experiment showed that the experimental group outperformed the control group in several ways, confirming the usefulness of LSA for matching. However, the experiment also showed that, quite in general, the learners found using peers as experts a satisfactory way of resolving their content-bound questions [47, 49].

What does this experiment imply for Learning Networks? The small groups of learners, question-asker and peer-tutors, form genuine but small communities, at least for as long as the wiki is in place. They meet the criteria of having a shared project, of generating new knowledge flexibly though intense mutual negotiations, while they maintain their autonomy and control what they do in a distributed fashion [53]. These communities, however, lose the reason for their existence once the question that brought it to life, has been resolved. Typically, therefore they will be short lived. To reflect this character, we have dubbed them Ad-Hoc Transient Communities (AHTCs) [42]. Others have stumbled on similar ideas. Weber, for example, in *The Success of Open Source* writes: “[...] Internet technologies radically undermine organizational structures because they reduce the cost of communications and transactions toward an asymptote of zero. This is supposed to enable the formation of ‘episodic communities on demand’, so-called virtual organizations that come together frictionlessly for a particular task and then redistribute to the next task just as smoothly” [51, p.171]. For every question that gets asked in a Learning Network, an Ad-Hoc Transient Community springs to life, exists for a while and goes extinct. If many questions are asked, many such live-and-die episodes occur. If a Learning Network is an active one, at a particular time-slice many living Ad-Hoc Transient Communities may be expected to exist.

However, once learners have met in an Ad-Hoc Transient Community, contacts between them may well be continued outside its realms. If this happens, genuine communities may arise. Through them, the long-term benefits of community formation may come to fruition. This applies in particular to the benefits of social learning and of transforming communities of learning into communities of practice. So Ad-Hoc Transient Communities at least provide a plausible mechanism for communities to emerge through self-organisation. But the question of why learners would contribute to Ad-Hoc Transient Communities in the first place has not been

answered yet; the Prisoners Dilemma, the relevance of which was noted at the conclusion of section 2, hasn't lost any of its bite yet.

3.2 Why help peers, the short-term perspective

Already several decades ago, Axelrod and others pointed out how one may overcome the unfortunate implications of the Prisoners Dilemma by repeatedly 'playing the game', thus adding a history perspective to it [4]. This makes intuitive sense. Dave can get away with letting Carol help him without reciprocating, but only if Dave and Carol never meet again. If they do, Carol will know about Dave's defection and refuse to help him. The application of this tit-for-tat strategy can even be helped by making data available to the potential help-providers of the past performance of all help-seekers. Now 'defectors' such as Dave will think twice, the argument goes, not to react to a request for help, for this will immediately lead to their inability to ask any further questions themselves. Indeed, simulations by Axelrod of the strategy best to adopt in the case of the Iterated Prisoners Dilemma – the Prisoners Dilemma with a history – point to the superiority of 'tit-for-tat': co-operate on the first encounter and copy the 'opponent's' behaviour from then on. Once established, tit-for-tat cannot be 'invaded' by other strategies, i.e. in the long term no strategy can replace tit-for-tat as the dominant strategy [4]. More importantly even, in a world of defectors (Daves), only a few collaborators (Carols) who team up, suffice to drive the defection strategy to extinction, i.e. the Daves will have to adopt Carol's collaborative strategy on pains of seriously harming their own interests. Simulations indicate that a few, partly overlapping Ad-Hoc Transient Communities would suffice to bring this extinction about [4].

There are, however, a few conditions that have to be met in order for the conclusions of the analysis of the Iterated Prisoners Dilemma to apply. I already mentioned that 'players' should be able to identify each other uniquely in order to know how to reciprocate. Second, it should be likely that they meet again in the future. Third, the future should be known not to be finite. Otherwise, one starts counting down from the last meeting and this again effectively takes away the iterative character. Fourth, although the impact on gains and losses of future meetings will decrease the further away they are ('discounting'), their effect should not dwindle too quickly. Otherwise, one might as well ignore them, which would mean a return to the original Prisoners Dilemma.

These conditions can easily be translated into design constraints for Learning Networks. The first condition implies that anonymity should be prohibited; pseudonymy is allowed, provided a user adopts a persistent pseudonym [25, 35]. Enforcing this rule should pose no problem. Enforcing the second rule is slightly more difficult. A Learning Network can easily become quite big, too big perhaps. However,

through the deployment of Ad-Hoc Transient Communities, groups within the larger Network will appear the members of which have interacted more often with each other than with ‘outsiders’. Because of the way Ad-Hoc Transient Communities are put together, such groups are likely to have a common interest. If users on the basis of their having met in an Ad-Hoc Transient Community decide to interact on their own accord, they might share other characteristics too, such as being physically co-located or sharing the same native language. Social Network Analysis may reveal the existence of such communities. Their size is likely to be in the right range for sufficiently frequent encounters to occur. Research by Hill and Dunbar on the natural size of social networks in humans is relevant here too [19].

The third condition implies that a Learning Network should not be known to end at some specific date. Living up to this condition is particularly difficult for experiments with Learning Networks, which by their very nature have a fixed ending. Indeed, experiments on the usefulness of incentive structures for social networks usually fail to take this condition into account [*cf.* 21]. However, for an operational Learning Network one should only refrain from speculating about its ending to fulfill this condition. Meeting the fourth condition – not discounting the impact of future meetings too fast – is harder to implement. As indicated above, keeping track of the reactions of all users to requests for help is a means of increasing the transparency of the Network. It means that one can already make an estimate of a person’s inclination to co-operate without ever having met that person. As this record can persist ‘for ever’, it is up to the individual user to decide to what extent to hold someone accountable for his or her past behaviour. Another way would be to increase the frequency of interactions, which can be promoted by the emergence of communities within the overall Learning Network, as discussed already under the first condition.

The Iterated Prisoners Dilemma points out that co-operative behaviour emerges spontaneously, provided a number of conditions have been met. These conditions can indeed be met by designing a Learning Network accordingly, in particular by deploying Ad-Hoc Transient Communities. Simulations with the Iterated Prisoners Dilemma, however, also point out that it may take quite some time (in terms of the number of interactions) for the tit-for-tat strategy, which stands for co-operation, to become the dominant strategy [4]. Are there other measures one may adopt to speed up this process? Weber, already introduced in the previous section, identifies some. Promoting relations of trust is a final candidate.

Weber points out that the emergence of such communities ‘is an important puzzle for social scientists worrying about problems of both small- and large-scale cooperation’ [51, p.2]. Although Open Source Communities differ from Learning Networks in many ways, most significantly in that the former do and the latter don’t have a common goal that all community members share, his analysis holds several valuable lessons for the analysis of Learning Networks. This is even more so if we descend from the level of the overall Learning Network to that of its constituent

communities (brought about by Ad-Hoc Transient Communities). Space forbids pursuing this analysis to any depth, however I will discuss some of the most obvious design lessons that may be derived from Weber's book.

Weber distinguishes micro-foundations from macro-organisation. Micro-foundations are about people's personal motives to participate in the development of open source software, macro-organisation refers to the way a division of labour in an open source community could arise. Unlike developing software code, answering questions requires little in the way of a division of labour other than that a careful match should be made between the content of the question and the expertise of the answerer. In the previous section I described how this may be done. Consequently, I'll focus solely on the microscopic level. Three of Weber's observations on open source communities hold promises for Learning Networks. According to Weber, programmers contribute to open source code because, among other things i) it is a means to boost their egos, a way to show their programming capabilities; ii) it increases their reputation with and recognition by their peers; iii) it lets them belong to a group with similar beliefs, the same select 'incrowd' [53, pp. 140 *et seq.*].

All three are fairly easily translatable to Learning Networks or the communities they are made up of. Answering questions posed by others certainly is a good opportunity to show one's adroitness with the subject matter of a particular Learning Network. For the design of a Learning Network this implies that it should always be traceable, or even readily visible, who has contributed to what specific answers. The use of wikis takes care of the traceability, collecting answers in a FAQ and prefacing each entry by its contributors takes care of the visibility. This way, answering questions also increases a person's standing with his or her peers. This increased standing may be assumed to be particularly profitable if the communities of learning one grows to belong to (as described, through the effects of Ad-Hoc Transient Communities) gradually fade into communities of practice. Then, over time, a learner teams up with like-minded people, perhaps even to the extent that one forms an incrowd within the larger Learning Network. This process of community formation can be promoted by, for example, adding to someone's address book as a specific group all people with whom one has interacted frequently. Social Network Analysis tools may again help identify such groups. Finally, increased reputation and recognition could easily translate into increased job opportunities, something no professional would frown upon.

A final candidate for speeding up collaboration within Learning Networks is promoting the establishment of trust between the network members. Trust is not a tangible good that can handed out, it s something that should emerge. One may define it as the investment someone is prepared to do in the well-being of someone else without demanding immediate recompense for it. Trust is intimately connected to knowledge about the other person's past behaviour. In that sense, it fits within the scheme the Prisoners Dilemma paints. However, the tit-for-tat strategy, which is the most successful strategy, bases itself upon the opponent's previous move only. If more

knowledge about the other is available, for instance in the form of a generalized trust profile, co-operation could perhaps arise more quickly [37]. For the design of a Learning Network this implies the availability of such profiles.

4 Conclusion

Learning Networks are online learning environments specifically designed for the support of non-formal learning. With them, I argued, lifelong learners can best fulfil their competence development needs. Learning Networks are not communities by design or fiat, their community-like nature emerges from the interactions of their inhabitants and evolves over time. Of, course they need to be engineered in order that these characteristics can and most likely will emerge and evolve. Ad-Hoc Transient Communities play a significant part in this.

Although it is easy to see what long-term benefits accrue to collaborating with others in a Learning Network, this fails to explain why people would collaborate: after all, it is even more profitable to rely on others to help you, without helping others yourself. This fundamental tenet of the Prisoners Dilemma may be overcome by giving Learning Networks a history and a future. The rules of the Iterated Prisoners Dilemma then apply, which imply – under a few conditions that can readily be fulfilled in a Learning Network - the slow emergence of collaboration. But can this process be sped up? A comparison with the emergence of collaboration in open source communities points to a few mechanisms that should be employed, such as ego-boosting, reputation building and group formation. Finally, building tools that facilitate the emergence of mutual trust probably also helps. In summary, when designing Learning Networks one should go at great length to stimulate the emergence of communities of like-minded people. Ad-Hoc Transient Communities can act as a strong driving force in this respect.

This has been predominantly a theoretical analysis. Much work therefore still needs to be done in order to make non-formal learning in Learning Networks a reality. The analysis revealed broad design guidelines, these need to be translated in specific ones, which are possibly domain bound and thus would differ between networks. Having built a Learning Network, the guidelines need to be put to the empirical test: do they indeed have the effect predicted here? And finally, Learning Networks themselves are a tool, devised to foster the effectiveness and efficiency of non-formal learning. As this requires generalizing over Learning Networks this is the most difficult test to perform. Research of this kind will no doubt be some time in the making.

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