Paragogy: Synergizing individual and organizational learning

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Abstract. This paper describes a new theory of peer-to-peer learning and teaching that we call "paragogy". Paragogy's principles were developed by adapting the Knowles's principles of andragogy to peer-based learning contexts. Paragogy addresses the challenge of peer-producing a useful and supportive context for self-directed learning.
The concept of paragogy can inform the design and application of learning analytics to enhance both individual and organization learning. In particular, we consider the role of learner profiles for goal-setting and self-monitoring, and the further role of analytics in designing enhanced peer tutoring systems.

Key words: peer-to-peer, pedagogy, organizations, andragogy, learning analytics

1 Introduction

Jonathan Grudin identified several problems for computer supported collaborative work (CSCW), which apply *a fortiori* in computer supported collaborative learning (CSCL) [1]. The current paper tackles similar problems, from a human and social perspective, in which both individual and organizational learning are front and center.

Grudin's thematic problems are: (1) The disparity between the people who do the work to create and support the application, and the people who get the benefit; (2) The breakdown of intuitive decision-making whenever intuition comes from a different context; and (3) the ultimate difficulty of evaluating CSCW applications, precisely because they involve complex social dynamics.

In the peer-based context, Problem 1 is somewhat mitigated, but by no means completely gone. Specializations tend to develop within every group. Power laws appear to distribute work between a core of dedicated users or contributors and a peripheral "long tail" of persons who are less involved.

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We encounter Problem 2 as a direct side-effect of novelty. However, peer-based learning itself can more accurately be thought of as "new-old" (see Eisen [2]). Eisen's peer-based learning principles of voluntary involvement, trust, mutuality, authenticity, non-hierarchical status, and duration and intensity leading to closeness, [2] are ways to describe fundamentally human situations (and quite nice-sounding ones at that). Perhaps these features are not as prevalent as they should be in our educational cultures; still the fact remains that it is not peer-based learning that is new, but many of the technologies that can support it (we count analytical methods and pedagogies among these).

We feel that Problem 3 is generally best handled by asking the people involved. If they are satisfied with their experiences, the systems involved are probably working reasonably well. If, on the other hand, they can identify some way the system could be improved, there may well be a chance to improve the system in a subsequent iteration. User feedback or even observation can thus comprise a "light" form of end-user development. That said, this approach merely transposes the problem of understanding social dynamics into a new, "technology-enhanced", version of the same problem. In any case, this will be a key problem for the nascent field of learning analytics.

In Section 2, we will describe our new theory of the social dynamics of peer-based education. In Section 3, we will develop the ideas further, relative to more general forms of peer production. Our views on how this new theory can inform the development of learning analytics are presented in Section 4. Finally, in Section 5, we describe some of our own planned work in this area, and suggest some other possible lines for future investigation.

2 Paragogy: a theory of peer-based teaching and learning

The theory of paragogy was developed in the context of two online courses that we ran at Peer 2 Peer University (P2PU) in Autumn of 2010. One of the courses was called "DIY Math", and it was "designed to build independent study and peer-support skills for mathematics learners at all levels."[1] The other course was called "Collaborative Lesson Planning", and it was built around the question "Can publishing and collaboratively building lesson plans online make them better?"[2] The first course (which was facilitated by the first author of the current paper) was not a resounding success as a course, but we learned a lot from it anyway, especially in a rich discussion about how it could be improved that took place in the second course (which was facilitated by the second author).

The key outcome was an outline of an analytical framework that applies to peer-to-peer or peer-based teaching-and-learning-between-equals. The difficulties with DIY Math pointed to possible improvements at the organizational level, such as developing a P2PU-wide "social contract", or only running courses when sufficient commitments had been "anted up". In light of this, Corneli's post-mortem analysis of DIY Math suggested that the concept of pedagogy is

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[1] http://p2pu.org/general/diy-math
[2] http://p2pu.org/general/collaborative-lesson-planning

not sufficient in the peer-based learning context; he then introduced the etymologically more appropriate term, paragogy.[3] He subsequently five paragogical principles (Section 2.1), which were then improved and refined through a peer mentoring process in the Collaborative Lesson Planning course.

The fact that παραγωγή is an existing word in Greek, meaning "generation" or "production", should not dissuade us from this new usage in English. Indeed, here we are precisely concerned with the activities that generate learning. And, vice versa, in the situated learning and communities of practice point of view, "learning was shown to be an inevitable aspect of all productive practices" [3].

In any case, paragogy will be defined here in contradistinction to another neologism, *andragogy*, the teaching of adults, coined in [4], cf. [5], [6]. We found Blondy's "Evaluation and Application of Andragogical Assumptions to the Adult Online Learning Environment" [7] to be quite useful. In succinct form, Knowles's five principles of andragogy are as follows: (1) that adult learners are self-directed; (2) that they bring a wealth of experience to the educational setting; (3) that they enter educational settings ready to learn; (4) that they are problem-centered in their learning; and (5) that they are best motivated by internal factors.

2.1 Paragogical principles

Each of these principles adjusts one of Knowles's five principles to the peer-based learning context, often by turning the original by 90°. This is not because we particularly disagree with Knowles about how to teach (see Section 2.2), but because paragogy deals with a very different challenge, that of analyzing and co-creating the educational environment as a whole.

1. **Context as a decentered center.** "For learning design in a peer-to-peer context, understanding the learner's self-concept – in particular, whether they see themselves as self-directed or not – may be less important than understanding the concept of 'shared context in motion'." (See Section 2.3.)

2. **Meta-learning as a font of knowledge.** "We all have a lot to learn about learning."

3. **Peers are equals, but different.** "The learner mustn't seek only to confirm what they already know, and must therefor confront and make sense of difference as part of the learning experience."

4. **Learning is distributed and nonlinear.** "Side-tracking is OK, but dissipation isn't likely to work. Part of paragogy is learning how to find one's way around a given social field."

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[3] `http://groups.google.com/group/diy-math/browse_frm/thread/`
`5fcb82598445cd54`

5. Realize the dream, then wake up! "Paragogy is the art of fulfilling motivations when this is possible, and then going on to the next thing."

2.2   Paragogy compared with andragogy

Blondy [7] points out both uses and challenges to each of Knowles principles of andragogy. For example, "Cheren stated that while learners may express a desire to be self-directed in their learning, most lack the required understanding of learning necessary to be self-directed and thus need guidance and encouragement in the learning process."

From our point of view, so much seems to depend on the way things are set up in the first place. For example, the most important initial condition in andragogy seems to be that *an adult educator* or *facilitator* is part of the picture. In a peer-based setting, that may not be the case: we can easily find examples of learning environments where there is no "teacher" in the "classroom"; where, for example, the task of facilitation is shared among all participants or even encoded in the learning materials or supportive technologies. Not that one way is more desirable than another: we simply mean to highlight the fact that the most basic features of a given learning environment will influence everything else.

In particular, it seems to us that a move to the more "horizontal" regime of paragogy can often occur within andragogy, e.g. when *inviting participants to interact*; and vice versa, a move to a more "vertical" regime of andragogy is possible within paragogy. For example, the second author fruitfully encouraged participation in his course via personal emails to those participants who had temporarily gone quiet.

In short, we agree with Blondy when she writes "Andragogy should be used as a starting point for approaching the adult online learning environment." We recommend paragogy as an additional starting point that sits on another dimension.

2.3   Paragogy and basho

The first paragogical principle stresses the importance of understanding the idea of shared context in motion. We will elaborate here.

The philosophical foundations of this notion, originally developed by Kitaro Nishida, and summarized in English by Masao Abe [8], describe the way in which events and objects arise from their larger contexts. In other words, the idea of basho ("shared context in motion") can help us think about how a context constrains or supports different types of (inter-)actions, and also about how we (re-)shape the contexts we find ourselves in.

Nonaka and Toyama take this idea and apply it to knowledge creation. They suggest that knowledge is created as people interact over time in a shared context, in a process that can be broken up into repeated phases they call Socialisation, Externalisation, Combination, and Internalisation (SECI) [9]. In simple terms, any given phase can be understood in terms of "what I do", "what we do", "how we do it", and "what it's all about".

The first paragogical principle says that instead of focusing on how learners see themselves (e.g. as "self-directed" or "dependent" or something else), we should be asking how the learning context shapes what learners are actually able to do. Note that this includes looking at ways in which learners can contribute to *reshaping* the learning context.

Instead of simply saying "so-and-so lacks the required understanding of learning, so I need to help them", a paragogue would also look for contextual features of the learning environment that are "blocking" self-directed learning. These may include features that block the ability of learners to make adjustments to the environment on their own behalf, or which limit their ability to ask for help.

3 Paragogy and Peer Production

The links between paragogy and peer production illuminate both. As Phillip Schmidt writes: "Upon closer inspection of commons-based peer production communities, we find learning at their core" [10]. Conversely, in the conclusion to "Education and Mind in the Knowledge Age", Carl Bereiter writes:

> Schools are places where knowledge creation can go on, but where it does not have to be market driven or competitive. [...] Knowledge creation in schools is the creation of knowledge by students for their own use. [...] To the extent that knowledge created in schools has value beyond the classroom where it was created, it enters into a barter economy. [11]

Context as a decentered center. The idea that internal motivation is in conflict with goal-directedness (from Tennant [12], cited in Blondy) seems somewhat dubious if we consider the reciprocal effect of environment on character development described by Benkler and Nissenbaum [13].

Meta-learning as a font of knowledge. Continuing this idea, gaining skills, employability, or a good reputation, seems to be a straightforward self-oriented way to enhance one's quality of life. But in fact, even these motivations come from somewhere. In a proper analytics of a learning or production landscape, we ought to ask: what learning? and why this learning?

Peers are equals, but different. Benkler describes three necessary features for peer production: (1) the potential objects of peer production must be modular; (2) the modules must be small in size (noting that heterogeneous granularity will allow people with different levels of motivation to collaborate by contributing smaller or larger grained contributions); (3) the integration mechanism must run at a fairly low cost (either through automation or enforced social norms).

There are parallels in paragogy. The choice to work in a small closed group (as described in e.g. [14]) versus the choice to work as a group embedded within a larger commons (as described in e.g. [15][4]) has to do with the question: how *much* difference do you want to confront while engaging with the learning process?

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[4] Cf. http://tiny.cc/wikisymteach

Learning is distributed and nonlinear. The view of fluid social contexts advanced by Engeström [3] as a move beyond the traditional "communities of practice" view is quite compatible with the most famous peer production virtue, freedom (cf. [13]), which is what allows people to function in a distributed and nonlinear fashion relative to a learning or production "ecosystem". Star and Griesemer [16], on whom Wenger drew heavily as he was developing the idea of community of practice [17], describe their view as "ecological". One key difference between Star/Wegner on the one hand and Engeström on the other has to do with the nature of boundaries. In the community of practice view, *boundary objects* exist to effect translations or initiations. In Engeström's view, attention is drawn to boundaries that remain in flux (via an ongoing process of co-configuration) or which are blurred (e.g. by a blurring of consumer and producer roles).

A closely related idea from Engeström is that sociality revolves around concrete "shared objects", as opposed to e.g. abstract connections between people (cf. [19]). Combining this with the idea of basho, we come to the at once intuitive and powerful idea of a context or environment as the largest shared object. An environment that is co-created by its inhabitants is likely to be a particularly meaningful and valued place.

Realize the dream, then wake up! Blurred boundaries make it difficult to pinpoint a universally-applicable definition of "success". However, as Schmidt points out, measurable things like code commits can be used to make reasonably objective evaluations about participation in open source software projects [10], and we can expect to find other similar measurables related to modular contributions to other types of commons-based peer produced artifacts [18]. It is may be in some ways more challenging to measure the (equally necessary) contributions to integration and coordination.

4   Paragogy and Learning Analytics

We now come to the paper's main application of paragogy, namely, to produce an outline that can give shape to the effectively infinite possibilities of learning analytics (henceforth, LA).

Context as a decentered center. George Siemens defines learning analytics as "the use of intelligent data, learner-produced data, and analysis models to discover information and social connections, and to predict and advise on learning." [20]

Measuring a student's progress in a given learning environment, whether it is centralized (Freshman to Senior) or decentralized (Padawan to Jedi), should suitably indicate the context of that student at each point. Progress may be defined relative to a context of the activities of other participants in the environment. In a straightforward case, LA will be established and maintained relative to a changing collection of goals that are defined by an instructor or facilitator. LA will themselves be a nontrivial part of any learning context that employs them, suggesting that transparency about the way they are used will be an important factor to consider.

Continuing, student and instructor LA will increase institutional effectiveness, one example being the project Paul J. Williams is working on, "to supply student and organisational 'learner analytics' functionality to schools so that the decisions they make about the application of time and dollar resources amongst competing priorities can be better supported and justified. Institutions could see results for whether money invested in technology, teachers, facilities and more yields an improvement in learning for students, or not."[5]

While applications of LA based on standardized tests is currently important, hopefully with more study the field will become more sophisticated and allow for a more holistic evaluation of learning than what is produced by standardized tests. In particular, this raises provocative question as to how best to measure school success.

Bereiter emphasizes developing a context that includes functional help for thinkers and learners, as opposed to applications of recieved wisdom about thinking or learning. He feels that thinking aloud research shows promise as a way to see just how people actually think ([11], p. 348). Paragogy suggests a broader view on thinking aloud: instead of traditional didactics, in a peer-based context, speech flows in a network, and thinking is done in an inherently social way.

Meta-learning as a font of knowledge. Another definition given by EDUCAUSE's Next Generation learning initiative is "the use of data and models to predict student progress and performance, and the ability to act on that information".[6]

In short, the meta-learning principle is the most obvious application of LA: the more effectively we can do LA, the more we learn about learning.

Peers are equals, but different. Not only can LA be used to measure an individual student's successes, failures, and hours invested, they can be applied in relation to data about peers, including peer-facilitators or teachers (e.g. in connection with suggestions or critiques). LA could be used to pair up weaker students with more advanced ones, or to help learners with overlapping interests find each other in the crowd. Threshold values could be set to indicate when a student might be allowed or asked to move from a mentored to mentoring role. Measurements can also be made of how well students work with their peers, or how much they have individually contributed to the learning environment.

Data on how different learners appear to learn best could be combined with information on how certain tutors work to find the best pairing. Various other sorts of recommendations are part of the subject of a significant body of ongoing research [21].

Learning is distributed and nonlinear. LA, especially attention metadata, can measure how much a student stays on topic, and give feedback on how these attentional investments pay off in the long-run. When logged into the class wiki, do they work for an entire hour on one page, or do they move around? Topics

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[5] http://groups.google.com/group/learninganalytics/msg/fbd3385b8a86785f
[6] http://nextgenlearning.com/the-challenges/learning-analytics

a student touches on but later abandons should be kept track of (for instance, because they may be useful later).

Students can show off their learning on things they may not have a degree in. For example, someone who majored in English in college who wants a career change can show an engineering firm school they independently completed "90% of the work towards a Journalism BA" to prove they have the skills and motivation for an entry-level job in public relations.

To get to point where a system can give feedback of this nature, goals need to be specified and agreed upon. Long-term goals would probably be easy enough, e.g. "I want to learn Japanese." It is harder to break a task into steps, and the first step is often the hardest. Corneli suggested to look for "the simplest step (that you can actually do) that gets you toward your goal."[7]

Students can then share that step however small, and once achieved, can chose another one along the way. These patterns can be studied to find LA that will show a learner their percentage towards e.g. fluency in Japanese.

Realize the dream, then wake up! We feel this is the key to combining LA and paragogy: a student should explicitly spell-out their motivations/goals and then keep track of their progress towards reaching them. LA will help students have a clear way to know how close they are to realizing their dreams, and to have a way to showcase their achievements to the rest of the world. In cases of trouble, LA should help identify how changes in behavior can help.

To think highlight here one possible large-scale application, we can imagine creating paragogical accreditation standards for learners, along the lines of those used for businesses by the Better Business Bureau.[8] This could come from a system to that would keep track of the kinds of courses people might like to take; and furthermore, courses could require people to ante up a certain level of commitment before the course would run. The degree to which people follow through on their commitments over time would determine their credibility rating.

5   Conclusion

We explored connections between paragogy and peer production, and paragogy and learning analytics, and showed how paragogy can intertwine with these to open new avenues for productivity, learning, and evaluation.

5.1   Next steps for the authors

We both plan to try running courses on Peer 2 Peer University again when the next round begins in January 2011. We will write syllabi that encourage paragogical activity while generating LA for evaluation. Another avenue we are

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[7] http://www.p2pu.org/general/node/5571/document/10225
[8] http://www.bbb.org/us/bbb-accreditation-standards/

exploring is creating our own learner profiles, as suggested by Siemens [20].[9,10] Building on his framework, we will endeavor to maintain an outline our learning goals, steps to complete them, and criteria for evaluation. We will do what we can to encourage P2PU to support learner profiles across the board.

The ideas from Section 4 will be further developed in an extensive case study by the first author on commons based peer-production in mathematics, cf. [22].

5.2 Implementing paragogy

We encourage the research community to test our ideas in practice of various forms. Some ideas for paragogical design include:

1. Establish a group consensus for expectations/goals/social contract of the course and how each of them should be evaluated at its conclusion.
2. Have learners designate learning goals that they then commit to stick with.
3. Formalize a process for assisting peers (e.g. responding to questions, giving feedback on publicly posted work).
4. Develop explicit pathways for learner feedback to translate into changes to the learning environment.

Acknowledgments

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[9] `http://en.wikiversity.org/wiki/User:Arided/Learner_Profile`

[10] `http://en.wikiversity.org/wiki/User:Charles_Jeffrey_Danoff/Learner_Profile`

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