

# Collaborative and Individual Learning

## *Mixing the Two*

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Abstract: What is the right mix of individual and collaborative learning? This position paper will explore how online platforms can mix the two approaches, addressing problems inherent to each while increasing the learning. Approaches to collaborative learning can be differentiated by the type of coordination that is required, either tight or loose (Alterman and Larusson, 2013). Tightly coordinated learning tends to be more collaborative and loosely coordinated activities have more of an individual orientation. Modifying platforms of either extreme can achieve better balance between the individual and collaborative features of a learning activity. Heuristics are presented that support these kinds of transformations; blog and wiki-based platforms are used to ground the discussion. Also considered is the sequence of learning and how mixed platforms better prepare students for future learning.

## 1 INTRODUCTION

There are advantages to both collaborative and individual learning, but how should they be combined? The think-pair-share (Kagan, 1989) – where the instructor poses a question and the students think alone for a minute, then discuss their answers with a seat mate, and then return for an open discussion with the entire class – is an example of an in-class method that combines individual with collaborative learning. What are the trade-offs between alternative styles of collaboration? This position paper will explore how online platforms can support the mixing of individual and collaborative learning.

Any online joint learning activity is a mix of individual and collaborative. The pedagogical scenario can influence the balance of individual and collaborative that emerges in the online learning environment. The platform itself predisposes the participants to engage one another in manner that requires greater or lesser amounts of coordination and convergence in understanding. From this perspective, collaborative learning can be differentiated by the amount of coordination and convergence of thought that is required, either tight or loose (Alterman and Larusson, 2013).

In a tightly coordinated collaboration, the students work closely together as a unit. They work together in a joint problem space to create a shared understanding. An example of a platform that supports tightly

coordinated collaborative learning is a wiki.

The reduced costs of coordination in a loosely coordinated activity make it less work to collaborate. The students work relatively independent of one another, enabling greater coverage and diversity of thought, while developing a collective “sense” of the course material. A student blogging platform is an example of a loosely coordinated collaborative learning activity.

This position paper focuses on methods for constructing mixed collaborative learning platforms. The position is that such systems have the advantage of both individual and collaborative learning and reduce the disadvantages of either one to the exclusion of the other. The discussion will center on how to make a blog-based learning platform more collaborative and a wiki-based one more individual. A later section will consider stages of mixed platforms as preparation for additional learning activities.

## 2 TRADE-OFFS

Both individual and cooperative learning have advantages (see Table 1). The individual learner has greater autonomy. As she does her work, she can more fully develop her own ideas. Working alone gives the student a sense of ownership, making the student feel more invested, responsible, and engaged. It also pro-

vides opportunities for the student to develop her personal identity – she is the one who is doing this and it represents her in some way. Finally, different students have different styles, and they pace themselves differently: working independently means a student can work according to her own way.

Table 1: Both have advantages.

Individual	Collaborative
greater autonomy	inter psychological; common understanding
personal identity	work in proximal zone
ownership	(meta) cognitive skill
work at own pace	multiple viewpoints
work according to own cognitive style	social cohesion/ solidarity

Cooperative learning also has many potential advantages (Slavin et al., 2003); for the purposes of this article the terms “cooperative” and “collaborative” are treated synonymously. A key advantage has to do with notion of the zone of proximal development (Vygotsky, 1980). The zone of proximal development is the difference between what you can learn alone and what you can learn in collaboration with peers or an “instructor.” Take a skill like reading (Cole and Engeström, 1993). A child first learns to read in collaboration with a more accomplished reader. Over time the child learns how to read alone. The trajectory of learning is from social and collaborative engagement to individual skill (Kaptelinin and Nardi, 2006). With peer collaboration, learners in the same proximal zone can work together. The skills of the learners are different but can be complementary. Students learn from one another and increase the amount they learn because the sum of their skills allows them to learn from more difficult problems. Externalization and the sharing of constructions enable students to develop cognitive and metacognitive skills collaboratively (Stahl, 2006; Suthers, 2006; Ludvigsen et al., 2015). The students are exposed to multiple viewpoints and perspectives. The social cohesion/solidarity that can develop in small groups can both increase engagement and reduce alienation (Slavin et al., 2003). The social elements of the situation can also increase motivation and the discipline of the group can be a powerful addition to the self-discipline required to succeed at any extended project.

There are issues for both approaches to learning. There are plenty of trade-offs. Working individually creates a greater sense of competence for those that succeed but perhaps at the cost of other students being able to learn things they could have in their zone of proximal development with peer collaboration. En-

abling students to work at their own pace and style reduces the potential causes of conflict in the classroom but perhaps at the cost of a more disciplined and coordinated approach to working. Working alone simplifies the problems of coordination but working “alone” outside of the school system is more of a rarity. Assessment and feedback on individual student work is more responsive to the individual student’s performance, but it also more labor intensive. Cooperative projects may reduce the load with regards to grading and feedback, but decisions about credit assignment and feedback for specific learners is more difficult to achieve.

There is no inherent reason, however, for individual and collaborative learning to be an either/or. The advantages of each are in many ways complementary: some of the negatives of one are the positives of the other and *vice versa*. A learning platform that fuses the right mix of individual and collaborative learning activities could achieve many of the advantages of both, while simultaneously addressing the deficiencies of each one. With the right mix, an individual learner can both maintain control of his work and, in cooperation with other students, extend the range of problems that he can solve. Or a student who is stuck can sample the space of other student’s work to look for alternate perspectives on an assignment. Or a student who is creative can develop her own ideas with the aid of feedback from her peers.

### 3 TIGHT AND LOOSE COORDINATION

Both tightly and loosely coordinated activities involve collaboration.

Small groups (roughly 5-8) can work together in close collaboration, learning things that would be difficult for the students to learn individually (Stahl, 2006). Virtual math teams chat online working together same time/different place in a joint problem space in a tightly coordinated collaborative space (Stahl et al., 2011). Students collaboratively writing a science article using a wiki is another example of a tightly coordinated collaboration (Forte and Bruckman, 2006). Argument-based dialogue systems (Scheuer et al., 2010) and discussion forums (Guzdial and Turns, 2000) are yet other examples. In each of these situations, there is a joint problem space amongst the students (Teasley and Roschelle, 1993; Sarmiento and Stahl, 2008). The interaction amongst the students, and their communication, enables cooperative problem solving and grounding (Baker et al., 1999), and meaning-making (Koschmann, 2002).

The key characteristic of tight coordination is that there is a convergence of effort and understanding amongst the learners. The trade-off is that the learners have less independence. So on the scale of highly collaborative to complete individual independence, these kinds of activities are decidedly collaborative (Dillenbourg, 1999).

In a loosely coordinated activity there are fewer coordination requirements. The students still cooperate but they do so in the context of developing their own ideas. When the students connect and share with one another, they can, with fewer commitments or constraints, collaboratively acquire knowledge and build skills, while distributing amongst their classmates knowledge relevant to their learning. Rather than converging towards a single solution/understanding, the students maintain independent solutions and viewpoints (Alterman and Larusson, 2013).

The key characteristic of loosely coordinated learning activities is that learners maintain their autonomy, have greater independence. They do not have to compromise. They are free to develop their own ideas and approach to the assignment. The interactions amongst the students produce some common understanding or skill set, but the reduced dependency between the contributions of the learners adds variety to the understandings and skills that emerge. So on the scale of highly collaborative to complete individual independence, these kinds of activities are collaborations that maintain the independence of the learners (Alterman and Larusson, 2013).

## 4 BLOG-BASED: LOOSELY COORDINATED

The main features of student blogging are writing a post, commenting, and community (Deng and Yuen, 2011). Students work in a closed blogging community. The structure of the interaction is either a community blog, where everybody posts to the same blog, or a collection of individual blogs, with each student owning her own one.

In its basic form, blogging is a loosely coordinated activity. The writing part is done by individuals. The posts have a social orientation: the intent is to communicate with other members of the community. The students have personal and intellectual ownership of their work (Ferdig and Trammell, 2004; Williams and Jacobs, 2004). As a participant in a blogging community, a student develops a social presence as an individual person. (Cameron and Anderson, 2006). The students can browse in the blogosphere, reading and

commenting on each other's posts. Commenting is collaborative and interactive. The heuristics discussed below increase the number and quality of interactions amongst the students.

### 4.1 Heuristics

Each of the following design features maintains the individual's control of their own work (autonomy and identity) while increasing learning and improving the collaborative elements of the activity.

**Small Groups.** With smaller groups, all students are likely to receive feedback (Larusson and Alterman, 2009). For a large, or even moderate-sized class, looking at all the posts can be an overwhelming task. With smaller groups, navigation becomes easier but at the cost of fewer alternative viewpoints to sample. This cost can be compensated by other phases of the learning activity.

**Drafting.** In the basic blog-based architecture, students write their posts and then collaborate by commenting on each other's posts. An alternate scheme is to enable open access to all phases of the writing process: students publish drafts of their text, interacting with each other as they write (Alterman and Gunnarsson, 2013). With this scheme, students receive and generate peer feedback while writing; they also can access multiple viewpoints on the same assignment. The students still own their own work and have autonomy, but they can also learn from the open collaboration that is enabled. An additional constraint is to require each student post a draft of their work before they can access the draft work of other students and collaborate. This feature ensures students will develop their own thoughts before exchanging ideas.

**Promotions.** With large classes, finding content in the blogosphere that is good and relevant can be more difficult. Also, the distribution of feedback is uneven and assessment becomes more costly.

Enabling students to *promote* each other's work is a heuristic that addresses these issues: students can attach *likes* and *badges* (Antin and Churchill, 2011) to each others' contributions when the reader considers the content noteworthy and wants to publicly label it as such for the community. The promotion feature is simple to use and easy to implement and understand. Studies have shown that students will actively promote content; promoted content tends to be of higher quality; the promotion data is used to navigate; and some students are reliably better at assessing quality

than others (Gunnarsson and Alterman, 2014; Gunnarsson and Alterman, 2013).

**Rubrics:** Where promotion identifies good content, rubrics can improve the quality of the peer feedback and interaction. Scaffolding structures the learning activity, making the activity simpler by focusing students on particular tasks and ways of doing them (Pea, 2004). A rubric is a kind of scaffolding that provides a format for giving feedback and assessing quality. It foregrounds, for both the assessed and the assessor, the important elements of the learning task.

## 5 WIKI-BASED: TIGHTLY COORDINATED

The basic features of a wiki platform are the text, the history of changes, and the discussion page (Leuf and Cunningham, 2001). The text is produced as an aggregation of small contributions and edits. Each contribution is published when saved, and can subsequently be edited, rewritten, or added to by other participants. A contributor may choose to *revert to* any earlier version of a wiki page by clicking on it in the history list. Because wiki-writing produces a single text, negotiation is required to produce an agreed upon text (Bientzle et al., 2014). The community can discuss and debate edits to the page on the discussion page. For a large wiki community like Wikipedia, the division of labor for most articles is not explicitly managed, but the contributors can informally adopt different roles (Welser et al., 2011). In an educational context explicit roles can be assigned (West and West, 2008; Altanopoulou et al., 2014).

### 5.1 Heuristics

A heuristic like drafting, which increases the interaction and collaborative features of blogging, is built into wiki writing. By its very nature, wiki writing provides fine grained open access to writing of the text. In an educational context, the small-group heuristic also has value for wiki writing: too large a group reduces the number of opportunities for the individual learner to make significant contributions. Small groups also make it harder for “shirkers” to hide but perhaps at the increased cost of commitment imbalance (Capdeferro and Romero, 2012). Methods that script the revision process for wiki writing (i.e., collaborative scripts) have been shown to improve the quality of the problem solving interaction (Wichmann and Rummel, 2013). Promotions and rubrics, which

support navigation, feedback, and assessment in blog-based writing, are less necessary for wiki-based writing because the setup of wikis, to a certain extent, supports recognition, joint problem solving, and focused interactions. Nevertheless, promotions like merit badges and rubrics for assessment, may achieve better team harmony, more thoughtful conversations about the text as it is written, and reliable peer assessments (De Wever et al., 2011; Kriplean et al., 2008).

**Division of Labor.** Wiki writing, in itself, is very collaborative with fewer opportunities for student autonomy, individual ownership, and the development of identity. A heuristic that introduces more of the advantages of individual work is to divide the tasks amongst the student wiki writers.

Suppose the assignment is to collaboratively write a book review using a wiki by small teams of students. Each review has two parts. The first part is a 1000 word summary of the central argument of the book. The second part is a 500 word summary of each chapter in the book. All students on a team are responsible for the text that summarizes the central argument of the book. Students within each working group will also be assigned one of the following roles for each chapter that the working group is asked to review: primary author, copyeditor, or content discussant. The *primary author* writes the summary for the chapter. The *copyeditor* proofreads the text produced by the primary author. The *content discussant* provides a commentary and raises issues on the the discussion page for the chapter summary he is assigned to discuss.

By dividing the labor, the students are able to do a mix of individual and collaborative tasks. They co-author the summary of the central argument, but are individually responsible for summarizing the chapters.

## 6 AFTER A STAGE OF MIXED LEARNING

During the semester, instruction can be divided into a sequence of learning activities with earlier activities preparing the students for later ones (Gagné, 1973). Each learning activity in the sequence serves a different function and can vary in the mix of individual and collaborative tasks.

A stage is a collection of one or more related learning activities that are centered on a particular topic or skill in preparation for a later set of learning activities (Alterman and Gunnarsson, 2013). An

important element of what constitutes a stage is that at the completion of the stage the students have reached a point where they have some kind of common understanding of the topic or they have achieved a common skill.

Collaborative learning activities that mix with individual ones have the promise of creating common understanding and skills with a fair distribution. Individual learning activities ensure that all the learners have the opportunity to learn the requisite knowledge or skill for subsequent actions. Collaboration increases the likelihood that learners working in their zone of proximal development will have acquired the requisite knowledge or skill.

In what follows, we look at three learning activities that benefit from being next in the sequence after a stage of mixed learning. One of them is tournaments. The other two – writing papers and project-based learning – depend on the commons of student content created during the mixed collaboration.

### 6.1 Tournaments

After the completion of a mixed collaborative/individual homework assignment, each learner can be a judge in the tournament (Li and Lam, 2005). As a judge, a student is randomly assigned a handful of assignments to assess – all assignments are written under a pseudonym. Each judge fills out a *peer assessment form* for each homework that he is assigned to review; the peer assessments are written anonymously. The answers to the questions require at most a few sentences.

Dividing the assignment in this way is a form of staging. In the first stage the students engage in a mixed learning activity that produces a common understanding. In the second stage, the students engage in analytic and reflective activities that improve their meta-cognitive skills for future related problem solving activities (Collins and Brown, 1988). For blogs, the tournament is to judge the homework/post of other students; if the small-group heuristic is used during the earlier stage, the posts that each student judges must originate in a working group other than the one in which the judging student participated. For homework that is produced by a team on a wiki, the students will individually judge the entries produced by other teams.

### 6.2 The Commons

(Mixed) collaborative activities create a *commons* of content (Bruckman, 1998; Scardamalia and Bereiter, 1994); alternately it is referred to as a warehouse

(Williams and Jacobs, 2004). The commons is a resource for all the members of the community that provides agreed upon content for subsequent stages of learning activity. Below we discuss two examples of learning activities where the commons created earlier are of specific value.

**Writing Papers.** In one case study of a blended course, students used a blog-based discourse community to discuss readings and lectures during the semester. Later, students used the content as a resource for writing papers (Alterman and Larusson, 2013). The data showed a significant increase of reading activity within the blogosphere three days before the deadline of the paper. For 16 of the 25 students, their work in the blogosphere foreshadowed a majority of the concepts that appeared in their two papers. The largest group of students benefited most from the reading.

**Project-based Learning.** Staging can be an important element of course design in a project-oriented class. In a blended course on human computer interaction (HCI), a team term project was an iteration of working with the methods and skills taught in the first part of the course (Alterman and Gunnarsson, 2013). During the first stage of instruction, the students worked on a mixed collaborative/individual platform, learning techniques, methods, and argumentation of HCI. During the project stage, the students developed skill and knowledge in more depth than what they attained from the less contextualized homework assignments. There were roughly 50 students in the class.

The collaborative environment was blog-based. Students posted drafts of their homework and could comment and promote each other's work. After the homework was finished, there was an official period of commenting and filling out peer assessment forms; each student was assigned two posts to assess. While doing their homework, the 25% most active readers read almost a third of the draft posts produced by other students. The second quartile read roughly 16% of the posts. During the commenting phase, the most active readers read an additional 4.9 posts beyond the ones they were officially assigned to comment and evaluate. As the students transitioned to the project stage of the course, they were given two weeks to write a term project proposal. During the transition, large numbers of students used the blogosphere content to support their work. While doing the project, the students continued to use the commons created during the homework stage of the class.

## 7 SUMMARY

Table 2 summarizes the how the various modifications effect the mix of individual and collaborative learning. Heuristics like small groups and drafting increase collaboration for loosely coordinated learning activities like blogging. Dividing the labor of the students, or assigning roles, increases the individual elements of a tightly coordinated learning activity like those based on a wiki. Other modifications improve the mix for both loosely and tightly coordinated learning. Small groups improve the distribution of feedback for blog-based learning and increase participation for wiki-based. Regardless of the style of interaction, collaboration scripts, rubrics, and tournaments improve feedback, meta-cognitive skill, and/or provide assessment support. Promotions provide useful feedback, recognition for student achievement, assessment support, and solidarity.

Table 2: Summary

Heuristic	Blogging	Wiki
Small Groups	better distrib. of feedback	increase participation
Drafting	increases collaboration	
Promotions	feedback; recognition; highlight good content assessment support; solidarity	
Rubrics	meta-cognitive skills; improve quality of feedback; assessment support	
Div. of labor		plus individual
Tournament	meta-cognitive skills	
	ensures feedback for all students	
	assessment support	
Commons	resource for later learning	

## 8 CONCLUDING REMARKS

Future work will focus on interleaving collaborative activities that are more oriented towards the development of the individual with learning activities that are more oriented towards the collaborative. In a study underway now, the students alternate between wiki-based and blog-based writing activities. During the semester, the students read four books on Internet & Society. For one book, the students work on a wiki platform to write summaries of the book. For the next book, the students use blogs to write opinion pieces. For the third book they write another review, and for

the forth another blog-based opinion piece. At issue is how the alternation between learning activities with different mixtures compares in the acquisition of knowledge and skill to a sequence of just one or the other type of activity.

Creating mixtures of learning activities that vary in the composition of individual and collaborative is a necessary component of any community learning platform (Bielaczyc and Collins, 1999). We are currently developing a community learning platform with a curriculum for citizen science and environmental studies. The platform we are building will support learning to plan and reason about water management environmental studies. Within this context, issues concerning the mixture of individual and collaborative learning are “front and center” because students work together virtually at different times from different places, with different backgrounds, expertise, interests, and educational levels.

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