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Abstract

Online courses may be criticized for failing to engage students. Faculty members teaching in the classroom often employ a number of strategies that capture the interest of students, but may find the migration to the online environment a daunting prospect. This paper describes the transitioning of two common strategies to engage students in the classroom – jigsaw groups and problem-based learning – from face-to-face to online courses in sociology and soil science, respectively. The paper discusses the challenges and opportunities that were found to be common to the implementation of both these strategies online, and provides suggestions for faculty considering this transition.

Keywords: online teaching, engaging teaching strategies, sociology, soil science, problem-based learning, jigsaw groups

Introduction

The growing popularity of online courses in higher education often involves the transformation of face-to-face (F2F) courses to the online environment, with all its attendant opportunities and challenges. For students, adequate reading comprehension and written communication skills, familiarity with appropriate technology, good organizational skills, and self-discipline are important for success in online courses (Schrum & Hong, 2002). From the perspective of faculty, identification and implementation of strategies that engage students is at the crux of student learning in virtual courses (Robinson & Hullinger, 2008). Student interactions have been identified as one of the most significant challenges in distance learning (Liu, 2008). Students in distance courses often report a sense of isolation and low motivation (Boulos, Taylor, & Breton, 2005). Pedagogical approaches that spark the interest of students and generate interaction through discussion and/or collaboration can foster a sense of community in the online environment (Swan et al., 2000).

General education programs at colleges and universities often promote the acquisition of particular skills, such as oral and interpersonal communication, appreciation of diversity, reading comprehension, data interpretation, and critical thinking. Keeping students engaged in online general education courses may present a particularly difficult challenge, especially for courses that rely on class discussion for students to master course content, develop the skills necessary for reasoned debate, and enhance their oral and interpersonal communication skills.

Effective faculty have identified and adopted pedagogical strategies that engage students, promote critical thinking, and support student interactions in F2F courses. These may include case studies, whole -class and small-group discussion, jigsaws, and project- and problem-based learning. The dynamic

nature of the interactions among students and between students and instructors – the unscripted give and take, unanticipated lines of argument, the non-verbal communication cues, and the quick pace of discussions – that are responsible for the effectiveness of these strategies seems dauntingly difficult to translate from the bricks-and-mortar to the virtual classroom, even for the most experienced instructor.

The following case studies present two approaches to transitioning two successful engagement strategies – small-group jigsaw discussions and problem-based learning (PBL) – from the classroom to the online environment. The cases are drawn from the authors' experiences teaching sophomore-level, general education courses in two different disciplines – sociology (SOC 212 *Families in Society*) and soil science (NRS 212 *Introduction to Soil Science*) – in F2F and virtual modes. The authors have used these techniques in their F2F courses for at least a decade, after learning about them through the Instructional Development Program at the University of Rhode Island. More recently they have incorporated these strategies into online versions of their F2F courses – a process supported by a series of university-sponsored workshops on online teaching and learning in which the authors participated. This paper describes the engagement strategies, their implementation in the context of the F2F version of the same courses, and their migration to the online version. A discussion of the common challenges and opportunities faced in this transition is presented from the point of view of the instructors/authors and their online students, and suggestions are provided for those considering the adoption of these strategies in online courses.

Successful Classroom Engagement Strategies: A Literature Review

Jigsaw Groups

Jigsaw is a method that emphasizes peer learning by dividing the labor of learning among small groups of students (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978; Aronson & Patnoe, 2011; Cohen, 1986; Crouch & Mazur, 2001). It can be used in two basic ways: as a discussion/peer-learning experience as an end in itself, and/or a work team that produces a tangible group product or project. In both cases, the jigsaw group arrangement allows students to help each other understand information about corresponding topics by apportioning the work of learning – each student in a small group is responsible for acquiring expertise about a different topic, theory, or reading, and sharing their expertise with others in the group.

As a work team that produces a tangible result (e.g., a group-constructed paper or project), the jigsaw process gives students practice in negotiation, communication, and teamwork. Research on the jigsaw method of peer learning suggests that students can benefit more from the jigsaw group approach to learning than they might benefit from trying to master each topic by themselves, because each can focus her/his expertise; subsequent discussion centers more on overlapping themes among topics and leaves time for higher-order comparisons and critical thinking (Choe & Drennan, 2001; Hedeen, 2003; Perkins & Saris, 2001). Slavin (1995) categorized this method as based on a social cohesion explanation of learning.

The jigsaw activity is organized by breaking a class into several groups and assigning each group a different, but linked, topic. Each student may be asked to complete a short individual assignment about the assigned topic. This individual assignment can be graded in order to give students motivation to prepare well for the subsequent jigsaw experience, and often it makes sense to include an individually graded component in the jigsaw exercise.

The jigsaw group exercise involves two steps (Figure 1). In the first step, students assigned the same topic meet in "expert groups" where they strengthen each other's expertise about their assigned common topic (Cohen, 1986). In this group, students compare notes on their analysis of the topic in order to gain confidence in their ability to represent their topic in the second step.

They bring this expertise to the second jigsaw step, where new small groups are composed of students who each have become "experts" on a different topic. In the jigsaw groups, members take turns contributing their unique expertise about each topic. As a group, they look for similarities and differences between their topics, and discuss these comparisons. This discussion moves beyond descriptive differences between the topics, and leads to more general, higher level comparisons that use course themes and theories.

If the jigsaw experience is organized as a workgroup, instructions are given about how to organize the group process that will produce the group product. Additionally, an outline for a group project, along with

a grading rubric for the project is provided. Although the group write-up can be graded or ungraded, research finds that the jigsaw group method is most likely to result in effective learning when a "group reward," or graded assignment, is added (Mattingly & VanSickle, 1991; Mikulecky, 1998). Students are advised that all members of the group are given the same grade. The discussion component of the jigsaw exercise in a F2F course is difficult to grade, as it requires close observation of each group during class, as well as a sophisticated grading rubric. This type of participant observation is nearly impossible to accomplish in courses with large numbers of students. However, in theory, and dependent on class size, the technique is versatile because the written component, the discussion, or both, may be graded, depending on the objectives and resources of the instructor.

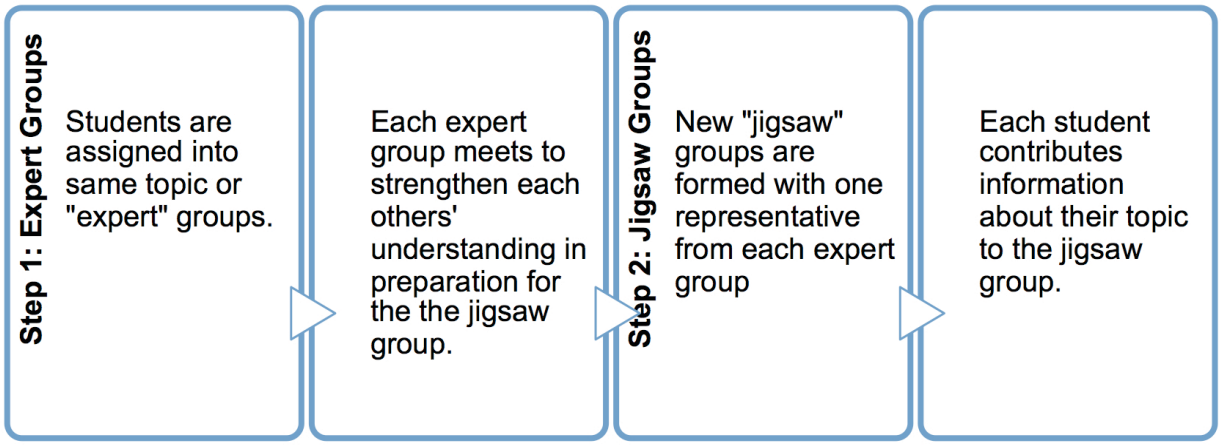


Figure 1. *Jigsaw group process for the F2F class*

The first step of the jigsaw process (the expert groups) may be skipped; however, early in a semester this type of peer learning gives students practice in how to contribute effectively to discussions, validates and enriches students' own understanding of the material, and thus builds confidence in their ability to participate. Including this step often makes a big difference in how well the second step – the "true" jigsaw – works.

One common issue with jigsaw in the F2F classroom is that inevitably a student will be absent on the day of the jigsaw groups, thus the instructor needs to be prepared with a brief write-up of each topic that can be distributed to groups with missing members. Often it doesn't matter if one person is absent – the same learning goals can be achieved with one piece missing – but students tend to feel more comfortable having all the information at their disposal.

Problem-Based Learning

PBL arises from the modern constructivist philosophy of education promoted by Dewey (1916). The constructivist approach has been identified as an effective approach to distance learning (Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Tam, 2000). Notably, it has been adopted successfully in professional education (Barrows, 1996; MacDonald & Isaacs, 2001; Williams et al., 2011). Like soil science, professional practice in medical, educational, and other fields often involves an interdisciplinary, integrative approach to solving problems. Because soil science is an integrative discipline, it requires that students draw from their knowledge of mathematics and basic and applied science – physics, chemistry, biology, ecology, and geology – to understand the properties of soils and the processes that take place within them (Amador & Görres, 2004). Furthermore, professional soil scientists work on problems that are complex and ill defined, and thus require that the individual develops the ability to apply knowledge in the proper context. Problems in soil science are often addressed by teams of individuals with different professional training, such that successful solutions require not only technical knowledge, but the ability to communicate this knowledge effectively to experts and non-experts alike (Amador & Görres, 2004). As such, the PBL approach to soil science education promotes not only learning of course content as students work through the problem, but also improves their written, oral, and interpersonal communication skills. The PBL approach has been praised as an exciting, new way to teach introductory soil science (Baveye & Jacobson, 2009; Field et al., 2011). PBL has been identified as a successful

student engagement approach in online courses (Duffy & Cunningham, 1996), although its implementation is not always straightforward (Lefoe, 1998).

A typical sequence of events in a PBL classroom is a recursive process that may be summarized as follows (Pennell & Miles, 2009, p. 378):

What do we know? → What do we need to know? → How will we learn it?

These steps are repeated until the students develop a solution that is satisfactory to the group and instructor.

PBL represents an active approach to learning, and doing so in context, which has been shown to be effective in retention and application of information to solve problems (Strobel & van Barneveld, 2009). Class activities – discussions involved in sorting out and sharing what students know and do not know, its relevance to the problem, explaining and integrating new information into the group's solution, and presenting and defending the group's solution to their classmates – all reinforce key processes involved in deep learning (Tiwari et al., 2006).

The role of the instructor in the PBL classroom is that of a "guide on the side," a marked departure from the "sage on the stage" model of instruction in traditional lecture courses, as is the case in most active-learning environments (King, 1993, p. 30). The instructor facilitates group discussion, intervening as necessary to help students progress through the problem (Maudsley, 1999).

Case Study 1: SOC 212 *Families in Society*

The Jigsaw Method in SOC 212

Jigsaws have been used regularly in the F2F version of the *Families in Society* course (SOC 212) for the past 10 years. This is a three-credit introductory course that attracts majors from sociology and related disciplines as part of their program of study, and other students looking to fulfill a general education requirement. While the course has several learning objectives, the ultimate goal of the course is to help create citizens who are sociologically informed about family trends and family diversity. This goal necessitates that students are provided ample time to practice conducting sociology conversations. (These discussions are sometimes referred to as "party conversation," with a reminder that this type of social discourse is an integral part of participating in a democratic society.)

The F2F version of the course enrolls approximately 35 students, primarily sophomores and juniors. There is no textbook in the course – the course content is delivered through lecture material in the form of slides created by the instructor, which are posted in an outline form on the course's online site. Course readings come from an anthology assigned to supplement lecture material, and from which student assignments are drawn. Student learning is assessed by multiple-choice exams on the lecture materials, written assignments based on the anthology readings, and different types of class discussions that use the jigsaw model and are designed to help students relate readings to course themes and theories. Much of the critical thinking necessary to learn about families sociologically stems from the practice of "making the familiar strange" (Conley, 2011). Readings that examine family diversity bring unique perspectives to the learning process. Communicating differences among families, and finding commonalities within the differences, teaches a student to think more abstractly about their own family experiences as a product of time and place. These discussions also help students understand what families have in common as a social institution.

Even with required reading of monographs and textbooks, students tend not to complete reading assignments, and the assignment of an anthology may exacerbate this tendency. Thus, using jigsaws to frequently evaluate students' mastery of the course reading can be an effective strategy to make the reading more manageable for students and provide peer support in finding connections between their readings and course themes.

In F2F classes, the jigsaw assignment is done in a constrained amount of time, usually one class period, with discussion expectations and the outline for the group write-up projected in the room. The instructor visits each group several times to keep everyone on task and make sure everyone is participating. The F2F group assignment is either handwritten or constructed on a laptop computer during class, and it is submitted at the end of class.

F2F jigsaw experiences are assessed in different ways as the semester progresses. To allow students to become comfortable with the method without penalty at the beginning of the semester, the first two jigsaw

experiences are not graded. Instead, for these initial forays, a small participation grade becomes part of the course grade. For the four remaining jigsaw activities, some written outcome is graded; half the time the grade is based on initial, individually written assignments that inform the discussion, and half the time the grade is a group grade based on a written product from the discussion. For each type of assessment (i.e., individual or group), a small participation (i.e., attendance) grade is sometimes assigned as well. The actual group process of peer learning and/or teamwork, however, is not directly graded in the F2F version of jigsaw. Thus, in this F2F course, it is difficult to reliably assess each individual's contribution and the main course skill students are practicing: the ability to contribute effectively to social discourse.

Migrating the Jigsaw Method in SOC 212 to an Online Environment

The challenge in translating SOC 212 to an online format was to retain the ultimate course goal of creating sociologically informed citizens, but in a more isolated learning environment. It was important not to lose the valuable aspect of the F2F discussion that spontaneously takes place during F2F class time, which provides practice for students to talk about their lives in a sociologically informed way. Obviously, group discussion and a sense of community needed to be emphasized online. A question that was explored was whether or not the jigsaw activity could help accomplish this need in an online course.

To migrate the energy that emerges in the F2F class to the online course, it made sense to keep the class size low, perhaps even lower than in the F2F version. Thus, the online version of the course enrolls a maximum of 20 students. Other parts of the F2F course easily translated to online. For instance, the same anthology is used as the course book, and lecture slides are posted – in a more elaborate form – for the online students, rather than the abbreviated, outline form for the F2F students. As in the F2F version of the course, several multiple-choice exams constitute a portion of their course grades. Several jigsaw discussions, based either on an initial, individually graded assignment that informed the discussion, or on a group project resulting from the discussion, are part of both the F2F and online assessment experiences.

However, in the online version of the course, both large discussions and jigsaw groups are used more heavily, and these techniques are integrated as a strategy for engagement. Throughout the duration of the online course, students simultaneously contribute to two different discussions for each course topic. The whole-class discussion, based on the lecture slides, is how the online students "come to class." These discussions are posted on the discussion board and are graded using a discussion rubric. Simultaneous small-group discussions are arranged in a jigsaw format based on anthology reading assignments. As in the F2F course, the membership of the jigsaw groups is varied for each assignment so that all students have a chance to work with each other by the end of the semester. An individually written and graded assignment based on an anthology reading is attached to the jigsaw discussions and divides the labor of reading among the jigsaw group. Toward the end of the semester, the individual assignment is not graded, but forms the basis of a graded jigsaw group project – a synthesis of all members' articles are analyzed in a "Part Analysis" (see Appendix A).

Unlike in the F2F course, the group-learning *process* – the whole-class and jigsaw discussions – is graded, using the discussion rubric (Appendix B). The opportunity to formally assess engagement in the course through discussion is a significant departure from F2F assessment, allowing a more valid, reliable, and robust method to grade participation than is available in the F2F course. In the online version, 30% of the course grade is based on discussion (15% for participation in each type of discussion), in addition to assessments of written assignments (either individual assignments that inform students' jigsaw discussion posts, or group projects that result from the jigsaw discussion). These varied types of assessment indicate to students that their performance will be evaluated not only individually, but also on how well they contribute to productive group interaction and task accomplishment. This gravitas given to peer learning through discussion might represent a significant change in student expectations in how they "should" be evaluated. As one student articulated in the post-course reflection:

> *"The emphasis on posting in discussions certainly leads students to participate more than most would in a typical classroom setting, but I believe too much of our overall grade is based on our comments, rather than actual work completed throughout the course such as papers, analyses, etc. That being said, learning online and having everything saved in writing on your computer, allows for students to easily look back and recall what has been said, and then apply it accurately to their own statements."*

As research on jigsaw discussions suggests, in some ways the jigsaw method might work better online because students have more time to reflect on what others have written about, and discussion is more thoughtful (Chang, 2009; Mikulecky, 1998). The asynchronous nature of the assignment has several advantages. It allows no absences from the groups, and it provides students with more time to prepare and think about course concepts. Combined with the anonymity of an online format, it takes away some of the social awkwardness of both time pressure and uncertainty. In the post-course reflections, a student made this point:

> *"Normally I am the quiet kid in face-to-face classes. Having the Internet as a shield (so to speak) emboldened me to speak up without feeling apprehensive about expressing my opinions. Speaking up allowed me to better understand class concepts, especially when other students would comment on the same ones, or elaborate further on small points I would make."*

Asynchronous discussions give students as well as instructors time to be more thoughtful. As another student commented:

> *"Everyone had different opinions and you could see why/how they were thinking what they were thinking. It actually really helped me learn because when I didn't understand something I could always turn to the small group discussion to guide me. . . Reading other people's opinions really helped me learn better."*

On the same point, another student wrote:

> *"You really get to see/'hear' what your classmates think. Sometimes in classroom settings it is hard to hear people, or it is easy to zone out when people are talking. By reading everyone's comments you are forced to 'listen' and understand other viewpoints of the material."*

Additionally, the tangible discussion record is more informative for instructors about where confusion persists, and how students' learning is progressing. This information becomes useful in subsequent course revisions.

However, in the online course, students universally felt that their final jigsaw experience, where they had to construct a group-graded jigsaw assignment based on their anthology articles, was less effective as an online discussion. Students suggested that they be able to use the chat room feature of the course software to coordinate their efforts in real time. A student articulated well what many students felt:

> *"The only assignment I had some problems with was the Group Part Analysis. I like the idea of the assignment, but I think it would be much better carried out face-to-face than online. Conversations we had spanning over 2 – 3 days could have gone by quicker in person. However, I did like how members could post their parts in the forum, which made it easier to compose the paper itself (copy, paste, and edit)."*

This sort of feedback suggests that the peer learning aspect of jigsaws has some important advantages in the online format, but online teamwork may benefit from a combination of synchronous chat room and asynchronous discussion board-based dialogue.

Case Study 2: NRS 212 *Introduction to Soil Science*

The PBL Method in NRS 212

NRS 212 *Introduction to Soil Science* is a three-credit course required for students majoring in environmental science and management and wildlife and conservation biology, and is taken as an elective by majors in landscape architecture and environmental horticulture. The F2F course has been taught using both lecture and PBL methods. The latter attracts between 40 and 50 students, mostly sophomores, juniors, and seniors. The PBL approach involves students working in permanent groups of four to five students per group to solve five authentic problems in soil science. An example of the problems given to the students can be found in Appendix C. The problems are delivered to the students in three or four stages. Class time is spent primarily on small-group and whole-class discussions working toward solutions to the problem. In a typical classroom sequence, students are given the first part of a problem, which is read aloud to the whole class. Groups are then given approximately 20 minutes to develop a list of things they know and how this information is relevant to the problem, and a list of things they need to know and how this missing information is relevant to the problem. Each group is then asked to present their lists to the whole class, highlighting what is different about their lists. Students are encouraged to enter into discussions with the presenting groups. After the whole-class discussion, groups

reconvene to decide how to proceed with acquiring the information they need. In the next class meeting, groups are given about 20 minutes to integrate the information they have obtained into answers to the problem, which they then present to the whole class. This discussion is followed by distribution of the next part of the problem.

Assessments come at the end of every problem and include: (1) writing a group paper describing the solution to the problem, which can be revised for a better grade; and (2) an in-class, multiple-choice exam in which student mastery is initially assessed individually, with students subsequently answering the same exam questions as a group. Students evaluate each other's contribution to the group through an anonymous peer evaluation process; the resulting score is used to adjust the group paper grade. Although the bulk of class time is taken up by discussion, discussions are not graded.

The role of the instructor in the classroom version of NRS 212 is to facilitate small-group as well as whole-class discussions, in the process getting students to think critically and in an integrative manner about all aspects of the problem. The instructor helps direct the discussion so that students are able to discover answers for themselves. Because many students are used to the "sage on the stage" pedagogical model, they often turn to the instructor for answers to difficult questions, to provide expert information, or for reassurance that their understanding is correct. This is particularly true in the early stages of the course. In most instances the instructor responds in a manner that helps students answer their own questions, often by pointing to knowledge they may already have, or by asking questions that will lead the students to find out the answer on their own.

Migrating the PBL Method in NRS 212 to an Online Environment

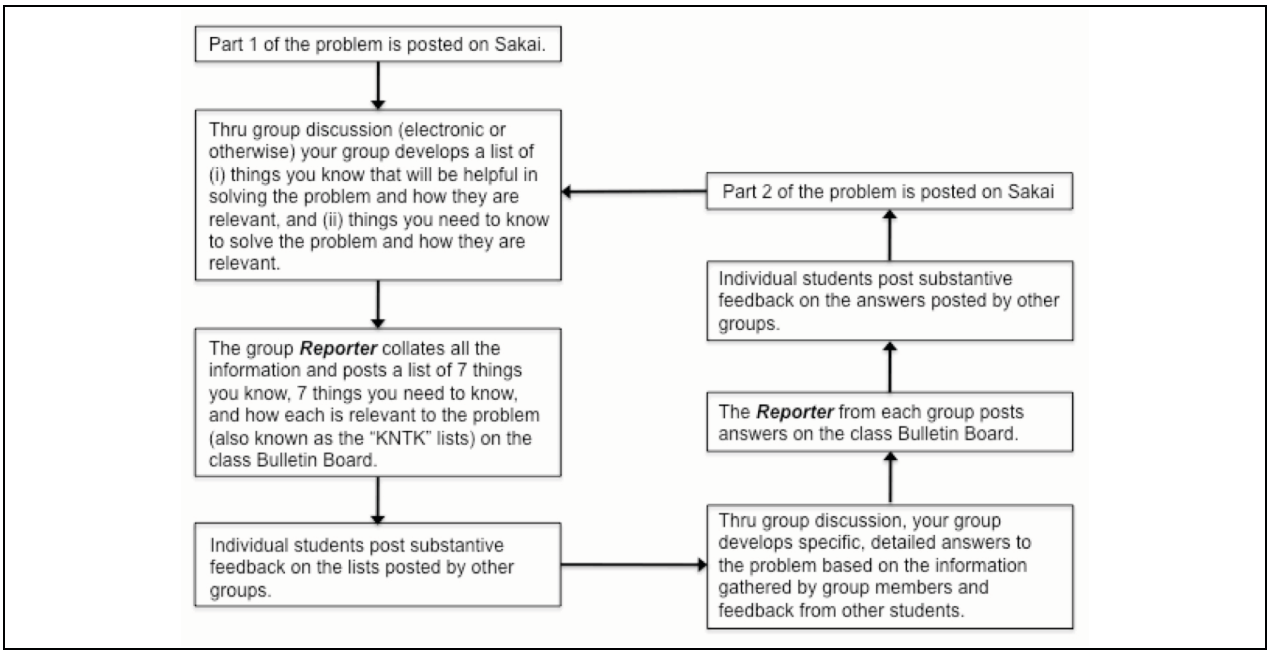
It is difficult to imagine transplanting the real time, spontaneous give-and-take of class discussions that are the crux of PBL from the classroom to the asynchronous world of online education. In fact, it is not possible. Part of the appeal of online courses is their asynchronous nature, which frees students and instructors from the constraints of scheduled lecture times and discussions limited by the length of a class period. The absence of immediacy online, however, need not interfere with the PBL process. If structured properly, the use of PBL online provides a number of advantages over the F2F version.

The online version of NRS 212 has been taught over a 10-week summer session for the past four years using PBL. The migration of PBL from F2F to online retained the requirement that students learn the content in the process of solving authentic problems. Successful online courses require that students be engaged, and solving the problem becomes the activity around which the online interaction revolves in NRS 212 (Figure 2). In the online course students are divided into permanent groups of three or four and are given the first part of a two-part problem. Each group is asked to discuss their views using the chat room tool on the course web site and produce lists of things they know and need to know (KNTK lists), and to explain how each of these is relevant to the problem. Groups have to identify a Reporter, whose job is to collate and post this information. Once these are posted on the course Discussion Board, students are asked to post substantive feedback on KNTK lists. The instructor then posts comments on the group KNTK lists and on the feedback posted by individual students, in an effort to clarify concepts, correct errors of fact, and avert avenues of fruitless inquiry. Groups are then asked to post their answers to the problem, followed by individual students posting substantive feedback on these answers. This round of postings is followed by comments from the instructor on group answers and student feedback. The process begins again once Part 2 of the problem is posted.

Unlike the F2F course, class discussions – group and individual postings – are graded, and account for two thirds of the course grade. At the end of every problem, groups produce a paper describing their solution to the problem (which can be revised for a better grade) and take an individual, multiple-choice test; these assessments account for the remaining one third of their grade. Peer evaluations are used to adjust the entire grade for a particular problem.

As is the case in the F2F course, solving the problem provides students with the motivation to learn the course content, and the online discussions are structured to promote interaction within groups and among students in the whole class. Because engagement and sustained student participation can be difficult to achieve in an online course, the grade distribution in the online course is heavily weighted towards assessing – and rewarding – these activities. Furthermore, interactions are recorded in the online environment, facilitating evaluation. Thus, whereas in the F2F course students receive no points for small-group or whole-class discussions, their online discussion postings make up the bulk of their grade

online. In addition, by weighing peer evaluations more heavily in the online course, students are encouraged to be particularly aware of the importance of being a good contributor to group activities.



Note. "Sakai" refers to the learning management system, i.e., the platform used for online teaching.

Figure 2. *Flowchart illustrating the PBL process in the online version of NRS 212*

As in the classroom, the online version of NRS 212 requires that the instructor facilitate the discussion, intervening as necessary to help students think critically and develop their own solutions. Facilitation and intervention in the online course are accomplished primarily by posting of instructor feedback on KNTK lists and answers to problem questions. These provide an opportunity to not only "push" students to develop a better understanding of a particular concept, but also to dispel inaccuracies and to bring the discussion back on track as necessary. Posting of feedback by the instructor can also help students develop a better sense of the depth and breadth of discussion – and tone – expected in their interactions, particularly early in the semester. This sort of modeling by the instructor can be expected to improve online interactions, both in terms of content and civility.

Because the course is asynchronous and all communication is written, the instructor has more time to consider the amount and type of feedback necessary to help students learn the content and develop their critical thinking skills. In this sense, the asynchronous online environment allows the instructor to develop a better perspective on how class activities are progressing. This comes at a price: the immediacy of moderating classroom discussions is absent online, as is the opportunity to engage students in individual discussions in the moment, at least within the current course structure. Thus, the instructor needs to be aware of the shift in the mechanism by which facilitation is accomplished in the classroom and online in order to perform his or her role effectively.

Discussion

Although these courses are taught in two different disciplines and the strategies they employ for online engagement are also quite different, there are a number of similarities in the experiences of transitioning from F2F to online. The online environment provides a number of advantages over F2F, including:

- *More time.* The asynchronous nature of the online environment in the authors' courses has meant more time for the students to engage with each other as they participate in these activities. With the temporal and spatial constraints of the F2F class removed, students are under less pressure to understand, explain, respond, or ask questions quickly. Instructors are also free from the need to provide feedback, intervene, or arbitrate at a moment's notice, as often happens in the lively – but time-constrained – classroom discussions. Given extra time for reflective thought often enables students to answer their own questions, facilitating deeper learning.

- *Higher quality interaction.* Based on the instructors' observation of student interactions in the F2F and online versions of their courses, it is clear that the extra time students have in the online version results in discussions – among small groups and the whole class – that are generally of higher quality than in the classroom. Students have more time to reflect on questions and develop their arguments, which often translates into discussion postings that demonstrate a better understanding of content and concepts. In these ways, discussions are more complete and better reasoned than those in F2F courses. From the perspective of the instructor, not having to react immediately to students also translates into better-conceived responses to class discussions.
- *Better assessment and feedback.* Online courseware keeps a record of all entries by participants – chat rooms, forums, and bulletin board postings. This information is generally not available in the F2F course, making it difficult to conduct student assessments based on class discussions. Often the pace of F2F student interactions can also make it difficult to keep discussions on track and honest. Although there are various methods by which interactions may be assessed in the classroom, the ease of availability of transcripts of all online interactions means that instructors are able to evaluate students' critical thinking skills more frequently and more precisely, with less effort. In the case of PBL and jigsaw assignments, this allows the instructor to evaluate not only the final product of discussions – a paper describing the solution to the problem or a group analysis of central themes – but also the process that led to that product. In addition, the asynchronous nature of online courses means that the instructor can intervene in a timely manner after spotting erroneous statements, dead-end lines of discussion, or interactions that are starting to go off topic.
- *A level playing field.* Both of the F2F strategies described engage students through verbal interactions, which tend to favor participation by more extroverted students who are quick to react, often at the expense of participation by more introverted or shy students. The online environment allows students who would otherwise not participate in discussions in F2F courses to make a more substantial contribution to the class. As one of the students in Families and Society put it: *"... you could always state your opinion online and not get embarrassed by your other peers because they do not agree with your ideas, so I guess learning online gave me a new found confidence."*

Transitioning to online also uncovers some other common challenges:

- *Fatigue.* The gains in time for reflection and constructing thoughtful answers online also mean that some of that energy from live discussion in F2F is lost. It can be difficult to keep students on task and the discussion interesting. Thus, an important skill to strive for is a balance between giving online students time to post and moving the discussion forward to maintain interest and momentum. The challenge of figuring out the best timing can be exacerbated by the more rapid pace of the summer terms during which the courses given as examples are taught, and requires some judgment calls and a lot of practice.
- *Participation.* Non-participation and late participation can compromise learning in group activities like jigsaw and PBL, which ideally involve timely contributions of all group members to learning. This is magnified in online courses because it is easier to "hide" by simply not answering queries from fellow group members. Waiting for people to post can slow down and even derail the process. This can be addressed by instituting rules about when the first and subsequent posts must be made, and a peer evaluation system through which group members (or instructors) can reward good citizenship and penalize underperforming group members. It is also possible to institute a chat room experience to facilitate the process. Furthermore, because the course management software keeps a transcript of all conversations, verification of late submissions or non-participation in discussions is straightforward in the online environment.

Although these next points are generally true of online courses, because the engagement techniques described here are discussion-intensive, they become even more important:

- *Reading comprehension and written communication skills are critical.* Students need to be able to read and write effectively so that others can understand their contributions. Like other comparisons between F2F and online, the importance of reading and writing comprehension is greater in online contexts. A clear warning to students early in the course (or ideally, before they

register) as to the reading and writing demands of the course should help students self-select. Self-assessment tools that provide feedback to students about their readiness for online learning are available and can serve to inform students about what is expected of them.

- *Off-topic discussions.* Discussion can get off track and stay off track longer because of the asynchronous nature of the courses. Many students in the online course make their contributions late at night when instructors are not likely to respond. This may be addressed by shifting the discussion posting deadlines so that students finish commenting early in the evening, or for instructors to weigh in early in the morning. In general, keeping a close eye on discussions is necessary.
- *Sensitivity in communication is key.* Interaction in an asynchronous online course is completely lacking in non-verbal communication, which accounts for the majority of human communication. Students (and instructors) need to be particularly aware of what they write and how this may be perceived to avoid misinterpretation. This is especially true in courses that employ activities like PBL and jigsaw, in which the give-and-take among students is an integral part of the learning process. Initial mention and periodic reminders of this fact as the course progresses can help prevent problems.

Conclusion

The truth be told, engaging students is a two-way street, no matter what the technique or venue. Like many instructional techniques, there are advantages and disadvantages in translating these engagement strategies to an online environment. Understanding the strengths and pitfalls of how to engage students online continues to motivate the authors. Moreover, as cultures evolve toward more virtual interaction, these engagement techniques may become more broadly applicable as ways to create and sustain all types of social bonds. Figuring out how to create online communities of interaction and shared responsibility thus becomes even more critical to developing more sustainable modern societies.

Although the techniques presented here were first established successfully in F2F courses, their enactment in the online courses has recursively informed how these techniques are now used in the F2F version of these courses. For instance, the *Families in Society* F2F course has moved to a more hybrid course structure in order to incorporate the advantages of online jigsaw groups, with online jigsaw discussions now added as part of F2F course requirements. Similarly, online discussion forums have become part of upper-level F2F soil science courses, which also employ a PBL approach, extending the interaction beyond the bricks-and-mortar classroom.

As online learning becomes more common there can be pressure to emphasize its cost-saving potential through teaching larger classes with little student interaction. In contrast, these engagement techniques emphasize what should not be lost as we move into this brave new world – a vibrant, intellectual learning community. Engaging students in online instruction might just keep online education from becoming a dull, isolating experience for students, and deliver on the promise of technology.

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Appendix A: Instructions for Jigsaw Group Assignments (Part Analyses) Used in *SOC 212 Families in Society*

General Overview of This Assignment

The Part Analyses, written collectively by the group, should:

- Provide a general overview of the Part. That is, the topic of the Part should be summarized, and the course themes illustrated by the Part should be mentioned and briefly discussed.

  Answer the questions: What is the theme of the Part? What course themes are illustrated by the Part?

- Each of the articles should **briefly** be summarized; their contribution to the Part, and their similarities and differences noted. Make this part very brief – one or two sentences about each article is sufficient. (This means you have to know the thesis of each article.)

  Answer the questions: Why did the editor include each article in the Part – that is, what does each article uniquely contribute to the theme? How are the articles different from one another, and how are they similar to one another?

- Course concepts and themes should be related to the Part and to the articles.

  Answer the questions: What course concepts are demonstrated across each of the articles? How do the articles reflect diversity in family structure and interaction? How do the articles illustrate commonalties in what families are and what they do (the purpose of families)? How do they illustrate the impact of social location, and the idea of social construction? How do these articles individually and as a collection in the Part, illustrate the theme of Ferguson's reader (shifting the center)?

Suggested Outline for Part Analyses

1) Introduction and overview: Brief summary of the Part, including identifying the course concepts to be discussed later.
2) Brief (one or two sentences maximum) description of each article's thesis and conclusion ("bottom line").
3) Include what contribution each article makes to the Part:
   - How are the articles similar and how are they different?
   - What course concepts are illustrated by each of the articles?

   ***** Organize this section by course concept, not by article! ***** For example, you might write something like this:

   > *Each of these articles was chosen for this part because they shifted the center about how divorce is thought about in our society. The Adams and Coltrane article demonstrated this concept by ..., while the Yodanis article used the same concept this way ... Finally, Walzer and Oles' article shifted the center by ...*
   >
   > *In addition to the articles' use of shifting the center, all of the articles also illustrated how divorce is socially constructed ...*

   There are at least three or four course concepts that each article has in common. Talk about at least three concepts that are illustrated across all three articles. (The example above contains some possible concepts, but you might choose others to talk about.)
4) A brief conclusion: How the articles fit together to illustrate course and book themes.

How Might Each Group Accomplish This Group Assignment?

In my face-to-face course, these Part Analyses are written in class in groups. I think we can adapt this technique to our online format. Here's how I envision each group might complete this assignment.

For Part 8 (Divorce and Remarriage), there are four people in each Part Analysis group. Each person in the group has read a different article. When the group discussion for this assignment opens, you've all got to work together to produce the group assignment. My suggestion for your group process follows:

Your Part 8 group project discussion will occur from Wednesday to Monday. You will have to meet online regularly during this time.

To start, on the day the group discussion opens, each member of the group needs to post a one or two sentence description of their article: the *thesis statement* and *"bottom-line" conclusion*. In addition, this initial post needs to describe what *course concepts your article illustrates*. You can probably do both of these tasks in the same post.

Then, in the second phase of the group discussion each member of the group should comment on each other's posts and come to some agreement about what concepts all three articles have in common, how the articles are similar, and how they are different. Perhaps you can take a day to complete this task. This is the most active phase of your discussion – you need to check in with your discussion several times this day. I suggest you do this part before the weekend.

Finally, you need to put your discussion in the form of an assignment that gets sent to me in a dropbox. Between the four of you, divide this remaining labor:

- One of you should write up a summary of the thesis of each article (you can cut and paste from your discussion about your articles here, and then edit it).
- One of you should write a brief introduction about the Part, taken from information in the Introduction to the Part, and a brief summary paragraph (one paragraph for the beginning and one for the end of this analysis/paper).
- Two of you should write up the concepts your articles have in common (again, you should cut and paste and edit your discussion about the concepts).

(Follow the overview and outline for this assignment, as described above.)

Don't forget that one of you needs to send me the completed assignment in a dropbox as a Word document! **Be sure to include your names on the assignment.** Make sure you decide who will do this. **Please let me know in a message to me whose dropbox to look in for the assignment.**

I'll be a part of each of your group discussions, and I'll try to keep everyone on track. But you all need to make a commitment for these Part Analyses to participate daily during the discussion.

My plan is to give everyone in the group the same grade (5 points maximum) for these analyses. However, if there are problems with participation in the group, I reserve the right to grade accordingly. Your individual contributions to the discussion will be graded individually (5 points maximum). Thus, the total number of possible points on this assignment (discussion and Part Analysis) is 10.

Appendix B: Online Discussion Grading Rubric Used in SOC 212 *Families in Society*

Criteria	Exemplary	Sufficient/Effective	Emerging; Needs Work
Number of postings, timeliness of postings	Student responds at the beginning of discussion period and participates throughout the discussion with at least the minimum number of required posts.	Student responds during the discussion period and meets the standard for the minimum number of posts.	Student responds only at the end of the discussion period and does not meet the standard for the minimum number of posts.
Application of course concepts	Student **always relates the course content to the concepts of the course**. Student creatively applies what he/she is learning, rather than relying on stereotypes about families.	Student **sometimes relates course content to the concepts of the course**. Student sometimes relies on stereotypes rather than using course concepts.	Student **does not relate course content to the concepts of the course**. Student relies on stereotyped thinking and does not apply what he/she is learning. Could have made the post without taking the course.
Facilitation of interactive discussion	Posts encourage and facilitate interaction among class members. Student responds to more than the minimum number of students in a way that makes connections and builds on others' ideas.	Postings respond to other members of the online community. Student responds to the minimum number of learners in a way that makes connections and builds on others' ideas.	Postings rarely interact with or respond to other members of the online community. Postings respond to questions posed by the instructor only.
Risk taking	Student takes risks by sharing what he/she does not know, in addition to ideas and opinions. Student asks questions, responds to suggestions posted by others in reply, and actively supports other learners.	Student takes risks by sharing what he/she does not know, in addition to ideas and opinions. Student asks at least one question and responds to at least one reply.	Student takes risks by sharing what he/she does not know in addition to ideas and opinions, or takes risks only by sharing what he/she does not know.

Note. Thanks to Professor Glen Ramsay for sharing a previous version of this rubric.

Appendix C: Sample Problem Used in NRS 212 *Introduction to Soil Science*

Introduction

Antonio Flores is a wealthy, politically connected developer in southern Rhode Island. He owns quite a bit of land, much of it inherited from his father, who bought a lot of swampland for cheap in the 1960s. His intention was to fill-and-build, but a weak real estate market and increasingly stringent wetland regulations prevented the elder Flores from realizing his original dream. So, the son is now trying to make up for lost time.

Antonio was particularly happy when he read in the *Providence Urinal* that some politicians were pushing for reclassification of wetlands, so that about 20% of current wetlands would no longer be considered such by regulatory government agencies. This, in conjunction with an anticipated renewed demand for unaffordable housing in South County, has led Antonio to call on the services of Slash and Burn, Inc., the fledgling environmental consulting firm you just started working for. He has a 50-acre property he would like to develop, but it may be "too wet." He's hired SBI to help him with that little problem.

Part 1

Señor Flores has data from a report that he commissioned from another consultant ten years ago, when he last tried to get approval for development of the property from the RI Department of Environmental Management. However, years of bad experiences with regulatory agencies have made Antonio a secretive and slightly paranoid man. Because he's afraid SBI may screw up his potential deal (who knows what you may rat to your cousin that works at DEM), he has not given them all the information he has - only what is shown in Tables 1 to 3, and the following information:

> *The sampling sites were established along a 100-ft transect perpendicular to XXXX Brook in a northerly direction up a 5% slope. Site 1 was 20 ft from shore, Site 2 was 50 ft from shore, and Site 3 was 80 ft from shore. A 5-ft deep trench was dug with a backhoe to reveal the soil profile. Sampling was performed on August &*(($@#~.*

Anita, your boss at SBI, has given you this information and asked you to look it over. All she tells you is that these data may end up helping Mr. Flores "push the wetland envelope" so he can build more houses on his land, which in turn may mean more business for SBI.

After a brief look at the information, you are in a sour mood: "Well, isn't this just grand. I learned all about the freakin' wetland plants and birds and furry animals, but I slept through dirt class. And here it is, coming back to bite me in the butt on my first job. Where the hell did I put that expensive-piece-of-crap Brady and Wyle, Willie, whatever? I guess it's a good thing that RIBCO wouldn't buy it back."

Unable to locate your old soil science textbook under the piles of dirty clothes, you get on your laptop and start looking for videos on soil in YouTube. You run into one starring "Pirate Peat" (http://www.youtube.com/watch?v=-jbbO6VaMeU) – something about a treasure and soil horizons, and a bunch of other stuff. Who knew there was so much information about soils online? After some more muttering, you come up with some questions that may help you get through your first consulting project:

- What soil forming processes are responsible for the differences in soil color: (i) within a soil profile in this area; and (ii) among soil profiles?
- What are "mottles"[1]? What physical and chemical processes can result in their formation at this site?
- What is the significance of the root data?
- Is there useful information in the horizon designations and depths?
- What sort of parent material did these soils develop from? Did they all develop from the same type of parent material?
- Which soil forming factor(s) dominate the formation of these soils?

A few days later Anita asks you to figure out whether any of the soils at the site could be considered hydric[2] based on the data provided by Mr. Flores. The main objective – which Anita has made very clear – is to minimize the total amount of wetland area in the property: a 40- or 50-ft fringe of "buildable" land on that side of the property can mean the difference between skiing in St. Moritz and sipping single-malt

whiskey, or drinking warm Yoo-hoo and snow tubing at Yawgoo Valley. Because you will be presenting your findings to various state and town regulatory and advisory agencies, you need to make a strong scientific argument to support your decision.

Which site has soil that could be considered hydric? Make sure that you evaluate all the pertinent criteria in making your case, including horizon depth and designation, texture, color, and presence of roots, as well as position in the landscape.

[1]Also known as redoximorphic features.
[2]As defined by your textbook.

Table 1. *Description of soil profile at Site 1*

Depth (inches)	**Horizon**	**Soil Property**			
		Textural Class[1]	Color[2]	Roots	Comments
0-6	Ap	Gravelly sandy loam	10YR 4/3	Many fine roots	
6-10	B21	Gravelly sandy loam	10YR 5/6	Common fine roots	
10-17	B22	Gravelly loamy sand	10YR 6/4	Few fine roots	
17-60	C	Very gravelly sand	10YR 6/2	None	Stratified

[1]U.S. Department of Agriculture (USDA) system.
[2]Using Munsell color chart.

Table 2. *Description of soil profile at Site 2*

Depth (inches)	**Horizon**	**Soil Property**			
		Textural Class[1]	Color[2]	Roots	Comments
0-7	Ap	Sandy loam	10YR 2/2	Common fine roots	
7-15	B21g	Sandy loam	10YR 6/2; mottles common (7.5YR 5/6)	Few fine roots	
15-19	B22g	Sandy loam	2.5Y 6/2; fine, distinct mottles common (10YR 5/6 and 7.5YR 5/6)	None	
19-60	IIC	Gravelly sand	10YR 4/4; coarse, distinct mottles common (7.5YR 5/8)	None	Stratified

[1]U.S. Department of Agriculture (USDA) system.
[2]Using Munsell color chart.

Table 3. *Description of soil profile at Site 3*

Depth (inches)	**Horizon**	**Soil Property**			
		Textural Class[1]	Color[2]	Roots	Comments
5-0	O2	Muck	2/1		
0-6	A1	Mucky sandy loam	10YR 3/2; few, fine mottles along root channels (10YR 5/6)	Not determined	
6-19	C1g	Loamy sand	10YR 5/1; mottles (2.5Y 5/4, 10YR 3/4)	Not determined	
19-60	C2g	Coarse sand	10YR 6/2; mottles (10YR 4/3)	Not determined	I'm hungry

[1]U.S. Department of Agriculture (USDA) system.
[2]Using Munsell color chart.

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