Identifying Shifting Roles, Expectations, and Practices in the Early Adoption of Challenge-Based Learning for Online Courses

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Abstract: Challenge-based learning situates learning in authentic contexts, with opportunities to meaningfully apply new knowledge and skills. However, the shift from traditional modes of instruction to challenge-based learning (CBL) introduces new roles, expectations, and practices for both instructors and students. In this design-based research study, we use an ethnographic lens to investigate feedback from instructors and students about their first semester with CBL. We identified common difficulties, strategies, and suggestions to incorporate into future design iterations of CBL courses, along with opportunities for deeper investigation into students' learning processes and development of agency within CBL courses.

Introduction

Challenge-based learning (CBL) is a form of inquiry learning that situates learning in authentic contexts where students are asked to engage in real-world tasks or challenges that result in work-relevant "deliverables." Our CBL approach is theoretically grounded in an understanding of learning and cognition that is deeply situated, "being in part a product of activity, context, and culture in which it is developed and used" (Brown, Collins, & Duguid, 1989), with the underlying goal of helping students to develop adaptive expertise that can readily transfer to real-world settings (Edelson, 2001; Martin, Rivale, & Diller, 2007). As an inquiry learning approach, CBL emphasizes students' agency within authentic contexts and assessments to provide a learning environment that motivates students to construct knowledge that can be meaningfully applied in the future (Barron et al., 1998; Blumenfeld et al., 1991; Edelson, 2001; Martin et al., 2007). For example, students learning to develop a website must also learn how to communicate with clients and manage time, which are necessary skills in the workplace. Positive outcomes associated with CBL include improvements in learning attitudes, conceptual outcomes, and knowledge sharing (Martin et al., 2007; O'Mahony et al., 2012).

While CBL helps students to learn and apply knowledge and skills in meaningful ways, transitioning from traditional instruction to CBL can be difficult. Instructors must develop challenges that highlight key disciplinary principles that transfer across contexts while balancing open-ended inquiry and specific learning objectives (Blumenfeld et al., 1991; Edelson, 2001; Martin et al., 2007). Instructors must also create and/or assemble supporting materials along with formative and summative assessments that reflect real-life tasks, so that students can seek content, construct knowledge, and manage their increased agency in learning (Barron et al., 1998; Edelson, 2001; Martin et al., 2007). However, determining an appropriate level of scaffolding may be difficult for instructors (Belland, Kim, & Hannafin, 2013; Hmelo-Silver, Duncan, & Chinn, 2007). Scaffolding is essential for inquiry learning, but understanding how and when to scaffold students is challenging, especially in light of communication differences across online and in-person courses (Hmelo-Silver et al., 2007; Ya Ni, 2013.). To help students manage their coupled responsibilities for inquiry and learning processes, instructors may highlight disciplinary thinking, embed guidance, and structure complex tasks within the course (Hmelo-Silver et al., 2007).

In addition, the transition to CBL for both students and instructors can be problematic for more practical

reasons. In postsecondary settings, and particularly in online courses, the dominant instructional model of lectures, readings, problem sets, and multiple-choice assessments is deeply entrenched (Blumenfeld et al., 1991). This model defines well-understood roles, routines, and sets of expected transactions for both students and instructors. The impact of this instructional model on our focal population of adult learners who are returning to university studies for professional advancement has been well documented, with six-year graduation rates below 50% overall and less than 30% for part-time students (Miller, 2014). For this population, we hypothesize that the motivational and educational benefits of our CBL design approach may be particularly beneficial, yet we recognize that the shift to CBL requires significant shifts in expectations and practices (Belland et al., 2013; Blumenfeld et al., 1991). Taking a design-based research approach, this study focused on the first stage of transitioning to CBL for courses that support nontraditional students' professional studies. Our implementation plan included the integration of CBL into five online courses in the first semester, followed by 30 courses (online and in-person) in the second semester, with more courses planned. The plan involved major redesign of courses, including the development of challenges appropriate to course goals; the positioning of students in roles with greater agency, including control over project management; the creation of simulated email exchanges with clients, which gave students practice with real-life communication skills; the addition of formative feedback, which gave students opportunities to revise their projects; and incorporation of rubrics as summative assessments, which reflected course objectives and key content and skills for future contexts.

To systematically identify how to better support both students and instructors, as well as to improve the design of our CBL courses, this study sought to understand how instructors and students transitioned into CBL as a new instructional approach, especially in light of other demands on instructors' and students' lives, such as full-time jobs. As a first step toward understanding this transition, we conducted an ethnographic study of feedback from instructors and students, using a variety of data sources from the first semester of CBL implementation. Our research question was: What difficulties did instructors and students face in transitioning to CBL for online courses, and what insights can we gain to better support students and instructors? This question has theoretical implications for understanding how nontraditional adult students learn in online CBL environments, and practical implications for the design of courses that integrate CBL.

Methods

Participants and Context

Our participants included six instructors, an instructional designer, and nine working adult students involved in online bachelor's completion programs in information technology. The instructors taught sections of five online courses: Human Computer Interaction; Systems Analysis and Design; End-User Data Analysis Tools; Database Management Systems; and Web and Mobile Development. Five instructors were first-time CBL instructors, with three (Anna, Ryan, and Bill) also teaching a traditional section for comparison. Two instructors (Kyle and Tim) taught only CBL sections. Another instructor (LeAnn) taught a traditional section but was heavily involved in CBL planning. Section enrollment varied from seven to 21 students, with an average of 15 students per section. We obtained feedback from nine students about their first semester with CBL via interviews (three students) and surveys (six students). We interviewed only CBL students but distributed surveys to CBL and traditional students.

Data Sources and Analysis

We collected four types of data about the first semester of CBL implementation, as shown in Table 1. These data included (a) informal monthly "fireside chats" with faculty; (b) three months of online chat communication with faculty via Slack; (c) three student interviews; and (d) six student survey responses. We used a holistic approach to qualitatively analyze the multiple data sources, as informed by grounded coding (Strauss & Corbin, 1998). For the fireside chats, we transcribed the instructors' feedback and annotated themes within and across the chats. We also annotated transcripts of Slack communication, students' interviews, and survey responses, using themes from the fireside chats. We also noted emergent themes. We conducted open coding of themes across data sources and then collapsed codes into categories that represented initial difficulties, strategies, and suggestions for CBL adoption. We discuss these findings below.

Data Source	Participants
Monthly informal "fireside chats", via videoconferencing	Six instructors + research team
Slack communication	Six instructors + research team
Student interviews	Three students
Student surveys	Six students

Table 1. Data sources and participants for the first semester of CBL implementation.

Findings

We used an ethnographic lens to understand how instructors and students transitioned to CBL in online courses, with an explicit goal of identifying insights to better support and scaffold both learners and instructors adopting CBL. Our analysis identified five common difficulties involved in implementing CBL for the first time, which we discuss below. We also identified instructors' strategies for addressing these difficulties, along with suggestions for the future. Finally, we included student feedback separately to show how the instructors' transitions impact students' transitions. In discussing our findings, we have used pseudonyms to protect participants' identities.

Difficulties

We found five common difficulties among courses implementing CBL for the first time: (a) setting expectations, (b) balancing guidance and independence, (c) scaffolding levels, (d) scheduling deadlines, and (e) providing formative feedback. We discuss these difficulties here.

Setting expectations. Instructors noted initial difficulties with setting expectations for students and exploring options that would "inform [students] of what is expected of them." With the redesign, CBL courses included new structures (e.g., challenges), modes of communication (e.g., simulated email exchanges), roles (e.g., students role-playing employees, working with simulated clients, and instructors acting as mentors), and demands (e.g., project management, communication), and thus necessitated adjustment. One instructor, Bill, indicated that setting expectations was important:

> Because it's nontraditional. So if I'm in this CBL course, what's expected of me? And let them know up front, it's more independent. You do a lot of the work up front. You communicate. Your instructor is your mentor. It's not the weekly, "Let's do Chapter 5. Let's do Chapter 6." That kind of teaching. (Bill, Sept. 25 fireside chat)

LeAnn, another instructor, noted that early communication was key in helping students adjust to CBL:

> You know, if we could get everybody like, day one, when they get to college, give them a different experience, then they wouldn't be as likely to do that. So, I think that's just a matter of—they gotta get used to it. (LeAnn, Sept. 25 fireside chat)

A major part of setting expectations was helping students to adjust to new roles. With CBL, instructors expected students to take on the role of an employee, while instructors played the role of a mentor and/or client within the authentic challenge scenarios. The purpose of shifting these roles was to foster student engagement and retention, help students build "soft skills," and develop discipline-specific knowledge and skills within authentic contexts. Instructors emphasized to students that success in the course would prepare them for success in their future careers and workplaces.

> All of this education that you're doing is not for me, it's for you, because you have to go out there. And out there is where it's going to matter. And if you're good at this, you'll be successful. And if you're not good at this, you'll be less than successful. (Bill, Sept. 25 fireside chat)

> For me, it's much more like doing on-the-job training than it is a lot of the traditional instruction. Because they're, you know, in many ways what you're doing is giving these guys projects, and you're saying, "Here's the project, here's what I expect to see for the project. Here's how I'm looking for the results to come back." And then trying to structure it sufficiently so they can succeed with as much of their own work as possible, and as little outside doing-of-the-work by you as possible, and really more guidance than actual doing. (Kyle, Oct. 25 fireside chat)

> Because I think what it does on them, is as we're teaching this, we're teaching them to do some research. We're teaching them to make decisions. We're teaching them to manage their time. And those are all necessary soft skills that they need in the workplace. (Bill, Nov. 25 fireside chat)

With shifts in roles, the instructors stressed that students would need to develop more independence, and thus agency, in their work. The instructors expected students to attempt to solve challenges on their own, then ask for help, rather than ask for point-by-point instructions. Bill described this as such: "Don't look for somebody to say, 'Look, here's the answer.' Go find the answer."

Balancing guidance and independence. While instructors increased students' agency in tackling challenges, they also expected to provide guidance. This is a common feature with other inquiry-learning approaches, in which scaffolding is key to students' success (Barron et al., 1998; Belland et al., 2013; Hmelo-Silver et al., 2007). However, in this first stage of CBL adoption, instructors struggled to determine appropriate levels of guidance in their courses. On Slack, Kyle expressed that students felt "thrown into [the] scenario without more guidance." LeAnn added that "figuring out what's the right balance between handing them enough or handing them too much or not enough—[it's] always gonna be a little trial-and-error." Bill also expressed the need to strike a balance between increasing students' agency and providing support:

> But I'm resisting doing the actual instruction for some of where they need to go. And that's me, that's because, that's traditionally what I do, is provide instruction. "Here's how you do it." And some of the stuff is complicated, and, you know, I let them struggle a little bit, but I'm not going to take the boat too far away from them. And eventually I'm going to throw a life preserver and [say], "Look at this and see if it will help you." (Bill, Oct. 25 fireside chat)

Scaffolding levels. One way that instructors embedded guidance was by scaffolding the structure of the

course. Kyle described creating "bite-sized assignments" that broke down complex tasks into smaller subtasks. Ryan also noted how tasks were connected when situated within a challenge:

> If they've been at Northeastern up until the challenge based, our main focus has been quizzes, assignments, and not always connected from top to bottom. And when we went to challenge based, my whole attitude changed, because I was looking at every single task as a building block to the next task. (Ryan, Nov. 25 fireside chat)

Anna, another instructor, echoed this approach by intentionally scaffolding week-by-week tasks that built toward students' final projects. This approach was based on her own experiences in studying human-computer interaction.

> So I went about it a different way. I made it more structured. Even the challenge based, I put them on a strict timeline, because from my own experience, if you're a grad student, well if you're a student and you have other things going on in your life, it's just so hard to catch up if you don't do regular work. (Anna, Nov. 25 fireside chat)

Scheduling deadlines. When scaffolding tasks within challenges, instructors encountered issues with communicating and enforcing deadlines. As discussed on Slack and in the fireside chats, this was partly due to design tension between the instructional design team and the instructors. Removing deadlines facilitated the import/export of course materials from one semester to the next, but it also removed critical information for instructors and students. One instructor edited the course to include deadlines, but another instructor did not, citing his respect for the instructional design team's vision. We noted this as an instance of divergent attitudes about ownership of course design. However, all instructors noted that they posted deadlines in multiple places (e.g., syllabi, announcements) to communicate this information to students. They also noted that, in the real workplace, employees have multiple projects and more flexibility with deadlines, and that they might want to consider offering flexibility to students when students share about other demands on their time with their instructors.

> When you're in a job, you don't just have one project to work on. You have a bunch of them. So that's the same equivalent as taking two or three courses. "This week I work on Project A. I still know that my deadline, I know all my deadlines (I hope). And I don't do anything on Project B until the very end, maybe, the five weeks that we're working on." So what we've done is we've given them a more realistic, real-life situation, okay? (Ryan, Nov. 25 fireside chat)

> But [the student] was going through a million other things. It isn't the course that made him disappear, it was his life. (Bill, Nov. 25 fireside chat)

Providing formative feedback. Integrating smaller subtasks into courses allowed instructors to provide more formative feedback, especially for tasks that built on each other from week to week. The instructors also noted that asking for feedback is a critical workplace skill, and they actively encouraged students to send drafts of their work via email, discussion board posts, and web meetings. The instructors also connected the addition of formative feedback to the shift in roles:

> Because part of the premise is, you are not allowed to proceed with the code until you get approval from your client that they like your wireframe design. That's one of the caveats they have to deal with. If I don't approve your wireframe, you're gonna go back and do another wireframe. (Bill, Sept. 25 fireside chat)

> And a couple of them, I said, "This needs to be redone. You basically did a pencil sketch that showed me nothing. So, you need to clean that up, you need to make it more professional." So, I threw it back at them and

say, "Look, I'm the client. I don't understand what you're showing me. You need to show me something that I can understand." (Bill, Sept. 25 fireside chat)

In summary, students initially struggled with the expectations of CBL, including the shift toward increased student agency and open-ended inquiry. Congruently, instructors struggled with balancing the level of scaffolding in their courses. The instructors hoped to foster self-directed learning skills by asking students to engage in independent work before providing help. Instructors found ways to break down complex challenges into smaller assignments but had issues with scheduling and enforcing deadlines. This was echoed in students' feedback, as students working full-time jobs needed flexibility in deadlines. In response, instructors encouraged students to (a) send drafts of their work for formative feedback, and (b) share when demands on students' time increased, as the instructors identified iteration and communication as necessary workplace skills.

Strategies and Suggestions

The instructors shared strategies they used to address initial difficulties in adopting CBL. First, the instructors set expectations through multiple modes of communication, including their syllabi, videos, weekly announcements, and emails. They also used these communication modes to keep students engaged. Anna and Ryan held virtual office hours each week so that students could ask questions. Anna also created a separate discussion board for students to communicate directly with each other. The instructors also supplemented their course materials by creating demonstrations and adding suggested websites (e.g., w3schools.com for web development).

As mentioned earlier, some instructors built in "bite-sized assignments each week or two, to make it easy to see/feel a regular rhythm in the course (and to make sure people aren't letting a lot of learning wait until the last minute)," as mentioned by Kyle on Slack. This was echoed by Anna, who recommended building in interim tasks. Both Bill and Anna invited students to send drafts for feedback. Kyle also mentioned his plan to evaluate and revise assignments postsemester to determine when students might benefit from more guidance.

The instructors also shared suggestions for the future, such as setting explicit course goals and objectives to clearly identify course content and overlap between courses, especially prerequisites. The instructors agreed that a separate introductory module would be helpful in setting expectations for CBL courses. As part of setting expectations, Bill added:

I would suggest that they make contact early with the students and make it clear what this course is about. Not necessarily the topic, they know that before they enroll. But what the course—the methodology of the course—and how different it will be, and how much they have to give, even more of themselves than they would in a traditional course. I think that communication has to be up front. (Bill, Oct. 25 fireside chat)

The instructors also recommended building in self-assessment and project-management components for additional guidance in understanding students' progress toward course objectives, along with tracking students' knowledge and skills.

Student Feedback

Students' feedback in interviews and surveys echoed the five common difficulties described above. In this section, we add students' reflections to the instructors' thoughts.

Setting expectations and scheduling deadlines. Students noted that the demands of CBL were high, especially the amount of time required to complete challenges. Students compared completing these real-world challenges to having an actual job in the area. One student with full-time employment stated that one CBL course was manageable for her, but two CBL courses put her at her limit. She recommended that instructors reevaluate the level of work and timelines involved in each challenge. Students also agreed that weekly tasks were difficult to complete, but biweekly tasks helped students to stay on track in a flexible way. In thinking about flexibility, we noted that the surveys indicated that most students took these courses to fulfill a degree requirement. Our takeaway here is to rethink the balance between situating students in authentic challenges and helping them to progress toward their degrees, with other real-life demands in mind, and to build in support for time management.

Balancing guidance and independence, scaffolding levels, and providing formative feedback. Based on survey responses, most students did not have extensive prior knowledge or experiences relevant to the course. However, students indicated in interviews and surveys that the instructors were responsive to their needs, and that this communication was helpful. One student, Raj, mentioned that he also benefited from collaborating with other students who were working in his field of interest. However, Anika had a different experience after her teammate withdrew from the course, and she suggested redistributing teams when appropriate. Overall, our instructors reliably provided as-needed guidance; however, we will reconsider the advantages and disadvantages of collaborative components in future curricula.

Students appreciated having challenges that were relevant to their fields of interest. However, one student, Vince, disliked that a "practice" challenge was not relevant to the final project but scaffolded subsequent challenges. Vince also mentioned that he liked the open-ended nature of the course, but that the initial lack of structure was difficult for him to manage. Another student, Jeff, sent a follow-up email that stated that he liked the overall course format and progression in the assignments, but that he would have preferred more scaffolding throughout the course, including more structure, additional materials, and sample solutions. These comments point to different student perceptions in how much tasks are scaffolded and sequenced. Further analysis into how to best balance open-endedness with scaffolding is needed as we move forward.

Students' survey responses indicated that they used the textbooks, online searches, and instructor communication as primary resources for learning. Students disagreed on the usefulness of assignments, with several indicating that assignments were "busy work." Several students felt motivated in their program and prepared for the future, while others were not comfortable using new skills. Greater understanding of students' negative experiences will help guide us in addressing those issues more proactively, both in CBL course design and engagement with instructors.

Discussion

Challenge-based learning helps students to use their agency to explore solutions to authentic challenges and meaningfully apply new knowledge and skills (Brown et al., 1989; Hmelo-Silver et al., 2007; Martin et al., 2007). However, transitioning from traditional instruction to CBL may be difficult for students and instructors (Barron et al., 1998; Blumenfeld et al., 1991). For our study, we sought to document the difficulties instructors and students faced in transitioning to CBL for online courses, along with the productive strategies used in addressing these difficulties. We planned to use these insights to guide design-based revisions and to support other instructors in CBL implementations.

We found that instructors and students struggled with the expectations of CBL in the early weeks of the semester, although instructors noted that most students adjusted. Instructors also struggled with balancing guidance and independence; creating scaffolded assignments; scheduling and enforcing deadlines; and providing formative feedback. Students struggled with CBL's open-ended structure; increased agency; time management; and formative feedback. Overall, finding an optimal level of scaffolding remains a challenge in CBL (Barron et al., 1998; Hmelo-Silver et al., 2007).

Following our design-based research paradigm, we are integrating these insights about difficulties, strategies, and suggestions into future design iterations of CBL courses and professional-development materials for faculty. We plan to include additional scaffolds in the design of CBL courses, such as introductory modules that set expectations; self-assessments of course progress; and project-management tools. We will also share our findings with our CBL instructors so that they may further reflect on helpful strategies for adjusting to CBL, which will be used in training workshops for past, present, and future CBL instructors.

An unexpected benefit of the introduction to CBL, in conjunction with the fireside chats and Slack discussions, was that we (the research team) gained a new venue for engaging with faculty and richer dialogue around teaching and learning than with our traditional courses. The shift to CBL problematized several learning issues for the instructors, especially contextualization of course content and connections between assignments, and generated a shared dialogue among instructors about how to best support students' learning. We also identified opportunities to explore students' learning processes in more depth, especially in how instructors communicate expectations to students; how students collaborate with each other for team projects; and how different students use different resources to support their learning. Given the small sample in this study, we see these fine-grained investigations as opportunities for exploring online learning in greater depth, and especially for maximizing the experiences of nontraditional adult learners in professional degree programs.

Conclusion

Challenge-based learning may help nontraditional adult learners in online courses to reach their goals of developing applicable knowledge and skills for their field. However, the transition to CBL may be difficult for instructors and students. By examining instructors' and students' feedback, we identified key difficulties, strategies, and suggestions for the redesign of future CBL courses. We also found opportunities for deeper analysis of learning processes, especially regarding communication between instructors and students about course expectations, supportive materials, and collaboration.

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