Competency-Based Education in a Traditional Higher Education Setting: A Case Study of an Introduction to Psychology Course

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This paper presents a case study of a Competency-Based Education Introduction to Psychology course conducted in a small, private, traditional university in the western United States. Two competency-graded sections were offered, one online and one in the classroom. Eleven undergraduate students completed the online section, and 24 students completed the classroom-based section of the course. For both sections, we present the course design including learning outcomes, course projects, grade assignments, instructional methods, and both student and instructor reflections on learning outcomes. This case study illustrates how competency-based courses can be designed and executed in a traditional academic environment in both online and classroom-based courses.

Competency-Based Learning (CBE) is a relatively new development in traditional higher education (Morcke, Dornan & Eika, 2013), but it has been in use since the 1990s in secondary education (e.g., Sullivan & Downey, 2015), adult degree completion programs (e.g., Klein-Collins & Olson, 2014), and medical education (e.g., Harden, Crosby & Davis, 1999). Course development in CBE consists of establishing standards for mastery of knowledge, skills, and abilities that demonstrate learning, as opposed to a "seat time" model that uses student time in class to grant credits toward college graduation (Council for Adult and Experiential Learning, 2013). CBE also differs from traditional "input" models where a good deal of the focus and planning priority is given to instructional process (i.e., teaching) instead of more focus on results (i.e., demonstrable learning outcomes; Harden et al., 1999). The purpose of this paper is to examine elements of CBE through the literature and a case study of a course in a traditional higher education semester, as well as to make recommendations for future use of CBE.

During the 1990s, medical education served as a precursor to the CBE approach because it was largely focused on measuring skills doctors needed to practice medicine successfully (Albanese, Mejicano, Mullan, Kokotailo, & Gruppen, 2008). As a result, peer-reviewed literature on CBE in higher education is largely limited to vocational training (e.g., Smith, 2010) and clinical/medical settings (e.g., Ten Cate & Billett, 2014). In the professional training literature, CBE is conceived of as a developmental progression through which students achieve skills, knowledge, and attitudes with the ultimate goal of serving the public as competent professionals (Hatcher et al., 2013). While there is research focused on professional training, a search in PsycINFO®, the primary database in the field of psychology, for the terms "Teaching Methods," "College Students," and "Competency-Based Education" with a peer-reviewed limiter yielded 0 results. Non-peer-reviewed case studies appear to be the primary source for information for Competency-Based Education in a traditional college setting (e.g., Klein-Collins & Olson, 2014).

In recent years, a critical mass of literature on CBE-styled competencies and assessment has emerged (Council for Adult and Experiential Learning, 2015); however, there remains a paucity of peer-reviewed literature on CBE-based curriculum design that can bridge the gap between competencies and assessment. As expressed by Morcke and colleagues (2013), CBE is "tightly linked to the assessment and regulation of proficiency, but less clearly linked to teaching and learning activities" (p. 851). In essence, there is rising interest in CBE for higher education (Seifert & Chapman, 2015) but a dearth of literature to demonstrate how to implement CBE, such as through project-based learning. In this paper, we describe two competency-based sections of an Introduction to Psychology course, one online and the other classroom-based. Both were taught in an American liberal arts university setting within a traditionally-graded semester structure. Not only is this the first paper to demonstrate CBE Implementation in such a setting, it is also the first to wed all three essential aspects of CBE (i.e., competencies, implementation, and assessment) in one model.

Project-Based Learning as CBE Platform

Project-based approaches focus on the student's use of knowledge, skills, and abilities to design a product, "deliverable," or experience that offers meaningful solutions to relevant questions (Lee, Blackwell, Drake, & Moran, 2014). The connection between project-based learning and competency-based learning offers a promising link and was the primary approach used in the course we discuss in this paper. The project-based platform requires that students move beyond *stating* what they have learned to *using* what they have learned to create change and advance solutions. Exams are not used to measure outcomes: outcomes are measured via projects that demonstrate the student's knowledge.

The tie between CBE and project-based learning can be traced to a case study that appeared in the *Teaching of*

Psychology in 1978 (Dilendik). In the case study, Dilendik described how he used projects to form a teaching and learning platform as well as "competency statements" to evaluate those projects (1978). Though this "first mover" case study made explicit the connection between projects and competencies, few competency-based courses and programs use projects as a basis for attaining competencies (C. Seifert, personal communication, December 22, 2015).

Students whose learning is accomplished by completing projects have been shown to learn more than their counterparts who experienced traditional methods of teaching and learning (e.g., Barak & Dori, 2005). For example, undergraduate chemistry students who engaged in a computer-based project that required them to seek scientific information, apply chemistry theories, and create molecular models on the computer scored better on a final examination than students who worked on traditional problem sets (Barak & Dori, 2005). Summers and Dickinson (2012) found that high school students who learned social studies through project-based instruction performed better on measures of social studies achievement than students who learned through traditional methods, such as lectures and tests. Additionally, the high school students who learned through projects showed better career readiness than their traditionally-instructed peers (Summers & Dickinson, 2012). Jiang, Parent and Eastmond (2006) showed that project-focused, competency-based learning graduate courses showed a higher completion rate than quiz-focused CBE courses.

Learning Advantages in CBE

In a CBE model, students determine the pace and focus of the learning process; they continuously gauge their own progress and are responsible to select individualized and targeted learning activities (Harris, Snell, Talbot & Harden, 2010). Students identify and adjust to their learning needs to attain competencies and, through achieving competencies, they gain self-reflection about their learning needs (Harris et al., 2010).

Students seem to have heightened engagement in the learning process with the CBE model. High school students who participated in a competency-based program were viewed by their teachers as working together, engaging in peer teaching, taking responsibility for learning, and attending class more frequently than in a traditional model (Sullivan & Downey, 2015). Dilendik (1978) found that students identified more personal relevance in their learning in a project- and competency-based Educational Psychology course. Sullivan and Downey (2015) noted a high level of engagement among teachers as

well as more relevance, significance, and meaning in the delivery of content in a CBE setting.

Rubrics in CBE

Competencies are not only the basis for learning in CBE, they are also the basis for evaluation and feedback. When feedback goes beyond mere correction, it is fluidly intertwined with, and a key element of, instruction (Hattie & Timperley, 2007). Rubrics as a vehicle for conveying expectations and sharing feedback are especially well-suited to the CBE model, because they can readily be framed in such a manner to evaluate the degree to which or whether students have demonstrated competencies. Furthermore, rubrics provide a structure for targeted, relevant, and detailed instructor feedback to students. At its most ideal levels, the process of feedback and evaluation becomes not only the endpoint of learning, but also the motivator and method of learning.

Shute (2008) noted that feedback is successful when it is task-based, specific, manageable, and focused on learning. Furthermore, Carless, Salter, Yang, and Lam (2011) and Shute (2008) found that feedback that is written or computer-based is more beneficial because it promotes objectivity. Specifically, students value rubrics because of the transparency and fairness they provide, as well as the clarification about the goals for their work and knowledge about their progress (Reddy & Andrade, 2010). The CBE approach may be ideally suited to the use of rubrics because competencies are readily rendered into a specific, concise, and measurable form. Rubrics and competencies that include feedback and expectations about processes and needs for student self-regulation are more likely to benefit students in the learning process than feedback about students' traits, or "self" (Carless et al., 2011; Hattie & Timperley, 2007).

Challenges Posed by CBE

A competency-based approach to a course requires careful work to identify target competencies and to create appropriate metrics for determining the degree to which competencies are achieved (Rivenbark & Jacobson, 2014). This process presents a range of challenges. Sullivan and Downey (2015) noted that instructors and administrators who participated in a program for development of competency-based courses found the work to be highly time-consuming and labor intensive (Sullivan & Downey, 2015). The need for collaboration and buy-in for competencies was identified as a challenge for groups of administrators and instructors approaching a competency-based process (Steele et al., 2014).

As happens with any curriculum change, faculty resistance to CBE is a challenge (Roberts, 1976). Faculty may resist implementing CBE due to objections with assessment practices that focus on student learning outcomes. Most relevant to rubric use are concerns about the time-intensive nature of developing systems for evaluation and, for some, concerns that learning is too complex to be measurable (Linkon, 2005). Reddy and Andrade (2010) posit that a lack of understanding about rubrics may contribute to instructor resistance to using them for evaluating learning in their courses. This "rubric resistance" could prevent a number of faculty from exploring CBE due to the central role of the method for evaluating learning. Other faculty may misperceive that including learning outcomes on a syllabus constitutes a competency-based approach, without understanding the in-depth process required for CBE (e.g., Rivenbark & Jacobson, 2014). Because of these and similar concerns, any CBE development process should be approached with acknowledgement of the difficulties associated with it and will likely require considerable attention to the concerns of faculty.

Steele and colleagues (2014) identified the need for skillful, creative, and engaged teaching in CBE classrooms. CBE instructors need to engage students in active learning, center instruction around students, allow flexibility in course design, and assure that learning activities are appropriate for work that will be assessed (Harris et al., 2010). CBE also creates demands for strong assessment of courses and programs to determine what students are learning so that it is a "basis for providing guidance, rather than blundering blindly in the dark." (Gauthier, 2013, p. 438). In order to engage in a successful CBE process, instructors need to possess the traits and experience necessary to organize, support, and evaluate student learning.

Another challenge with CBE comes when applying it in a traditional classroom. To date, no published work has addressed this issue. It is important and timely to bring CBE to the traditional grading structure, structured academic calendar, and classroom setting upon which most universities rely. Doing so brings CBE into the "here and now" of higher education and bridges a gap between online and classroom based instruction, making it applicable in the present academic environment.

Aims of the Project

In this paper, we outline the development and implementation of two sections of a competency-based Introduction to Psychology course, one online and one in-person, that employed a project-based approach. The questions posed were:

- How can CBE work in a traditional undergraduate semester-based setting?

- How can a letter grade requirement be achieved in a competency-based model?
- Do CBE outcomes differ between online and classroom-based environments?
- What CBE learning experiences are reported by students accustomed to more traditional college classrooms?
- What were the course design and instructional experiences and challenges faced by the course designers and instructors?
- What do the authors recommend for others approaching a CBE design and course delivery process?

Case Study: Competency-Based Introduction to Psychology

An institutional grant award committee selected Introduction to Psychology as an appropriate course to which a competency-based model could be applied. The majority of students in the course are typically first-year undergraduates with 25-50% of students in sophomore (2nd) to senior (4th) years. Majors represented in the course range widely from psychology to nursing, business, and education. Class size is capped at 25. The classroom-based section was nearly full to the 25-student cap with 24 students, while 11 students were enrolled in the online section. A month prior to the start of the semester, an email was sent to students registered in the CBE sections (see Appendix A).

In recent years, many professional associations, such as the American Society for Microbiology, American Association of Colleges in Nursing, and American Statistical Association and have created curriculum guidelines for undergraduate majors in their related discipline (American Association for Colleges of Nursing, 2015; American Society for Microbiology, 2015; American Statistical Association, 2015). The American Psychological Association (APA), the professional association with which Psychology departments are aligned, likewise developed guidelines for undergraduate majors (American Statistical Association, 2013). The APA Guidelines for the Undergraduate Psychology Major: Version 2.0 (2013; hereafter referred to as "Guidelines") delineated goals, outcomes, and indicators at foundational and baccalaureate levels that describe and define undergraduate psychology education.

The Guidelines contain 19 student outcomes that are evidenced by dozens of measurable indicators. We selected 42 indicators from the Guidelines (2013) to use as course competencies, based on their relevance to an Introduction to Psychology course. The 42 indicators were organized into six different learning goals: Scientific Investigation, Information Literacy, Ethical/Social Responsibility, Effective

Table 1
Descriptions of Badges.

Name of Badge	Description
Scientific Inquiry	Explaining why psychology is a science, using scientific reasoning, and understanding research principles
Information Literacy	Asking questions to effectively use databases for locating and using high-quality sources and academic literature as a basis for understanding.
Social & Ethical Responsibility	Understanding diversity, as well as challenges and recognition of the role of culture and other differences in research and in life. This badge includes advocating for outcomes that can benefit individuals and society.
Effective Communication	Citing, writing, presenting, and relating with others.
Academic Best Practices	Understanding and using high levels of academic integrity, fostering curiosity, displaying professionalism, and assessing one's progress.
Applied Content	Knowledge and accurate use of principles and terms, asking questions and understanding methods, and application of content to real-life situations.

Communication, Academic Best Practices, and Applied Content.

For the sake of organization and clarity, we used a gamification principle to use badges to represent groups of competencies with each of the six learning goals (See Table 1 for a description of badges) (Urh, Vukovic, Jereb, & Pintar, 2015). The practice of gamification is the application of elements of board or video games in educational practices. One commonly used strategy in gamification, earning badges, increases motivation through visible forms of learning achievement (Huang & Soman, 2013). For a middle-level of organization between specific competencies and broadly defined badges, we grouped the competencies into Psychology Achievement Knowledge and Skills sets that we called *PAKS*.

Badges and Grades

There were five required student projects in the course. Projects were completed in two steps, both of which were framed by detailed instructions. In the first step, the students submitted a written plan for the project. After the instructor provided feedback on the plan, students began work on their project. While students were engaged in their project work, instructors actively provided guidance and feedback. In the second step, the students submitted their "deliverables," which ranged from a written advocacy statement to a narrated slideshow. Students also submitted learning reflections with their project "deliverables." Following the first submission of the project, students had the opportunity to submit a revision, incorporating instructor feedback from their first draft. Though this process was both writing-intensive for students and grading-intensive for instructors, it allowed for the iterative and developmental process of learning.

A rubric was used to evaluate the competencies on each Plan and Project. Because a traditional letter-based grade was needed for each student at the end of the course, each rubric specified the standards for meeting competencies at three different quality levels. Gold reflected excellent/outstanding levels of achievement, Silver reflected proficient/good achievement, and Bronze reflected marginal, but passing/adequate, achievement. Table 2 outlines the number of earned badge levels that translated into different course grades. To pass the course, students needed to earn each badge at the minimum of a bronze level.

Each plan and project was designed to demonstrate multiple competencies within Badges. Therefore, by the end of the semester students demonstrated most of the competencies multiple times. See Appendix B for the full competency grid used for grading.

Table 2
Course Grades for Performance on Quality Levels for Badges

Gold Badges	Silver Badges	Bronze Badges	Course Grade
6	0	0	A
5	1	0	A
5	0	1	A-
4	2	0	A-
4	1	1	B+
			…etc

Table 3
Content Coverage and Project Types

Project Title	Project Summary Description	Deliverable/ Work Product	Associated Content Unit
Thinking & Writing Like a Psychological Scientist	"To correct mistaken beliefs about the field of psychology, to understand psychology as a science for more sophisticated and realistic views of the field, and to exercise critical and analytic thinking skills when reading about psychological research reported in the popular media through comparing popular press accounts of a study to the actual research report."	Written analysis of how psychological myths are based on poor scientific thinking. Written comparison between good and poor quality popular press research reports and between popular press and peer-reviewed sources for the same study	Thinking & Writing Like a Psychological Scientist
Mythbusting	"To expand on your ideas begun in the Thinking & Writing Like a Psychological Scientist project about mythbusting and to create mythbusting information to share publicly."	Three blog posts on a myth in the content area, including one myth that has social justice implications.	Cognitive Psychology & Neuroscience by group consensus in both sections for the first project.
Curation	"To collect and critique internet information about a topic in a content area covered in this course."	Content curation website with critique/ commentary at www.scoop.it.	Varied by student choice.
Advocacy	"To use psychological methods, sources, and content to promote civic, social and/or global outcomes that benefit others."	Mock congressional testimony or position paper.	Varied by student choice.
Observational Research	"To conduct a small study from start to finish using observation as a method of collecting data."	Narrated slideshow research report.	Varied by student choice.

Content Coverage and Project Types

Learning material was divided into the five units believed to be most fundamental for an Introduction to Psychology course. This represented a significant paring down from the typical Introduction to Psychology course. It was a deliberate decision to favor depth over breadth. The first unit focused on the process skills of thinking & writing for psychology and the latter four units on content areas that are most fundamental and commonly covered in Introduction to Psychology Courses. The content areas were Developmental Psychology, Social Personality Psychology, Cognitive Psychology & Neuroscience, and Clinical Psychology. Projects are described in Table 3.

Project Example

Given the novelty and complexity of the design, it may be helpful to describe one of the projects. The purpose of the Advocacy Project was to use psychological methods,

sources, and content to promote civic, social and global outcomes that benefit the mental health of others. The Advocacy Project could take many forms and the objective was to convey evidence-based recommendations to organizations or lawmakers (e.g. a letter to an editor, a letter to a representative, a meeting with a representative, a white paper for a non-profit). Before starting, students received detailed instructions for the Advocacy Plan and the Advocacy Project. As with all the projects, the instructions are designed to define expectations, provide background information, and delineate the connections between the project and the competencies. The rubric for the Advocacy Project illustrates how multiple competencies are demonstrated at multiple levels in the project. Table 4 shows sample elements from the Advocacy Project rubric and Table 5 outlines which PAKS and badges were addressed through the project.

Online and Classroom Course Designs

Learning was paced differently in the online and classroom-based courses. In the online course, student progressed through the content and projects at their own pace. Though they needed to competently complete all projects by the end of the semester, they could complete project work up to 2 weeks prior to each milestone deadline. The online course used the Canvas Learning Management System by Instructure to present modules to students that became available at least a week prior to the relevant time frame during the semester. Modules included general information (e.g., syllabus and grading information), project descriptions, and then each of the content units that consisted of a road map (see Table 6) that led students through content enhancements to assigned reading.

Table 4
Advocacy Project Rubric Sample Competencies

Advocacy Project Rubric Areas of Achievement	Level of Achievement: Gold	Level of Achievement: Silver	Level of Achievement: Bronze	Competencies
Academic Articles	Use of peer-reviewed article shows reasonable accuracy and initial understanding.	Use of peer-reviewed article shows some initial understanding	Use of peer-reviewed article shows some limited initial understanding.	2.2a Read and summarize general ideas and conclusions from psychological sources accurately
Database Strategies	Research demonstrated very good use of databases and sources of information	Research demonstrated good use of databases and sources of information	Research demonstrated adequate use of databases and sources of information	2.2c Identify and navigate psychology databases and other legitimate sources of psychology information
Scientific Reasoning	The position paper/mock testimony and advocacy work demonstrate strong reliance on scientific inquiry rather than myths, emotion, or personal values.	The position paper/mock testimony and advocacy work demonstrate very good reliance on scientific inquiry rather than myths, emotion, or personal values.	The position paper/mock testimony and advocacy work demonstrate reliance on scientific inquiry rather than myths, emotion, or personal values.	2.1B Develop plausible behavioral explanations that rely on scientific reasoning and evidence rather than anecdotes or pseudoscience
Principles and Terms	Use of terminology is effective to convey explanation of behavior that relates to the issue.	Use of terminology is adequate to convey explanation of behavior that relates to the issue.	Use of terminology conveys explanation of behavior that relates to the issue.	1.1a Identify basic biological, psychological, and social components of psychological explanations (e.g., inferences, observations, operational definitions, interpretations)

Table 5
Advocacy Project Badges and PAKs Addressed

Badges	PAKS (Psychology)
Scientific Inquiry	Scientific Reasoning
Information Literacy	Academic Articles
	Database
	Quality Sources
Social/ Ethical Responsibility	Advocacy
Communication	Citing
Academic Best Practices	Feedback
	Professionalism
Applied Content	Principles & Terms
	Application

Table 6
Example Road Map to Guide Students Through Content Units in Online Course

Read	Extend Your Learning
[Textbook] Module 9: Developmental Issues, Prenatal and Newborn Development Optional: Quiz Yourself	Learn from the video on conception and birth and from the TED talk on prenatal learning.
[Textbook] Module 10: Infancy and Childhood Optional: Quiz Yourself	Watch videos to see infant development research in action. Learn about temperament, the (more) biological foundation of personality, from a recorded lecture.
[Textbook] Module 11: Adolescence Optional: Quiz Yourself	Listen to chair of the Neuroscience Department, discuss "What's Up with Your Brain?" Printable handout here. Optional: TED talk on the adolescent brain.
[Textbook] Module 12: Adulthood Optional: Quiz Yourself	Learn about how career counselors work with young adults. Explore Views on Aging

In the classroom-based version of the course students were required to move as a group through the process on a predetermined course schedule that ran the duration of the semester. After students completed foundational reading for a new unit, the students engaged in classroom-based discussions and activities that sought to integrate, apply, and extend their reading. This portion of each unit looked similar to what one might find in a conventional classroom. During this phase of each unit, students completed "One Minute Papers" summarizing their classroom based learning and "Reading Reflections" summarizing the learning they gained from the required reading. Once the students, as a whole, seemed able to effectively use the foundational content, the instructional model shifted to a laboratory design. Students used class time to work on their individual projects that related to the content unit. This portion of the classroom-based section was led by an instructional team that included the instructor and 3 course assistants (1 graduate assistant and 2 advanced undergraduate students) who were available to provide support and guidance to students while working on their

individual projects. Once a student successfully completed a unit project, attendance at the remaining lab sessions for that unit became optional. This flexible model required "real time" feedback on student projects and was "high touch"; the instructional team needed to track each student's progress through projects.

Student and Instructor Outcomes

Student Reflections

At the end of the course, students were asked to evaluate their learning experience in the CBE format. Although the final reflections were assigned as a course requisite, they were not read until after the conclusion of the course and therefore did not influence the students' final grades. Overwhelmingly, the students found the CBE format to be both helpful in solidifying their learning, as well as requiring significantly more time management than a traditional course structure.

Students reported that adjusting to being graded on the achievement of several learning goals, rather than receiving a single letter grade for the entire assignment, was initially challenging and, as they adjusted to meeting the expectations of the assignment rubric, the grading standards became clear. One student described, "I believe that [CBE Grading] is a much more valuable and efficient way of determining the quality of an individual's work." When describing how a CBE class is different from a traditional class, students emphasized that the grading system is based on how well students understand and apply the material rather than how well they have memorized content.

The students recommended that incoming students be prepared to carefully read the grading rubrics and be prepared to self-motivate and work independently. Students recommended the following for peers who undertake CBE course work for the first time:

- "I would advise to another student to be prepared to invest a proper amount of time for the assignments given. There is no way that a project could be done in a small amount of time. Be prepared to think outside of the box and be willing to take advantage of the resources given to you."
- "Aim to get as many golds as possible, always do revisions, and allow yourself plenty of time to work on the projects."
- "I would tell a student who is taking a CBE course for the first time that they should focus on truly understand the information given in class and in the required texts."

Student advice for preparing in advance, having goals for high grades, using resources, and learning from reading could be found in most university courses. This is an indication that, while CBE is a novel format for students in a traditional higher education setting, the learning process shares similar qualities with most any pedagogy.

More unique to this format, students also noted that secondary learning was achieved through the CBE format, and that this increased their competence in other classes and work environments. Students said that the project-based format provided the secondary gain of increasing their time-management and planning skills. Seemingly, the consistent project rubric requirements, such as the use of proper citations and supporting claims with scientific evidence, increased students' attention to these competencies, which increased their knowledge acquisition in these competency areas. A student noted that by working toward earning the Social and Ethical Responsibility badge, he was better able to "appreciate all the blessings in my life and come at issues from a different point of view." When reflecting on how the skills acquired in the CBE format could be applied to other classes or profession settings students described that they learned to value feedback as a learning tool for improvement and to effectively manage their time to meet deadlines. Students also frequently reflected that they thought they benefitted more from having to apply course concepts to projects, rather than memorizing material for the purpose of passing a test.

Perhaps most importantly, students said that they learned more in the CBE course than they believe they would have learned in a traditional course . From the online course, one student said, "I think that the CBE style was a very effective way to learn and I am positive I learned as much if not more than I would have from a traditional style class. I say this because of the way we had to do our projects to fit the CBE style." Students reported that they learned auxiliary skills, such as creating a blog or how to create an advocacy campaign, from the project requirements. Further, students reported that they benefitted from being able to revise their assignments to better meet all standards of the grading rubric, which allowed them to improve specific areas of weakness. Students also reported that they gained a greater depth of knowledge from the CBE format than they would have gained from a class model that did not rely on projects as the demonstration of knowledge.

The project-based learning model required students to exercise greater time management skills, which seemed to become easier to master as the semester progressed. Students found that the amount of work required for each project varied, and that the first projects were more difficult because of the amount of work required. Although students expressed that they disliked the amount of work required for the project proposals, they benefitted from completing a large volume of the final work ahead of time. The classroom

course section was asked, "On a scale of 1-10 (1= "no way!", 10= "absolutely!"), how likely are you to recommend this course to others?" Students responded with scores between 7-10, and they also commented that if they would have been asked the same question earlier in the semester, they would have responded with a lower score. It seemed that as students acclimated to the different learning and grading model, their affection for the model increased.

Instructor Experiences

We noted that the course required a large investment of time and attention to detail. A higher degree of accountability was required to successfully implement the CBE curriculum because of the specificity and volume of the grading and revision process. Additionally, explaining the evaluation process, which was markedly different from the standards of grading in a traditional course, required considerable effort. Students seemed to have difficulty understanding how projects translated into badges and how badges translated into a final grade.

In both the online and classroom sections, instructors found that they spent an extraordinary amount of time evaluating and documenting competencies for each assignment. The amount of time required to accurately record earned competencies throughout the semester was due to the need to create and maintain a user-friendly system to represent student progress. For example, in order to earn the Scientific Inquiry Badge, there were 7 competencies that could be earned a cumulative total of 16 times during the semester. Not only did the instructors have to maintain meticulous records of student progress, but also individual learners needed to understand a complicated spreadsheet to assess their progress toward course completion and a grade. Course assistants were integral to keeping the competency spreadsheets updated.

Although the instructors had used grading rubrics in other courses, the rubric's level of specificity and detail required significantly more time and attention than the norm. Also, because *all* assignments were graded on a rubric, and nearly all of the assignments could be resubmitted for revision, instructors graded as many as 15 projects per student during the semester (5 proposals, 5 projects, 5 revisions). The time required to effectively evaluate assignments can be understood as a requisite to instruct a CBE course.

Although instructing both the online and classroom sections required additional time commitment, the satisfaction we felt as instructors was noteworthy. The students' response to the CBE model served to motivate us to complete our work. During the semester we found that the students were motivated to work on their projects and spoke with excitement and pride about

their artifacts and the achievements they represented. It seemed clear that students were engaging with the material in a manner that demonstrated that they could not only apply the course concepts, but that they could also analyze the material they were learning. In short, student learning far exceeded the basic accumulation of knowledge. At the conclusion of the course, instructors felt an increased sense of pride that they had successfully engaged students in a learning model that they reported enabled them to learn more than in a traditional course.

Recommendations

We learned some valuable lessons while teaching this course. The following recommendations are based on student and instructor feedback and are designed to maximize student understanding and engagement.

Instructor Preparation

CBE courses require a high level of instructor commitment (Sullivan & Downey, 2015) and course development. Instructors need to be comfortable with, and competent in, the use of rubrics. This issue is critical: the literature suggests that a significant portion of instructors may resist the use of rubrics (Linkon, 2005; Reddy & Andrade, 2010).

In-Person Orientation to CBE and the Course

Students struggled to understand the CBE model in the early weeks of the course; therefore, a half-day orientation would allow discussion and clarification of the CBE model. It would enable students to adjust to the model with the support of their student colleagues. In addition to community- and comfort-building, the orientation would provide a way to set clear expectations and convey suggestions from previous students. Additionally, an optional technology training could help students learn how to use the online course platform and avoid technology frustration.

Hybrid Format

Initial confusion about the CBE model in the online format could have been minimized by periodic in-person meetings with instructors in addition to the orientation recommended above. In-person meetings were held between individual students and online instructors, but typically after heightened frustration and misunderstanding. It would be preferable to schedule in-person or online meetings between instructors and students at the beginning of the semester. A hybrid model, that combines live introduction to and discussion about the model and periodic, live group check-ins

would provide a better basis for students to gain comfort with the CBE model.

Initially it was difficult to determine how to reconcile time and project flexibility with the scheduled nature of the classroom-based section. To address this, as the semester progressed, a plan emerged that within each unit we would segue from a discussion-based and experiential group learning format to a laboratory format after basic comprehension of unit content was attained.

Accountability for Content Learning

Students were held accountable for content learning through reading reflections and one-minute papers in the classroom-based section, but these "content checks" were not used in the online format. In some cases, students' initial submission of projects in the online section contained little to no content basis or connection to the unit at hand. Based on this, we recommend online quizzes or reading reflections to make sure students have read and learned essential content.

Projects as Vehicles for Mastery of Competencies

Similar to findings by Dilendik (1978) and Jiang and colleagues (2006), the student and instructor experiences in this course were that projects successfully engaged students as a platform for gaining skills, knowledge, and abilities.

Explicit Connection to General Academic and Workplace Skills

A fortunate by-product of process-oriented competencies and project designs was that students reported benefits from the course that they anticipated using in future coursework and workplaces. Adding clear connections from competencies to outcomes that extend beyond the semester would enhance this aspect of the course for all students.

More Streamlined Competency Tracking

Recording badge levels (gold, silver, bronze) for each competency using as individual spreadsheet for each student in a cloud-based spreadsheet program could best be described as "clunky." The process was time consuming and was the source of initial confusion for students. Future applications of CBE where letter grades are required would benefit greatly from an instructional technology application or program to make this process easier for instructors and more understandable for students. Perhaps this is functionality that can be added to online course management systems.

Applicability to Other Disciplines

Some disciplines have formal guidelines, developed by their professional associations, that delineate learning goals, outcomes, and indicators for academic majors (e.g., Harden, Crosby & Davis, 1999; Klein-Collins & Olson, 2014; Sullivan & Downey, 2015). In those cases, the process of establishing CBE curriculum is streamlined. However, many disciplines do not have formal guidelines. In those cases, we suggest that faculty might begin the CBE process by extracting learning goals from prior course syllabi and, using those goals as a starting point, consult with a behavioral scientists, likely a psychologist, and/or assessment professionals about identifying, defining, and measuring learning outcomes as competencies.

Implications for Future Research

This case study lays groundwork for future quasi-experimental research comparing CBE with traditional methodology. In this framework, carefully selected pre- and post-test outcome measures could show differences in learning gains between the two formats of the same course. Standardized measures such as the ETS Major Field Tests (2016) for areas of study could be used in disciplines where content knowledge is of primary focus. In disciplines that place priority on process skills, projects from a CBE course could be compared with research papers from a traditional course using a rubric that employs common learning goals.

Other topics for future study might include student perceptions of the learning process, faculty attitudes toward CBE, and transfer of process learning to future academic and professional work. A particular area of focus could be on instructor preparation experiences, as we found the process to be arduous. Research could inform best practices in this area to create more efficient course preparation and evaluation. Similarly, student adjustment to the CBE model was equally challenging, and so research could be done on ways to facilitate student acclimation to the model.

Ultimately, we found that Competency-Based Education is an effective pedagogical tool for student learning. For instructors, beginning with learning goals is a best practice that is the center of CBE and stays in the forefront of course design, instruction, evaluation of student work, and assessment of the course. Students gained more ownership over their learning and found that learning can transfer to other settings and can be highly relevant in the form of projects based on realistic application with clearly-outlined end results. With improvements based on the recommendations above, CBE can provide an active and engaged basis for enhanced student learning in a traditionally-scheduled and graded semester system.

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Appendix A

Letter to students registered in CBE Sections of Introduction to Psychology - 1 Month Prior to the Start of the Semester

Hello, Students,

I am writing to tell you about two of the Introduction to Psychology sections this fall that will use a form of learning called Competency-Based Education (CBE). You are receiving this email because you are registered for one of these sections.

In CBE, students demonstrate learning through projects and the work is evaluated using a list of skills, abilities, and knowledge. Professors design the learning experiences that help students apply course content to real-world situations. A way to think of this is that you primarily learn through doing.

In the CBE Psychology courses, students will have choices about project types and will be presented with clear guidelines for demonstrating the type of learning needed for each one. While there is choice, there are also examples of typical assignments that are provided as well. This approach empowers students to make choices about the way they show what they have learned, presents some flexibility in the way learning is approached, and provides support and coaching from faculty member and course assistants.

Students who would likely enjoy and be successful in this style of learning like to:

- Take ownership over their learning

- Apply what they learn to real-life situations

- Be active and engaged throughout the learning process

- Use individualized feedback and guidance to learn more than any student might have thought possible.

Of course, these elements are present to some degree in other sections of Intro Psych; they are more prominent and more constant in the CBE sections.

If you have any questions for either or both of the instructors of these sections, please email [instructor names and email addresses] If you need help re-arranging your schedule or getting permission to register for a class, please contact [name and email of the psychology department chair]

Appendix B

Competency/Project Grid

Color Guide: Gold [Gold]   **Silver** [Silver]   **Bronze** [Bronze]

Badges	PAKS	Competencies	Projects Where Competencies are Earned				
			Think/ Read Like Psych Sci	**Myth Blog**	**Obs Res**	**Advocacy**	**Curation**
Achievement Areas that are comprised of competency areas	Groups of competencies	These competencies were selected from the American Psychological Association Guidelines for Undergraduate Psychology Major, Version 2.0.					
Scientific Inquiry	Psychology = Science	1.1b Explain why psychology is a science, with the primary objectives of describing, understanding, predicting, and controlling behavior and mental processes	[ ]				
	Scientific Reasoning		[ ]				
		2.1a Identify basic biological, psychological, and social components of psychological explanations (e.g., inferences, observations, operational definitions, interpretations)	[ ]				
		2.1b Use psychology concepts to explain personal experiences and recognize the potential for flaws in behavioral explanations based on simplistic, personal theories	[ ]				
		2.1B Develop plausible behavioral explanations that rely on scientific reasoning and evidence rather than anecdotes or pseudoscience	[ ]	[ ]	[ ]	[ ]	[ ]
		2.5a Relate examples of how a researcher's value system, sociocultural characteristics, and historical context influence the development of scientific inquiry on psychological questions			[ ]		
	Research Principles	2.4g Describe the fundamental principles of research design	[ ]		[ ]		
		2.2e. Interpret simple graphs and statistical findings	[ ]		[ ]		
		3.1a Describe key regulations in the APA Ethics Code for protection of human or nonhuman research participants	[ ]		[ ]		

Category	Subcategory	Competency					
Information Literacy	Question Driven	2.1d Ask relevant questions to gather more information about behavioral claims					
	Database Strategies	2.2c Identify and navigate psychology databases and other legitimate sources of psychology information					
	Quality Sources	2.2b Describe what kinds of additional information beyond personal experience are acceptable in developing behavioral explanations (i.e., popular press reports vs. scientific findings)					
	Academic Articles	2.2a Read and summarize general ideas and conclusions from psychological sources accurately					
Social & Ethical Responsibility	Diversity	3.2c Explain how individual differences, social identity, and worldview may influence beliefs, values, and interaction with others and vice versa					
	Challenges	3.3a Identify aspects of individual and cultural diversity and the interpersonal challenges that often result from diversity and context					
	Recognition	3.3b Recognize potential for prejudice and discrimination in oneself and others					
	Advocacy	3.3c Explain how psychology can promote civic, social, and global outcomes that benefit others					
Communication	Citing	4.1d Write using APA style					
	Writing	4.1a Express ideas in written formats that reflect basic psychological concepts and principles					
		4.1b Recognize writing content and format differ based on purpose (e.g., blogs, memos, journal articles) and audience					
		4.1c Use standard English, including generally accepted grammar					
	Presenting	4.2a Construct plausible oral argument based on a psychological study					

Category	Subcategory	Competency
		4.2b Deliver brief presentations within appropriate constraints (e.g., time limit, appropriate to audience)
	Relating	4.3e #1 Respond appropriately to electronic communications - Reflections I & II and Final Reflection.
		4.3e #2 - Reply appropriately to electronc communications - Post and reply to online discussions
Academic Best Practices	Academic Integrity	3.2d Maintain high standards for academic integrity, including honor code requirements
	Curiosity	4.3d Ask questions to capture additional detail
	Professionalism	3.2b Treat others with civility
		5.3a Follow instructions, including timely delivery, in response to project criteria
	Self-Assessment	5.2b Accurately self-assess performance quality by adhering to external standards (e.g., rubric criteria, teacher expectations)
	Feedback	5.2c Incorporate feedback from educators and mentors to change performance
	Engagement	Login Frequency or Class Attendance & Participation
Applied Content	Principles and Terms	1.2a Identify key characteristics of major content domains in psychology
		1.1a Use basic psychological terminology, concepts, and theories in psychology to explain behavior and mental processes
	Questions and Methods	1.2b Identify principal methods and types of questions that emerge in specific content domains
		4.2e Pose questions about psychological content (Completed in reflection papers)

	Applications	1.2d Provide examples of unique contributions of content domain to the understanding of complex behavioral issues				
		1.3a Describe examples of relevant and practical applications of psychological principles to everyday life				
		5.1d Describe how psychology's content applies to business, health care, educational, and other workplace settings				