IMPLEMENTATION OF AN ONLINE QUIZ PROGRAM TO SUPPORT LEARNING FOR ALL STUDENTS IN A FIRST-YEAR COURSE

by

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Abstract

Information and communications technology (ICT) is increasingly being incorporated into undergraduate courses to use resources efficiently without compromising teaching and learning quality. While instructors have started to revisit the use of assessment as a means to support students’ learning by encouraging greater levels of self-directed learning, traditional forms of assessment are often resource-intensive. The use of online assessment can better support students’ learning by enabling students to take more assessments, resulting in more frequent feedback. Moreover, the features found within online assessments can make administration more accessible and efficient by decreasing the necessary level of external learning supports, which can benefit both students and faculty. These features are pertinent to the application of universal design to assessment, a set of principles that focuses on minimizing differences in access between students with and without disabilities.

This research reports on a case study of an undergraduate psychology course that transitioned to online quizzes, replacing one of the course’s paper-based assessments. The quizzes set out to bring forth improvements in efficiency, feedback, self-directed learning, and accessibility through practices consistent with universal design. Based on faculty and student perceptions gathered through interviews, surveys, and focus groups, in addition to quiz data, the study aimed to identify the benefits and challenges of implementing these quizzes to support teaching and learning in a large-enrolment course.

The study found that timing and scheduling issues during quiz administration interfered with the expectations of course staff. Consequently, students used the quizzes for unintended purposes (e.g., maximizing their marks). Moreover, because of these aforementioned issues, instructors did not express confidence that the quizzes were supporting student learning. Course
administrators addressed these issues by changing the period of access one year, and then removing time limits the next. It was only after these two years that consistent and immediate feedback for students became possible; prior to these changes, among three desired properties of online assessment—accessible, efficient, and consistent—only two of them were satisfied at a given time. Thus the perceived usefulness of the quiz information (feedback) to teaching and learning was largely determined by the properties that were considered.
Acknowledgements

This dissertation would not have been complete without the support of others. I would like to acknowledge their contributions.

- Don Klinger, my faculty supervisor, whose dedication to educational assessment and measurement has inspired my own work. I am grateful for having had the opportunity to collaborate with him and look forward to our conversations to come.

- Nancy Hutchinson and Allyson Harrison, my dissertation committee members, for their careful and detailed feedback on my drafts. Their feedback encouraged me to reflect constantly on my work and to ensure that my best writing surfaced.

- Louis Volante and Brian Frank, the examiners at my oral examination; and Theodore Christou, the Dean’s Delegate; for posing challenging, thoughtful questions that will broaden my thinking about the future of assessment in higher education.

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<th>Description</th>
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<tbody>
<tr>
<td>BL</td>
<td>blended learning</td>
</tr>
<tr>
<td>CAT</td>
<td>computerized adaptive testing</td>
</tr>
<tr>
<td>CCM</td>
<td>constant comparison method</td>
</tr>
<tr>
<td>CDS</td>
<td>Continuing and Distance Studies</td>
</tr>
<tr>
<td>DSO</td>
<td>Disability Services Office</td>
</tr>
<tr>
<td>ETA</td>
<td>extended time accommodation</td>
</tr>
<tr>
<td>f2f</td>
<td>face-to-face (instruction)</td>
</tr>
<tr>
<td>ICT</td>
<td>information and communications technology</td>
</tr>
<tr>
<td>ITS</td>
<td>Information Technology Services</td>
</tr>
<tr>
<td>LMS</td>
<td>learning management system</td>
</tr>
<tr>
<td>MTCU</td>
<td>Ministry of Training, Colleges, and Universities (Government of Ontario)</td>
</tr>
<tr>
<td>PSYC-100</td>
<td><em>Psychology 100: Principles of Psychology</em> (course code)</td>
</tr>
<tr>
<td>RQ</td>
<td>research question</td>
</tr>
<tr>
<td>SDL</td>
<td>self-directed learning</td>
</tr>
<tr>
<td>TA</td>
<td>teaching assistant</td>
</tr>
<tr>
<td>UD</td>
<td>universal design</td>
</tr>
<tr>
<td>UDA</td>
<td>Universal Design for Assessment</td>
</tr>
<tr>
<td>UDI</td>
<td>Universal Design of Instruction</td>
</tr>
<tr>
<td>UDL</td>
<td>Universal Design for Learning</td>
</tr>
<tr>
<td>UID</td>
<td>Universal Instructional Design</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

Educators and administrators rely on student assessment data to make important decisions about their students’ progress and achievement. Developments in educational assessment offer possibilities to address challenges encountered in the process of generating student assessment data, from the design of the instrument to the way the assessment is administered. While the measurement of student achievement is still a primary role of student assessment, the use of such measurement continues to expand. In addition to determining students’ marks or grades, assessments can serve other valuable roles for both teachers and students, including the provision of ongoing feedback and the monitoring of student progress. This information can help direct teachers’ subsequent efforts and also support students’ ongoing learning. In particular, well-positioned and well-designed assessments can encourage students to be more self-directed (Nicol, 2009).

One learning environment where students ought to demonstrate such self-direction is the university setting (Nicol, 2009). In particular, first-year university courses can be rather challenging for students who have not developed the necessary skills. First-year courses are often characterized by large class sizes, with very little direct or one-to-one contact between the instructor and the students (e.g., Leger et al., 2013; Sana, Fenesi, & Kim, 2011). These courses fulfill the role of introducing students to concepts in a subject area or discipline that continuing students will explore further in later years. Assessments conducted in first-year courses are thus critical to determining achievement, as university officials (e.g., administration, faculty) may use academic standing as a
criterion for students who wish to enter (or continue in) specialized degree programs, not to mention eligibility to take upper-year courses. Instructors have begun to understand the need for alternative learning structures in first-year courses; one key shift has been the use of assessment. Recognizing the value of assessment to better support students’ learning, there has been an expansion in the use of ongoing formative assessments throughout a course. It has been suggested that such assessment practices can result in greater achievement and self-directed learning (SDL) by students (e.g., Ibabe & Jauregizar, 2010).

As information and communications technology (ICT) becomes increasingly integrated into teaching and learning – emerging as an important means for students to engage with course materials – SDL becomes a necessary skill for students. Advances in ICT have entered the realm of educational assessment, giving students access to features that could support both the way they interact with the assessment, in addition to alternative methods to support and monitor learning (i.e., SDL). ICT-based assessments can offer further benefits if they are administered via the Internet as an online assessment, due to the removal of time and location barriers. Within the context of first-year university courses described above, online assessment can provide efficiencies and advantages for both course management and learning, including:

- automated administration of the assessment, including control of timing and access;
- quicker scoring, resulting in a shorter time to return marks and feedback to students;
- the ability for students to reattempt an assessment;
• integrated supports for students who would typically receive accommodations on traditional assessments, facilitating course management; and
• lessened dependence on the availability of tangible resources.

(Buchanan, 2000; Csapó, Ainley, Bennett, Latour, & Law, 2012)

The features of an online assessment may also be pertinent in the context of the changing student population diversity in postsecondary institutions. Increasingly, students with disabilities are attending university, and hence require specific learning supports. These supports, or *accommodations*, are commonly granted to these students as a means of achieving equity (Hutchinson, 2010). For course staff, the challenge of this arrangement is administering the accommodations consistently and efficiently. On the other hand, an online assessment can incorporate or enable certain nonspecific forms of accommodations (e.g., extended time, reading text aloud, separate room) available to students granted these accommodations, but possibly as features that all students may use, the latter of which improves overall assessment equity and accessibility.

The notion that accommodations be made available to all students during assessment is related to a concept known as *universal design* (UD). UD focuses on the design of products and services free of barriers that can potentially limit user accessibility (Center for Universal Design, 1997). Attention is given to both accessibility and assessed learning objectives during the planning and development stages of a universally designed assessment (Ofiesh, Rojas, & Ward, 2006). This approach minimizes the need for external accommodations, thereby enabling all students to participate in an assessment in the same way. A universally designed online assessment is hence a departure from the typical process of providing accommodations, as it addresses the need for
accommodations prior to the assessment being administered. As a result, the process of assessment becomes less dependent on the availability of auxiliary supports.

The supports found within a universally designed online assessment may also be relevant to teaching and learning in core first-year courses. Because the smallest class sizes in these courses can still encompass hundreds of students (e.g., Leger et al., 2013), administrators are constantly shifting resources to meet these increased enrolment demands without exhausting their available departmental resources (e.g., staffing, physical space). In turn, students in larger classes typically have fewer opportunities to engage in learning activities during class, due to logistical and planning issues (Sana et al., 2011). Consequently, students may not be receiving sufficient feedback from course assessments to support their learning. The potential for online assessment exists in its ability to address time and resource limitations in the course that often impede students’ learning. For example, frequent assessment through an online system can provide students with more feedback about their learning.

While faculty continue to integrate ICT into teaching and learning components of their courses, online applications of assessment, in comparison, have been limited. In larger classes, assessments are typically conducted under standardized conditions, with the provision of supports for students with disabilities serving as a means to ensure these students can participate equitably during assessment. However, this process can potentially become resource-intensive in larger classes, as it becomes more likely that there will be students requiring some type of accommodations. Hence different implementation challenges to the assessment may exist from one year to the next, as both the number of students receiving accommodations and available learning supports may
vary. A universally designed online assessment is therefore a promising solution to these challenges.

**Purpose and Research Questions**

Given the changes in postsecondary education, ICT, and the landscape of university classrooms, a study that explores efforts to implement an online assessment system in the current context is valuable. Central to this research is the need for equitable forms of assessment to address the challenges of accommodating students within university courses. The use of online assessment may be one way to provide accommodation supports, an option made widely available by the prevalence of learning management systems (LMSs) in universities. In the present study, data were obtained from a first-year university course over a multiyear period, during which the course was redesigned to incorporate more elements of ICT into teaching and learning activities. The online assessment consisted of a series of quizzes administered throughout the year. Administration of the online quizzes was aligned to the principles of UD to offer the benefits of efficiency, feedback, self-directed learning, and accessibility. The study aimed to identify the extent of benefits and the challenges experienced during the implementation of these quizzes, based on the following research questions:

- **RQ1.** What were the defining characteristics of the online quizzes during the transition that ultimately shaped their development?
- **RQ2.** How well did the implementation of the online quizzes address issues relating to the provision of accommodations?
- **RQ3.** What were course faculty members’ initial expectations of the online quizzes, and how were these expectations altered through their experiences?
• RQ4. What were students’ perceptions of the online quizzes, and how did these perceptions relate to the learning approaches they took?

**Context of the Study**

This study was situated in a first-year undergraduate psychology course, entitled *PSYC-100: Principles of Psychology*. PSYC-100 is a full-year course at a midsized degree-granting institution in the province of Ontario. As one of the largest courses at the university, as well as a prerequisite for one of the most common degree programs, both pre-psychology majors and students who want an elective in psychology enroll in PSYC-100. Students continuing into a psychology degree program take PSYC-100 in their first year, and then apply for admission to a four-year Bachelor of Arts (Honours) or Bachelor of Science (Honours) program with a major in psychology, as a medial or specialization (with another area of concentration), or a three-year Bachelor of Arts with a concentration or minor in psychology. Students’ grades in PSYC-100 are used to determine admission to these programs as well as eligibility for senior-level courses.

In 2009, the PSYC-100 course coordinators indicated an interest in moving the assessment component online for the following year, with the purpose of improving the administration process while optimizing resource use with ICT. Faculty from both the psychology department and assessment research group participated in an informal meeting to discuss this possibility. The plan was to eventually offer all course assessments online. Prior to this meeting, all PSYC-100 course assessments were paper-based and administered on campus. The challenges with the on-campus administration and supporting reasons for transition included conducting the assessment for a large number of students, providing accommodations for a sizable proportion of students with
disabilities, and insufficient assessment feedback for students. The implementation of the
online assessment had the purpose (and potential) of simultaneously addressing all of
these challenges.

In concurrence with the changes to assessment, the instruction in PSYC-100 also
moved from a lecture-only model to a blended model consisting of lecture, small-group
instruction, and online learning during this period. The department was interested in
observing the impact of the changes to PSYC-100 over this transition period. This
implementation presented an opportunity to conduct a multiyear case study to explore the
value of implementing online assessments into the course structure. As a reference point,
the study began during the final year in which only paper-based assessments were used
(defined as Year 1). Data were collected over the next 3 years in which a combination of
paper- and computer-based assessments was used (Year 2, Year 3, and Year 4).

In Year 1 (2009-2010) and Year 2 (2010-2011), the course followed a traditional
structure in which instruction consisted solely of lectures (three hours per week). Weekly
on-campus tutorials and an LMS were available to all students but the use of either was
neither monitored nor mandatory. The course assessments included two midterm tests, a
midyear exam, and a final exam. The midterm tests served as interim assessments for
providing student feedback, while the exams were summative assessments. Total
enrolment in PSYC-100 was approximately 1,300 students under the traditional learning
model. The online quizzes were first introduced in Year 2 to replace the midterm tests,
and a reason for using an online system was to largely address the need for
accommodations through an integrated extended time administration option for students
with disabilities.
In Year 3 (2011-2012) and Year 4 (2012-2013), a blended learning (BL) model was used in PSYC-100. The lecture was truncated to one hour per week, and two components were added: (a) a weekly, mandatory one-hour learning lab of approximately 25 students; and (b) an online learning component expected to require three hours per week. Student access to the online component was not monitored, but nonetheless contained course material that could be assessed. Incidentally, one of the benefits of the BL model was the ability to expand the course capacity to 1,800 students. The redesign work with the online component allowed a fully online section of the course to be offered through Continuing and Distance Studies (CDS) to accommodate students who were unable to enroll in the on-campus sections. A summary of the teaching and learning components for the years in this study is provided in Table 1.

Successive changes to the online quiz program were made in Year 3 and Year 4 in response to student use during the preceding year. These changes, related to timing, scheduling, retakes, and the use of course materials, were intended to ensure that original teaching and learning purposes were fulfilled. Although the course coordinators considered the possible transition of their other assessments to online assessments in later years, it did not occur during this study (i.e., the midyear and final exams remained paper-based and administered on-campus for Year 3 and Year 4). Moreover, students with disabilities were still given accommodations through the Disability Services Office (DSO) for these assessments.

1 Students with first-year academic standing are given preference for on-campus sections, according to the course coordinators. Approximately 100 students are enrolled in the CDS section during the year. Despite differences in instruction, coursework, and assessment, the courses are considered to be equivalent.
The PSYC-100 instructional staff was composed of faculty members, graduate and undergraduate students. A coordinator (two coordinators in Year 3 and Year 4) planned and oversaw general course operations (e.g., academic issues, student absences, accommodation requests, assessment). The number of instructors varied each year depending on how the course was organized (4 or 6 during this study). There were also dozens of graduate teaching assistants (TAs) who led tutorials (and later, the learning labs), marked assessments, and moderated online discussions. Lastly, in Year 3 and Year 4, honours undergraduate students in psychology facilitated learning lab sessions after having completed a specialized course in teaching and learning in higher education, in a peer instruction model.

Table 1

*Summary of the PSYC-100 Teaching, Learning, and Assessment Components*

<table>
<thead>
<tr>
<th></th>
<th>Year 1 2009-2010</th>
<th>Year 2 2010-2011</th>
<th>Year 3 2011-2012</th>
<th>Year 4 2012-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>3 hr per week</td>
<td>3 hr per week</td>
<td>1 hr per week</td>
<td>1 hr per week</td>
</tr>
<tr>
<td>Learning Labs</td>
<td>–</td>
<td>–</td>
<td>1 hr per week</td>
<td>1 hr per week</td>
</tr>
<tr>
<td>Online</td>
<td>–</td>
<td>–</td>
<td>3 hr per week</td>
<td>3 hr per week</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Midterm Tests</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>• Online Quizzes</td>
<td>–</td>
<td>6</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>• Exams</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

*Note.* The duration of a full-year course is 26 weeks.
Theoretical Framework

In postsecondary contexts, there has been growing interest in using ICT to improve student engagement in courses where fewer opportunities for instructor-student contact exist (Leger et al., 2013). Course developers recognize the ability of using ICT to carry out automated (but individualized) student activities such as administering online quizzes, which is but one way to engage students outside of direct instruction. Assessment for learning focuses an assessment’s purpose on providing students with feedback (Black & Wiliam, 1998). This feedback is viewed as part of a cycle between assessment and learning. By modeling course planning around this cycle, it is expected that student achievement can be improved because students have opportunities to use the information from the assessment to build their learning (Nicol & Macfarlane-Dick, 2006).

This study also expands the notion of broadening access to course assessments through a UD approach. Universally designed assessments are intentionally developed and administered in a manner that meets the needs of the widest range of students (Ketterlin-Geller & Johnstone, 2006). Implementing UD does not mean moving the goalposts: “[T]he idea of universal design is not for all students to ‘pass’, but for all students to be able to demonstrate their skills and knowledge without barriers” (Ketterlin-Geller & Johnstone, p. 174). One benefit of universally designed assessments is the reduced dependence on external supports as accommodations, supporting students who would otherwise be unable to interact with the assessment in its original format.

The feasibility of applying UD principles is generally considerably easier through the use of ICT than with traditional, in-class methods. Moreover, planning for access during the development process may be less expensive than developing accommodation
strategies after a student with disabilities has enrolled, especially as the costs of ICT continue to decrease (Thurlow, Lazarus, Albus, & Hodgson, 2010). One variant of UD, universal design for learning (UDL), reflects the characteristics in the development of the formative online quizzes used in the present study (see Meyer, Rose, & Gordon, 2014).

Key Terms Used In This Dissertation

As with most research, terms used throughout this dissertation can have multiple meanings or interpretations. This section defines how these terms are used in this research. Assessment refers to the process of collecting information from students to determine how well they are meeting academic outcomes (Gikandi, Morrow, & Davis, 2011). Feedback occurs when the information collected from assessments is provided to students or used by the instructor to plan subsequent learning activities. According to Hattie and Timperley (2007), feedback is intended to guide the student toward next steps in the learning process, and can also be used by instructors to gauge student progress and direct future approaches to teaching. Self-directed learning (SDL) refers to a student’s ability to engage in the learning process using available resources (Nicol, 2009). Students with successful SDL skills are able to use the feedback from assessment and proceed with the next steps to further their learning.

This study also distinguishes between traditional and online approaches to learning and assessment. The word “traditional” connotes the conventional existence of an approach in postsecondary settings, while “online” refers to an approach that uses an Internet connection. Traditional learning (i.e., face-to-face instruction, or f2f) refers to a course structure characterized primarily by on-campus, real-time methods, while online learning refers to a process that requires students to access their course content through
the Internet, and can be real-time or asynchronous (Young, 2002). Broadly speaking, information and communications technology (ICT) refers to any form of learning that involves the use of a computing device or network to deliver information, including online methods (Ellis & Moore, 2006). Blended learning (BL) is the integrated combination of traditional and online learning methods, maximizing the benefits of both forms (Osguthorpe & Graham, 2003). Graham, Woodfield, and Harrison’s (2013) definition of BL is consistent with the approach taken in the current study, which involves the substantial reduction of f2f instruction and replacement with content delivered online. The online portion of BL courses is often shouldered by a learning management system (LMS), a Web-based system that delivers a variety of course-related activities and can be accessed by students outside the classroom (Garrison & Vaughan, 2007).

Similarly, traditional assessments are assessments with formats that do not involve ICT (e.g., paper-based tests) and are generally administered in a single sitting to all students. In contrast, online assessments are administered to students through the Internet to their computer or mobile device in real-time, or at the instructor’s discretion, asynchronously. Unlike a computer-based assessment, which can be administered locally or remotely, and with or without an Internet connection, online assessments require an Internet connection so that students can send and receive data (e.g., items, scores, feedback).

Accessibility is the extent to which a service (e.g., assessment or learning tool) enables barrier-free interaction to its users. Commonly, accessibility features are added ad hoc to a service, in the form of accommodations, when a deviation from established
protocol is needed in response to a user’s disability or limited language proficiency (Hansen & Mislevy, 2008). Accommodations are thus changes to assessment conditions intended to facilitate a student’s access to the content while preserving the intended purpose of the assessment to increase the validity of the results (Bolt & Roach, 2009; Hutchinson, 2010).

**Dissertation Overview**

The current chapter introduced the context of the first-year course that became the case study for my research, and described the research questions of this dissertation. In the following chapter, the literature review establishes the foundations for the topics associated with the research, including a detailed description of the characteristics of online assessments, the principles of universal design, and how these assessments could be used to support learning, ICT-based learning models used in postsecondary education, and challenges relating to the implementation of online assessments. Chapter 3 describes the data collection methods used in this study, which included the use of qualitative and qualitative data methods. The results for the research questions are presented in Chapter 4. Finally, in Chapter 5, I present a discussion and analysis of these findings, plus the implications of the study.
Chapter 2

Literature Review

Information and communication technology (ICT) use in postsecondary education is creating new avenues for interaction between instructors and students. Teaching and learning activities that at one time were conducted only on campus are increasingly being offered in electronic formats. By taking advantage of now-ubiquitous Internet connections, ICT-based activities offer students benefits such as continual access to course content and reduce institutional use of costly resources. However, ICT is not the only shift occurring within postsecondary education: Changes to student demographics are also taking place, as evidenced by the increasing proportion of students with specific learning disabilities and other challenges that require supports. While these changes in student populations are well documented (e.g., Ministry of Training, Colleges, and Universities [MTCU], 2012), postsecondary institutions struggle to best meet the learning needs of all students, particularly in courses with large enrolments where there is an expectation that students will be independent and take greater responsibility for their learning. These changes also require shifts in the approaches that course instructors and developers use with respect to teaching, learning, and assessment components. Yet it is not clear instructors have entirely adjusted their methods within such classes, resulting in new tensions between the aforementioned components. A review of the tensions across these components is beyond the scope of the current research. Rather, my research and this review focus on aspects of assessment within the context of ICT, namely online
assessment, and how a transition online can offer more flexibility, but also brings challenges.

This chapter contains a review of the literature about (a) the evolution of online assessment; (b) the potential of online assessment to monitor and support learning; (c) the principles of universal design and the application of these principles to online assessment, as a means of preemptively accommodating students; (d) the shifting landscape of university settings, highlighting the issues of increased student enrolment and the challenges of assessing students with disabilities; and (e) the considerations of online assessment implementation within university settings.

**The Evolution of Online Assessment**

ICT-based assessment has been used to automate certain processes in educational assessment, including the administration, scoring, and recordkeeping of results. Beginning in the 1970s, “dumb” computer terminals (i.e., connected to a mainframe or server computer) were used in administering assessments, with content delivered from the mainframe (Luecht & Sireci, 2011). In the following decade, personal computers connected to *local area networks* (LANs) allowed communication and data sharing across computers. Finally, the availability of the Internet in the 1990s removed most practical barriers to connectivity, as assessment content could be stored on a campus server anywhere in the world and delivered to the computer where the student is located during an administration. Without being confined by time or setting factors, the Internet provided a reliable architecture for online assessment. From there, developments in hardware and software have enabled assessments to use a variety of designs and item formats (Luecht & Sireci, 2011).
The features of online assessment may be beneficial in educational environments where time and setting limitations can encumber teaching and learning. For example, in postsecondary institutions, often the degree of student-teacher interaction and availability of learning resources can be limited, particularly in larger classes. Online assessment is a cost-effective way to address these limitations by providing students with continuous, on-demand access to material requiring the resources relating to ICT. The benefits of online assessment include efficiency, feedback, and accessibility, all of which can help to bridge gaps between teaching, learning, and assessment that exist within undergraduate courses.

**Efficiency**

Online assessments can be more efficient than paper-based assessments, in terms of time spent and the resources used during administration and scoring. Efficiency-related factors have cost and resource implications (Thurlow et al., 2010). Some examples described by Thurlow et al. include savings from reduced printing and shipping costs when students access the assessment through their computing devices instead of on paper, and the ease of issuing corrections to test content if errors are discovered. The presence of an Internet connection gives course staff the option of administering the assessment to students on campus or elsewhere in the world. Assessments can be prescheduled for administration for a certain time with automated scoring and recordkeeping of marks (Peat & Franklin, 2002). Moreover, the system is able to score student responses quickly for certain item formats and return these scores and other feedback to students immediately or at a specified time. Electronic feedback can be provided to large numbers of students quickly (Zakrzewski & Bull, 1998). Course
instructors who use easily scorable item formats (e.g., multiple-choice) can spend less
time marking assessments (Bennett, 2002; Griffin & Rankine, 2010; Nicol, 2007).

Developments in ICT have increased the power of computing devices, thereby
improving the scoring technology of some assessments. The efficiency in measuring
student learning has grown for assessments using a computerized adaptive testing (CAT)
framework (Luecht & Sireci, 2011). High-stakes assessments such as the GRE and
GMAT (both of which are used in graduate school admissions) employ the use of CAT,
where an accurate measure of student ability is the critical purpose of the assessment. A
quicker ability to determine an examinee’s score can save time during administration.
Regardless, the development of assessments using CAT requires much expertise and is
orders of magnitude more expensive, which limits their value primarily to large
commercial assessment settings.

Feedback

Feedback can help students reduce the discrepancy between “what is understood”
and “what is aimed to be understood” through increased effort, motivation, or
engagement (Hattie & Timperley, 2007, p. 112). Hence to enhance learning, frequent and
timely student feedback are necessary conditions for an effective assessment program
(Gibbs & Simpson, 2004); however, given that administering assessment becomes
increasingly difficult and impractical with frequency, online and ICT-based solutions
offer feasible alternatives.

Early models of ICT-based assessments were largely used to provide information
in an efficient manner, whereby specific preprogrammed feedback was displayed in
response to user input. These minimal feedback response models are still used today
(e.g., Bryans Bongey, Cizello, & Kalnbach, 2010; Dopper & Sjoer, 2004). Nevertheless, there is a surprisingly long history of using ICT to provide more direct individual learning and guidance. Based on the drill-and-practice model of learning, computer software used positive reinforcement strategies to encourage students. For example, *Alga-Blaster, Reader Rabbit,* and *Knowledge Munchers* were popular teaching and assessment games intended to support children’s learning. These programs provided immediate feedback to children and also used this information to direct subsequent learning in the framework of a computer game (Squire, 2003). More recently, testing organizations are exploring methods to provide more direct feedback to students using online assessments. One example is cognitive diagnostic assessment, which combines theories of cognitive psychology and psychometrics into a design through which information is provided to the student during the assessment about his or her cognitive strengths and weaknesses based on specific knowledge and skills (e.g., Leighton & Gierl, 2007).

Despite ongoing research into the technological influences on the provision of feedback, the minimal feedback response format is prevalent in large classes, as assessment software based on this model is ubiquitous in postsecondary education settings (e.g., learning management systems). In self-administered online assessments, the software can play the role of an electronic tutor, providing students with instant, relevant feedback after an assessment has been submitted. For example, each multiple-choice item distractor can be associated with a comment (i.e., feedback) that is displayed when the student selects that distractor. Feedback can reinforce and direct learning through: (a) explanations of why a particular choice was correct (or incorrect); (b) provision of contextual information about the objective being assessed; (c) the display of
other correct solutions; or (d) the reference and direction to relevant topics in the course material (Bryans Bongey et al., 2010).

Previous research has examined the effects of providing different levels of feedback to students, including minimal feedback (e.g., binary feedback) and detailed feedback, but also instructors’ use of feedback (e.g., Bälter, Enström, & Klingenberg, 2013; Ibabe & Jauregizar, 2010; Miller, 2009; Stull, Majerich, Bernacki, Jansen Varnum, & Ducette, 2011). While instructors should not dismiss the importance of providing detailed feedback, one study suggests that the quality of feedback may not matter as much as providing opportunities for feedback. Through a principal component analysis of survey data, Miller (2009) found that regardless of the type of feedback a formative online assessment provided to undergraduate education students (directed students to a resource, rephrased a question, provided additional information, or gave the correct answer), feedback was moderately effective in supporting students’ learning (i.e., student ratings of the effectiveness for each of the feedback types were about the same, approximately three points on a five-point Likert scale). However, Miller acknowledged that these students may have been more interested in the marks associated with the assessment than in using the feedback for deeper learning.

**Accessibility**

Online assessments can bring new options for student accessibility, through a combination of thoughtful design practices (see Ofiesh et al., 2006), plus the use of features built into existing software. Fair and equitable practices during assessment are becoming recognized as a required standard (see American Educational Research Association, American Psychological Association, & National Council of Measurement
in Education, 2014). For the most part, these practices include the use of assessment accommodations, which are changes to the conditions intended to facilitate a student’s access to the content while preserving the intended construct of the assessment so that the validity of the results is increased (Bolt & Roach, 2009).

Assessment accommodations typically involve changes to the setting, the amount of time allocated to the student, the assessment format of information, method of response, and materials or equipment to support interaction (Ketterlin-Geller & Johnstone, 2006). Specific examples of such accommodations include administering the assessment in a separate room, providing students with extended time, having assessment items read aloud (provided that reading is not a construct being assessed), responding to assessments orally instead of in writing, and providing access to assistive technology or trained professionals (Bolt & Thurlow, 2004; Ranseen & Parks, 2005). Since these accommodations do not alter the construct of an assessment (i.e., involve changes that do not change the assessment content), ICT makes it possible to provide these accommodations without the additional resources, equipment, or staff that would otherwise be required for paper-based assessments.

**Online Assessment Features that Support Teaching and Learning**

The advantage of ICT use—including online assessment—has not gone unnoticed by educators and administrators. Online assessments that are aligned with curricular objectives can direct the focus for teaching and learning. For example, in university classes, the use of online assessments is popular for purposes that include (a) motivating students to complete assigned readings prior to class (e.g., Dobson, 2008; Johnson & Kiviniemi, 2009; McKenzie et al., 2013; Stull et al., 2011); (b) conducting periodic
checks on learning (e.g., Kibble, 2007; Nicol, 2009; Peat & Franklin, 2002); and (c) diagnosing students’ learning (Dopper & Sjoer, 2004). Hence not only can online assessment be used to encourage students to engage outside of class time with a time-limited task, but it can also provide students with feedback. While these examples suggest the variety of ways that online assessment can support teaching and learning, the assessment design has implications for how teaching and learning are supported. Csapó et al. (2012) listed three components of assessment design as domain, purpose, and construct.

- The domain refers to the use of an online assessment as the best way to have students demonstrate their learning. With respect to general-purpose online assessments, the most relevant situation Csapó and colleagues (2012) described for undergraduate courses was the option of using technology based on user preferences. However, for online assessment, students may not be given this option (i.e., the online version is the only option).

- The purpose determines if the course, student, or both are the focus of conclusions drawn from the online assessment administration. Naturally, students are the primary users of the assessments, and therefore the purposes may include supporting and monitoring their learning. Instructors may also use the information to improve their teaching. This decision factors into whether or not to allow students to use their notes during the assessment (e.g., Dobson, 2008).

- The construct refers to the stakes associated with the decisions made based on test performance (Csapó et al., 2012). The use of online assessments for high-
stakes assessments is still uncommon compared to the use of online quizzes for formative purposes, particularly unsupervised assessments.

Ultimately, these three components should be able to discriminate between students who have mastered the domain and those who have not, and should do so without changing the assessment purpose or construct (Thurlow, Johnstone, & Ketterlin-Geller, 2008). Previous research has suggested that online assessment as a means of formative assessment can benefit student achievement (e.g., Buchanan, 2000, Ćukušić, Garača, & Jadrić, 2013; Dobson, 2008; Johnson, 2006; Wilson, Boyd, Chen, & Jamal, 2011). Not surprisingly, comparing studies of this nature is difficult because each assessment context is different (i.e., different domain, purpose, construct). Furthermore, no commonly agreed-upon procedure exists for assessment development and administration, let alone for online assessment. Inclusion of certain online assessment features determines the type of information that is generated; these features include item format, use of marks as incentives, number of attempts, and time limits. Moreover, students have control of certain factors in how they interact with the online assessment which may influence how they perform on the assessment.

**Item Format**

The item formats that can be used with online assessments include those found on paper-based assessments (e.g., multiple-choice, short answer, essay, etc.). Dichotomous items, which are scored as correct or incorrect (e.g., multiple choice and other selected response methods) can be quickly administered and scored in an online setting. This format is sometimes perceived to focus too much on low-level knowledge (Coates, James, & Baldwin, 2005). On the other hand, constructed-response items on both paper-
based and ICT-based assessments (i.e., qualitative responses) incur a time lag between administration and reporting as these types of items usually need to be scored by a person.

In contrast, formats that incorporate interactive elements such as animated graphics, audio, and video are possible with ICT-based assessments, and provide a wider variety of methods to assess complex knowledge and skills. However, these types of assessments are still not widely used, given that much technological effort and expertise is needed for design and development. Teachers’ and instructors’ knowledge and understanding of how these formats could fit within their course assessments are still at an early stage (Parshall & Harmes, 2009). Consequently, instructors new to developing online assessments may use paper-based assessments as a model, since this format is familiar to them (Coates et al., 2005).

By employing dichotomous item formats, instructors experience the advantages of reduced marking time and students receive feedback immediately (Coates et al., 2005). However, there can be challenges with the automated scoring processes: For example, automated scoring methods for short-answer items can be impacted by irrelevant factors such as spelling errors and capitalization, thereby negatively influencing scores (Johnson, 2006). Moreover, Coates and colleagues caution that the popularity of quick-response item formats found in online assessments may “drive pedagogy towards a simplistic, mechanical form” (p. 27). Given that instructors may use existing commercial resources to obtain items for their assessments (e.g., Johnson & Kiviniemi, 2009; McKenzie et al., 2013), these items may be of variable quality and must be checked for alignment with course objectives.
Credit as Incentive

As a means to motivate student behaviour, students may be awarded credit toward their course requirements for completing an online assessment. Instructors ought to make a decision about awarding credit to students, particularly for assessments that are optional (and unsupervised). Credit can be awarded based on participation (e.g., the requirement is that the student attempts the assessment within the time period), or the score obtained by the student (Davis, 2013). In other cases, no marks are awarded with the expectation that students who participated would be better able to demonstrate their learning on subsequent summative assessments (i.e., a purely formative assessment).

Findings are inconclusive as to whether or not the practice of awarding marks is beneficial to learning. Some studies have suggested that offering marks as incentives may improve student participation, but the relationship between their quiz scores and overall course achievement may be more tenuous (see Hannah, James, & Williams, 2014, and Kibble, 2007). For instance, previous research has found that assessments that are neither compulsory nor awarded marks toward a grade were used less frequently or ineffectively by the majority of students (e.g., Buchanan, 2000; Johnson, 2006). Similarly, students may opt for learning activities worth marks over those that are not. More recently, McKenzie et al. (2013) observed that almost all students completed online lecture topic quizzes, but the majority of students did not use the formative personalized learning assessment system before taking the quizzes. Through hierarchical linear modeling, students who did use the system, however, were shown to have attained higher achievement on the learning outcomes. The effect was stronger with more frequent use of the quizzes. McKenzie and her colleagues suggested that the lecture quizzes were used
more often than the learning system because marks were awarded in the former but not the latter, thereby influencing students’ attitudes towards their use.

Awarding a small credit can make the assessments seem worthwhile to students, thereby ensuring high participation (Dobson, 2008). As an example, the participation rate for online quizzes in a medical physiology course went from 52% to 97% when minor credit (1% per quiz) was given for the quizzes, with only a marginal increase (to 98%) when the credit increased from 1% to 2% (Kibble, 2007). Yet the awarding of credits may have a negligible effect on overall student achievement or learning. Davis (2013) used low-stakes (score counts) and no-stakes quizzes (participation counts) with different classes and found only small differences in exam scores and course grades. While a high percentage of students took the quizzes when they were optional, the group of students with the low-stakes quizzes took them more often than was necessary. Davis’ rationale for awarding marks based on completion was to encourage students to retake the quiz after they had already obtained a good score. Although it was possible for students to obtain credit for simply logging in, the vast majority of students (29 of 30 students) did not take advantage (or were unaware) of this loophole. This research suggests that students appreciated having optional quizzes for participation marks because not only did the quizzes contribute to students’ grades, but they also served as a learning resource. In other words, students preferred it when the pressure to focus on marks was taken away but they still had the opportunity to earn marks. This finding leads to another online assessment feature, the number of attempts given to students, the scores of which can be used to determine credit in different ways.
Number of Attempts

Online assessments can easily allow students to attempt the assessment multiple times. Commonly, if the score counts toward a grade, one attempt is given to students, similar to a traditional assessment. On the other hand, if the purpose is to provide students with informal feedback on their learning, then learners ought to be provided opportunities to repeat or revise tasks (Gikandi et al., 2011). In such cases, the first attempt accomplishes a different purpose, helping students establish parameters around what is assessable. In a combined approach where assessments are counted for marks, Kibble (2007) suggested allowing students two attempts so that there was an opportunity for corrective action. The second attempt was found to have benefitted students who completed it, whether for personal learning or to improve their grade. The students who did not attempt the quiz a second time obtained higher first attempt scores, but Kibble suspected that their scores were due to inappropriate use of the quizzes (i.e., cheating), which the students nonetheless took as a validation of their learning.

On the other hand, there may be a limit to the relationship between the frequency of reattempts and student achievement. In Hannah et al.’s (2014) study, weaker students spent more time on their quizzes (i.e., reattempted until they obtained full marks) but their achievement on summative assessments had not caught up to their higher-achieving classmates. These students might have been using an ineffective strategy that gave them a false sense of achievement. One such strategy might be a trial-and-error approach, where students tried different options until they achieved success, as Davis (2013) had suggested. Therefore, if there is no limit to how often a student is able to access an
assessment, then instructors should carefully consider if and how marks should be awarded.

**Time Limits**

Students are typically given a time limit to complete and submit an assessment. While the time limit should be sufficiently long to allow students reasonable opportunities to demonstrate learning, the process of determining an appropriate time limit is variable. Developers can easily adjust the length of an assessment to make it fit within a schedule without regard to the construct being measured. If the time limit is excessive during an unsupervised online assessment, security of the assessment may become a problem (Sewell, Frith, & Colvin, 2010).

Some studies have used time limits to minimize administration differences between an unsupervised online quiz and a supervised in-class quiz (e.g., Daniel & Broida, 2004), while others have used time limits to motivate students by reducing the length of time students had to search their materials for answers (e.g., Brothen & Wambach, 2004; Dobson, 2008). For example, Dobson allowed students to consult their course materials during the quiz but deliberately set a short time limit on the quiz to prevent students from becoming over-reliant on these resources during the assessment (i.e., only students who prepared in advance would be able to finish the quiz in a timely manner and do well). This use of time limits was effective in that it successfully shaped students’ behaviours to spending more time preparing for quizzes, and their quiz scores had predictive validity for summative exams. However, this arrangement may not be an appropriate assessment practice, as issues of equity might arise when students who take
more time to process information during preparation or the assessment itself are assessed (i.e., require a timing accommodation).

**Student Factors**

Despite the various features that can be incorporated into an online assessment, students control how and how often they access the assessment. As students become accustomed to using ICT in their learning, performance or anxiety effects of online assessments may be no greater than paper-based assessments (Cassady & Gridley, 2005). Students’ infrequent access may thus be due to reasons unrelated to interacting with a computer. Nonetheless, students who participate regularly in online assessments designed for formative purposes by accessing them more frequently and over a sustained period may better demonstrate learning outcomes in the course.

In Stull et al. (2011), students’ early use of optional formative online quizzes was associated with achievement, rather than the awarding of the credit itself. Their regression model found a statistically significant association between students who took the quizzes in the first unit in the course and student achievement, regardless of how well students did (i.e., their scores were not significant). Stull and colleagues proposed that students used the results of the quizzes differently. While some students used the scores simply to validate their learning, others used the results to determine what they needed to study next. Students who used the results to extend their learning obtained higher scores on later assessments. Despite these promising findings, factors relating to use must be interpreted with caution, as self-selection bias may be present, where higher-achieving, motivated students are more likely to use the resources available to them, particularly for
optional assessments (e.g., McKenzie et al., 2013). This suggests that making quizzes a requirement in a course may not necessarily result in higher achievement for all students.

Despite the opportunities for efficiency, feedback, and accessibility generated by online assessment, the use of online assessment has yet to dominate the postsecondary education landscape. The issue of cost is a consideration at most institutions, as the development of new forms of assessment such as online assessments can be resource intensive. Moving to online assessments can also break the traditions that have long existed at universities, creating resistance and lack of motivation (Rosenthal & Weitz, 2012). If undergraduate courses are to follow practices that are inclusive of all students, then the traditional forms of assessment are currently inadequate. Accommodations have been criticized for being indifferent to students’ individual differences and for being offered inconsistently from course to course, either of which limits their effectiveness (Ketterlin-Geller & Johnstone, 2006). Accordingly, some researchers and fairness advocates (e.g., McGuire, Scott, & Shaw, 2006) have suggested that individual accommodations be completely removed in favour of an alternative approach. The concept of *Universal Design* can provide a framework to reconsider how accommodations are used during assessment.

**Universal Design**

The practice of giving accommodations to students with disabilities is prevalent throughout the educational system as a means of increasing accessibility. McGuire et al. (2006) termed this approach the *special education* (SE) model, in which accommodations (or other changes) made to facilitate access for students with disabilities were secondary to the design of the learning tool (i.e., a retroactive approach). McGuire et al. criticized
the SE model for being unable to anticipate potential access barriers that exist for students with disabilities, as it creates a continual dependence on post facto changes. *Universal Design* (UD) is a model that gives student interaction primary consideration when planning and developing learning tools, which could minimize the need for such post facto changes (Thurlow et al., 2008).

Borrowing on the UD concept from architecture, the focus of UD in education is to increase accessibility of instruction and curriculum by minimizing barriers. In other words, UD is premised on the notion that proactive designs can enhance inclusion and access to learning. While it can be argued that the principles of UD align with modern, inclusive practices in education, the literature for UD in education is still growing as researchers try to establish common ground. Rao, Ok, and Bryant’s (2014) review of studies of UD educational models found the studies supported the application of UD and offered advantages for students and instructors. However, Rao and colleagues also advised that caution be taken in interpreting their conclusions because the designs and analyses of these studies (i.e., interpretation of the principles of UD) varied greatly. Nonetheless, their conclusion suggests that while there is value to UD in education, there is also a need to clarify the operational definitions used in the research.

Research and applications of UD in postsecondary education are typically based on one of three models. These models are *universal design for learning* (UDL\(^2\); see Dolan et al., 2013, and Meyer et al., 2014); *universal design of instruction* (UDI; McGuire, 2011); and *universal instructional design* (UID; Higbee & Goff, 2008). Although each model interprets the principles in UD differently, all three focus on

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\(^2\) These principles of UDL were developed by the Center for Applied Special Technology (CAST). See [http://www.udlcenter.org/](http://www.udlcenter.org/) for more details.
cognitive access and identify aspects in teaching, learning, and assessment that can be made more flexible (Rao et al., 2014). Within each of these frameworks there is one principle related to assessment, generally characterized by the provision of multiple ways to enable students to demonstrate their learning. These frameworks also include provisions for feedback, with the intention to ensure it is timely and constructive.

Accessible learning environments extend beyond simply a means of transmitting information or as a shelter, but they also should support and foster changes in students’ knowledge and skills (Rose, Harbour, Johnson, Daley, & Abarbanell, 2006). Therefore, providing access to information or to materials is essential to learning but is not sufficient. Of the three frameworks, UDL appears to specify the application of UD into effective assessments. Centred on the pedagogical principle of _multiple means of action and expression_, effective assessments: (a) are ongoing and focused on learner progress; (b) measure both product and process; (c) are flexible, not fixed; (d) are construct relevant; and (e) actively inform and involve learners (Meyer et al., 2014). This description suggests that UDL needs accessible information, plus an accessible pedagogy (i.e., multiple means of representation, expression, engagement). Hall and Stahl (2006) suggest that the following UDL factors be considered in assessment development: flexibility in setting, flexibility in scheduling and timing, and the method of presentation and response (p. 74).

The principles of UD with respect to assessment can be interpreted in different ways. A number of studies have focused on redesigning the assessment component of the course so that students can choose how to complete their final exam or assignment under UDI (e.g., Poore-Pariseau, 2013) or UDL (e.g., Rose et al., 2006). For instance, Poore-
Pariseau described how she allowed choice on a college success course final exam. This change was to help minimize potential barriers relating to students’ writing skills, creativity, memory, or performance abilities under time constraints. The exam task and the rubric used for grading were given to the class of 25 students one month in advance. However, feasibility may be an issue in large classes, limiting the success of this approach. Moreover, the approach described by Poore-Pariseau may be appropriate for certain types of courses but not for others.

On the other hand, Ketterlin-Geller (2005) interpreted the principles of UD in the context of a single assessment, focused on customizing the instrument by integrating accommodations to meet students’ needs. Ketterlin-Geller used an online platform for elementary students in mathematics assessments. This approach was not a component within one of the educational models for UD described above. Rather, it was framed within a distinct category, universal design for assessment (UDA). The advantage of the UDA framework is that it provides an opportunity for comparable performance across students through a consistent testing platform, item format, and embedded accommodations. When an accommodation is made available to all students, it is no longer an accommodation but rather a feature of the assessment design itself.

Thurlow et al. (2008) devised a series of considerations for instructors in the development of universally designed assessments that are applicable to online assessments. Instructors should first articulate the decisions they want to make from the assessment about students’ skills and knowledge, and then develop the activity to elicit these skills and knowledge. Access skills—the ability and skills needed to interact with the assessment—need to be thought out, so that the construct is properly assessed. Lastly,
instructors need to clarify what will or what will not be assessed, and then design the scoring guide based on the decisions they have made.

In addition to improved accessibility, UD is consistent with other characteristics such as feedback and resource efficiency. The potential for online assessment and UD has been suggested in Ketterlin-Geller’s (2005) research, but similar applications of UDA in postsecondary education contexts are scarce, particularly in comparison to universal design of assessments in the broader course redesign contexts such as UDI, UDL, or UID. Regardless of the educational model, UD resonates as a possible solution to the growing demand for accommodations: A comprehensive system that anticipates the learning needs of all students negates the need for all but the most specialized accommodations, resulting in a more efficient and equitable system.

**Universally Designed Online Assessment: Efficiency + Feedback + Accessibility**

The combination of UD and online assessment offers a host of advantages for students, instructors, and administrators, in efficiency, feedback, and accessibility. Challenges to accessibility that exist within traditional in-class assessments are generally attributed to the process of providing accommodations to students on paper-based assessments, which can be addressed through the features of an online assessment. Briefly, this assessment solution provides information to benefit learning as well as the necessary supports to access this information; oftentimes, the system allows multiple options for interaction (Dolan, Hall, Banerjee, Chun, & Strangman, 2005). Moreover, this platform is continuously available, whether the assessment purpose is formative or summative. Online assessments can thus improve the process of learning and assessment by facilitating student access to them outside of class time. An online assessment could
be advantageous because it is not constrained to a static format: For example, online text can be rescaled to increase visibility without changing the construct being assessed. Using built-in features found within most computer operating systems, on-screen items can be changed as needed by the student (Csapó et al., 2012; Thurlow et al., 2010). Replacement of a traditional single-sitting assessment with a universally designed online assessment may be especially useful in incidences where an accommodation is variable because it is administered by a human, or is interdependent with another accommodation.

On paper-based assessments, certain accommodations provided by humans are prone to inconsistencies. As an example, reading text aloud can vary due to voice quality and differences in the reading ability of the reader (Thurlow et al., 2010). These accommodations typically also require a separate examination area for the student requiring the read aloud. In contrast, a UD-based approach might employ screen-reading software to read text contents aloud, obviating the need for a human. An added feature of the UD-based approach is that if the student uses a headset, the student could also complete the assessment in the same space as other students (e.g., for on-campus, computerized assessments). In UD, specific accommodations that are not foreseen to provide an unfair advantage to students without disabilities (i.e., do not change the assessment construct) could be made available to every student. Students—regardless of disability status—are more successful when they have access to general accommodations (Dolan et al., 2005). This self-sufficient solution increases student access and potentially minimizes inconsistencies arising from the process of determining accommodations for students with disabilities.
Improved accessibility is not restricted to the presentation of the assessment, but can also handle timing-related accommodations during its administration. Extended time, among the most common accommodations, can be preprogrammed into the system for individual students. The system is able to terminate a student’s assessment automatically once the time limit is reached, a feature that creates administration consistency. The use of ICT when assessing students with disabilities should not be regarded solely as a limited replacement for human helpers, but as an enhanced service that enables these students to learn independently (Csapó et al., 2012). Therefore, an LMS can streamline the implementation of online assessments, bringing an inclusive learning environment to all students, regardless of class size.

**The Shifting Postsecondary Education Landscape**

Enrolment in both colleges and universities has increased over the past quarter century, as more high school students opt to pursue postsecondary education. In the province of Ontario, for example, total student enrolment at universities increased by over 40% in the decade between 2002-2003 and 2012-2013 (Higher Education Quality Council of Ontario, 2013). At the same time, these postsecondary institutions experienced increased fiscal restraint (e.g., reduced governmental funding) and resource limitations (Leger et al., 2013). Governments have called on institutions to achieve equilibrium between increased student enrolment and decreased means by finding their own creative and innovative approaches (e.g., MTCU, 2012), so that the overall quality of teaching and learning is not adversely affected.

Previously, universities may have respond to increases in enrolment by boosting the course capacity (e.g., moving the class to a larger space) or modularizing courses
(Nicol, 2009; Peat, 2000). However, while institutions can achieve economies of scale in this manner, the most efficient approach may not necessarily be the best one (MTCU, 2012). The growing student diversity highlights the need for faculty and administrators to provide students with teaching, learning, and assessment opportunities corresponding to their student population. To a large extent, universities—through their disability service offices (DSOs)—have the task of ensuring that students with disabilities have fair and equitable access in their courses. Provincial human rights legislation guarantees inclusive access to education for all students (Logan, 2009). While the diversity of students necessitates flexibility in teaching and learning approaches and supports, the structure faculty have been using is one that has been in existence since the beginning of postsecondary education—the traditional learning model.

**Teaching, Learning, and Assessment in University Courses**

This section describes practices in teaching, learning, and assessment in university courses that are inconsistent with the shifting landscape described above. These practices include an emphasis on content coverage and insufficient use of assessment to promote learning. Education in university settings is founded on a structure in which instructor contact with students occurs at scheduled times and the predominant teaching strategy is the lecture transmission model (Nicol & Macfarlane-Dick, 2006). A university course is defined by the length of instructional time using a credit hour system, but within this parameter, instructors have autonomy in how they offer their courses. Consequently, the instructor’s approach may influence the achievement of his or her students. The typical course at a Canadian university consists of three hours of f2f teaching every week for 12 weeks, for one to two terms. In order to obtain credit for a course, a student must
demonstrate sufficient achievement of the course content and expected skills that were acquired during lecture, commonly through written examinations. Incoming university students may experience challenges adapting to this new learning environment, as the teaching and learning methods may differ from ones to which they were accustomed (i.e., from high school).

Content coverage is common in university first-year courses to ensure that all students—regardless of their prior knowledge in the subject—have been exposed to the requisite background information for later courses (e.g., Davis, 2013). These courses introduce students to the basic concepts and terminology of the field. One of the greatest challenges for these first-year courses is the limited time in class (e.g., 36 hours) to cover the required content. The competing pressures of time and content within a course may lead instructors to emphasize the advancement of course content through the lecture (Sana et al., 2011). As a result, there are few opportunities for close interaction between students and the instructor during these classes (Mazur, 2009). This expectation of independent learning may impact learning, as the student composition in these classes is highly variable with respect to prior education, age, gender, and, increasingly, access to specific learning resources (Vermunt, 2005).

These differences in student demographics collectively become a bigger issue, as class size itself becomes a burden on assessment (Cuseo, 2007). To ensure maximal course material coverage, instructors may plan courses without sufficient assessment opportunities. In addition, instructors of large classes may design their assessments for ease of scoring. This approach tends to result in assessments that focus on measuring students’ knowledge rather than understanding, resulting in an incomplete representation
of what students have learned (Postareff, Virtanen, Katajavuori, & Lindblom-Yläne, 2012; Yorke & Longden, 2004). Lastly, researchers and some academics advocate using assessment as part of a continuing process to enhance learning, rather than simply measuring the extent of students’ knowledge (Nicol & Macfarlane-Dick, 2006). Yet, in postsecondary settings, assessments are typically used for summative purposes to distinguish achievement amongst students at the end of a course (e.g., Yorke & Longden, 2004).

Frequent assessment may not be feasible in large classes due to time and resource limitations. The solution of relocating classes to a larger setting to accommodate more students leaves resource-type challenges for the marking and grading of assessments, which do not benefit from economies of scale. Apart from the logistics of administering an assessment, another issue that becomes more challenging in large-enrolment courses is ensuring the assessments are accessible to all students (e.g., Ofiesh et al., 2006). As a result, assessments are commonly administered at a single sitting in larger classes, necessitating a standardization of conditions (especially for summative assessments, where student performance on them bears consequences for their academic future).

**Students with Disabilities**

As postsecondary enrolment continues to grow in Canada, the number of students with disabilities increasingly represents a larger proportion of the postsecondary student population. Such students may have sensory, physical or cognitive processing deficits that can impact their ability to learn. To reduce the impact of these deficits during their studies and to ensure that these students have equitable access to postsecondary education, support services are available on-campus, which may include advocacy,
counseling, and support for the use of adaptive technology. Students with disabilities typically make requests for such supports through DSOs. Given the increasing numbers of students with specific learning needs, it is not surprising that there was a 66% increase in the number of students registering at DSOs across Ontario between 2003-2004 and 2010-2011 (see McCloy & DeClou, 2013). In comparison, using data from the Higher Education Quality Council of Ontario (n.d.), the increase in undergraduate student enrolment during this same period was approximately 22%. The trend suggests that as DSOs continue to receive higher numbers of requests, university faculty will need to adapt policies and practices to ensure the supports for this important subgroup are available in their courses.

**Accommodating students during assessment.** As the range of disabilities students may have is diverse, so too are the types of learning supports offered to them. Accommodations vary based on the nature of a student’s disability; the procedure used to determine the type of accommodations differs from institution to institution, but usually includes a professional diagnosis or psychological testing (Ketterlin-Geller & Johnstone, 2006). Accommodations have been required at Ontario’s universities and colleges since the early 1990s (Logan, 2009). The issue of accommodations is a necessity, given the diversity that exists in postsecondary education, but it is an inadequate solution to the barriers that exist during assessment (Hall & Stahl, 2006). A large number of students may elect not to contact the DSO. For example, in one study, approximately 20% of students with disabilities in an introductory psychology course sought accommodations at an American university (Schelly, Davies, & Spooner, 2011).
Faculty have the challenge of offering accommodations while ensuring that the administration of assessments remains reliable, consistent, and efficient. A supervised, in-class assessment provides a consistent setting to students (i.e., is equal) but does not ensure that all students have a fair opportunity (i.e., is not equitable), which is the basis for providing accommodations for students with disabilities. Providing supports typically requires additional intervention by staff, either making changes to the instrument itself beforehand (e.g., paper-based version of an assessment with larger type) or during the administration (e.g., extended time). Undoubtedly, the larger the class, the more likely specific supports are required to meet students’ needs.

Limited resource availability and growing enrolment at universities add to the challenges in providing accommodations. Attempts at developing assessments that work around these challenges have aimed to remove the need for separate accommodations. For example, as a proxy for extended time in her course, Higbee (2008) provided 50 minutes to all students for an exam in a first-year course that most students completed in 20 or 25 minutes. She thought this condition was a good application of UD as it made the separate room accommodation unnecessary (although still available) and removed the segregation aspect. Moreover, this change did not have a noticeable effect on the performance of students with disabilities. However, to allow this accommodation, the construct used to assess student learning was limited to what could be reasonably measured in 20 to 25 minutes. This arrangement illustrates the challenges of in-class assessment: In practice, the class period length often is used to define assessments, when time should instead be a function of what is being assessed (Ofiesh, Mather, & Russell, 2005).
Despite their ineligibility to receive accommodations, students generally have positive perceptions of accommodations (e.g., Finn, 1998; Kurth & Mellard, 2006), even though it has been suggested that accommodations should only enable students with disabilities to demonstrate their learning, while having a neutral effect if provided to nondisabled students (Sireci, Scarpati, & Li, 2005). Given that accommodations are provided selectively, it has been questioned whether or not accommodations may be subtly disadvantaging students who do not receive them (e.g., Ketterlin-Geller, 2005). In certain cases, accommodations may actually improve the assessment and instruction of skills of students who encounter general difficulties that are not associated with a particular disability (Bolt & Roach, 2009). Both students with and without disabilities perceived extended time, separate rooms, and breaks during assessment as beneficial when offered, and their perceptions became even stronger for high-stakes assessments (Lewandowski, Lambert, Lovett, Panahon, & Sytsma, 2014). Therefore, the characteristics of a universally designed online assessment could minimize the need for accommodations, while allaying desires from students without disabilities for access to such features.

**Considerations for Online Assessment Implementation**

The use of online assessment instead of paper-based formats can remove limitations for students with and without disabilities. Thurlow et al. (2010) note that the advantages and challenges of ICT-based assessment (including online assessment) are not specific to students with disabilities. This section reviews faculty and student considerations for the implementation of online assessment, particularly in large, first-year classes.
**Faculty considerations.** These considerations are related to the stages of assessment prior to administration, including the decision to use a learning management system (LMS) as the platform for an online assessment, the existence of any institutional policies that may be in conflict with the use of online assessment, and faculty acceptance of online assessment procedures. Even though instructors may be willing to implement online assessment in their courses, some may hold an assumption that the mere availability of ICT will enhance learning, and so instructors must be mindful of institutional policies, and understand the limitations of using an LMS-based online assessment as an alternative or replacement for traditional forms of assessment. Faculty should think about the learning outcomes for students and how best to use ICT to support these outcomes (Lopes & Dion, 2015).

**Learning management system.** The use of an LMS to administer online assessments may be a practical and economical consideration for institutions, as existing assessment tools are built into the system (e.g., Griffin & Rankine, 2010; Huon, Spehar, Adam, & Rifkin, 2007; McKenzie et al., 2013). Moreover, an LMS may be beneficial as it places all course materials in one location, and provides a security layer for the online assessment. Students would thus already be familiar with the interface and login procedures prior to the assessment. While an LMS has the disadvantage of having limited customizability compared with a standalone online assessment, its use does allow instructors who do not have high levels of technological skills to implement some of the benefits offered by ICT-based assessments.

**Institutional policies.** Administrative barriers may further restrict the effectiveness of using ICT for assessment. Institutions may not have updated their
policies to reflect the use of new technologies on their campuses (Wallace & Young, 2010). One possible consequence is that students may unnecessarily be prevented from accessing certain features. These restrictions can also have implications for the application of UD, as functionality to increase accessibility may not be available to students. Consequently, not only are students denied the ability to take advantage of preexisting capabilities, but may also be left with the impression that the software cannot provide comprehensive and accessible options (Elias, 2010). In such cases, instructors must resolve the tension between accessibility and institutional policy before online assessment can be used. If accessibility is prioritized, then unrestricted access to electronic learning materials should be enabled on all hardware and software by default; else the purpose of the original learning goal is defeated (Fichten, Asuncan, Robillard, Fossey, & Barile, 2003).

**Administration conditions.** The same time and space barriers in teaching and learning overcome through ICT use can also result in challenges monitoring students during the administration of online assessments. If faculty use online assessment for reasons of convenience, then they also bear the responsibility to ensure that the assessment(s) are able to fulfill teaching- or learning-related outcomes within the conditions they established.

Faculty members commonly perceive cheating as a disadvantage of unsupervised online assessment administrations, even though the prevalence of cheating on these assessments is about the same as on their traditional counterparts (Grijalva, Kerkvliet, & Nowell, 2006). Whether the assessment is administered in-class or online, the higher the stakes (or consequences), the greater is the incentive for students to cheat. If the
properties of online assessments are not carefully considered, opportunistic students may find loopholes in the system to maximize their score, thereby affecting the validity of the result while taking away some of the advantages of online assessment. For example, in Brothen and Wambach (2001), lax conditions allowed students to use the unlimited time and unlimited number of attempts to look up answers. Students retook the quizzes until they attained the maximum score. Despite students’ high quiz marks, they did not do well on subsequent summative assessments, thereby demonstrating that few learning benefits resulted when students approached quizzes in this way. Kibble (2007) arrived at a similar conclusion. On the other hand, Fask, Englander, and Wang (2014) suggest that, in comparison to an in-class assessment, the conditions for online assessment may have a negative effect on performance (e.g., distraction in remote setting, technical problems, inability to have questions clarified), but this effect is more than offset by gains attributed to cheating.

One strategy to reduce the incidence of cheating involves programming the assessment to administer a different set of items upon subsequent reattempts, with items sourced from an item bank. Most online assessments described in the literature either employed an item bank containing generic selected-response questions (e.g., Johnson & Kiviniemi, 2009) or relied on automated item generation (e.g., Bälter et al., 2013). Both of the cited studies used randomized arrangement of distractors to ensure students did not simply memorize the questions when retaking the quizzes. Johnson and Kiviniemi suggest that item banks are most beneficial when the online assessments are offered for mastery purposes and student attempts are unrestricted, because it enables students to see the full range of items. For higher-stakes assessments, a larger item bank alone is not an
effective substitute for proctored assessments. Lewandowski et al. (2014) caution that if administrators have concerns about test security, then they need to carefully consider the flexibility of administration conditions. As administrators become more reliant on online assessment, they should take responsibility to ensure that their assessment reflects student learning (Fisk et al., 2014). Finally, controlling the time limit was decidedly the best solution to deterring student cheating in two studies (Brothen & Wambach, 2004; Daniel & Broida, 2004). The benefits of online assessments for achievement only became apparent when the opportunity for cheating was curtailed in this way.

**Student considerations.** The vast majority of students in first-year courses have limited experience in a postsecondary education environment. Among these students, personal and academic challenges may exist (e.g., time management and study skills), challenges that their advanced standing counterparts have usually learned to overcome (Christie, Tett, Cree, Hounsell, & McCune, 2008). Moreover, first-year students may not have accurate judgment of their ability to achieve (Lizzio & Wilson, 2013). Hence students may not be receiving an adequate level of student engagement to support their learning in large classes. Although UD is intended to broaden access to students through an inclusive, integrated strategy, individual student factors relating to how they approach learning and assessment may have an impact on the outcomes of an online assessment implementation, regardless of each student’s disability status.

**Approaches to learning.** There is a relationship between students’ perceptions of their learning environment and their learning approach (Prosser & Trigwell, 1998). This relationship is related to assessment, as student efforts toward learning are driven by the content and skills they perceive will be assessed (Black & Wiliam, 1998). Student
approaches to learning can be described within a student engagement continuum: At one end, a *surface approach* is characterized by little engagement in the task, and, at the other end is a *deep approach*, where students actively try to understand conceptual foundations (e.g., Struyven, Dochy, & Janssens, 2005). There are possible reasons why it is difficult to encourage students in large classes to develop a deep approach. Not only are students’ learning approaches and academic performance influenced by the limited interaction within the culture (Biggs, 2003), but the design of existing learning environments found in postsecondary education only further reinforces the nature of restricted student engagement (Cuseo, 2007).

Despite the learning challenges in these courses, first-year students may find the large-group lecture and infrequent assessment comfortable, since a surface approach appears to work in this environment. In courses with low engagement and infrequent assessment, even transfer students with college experience encountered difficulties at university, noting that, while they had more free time, they also realized that they had few opportunities to mitigate poor performance on an assessment (Gerhardt & Ackerman, 2014). As a result, students’ deficiencies in time management and study skills (see Baldwin & Koh, 2012; Cook & Leckey, 1999) may not become apparent to themselves and their instructors until the students are assessed, which, in some cases, may not occur until the end of the course (e.g., a final exam). Students are likely to adopt a surface approach if they perceive that the assessment encourages the recall of facts and bits of information (Prosser & Trigwell, 1998). Students may look forward to getting the correct answers on activities designed to help them prepare without attempting it on their own first, behaviours that Peat (2000) calls “an expectation of being spoon-fed” (p. 53).
In large classes, assessment is often not frequent enough to engage the student, is poorly designed, or both. Infrequent assessment encourages students to focus on learning what will be assessed instead of what is taught (Black & Wiliam, 1998), and students may direct their studying efforts to being able to reproduce information from lectures (Vermunt, 2005). Despite students’ perceived efficiency of using such strategies, they were overall less effective for (and an impediment to) learning (Muldoon, 2012). Poorly designed summative assessments tend to assess lower-order thinking (Gikandi et al., 2011), and provide students with less frequent and less timely feedback (Gibbs & Simpson, 2004; Nicol, 2009).

If students are to use deeper approaches in their learning, they need to possess or develop the skills necessary to engage in learning activities. These skills may be fostered through formative assessment opportunities. The use of a formative assessment framework can lead to increased opportunities for student feedback, self-regulation, and control of their learning environment, subsequently resulting in higher satisfaction with the course and achievement gains on summative assessments (Nicol, 2009; Yorke, 2003). Feedback from assessment could thus be used to guide this learning (see Sadler, 1998). Instructors are starting to recognize that more student engagement is essential to improving the learning experiences of their students.

**Approaches to online tools.** Assessment has the purpose of informing students about their learning, but their performance can also be used for grading purposes. In reaction to the latter, student approaches to learning may be to devote time to what they think is the most important aspect of the course, which is often assessment (Gibbs & Simpson, 2004). The literature suggests that this finding is no different with online tools.
Huon et al. (2007) studied how often first-year psychology students used online resources and the relationship of use to academic performance. Students were strategic with their use of tools: Resources perceived to be associated with assessment were used more often, while tools designed to take advantage of ICT for enhancing understanding (e.g., interactive content) were used less. Similarly, students in a large, first-year chemistry course at an Ontario university found practice questions more helpful to their studies than other electronic resources such as video lectures and tutorials (Burk, Lyons, Noriega, & Polovina-Vukovic, 2013). Lastly, students may also misuse an assessment for marks; Davis (2013) posited that this was evident in students who used a trial-and-error approach while taking online quizzes (that allowed unlimited access). Students who employed surface learning approaches maximized their quiz marks, but their approach did not have much effect on subsequent summative assessment performance.

These studies collectively suggest that students are largely assessment-driven and concentrate on short-term activities that prepare them for an assessment, rather than focusing on gaining a deeper understanding of concepts. With unfettered access to learning tools within an LMS, motivated and self-directed students who use these resources effectively may be more successful. Faculty members have to be aware that some students will use unsupervised assessment environments to their advantage by employing strategic approaches during administration.

**Summary**

Large undergraduate courses are experiencing continual growth at a time when available resources for teaching and learning are scarce. The increased presence of students with disabilities signifies the need to take a different approach beyond the
retroactive process of providing accommodations. Meanwhile, teaching of first-year students is also changing to improve in-class engagement. Online assessment can bridge the teaching-learning divide that occurs between on-campus instructional sessions by providing students with more independent learning opportunities to learn outside of class.

There is interest among researchers about how to reconceptualize online assessment in universities (Nicol, 2009). Accordingly, faculty members have begun to view assessment beyond the customary purpose of measuring student learning to include informing students about their learning. Combined with UD, whose principles focus on accessible learning and assessment tools that accommodate all students’ learning, a universally designed online assessment holds the promise of being accessible, efficient, and able to provide timely feedback. The integration of online assessment with other teaching and learning activities may promote deeper learning approaches and higher student engagement. However, while UD and online assessment proffer opportunities to improve accessibility and inclusion at universities, policy and resource allocations may interfere with attempts by faculties and departments to work within the confines of organizational systems entrenched at their institutions. Faculty will also need to have a confident understanding of the potential benefits and challenges of unsupervised online assessments. On the other hand, one cannot disregard common student approaches to learning (e.g., surface approach) and to assessment (e.g., marks-driven use), as these issues may affect the success of an online assessment implementation.

ICT was initially used to develop alternatives to teaching, learning, and assessment approaches. Although one would be hard-pressed today to find an undergraduate course that does not incorporate any elements of ICT, prevailing use of
ICT in assessment is reflective of an early-stage adoption, where new technologies are used to do old things (Bunderson, Inouye, & Olsen, 1989; Dolan et al., 2013). To examine the underlying benefits and challenges of online assessment, this study focused on the implementation of an LMS-based assessment in an undergraduate course redesigned to integrate elements of ICT and UD. This assessment program, a series of online quizzes, was designed to facilitate access for all students during administration, while the activity was intended to support student learning. To examine the research questions, the study looked at the online quizzes in the areas of efficiency, feedback, self-directed learning, and accessibility, from both faculty and student perspectives.
Chapter 3

Method

The context and procedures employed in this study are organized into three sections within this chapter. The first section describes the course structure for the four years encompassed by this study, highlighting the changes made in each year to the instructional and assessment components. The second section outlines the data collection procedure and provides details about the quantitative (e.g., online quiz scores) and qualitative data (e.g., interviews with students, faculty and teaching assistants) used. The final section details the data analysis procedures that were employed to answer the research questions.

Course Structure

PSYC-100: Principles of Psychology is one of the university’s most popular undergraduate courses. Beginning with the 2011-2012 academic year (defined as Year 3 in this study), students had a choice of taking the course on-campus (blended learning model) or through Continuing and Distance Studies (fully online). The course does not have formal prerequisites, but does serve as a required course for admission to specialized degree programs offered by the Department of Psychology. For instance, some upper-year courses offered in these programs require a minimum grade of B- (2.7 on a 4.3 grade-point scale, or 70%) in PSYC-100.

During this study, PSYC-100 course content was organized into units, called modules, each module taught by a faculty member or a graduate teaching fellow. The course coordinators reorganized topics within modules as needed from one year to the next for logistical purposes. The introduction of the blended learning (BL) model in Year
3 changed the instructional and assessment structure in the course. For these reasons, comparability of data across years was limited.

**Year 1 (September 2009 – April 2010)**

Students attended three hours of lecture per week in a large group setting on campus, either as a 3-hour session or two 1.5-hour sessions. There were three sections of PSYC-100, each having an enrolment of approximately 450 students.

**Instruction.** The course had six modules, each one approximately three to four weeks in length. In addition to the lectures, optional one-hour tutorials (six sessions among which to choose per week) were available. These tutorials were led by TAs, and reviewed material covered in lectures during the previous week. Online, some content was posted to a learning management system (LMS), including course announcements, lecture notes, discussion forums, marks, and other general information.

**Midterm tests.** Two 75-minute midterm tests were administered to students, one in October and one in March. These assessments contained only written questions and each test was worth 10% of the final grade. If aegrotat standing was given (i.e., an excused absence), the weight of the missed test was transferred to the subsequent midyear or final exam.

**Term assessments.** The midyear exam (December) and the final exam (April) were each three hours in length and worth 40%. They were scheduled by the university’s Exams Office. Each exam was composed of 90 multiple-choice questions and seven short answer questions. The multiple-choice section contributed 30% to the final grade, while the written section contributed the remaining 10%. The material assessed on each exam
was not cumulative. Students had access to practice items through the LMS but these quizzes were not graded.

**Year 2 (September 2010 – April 2011)**

The only change to the course structure from Year 1 was the replacement of the midterm tests with online quizzes.

**Online quizzes.** Online quizzes were administered at the end of each module (approximately every four weeks; six quizzes in total). Quizzes could be taken from any computer with a high-speed Internet connection. Each quiz contained 25 multiple-choice items; students had a one-hour window within which to access their quiz (i.e., log into the LMS), and a time limit of 50 minutes to complete the quiz. Students who anticipated a conflict with the designated time were to request permission for earlier access, which would allow them to take the quiz up to one hour earlier. The five highest marks from the quizzes collectively counted 10% toward the final grade. Students could thus miss one quiz without documentation or have their lowest score discarded.

**Year 3 (September 2011 – April 2012)**

PSYC-100 was among the first courses at the university to adopt the BL model in this year. The course expanded to four on-campus sections, which enabled a maximum enrolment of 1,800 students, and content was reorganized into four modules. The course content used a combination of three learning methods: (a) large-group learning; (b) small-group learning, called learning labs; and (c) online learning. While the large- and small-group sessions were scheduled with mandatory attendance, the online component was entirely self-directed. The course syllabus (Department of Psychology, 2011a) stated that students were expected to spend three hours every week interacting with the online
content, three hours per week reading the textbook, and one hour per week preparing for the learning lab.

**Learning labs.** Each student attended a weekly session in a section of approximately 24 students; students worked regularly in smaller groups of 5-7 students to complete assignments. Learning lab activities were worth 20% overall. Students were evaluated at each learning lab session based on preparatory work (activities to be completed prior to the learning lab); in-class group work (activities completed during the learning lab); and participation during the session. Each lab was graded on a ‘pass’ or ‘fail’ basis and contributed 1% to the final grade (20 labs in all).

**Online learning.** Moodle (version 1.9) was used to deliver content to students. As part of their learning responsibilities, students were expected to log into the LMS regularly to access this content, which included reading checklists, lecture notes, video recordings from lectures, and online readings. The same system was also used to administer the online quizzes.

**Online quizzes.** Four quizzes were administered during the year, one for each module (approximately one every six weeks). The online quizzes were worth 10% of the overall grade, based on the highest three of four quiz marks (like in the previous year, the lowest score was dropped). The access window for quizzes was seven days. Students had 45 minutes to complete a quiz. Each quiz contained 25 multiple-choice items. A document written for students, entitled *Psyc100 Module Quiz Policy* (Department of Psychology, 2011b), summarizes the conditions for the quiz administration:

The quiz is designed to test your understanding of the material covered in that module, and is to be completed ONLY by the student who logged in and with no
study aids such as the text, your notes, or the internet. This exam is designed to test what you have learned and understood, and not your ability to look up information. (pp. 8-9)

**Term assessments.** The format of the midyear and final exams remained the same, but these exams were reweighted so that written short-answer questions made up the bulk of the points. The December midyear exam consisted of 60 multiple-choice, machine-scored items (worth 10%), and eight written response questions (four from each of Module 1 and Module 2; worth 2.5% apiece), for a total of 30%. The April final exam consisted of 60 multiple-choice, machine-scored items (15%), six written response questions (three from each of Modules 3 and 4; 2.5% each), and one of two integrative essay questions (10%), for a total of 40%.

**Year 4 (September 2012 – April 2013)**

The course structure remained the same as in Year 3, although the online learning materials were made more interactive using resources produced by the textbook publisher. Most of the other changes were made to the online quizzes.

**Online quizzes.** The conditions and frequency of the online quiz component were changed. There were 12 quizzes throughout the year, each quiz was open for two weeks, and the highest 10 scores counted toward 10% to the overall grade. Each quiz contained 20 multiple-choice items. As part of the revised online quiz policy, the following text was added into the course syllabus (Department of Psychology, 2012):

Although you can work together on the quizzes, and use study aids like the text, notes and the Internet, it is in your own best interest to a) do it by yourself; and b)
do it *after* you have read the text and completed the relevant online lessons. (p. 5, original emphasis)

Students were allowed unlimited attempts. The highest score they obtained over the two-week period was recorded. The system also recorded scores obtained on the first attempt; these data were used in this study identify trends in student performance. A summary of the interim assessment characteristics for each year of the study is presented in Table 2.

Table 2
*Summary of the Four-Year PSYC-100 Interim Assessment Transition*

<table>
<thead>
<tr>
<th></th>
<th>Year 1 2009-2010</th>
<th>Year 2 2010-2011</th>
<th>Year 3 2011-2012</th>
<th>Year 4 2012-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Model</td>
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<td>Traditional</td>
<td>Blended</td>
<td>Blended</td>
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<tr>
<td>Type</td>
<td>In-class</td>
<td>Online</td>
<td>Online</td>
<td>Online</td>
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<tr>
<td>Format</td>
<td>Short and long answer essay</td>
<td>Multiple-choice</td>
<td>Multiple-choice</td>
<td>Multiple-choice</td>
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<td>1 day</td>
<td>1 week</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Length</td>
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<td>50 minutes</td>
<td>45 minutes</td>
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</tr>
<tr>
<td>Frequency</td>
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<td>2 per term</td>
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<tr>
<td>Reattempts</td>
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</tr>
</tbody>
</table>

Data Collection

In this single instrumental case study that focused on one issue (Stake, 1995) bound by time and setting, quantitative and qualitative data were collected simultaneously. A case study approach was used because this research sought to
understand a phenomenon in a real-world context (Patton, 2002). The PSYC-100 context aligned with the purpose of the study; hence, the data I collected can be considered as coming from a convenience sample. The quantitative data consisted of PSYC-100 student assessment data obtained from the LMS database, while qualitative data were from individual interviews and focus groups with PSYC-100 students, in addition to individual interviews with faculty and graduate student teaching assistants (TAs). Ethical clearance for recruitment and the collection of all data in this study was received from the General Research Ethics Board at Queen’s University (see Appendix A).

**Quantitative Data**

The Moodle LMS was programmed to automatically record students’ online quiz scores after each attempt. Course staff manually entered other assessment data collected outside of the LMS into the database (e.g., learning lab and term exam marks) for the purposes of recordkeeping and the determination of course grades. No data were collected in Year 1 as this model served as a point of reference for the study. In all, data were available for $n = 1452$ students in Year 2, $n = 1592$ students in Year 3, and $n = 1478$ students in Year 4. (Complete data were not available for all students. Students withdrew from the course as the year progressed. Therefore, these numbers represented the enrolment peak near the start of term.)

**Quiz items and feedback.** Each quiz consisted of multiple-choice items drawn from an item bank. Items were provided by instructors and selected by the coordinator for inclusion in the item bank. The quiz procedure was different across years, particularly between Year 4 and the two years preceding it.
According to an explanation provided by the coordinator, a small subset of common items (five items) was administered to every student in Years 2 and 3, while the rest of the quiz was selected randomly from the item bank. The LMS was programmed to generate the item order randomly within the quiz as well as the distractors for each item. Five items were displayed on every page, but the pages were navigable and students could answer items in any order. Once a student had submitted the quiz, their score was displayed immediately, and further access to the quiz was ceased until the answers were released. After the quiz period had elapsed, students could access their responses and correct answers to their own quiz. In Year 4, the students were given their score and their own responses to the items, and answers were posted once the two-week window had elapsed. The same quiz was presented during reattempts, and did not employ an item bank to select items.

**Preparation.** A practice quiz was available on the LMS near the start of the course in Years 2 and 3. Like the other quizzes, students could attempt this quiz once. While the practice quiz assessed general information for possible pre- and post-test evaluation, the coordinator said that the purpose of this quiz was to familiarize students with the procedure. There were also two documents that students were to read before attempting the practice quiz. The *Psyc100 Module Quiz Policy* described the rules of the quiz and explained procedures to follow if students encountered technical difficulties. An online slideshow showed screenshots of the LMS user interface to explain the features of the system including the countdown timer, as well as the save and submit functions.

**Access.** Students in Year 2 were directed to log in between 17:00 and 18:00 on the designated date, and 50 minutes thereafter to complete the quiz. In Year 3, students
could attempt the quiz anytime within a seven-day window (from Monday at 0:01 to 23:59 the following Sunday). Start and end times for each student were recorded by the LMS. In Year 4, students could access the quiz during a 14-day window, without any time or attempt restrictions. This arrangement allowed all students to interact with the same version of the quiz (i.e., a “universal design”).

**Extended time accommodation.** In Years 2 and 3, students who were granted an extended time accommodation (ETA) had access to a version of the online quiz with a different time limit (70 minutes). This version was otherwise identical to the version taken by other students; no other accommodations were provided by the LMS or by staff during administration. This version of the quizzes was programmed into the LMS as a different quiz and data were logged in a separate file. The ETA version was not needed nor used in Year 4.

**Data processing.** Student achievement data were obtained for Year 2 and Year 3 from the course coordinator. Student-level data included the version of quizzes students took, their scores on these quizzes, and the time they spent on each quiz. Aggregate course-level data were also available from Year 4, which provided descriptive statistics from the quizzes. A systems analyst at the university’s Information Technology Services (ITS) extracted these data, which were stored on a campus server, and provided them to me.

**Student categorical data.** Identifying student information, such as names, email addresses, and identification numbers, was removed from the data. Data from the different versions of the test (i.e., the regular, extended time, and early access versions) were combined into a single data file for analysis. Student course assessment data were
categorized by the version of the quizzes that each student took. In Year 2, \( n = 20 \) students received extended time and \( n = 7 \) in Year 3. According to the course coordinator, 39 students were eligible for accommodation(s) of any type for the midyear and final exams in Year 3.

**Student assessment data.** I cleaned the data obtained from the LMS prior to analysis. The process of data cleaning included the deletion of data from students who withdrew from the course or did not write the midyear or final exams, although the scores from any quizzes they had completed were included in analyses that explored correlative relationships between time spent and scores. In addition, the quiz data were also recoded into a format that would allow quantitative analysis through descriptive and inferential statistics; data logged by the LMS as string data were converted into continuous numerical data using the value splitting and time conversion functions in Microsoft Excel. For example, for a start time and the time spent on quizzes recorded as “2 December 2011 12:36 PM” and “30 min 18 sec”, these data were converted into values such as “40879.20403” (the real number value of days since January 1, 1900) and “1818” (the number of seconds), respectively. The date and time students attempted their quizzes (i.e., student access data), and the time that students were logged into the quiz were coded using SPSS software to create subgroups, in particular with Year 3 data, for further analysis.

**Assumptions.** The times recorded in the LMS presented a quantitative measure of the time students logged into the quiz. It was assumed that students were working continuously on the quiz while logged in. I was later informed by the ITS systems analyst that the recorded time spent on quizzes might not be completely accurate: For instance, if
students did not submit their quiz properly or did not log out of the system properly, the recorded time might be higher than it was in actuality (e.g., logging stopped when the session or connection timed out).

**Qualitative Data**

Qualitative data were obtained in (a) focus groups conducted with PSYC-100 students in Year 3, and (b) individual interviews with instructors and graduate TAs from Years 3 and 4.

A snowball sampling procedure (Miles & Huberman, 1994) was used to identify other individuals within the course who could be considered in the data collection. I used a semi-structured format during the focus groups and interviews. This approach is characterized by a set number of questions to be asked in each session, with the inclusion of unstructured time to allow the researcher and participant(s) to be responsive to the situation (Patton, 2002). In this study, the focus groups and interviews were conducted as a way to gather perspectives from students, instructors, and TAs.

**Student sampling.** Recruitment of students receiving accommodations was done separately from those who were not. The sampling procedure for these two subgroups differed slightly, although the sample for each subgroup was the same size, which was a maximum of 10 students (i.e., 2 focus group sessions of 5 students each). It was intended that this stratified random sampling approach would ensure a sufficiently large sample for the subgroup of students receiving accommodations.

**Students receiving accommodations.** The Year 3 coordinating TA sent recruitment notices (see Appendix B) to the campus email addresses of all students with disabilities, using a list obtained from the University Registrar \( n = 39 \).
purposeful sampling procedure, participants were accepted on a first-come basis. Students were invited to disclose their disability (self-identify) in their responses, so that information that could assist in ensuring that students with a variety of disabilities were represented during data collection, but a response was optional. To ensure an accessible process was available, participating students were given the option of an in-person interview or answering questions by email in place of a focus group. Students were asked which option they preferred after indicating their interest. If they chose to participate, the questions were offered to them in advance by email so that they would have an opportunity to reflect on the questions beforehand. Attempts to organize a focus group for students receiving accommodations were unsuccessful because there was not enough interest, but one student opted for an individual interview. The TA sent a follow-up email to this list two weeks later but it did not gather any additional interest. As an alternative to the focus groups, an online survey was created and all students from the original list were invited to participate. Participants were invited to enter a draw for a movie theatre gift certificate.

**Individual interview.** A 30-minute on-campus interview was conducted with one student with dyslexia in March 2012. I made anecdotal notes in addition to audio-recording the interview. The student received $10 for participation.

**Online survey.** I developed an online survey using the TooFAST assessment summary tool (https://www.toofast.ca), which consisted of the same questions students would have been asked in the focus group. The latter was an alternative means of gathering student perceptions using open-ended questions, thereby allowing them to participate at their convenience while protecting their identity. The Coordinating TA sent
out the invitation for this survey one week after the focus group session dates were held. Eight students responded to the survey; all were female with seven of them in their first year of studies; one student was in her second year.

**Students not receiving accommodations.** To ensure the sample was random and that every student had an equal probability of being selected, 39 randomly selected students were invited to participate with a recruitment notice sent to their campus email address by the Coordinating TA (see Appendix B). To obtain this sample, a list of students in this group was first numbered 1 through \( m \). Then, \( m \) was divided by \( n \) to obtain \( p \). A number between 1 and \( p \), value \( q \), was randomly generated using the \texttt{RANDBETWEEN(1, p)} function in Microsoft Excel. Students \( q, q + p, q + 2p, q + 3p \), and so forth were selected, until \( n \) students were invited.

This sampling technique did not result in an adequate sample for data collection. Subsequently, to increase the responses for the focus groups, the recruitment strategy was modified by inviting all students enrolled in on-campus sections of PSYC-100 to participate. The coordinating TA posted the recruitment notice on the LMS in early March 2012; participants were accepted on a first-come basis by contacting me by telephone or email. The Letter of Information (Appendix C.2) was sent by email to students who agreed to participate. Students accepting the invitation attended one of two focus group session dates and signed a Consent Form (Appendix D.2) prior to participation (per university policies and ethics guidelines, an active consent process was used). Focus group sessions were only held with students who did not receive accommodations.
**Focus group interviews.** Feedback was obtained from students on their experiences with the online component of the course, particularly the quizzes. The focus group method was chosen to collect data as it was thought that the discussion and interaction among interviewees would likely yield the best information (Creswell, 2013). Given that all PSYC-100 students were required to participate in the online quizzes, a focus group discussion enabled them to relate their shared experiences about the course assessments to each other (Krueger & Casey, 2000). The focus group method was also chosen because the time to collect information (i.e., conduct interviews) for this study was limited: The course was ending within four weeks, thereby making the focus group an efficient strategy (Creswell, 2013). To ensure participants’ availability prior to the end of term, focus group interviews were conducted in March 2012 in a meeting room of a university library. Each session lasted approximately 60 minutes, with five student participants at each session (10 students in all).

Of the 10 students, eight were first-year students, one was in her second year, and one was in her third year; all were female. A short survey (see Appendix F) was administered prior to the focus groups to collect information from participants regarding their student status and how they accessed the online component of the course. Given the sensitivity of these discussions, it was explicitly mentioned prior to each session that the conversations were to remain confidential. Focus group sessions were audio-recorded to ensure that the participants’ words and thoughts were accurately captured (transcription accuracy). An assistant was present during the focus groups to make anecdotal notes that would enable responses and statements to be attributed to each participant during transcription. The questions I asked focus group participants were designed to elicit
student responses that reflected their experiences in the course. Each student who participated in a focus group interview received $10 compensation.

**Faculty interviews.** Individual interviews were conducted with instructors and teaching assistants involved with the course. All interviews took place during Year 4 of this study. Letters of Information and Consent Forms were sent to them by email (see Appendices C.1 and D.1). I conducted interviews with the following staff:

- The PSYC-100 course coordinator, a professor who had held this position for over 12 years as well as being an occasional instructor in the course. In Year 4, she shared coordination duties with another faculty member.
- Professor A, Year 2-3 instructor, an Associate Professor who had taught sporadically in PSYC-100 over the past decade;
- Professor B, Year 1-3 instructor, an Associate Professor who had previously taught in PSYC-100 for over five consecutive years;
- Professor C, Year 4 instructor, a graduate teaching fellow in psychology who was also a TA and facilitator in the course in Year 3; and
- A Year 4 coordinating TA, who was responsible for handling accommodation requests from students. She had worked as a graduate TA and learning lab facilitator in Year 3.

During the interview with the course coordinator, I asked her to describe what actions were taken in collaboration with the DSO in preparation for student accommodations, and the expected benefits that the BL model implementation would bring to students and course instructors. Using a semi-structured interview approach, I asked instructors questions related to the purpose of assessment in higher education, what a fair assessment
looked like to them, and how they worked to support student learning within the BL model. I interviewed the TA at the suggestion of the course coordinator (i.e., through the snowball sampling technique); the TA was asked about her role in working with students and perceived challenges of the BL model. The questions I asked the instructors and the TA were open-ended and intended to gain their perspectives about the course’s teaching, learning, and assessment practices during the years in which they were involved. All interviews were audio-recorded to ensure transcription accuracy, and transcription was done verbatim.

**Link to Research Questions**

The research questions in this study (see Table 3) were used as a framework to create the questions I used during the interviews, focus group discussions, and survey. Details of questions asked to the course coordinator, instructors, the TA, and students are listed in Appendix E.1–E.5. Other questions I asked participants were intended to establish the context or to gather their opinion about related topics. Table 3 contains only the questions developed before the interview or focus group session; based on the responses given, further questions were asked for clarification or elaboration. (For surveys, a follow-up to any participant responses was only conducted by email or telephone if the participant was willing and had provided contact information.)
Table 3

Research Questions in Relation to Interview and Survey Questions

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Interview / Survey Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What were the defining characteristics of the online quizzes during the transition that ultimately shaped their development?</td>
<td>C4, C5, C8, C9, C11, C12, C13 I1, I6, I7, I9 T7</td>
</tr>
<tr>
<td>How well did the implementation of the online quizzes address issues relating to the provision of accommodations?</td>
<td>I3, I5, I9, I10 C4, C7, C11, C12 T3, T4 S7, S8 Q12, Q13, Q16, Q17, Q18</td>
</tr>
<tr>
<td>What were course faculty members’ initial expectations of the online quizzes, and how were these expectations altered through their experiences?</td>
<td>C7, C8, C9, C10, C13, C14 I1, I2, I4, I6, I8, I10, I11 T5, T6, T7, T8, T9, T10</td>
</tr>
<tr>
<td>What were students’ perceptions of the online quizzes, and how did these perceptions relate to the learning approaches they took?</td>
<td>Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q14, Q15, Q17 S1, S2, S3, S4, S5, S6, S7, S8</td>
</tr>
</tbody>
</table>

Note. The letter of each code indicates where the question was used, while the number indicates the question number. C = course coordinator interview; I = instructor interview; Q = student survey (questionnaire); S = student interview; T = TA interview. Refer to Appendices E and G for the wording of these questions.

Data processing. Transcriptions of each audio recording into text documents were made within one week of each interview or focus group session. Qualitative data analysis software (nVivo) was used to import and organize the transcripts for analysis.

Data Analysis

To examine the score-level effects of providing students with extended time accommodation (ETA), quiz score data collected in Year 2 and Year 3 were analyzed using a t-test, which allowed the determination of quiz score differences between the two subgroups (i.e., received the ETA version or regular version of the quiz). I then ran a
similar analysis using time spent on the quizzes as a dependent measure. Effect sizes were calculated using Cohen’s $d$ for subgroup differences found to be statistically significant. To look for access patterns in Year 3, descriptive statistics for each subgroup were calculated, including mean score and frequency. Data obtained from the quizzes in Year 4 could not be analyzed and compared in ways that were done with previous years’ data because the scores and time spent on individual student attempts were not collected. Instead, the aggregated data in Year 4 were used to calculate the average number of attempts by students for each quiz.

To examine the research questions in this study that used data collected from student and staff, I conducted content analysis on interview data. Content analysis is the examination of language and classifying text into themes with similar meanings (Weber, 1990). I imported transcripts and survey data into $n$Vivo for analysis, and used it to organize and code the text into themes. The initial organization scheme I used attributed each piece of data (e.g., quotation, survey response) to the participant. I then used an open coding technique (see Strauss & Corbin, 1990) to discover and name categories, which involved identifying descriptive segments with participants’ perceptions and opinions. Within the software, I highlighted relevant text and attributed it to a number of subcategories, using the linked research questions as a starting point. I then compared the similarities and differences of responses between groups of participants (e.g., student responses, faculty responses) within the subcategories. The next step was to conceptualize and label similar segments within these groups and aggregate the responses (i.e., categorizing) to form a set of possible categories (Strauss & Corbin, 1990).
The second part of the qualitative data analysis was to code the text using these themes. I read all of the transcripts and survey responses a second time to verify the categories that were created, and then built these categories into themes. This process was facilitated using nVivo to make connections between these categories in a manner that enabled my research questions to be answered. The constant comparative method (CCM) was used to refine the themes by combining initial possible themes with similar features while identifying possible new themes (Boejie, 2002; Glaser & Strauss, 1967). CCM involves the comparison of each piece of text coded under a theme to other text already coded under that theme, with the purpose of identifying the defining features of the theme (Boejie, 2002). The themes (constructs) that emerged relate to accessibility, feedback, self-directed learning, and efficiency from the faculty perspective. I then linked student perspectives to these constructs. The data analyses provide evidence of the extent to which online formative assessment can support the learning of all students through a universal design approach. Additional details about the elicited constructs and their relationships to the context of the study are presented in the following chapter.
Chapter 4

Results

This chapter presents the results from an implementation of an online assessment program in a first-year undergraduate course. The assessment program, a series of online quizzes, was part of a larger initiative (namely, the blended learning model) to incorporate online components into its on-campus course. This course redesign was intended to promote learning for all by addressing course challenges in the areas of efficiency, student feedback, and accessibility. The results are organized by the research questions in this study:

• RQ1. What were the defining characteristics of the online quizzes during the transition that ultimately shaped their development?

• RQ2. How well did the implementation of the online quizzes address issues relating to the provision of accommodations?

• RQ3. What were course faculty members’ initial expectations of the online quizzes, and how were these expectations altered through their experiences?

• RQ4. What were students’ perceptions of the online quizzes, and how did these perceptions relate to the learning approaches they took?

I will address RQ1 by analyzing the transition to online quizzes and the subsequent process, as the other research questions build upon these results. RQ2 involves analyses of differences in quiz performance and timing of students who received testing accommodations compared with those who did not, in addition to looking at general trends between years. The remaining two questions were addressed using four
constructs that appear to underlie the themes represented in the data obtained in the research. These four themes are resource efficiency, feedback, self-directed learning, and accessibility.

The research spans a four-year period in the PSYC-100 course. A comparison of course achievement data between years was not possible, because the instructional reorganization of course content appeared to prioritize the changes made to the assessment structure. The LMS logged the quantitative data for the online quizzes and the course coordinator made these data available to me. In addition, I collected qualitative data during the two years in which the blended learning model (Year 3 and Year 4) was used. These data included individual interviews, focus groups and surveys with faculty and students.

**The Constructs Used as a Foundation for the Data Analyses**

I will begin by describing the constructs used in the data analysis for RQ3 and RQ4, as familiarity with these constructs will be helpful in interpreting the results. The constructs were based on themes that emerged from interviews and meetings with staff in relation to the online quizzes. The constructs included resource efficiency, feedback, self-directed learning, and accessibility, and the corresponding definitions I used in this chapter were based on the coordinators’ intended purposes for the online assessment component.

- **Resource efficiency** refers to decisions made in allocating finite resources (inputs) to a course activity, such as the course assessment. Furthermore, using the *status quo* as a baseline, it was hoped that the quality of student learning or achievement
(outputs) would be maintained or improved. This construct is a consideration in cost-benefit analyses.

- **Feedback** refers to information intended to benefit the learner, and this information is derived from the process of assessment. Generally, feedback is characterized by quantity (i.e., how frequently it is provided) and quality (i.e., how detailed is the information). Instructors can also use feedback to adjust teaching.

- **Self-directed learning** (SDL) refers to a process of learning that is motivated and supported by the availability of feedback. In this study, SDL is the presumed subsequent action taken by students once feedback from the online quizzes was provided, thereby fostering student engagement with the course material.

- **Accessibility** refers to the ease of access to the assessment system. An accessible assessment contains minimal interaction barriers that may obstruct the demonstration of student learning.

These terms are all features of a universally designed online assessment and will be revisited in the context of instructors’ (faculty) and students’ experiences later in this chapter.

**Evolution of the Online Quiz as the PSYC-100 Interim Assessment**

Prior to the implementation of the online quiz, PSYC-100 used only written formats for course assessments, similar to the arrangement in Year 1. Hence the introduction of the online quiz in Year 2 was the first notable change to the course assessment since the course coordinator started working at her position. This section begins by describing the transition of the interim assessment beginning with Year 1, and
then detailing the online quiz characteristics that were changed in the three subsequent years. Enacted changes in a particular year were generally intended to address challenges experienced during the year preceding it.

**Year 1: Challenges of the Written Midterm Test**

The midterm tests predated any use of ICT in the course; the tests consisted of written essay-type questions and were administered once every term. Students from all sections took midterm tests during a coordinated session on campus. The intended purpose was formative, as students received feedback based on course material covered up to the time of assessment (i.e., an interim assessment), but the tests were also low stakes (worth 10% each). In contrast, the term exams contained mostly multiple-choice items, and were high stakes summative assessments (worth 40 or 45% each) that assessed material over an entire term.

The challenges with the midterm tests involved time and resource limitations: Midterm tests were challenging to administer because of the large class size, and correspondingly, the large number of tests to mark meant that individual feedback was brief. For some time, faculty had recognized that proctoring and marking assessments in large-enrolment courses were resource intensive (see Trevisan, 2004), and it was financially prohibitive to provide students with more detailed feedback regarding their essays. Moreover, a notable proportion of students required accommodations or had scheduling conflicts with the test, which was handled by adding a halftime equivalent TA position in the course.
Year 2: Moving Online

While the online quizzes were a change to the PSYC-100 assessment structure, the quizzes themselves were not new to the course, having previously existed within the LMS for the sole purposes of formative assessment (i.e., for practice). The Year 2 iteration contained additional measures that distinguished it from the practice version. First, quizzes counted toward their course marks, to motivate participation; but second, the quizzes were intentionally low stakes, to communicate the expectation that the quiz was an affordance for SDL. Further, rules were established (e.g., time limits, individual work, etc.) to convey the importance of academic integrity and consistent administration. To promote the quiz as an individual learning opportunity and for ease of handling missed quizzes (whether excused or not), the lowest score among all quizzes was dropped during the calculation of each student’s final grade.

The online quizzes also differed from the midterm tests in regards to item format and administration: The quizzes used multiple-choice items (objective assessment format) whereas the midterm tests had used essay-type questions (open response format). Moreover, an item bank sourced the quiz, with a partial random selection process employed to vary a portion of the items included on student quizzes. Finally, to make cheating more difficult the system shuffled the item distractors. Altogether, the changes in item format were intended to enable both quicker scoring and the autonomous measurement of students’ learning, while the randomization of items and their distractors enforced academic integrity.

Use of the online quiz brought about the desired reduction in resources for course planning and scheduling, even with more frequent assessment. From a cost-benefit
standpoint, the online quizzes benefitted from economies of scale, since the increase in resource usage (mostly ICT-based resources) was negligible relative to the increased number of students. The online platform also provided advantages with respect to supporting students with accommodations. The feature to provide ETA was programmed into the system for eligible students, enabling them to work on the same interface as their peers during an administration without additional supports.

In Year 2, as exemplified by the rules that asked students to log into the LMS at a designated time and to work independently, the coordinators attempted to keep the administration of the online quizzes consistent with the midterm tests, notwithstanding location. Despite the standardization, multiple variants of the quizzes were still needed. An early access version of the quiz was made available to students (with staff approval), since it was anticipated that some students would encounter scheduling conflicts with the quizzes, in addition to the ETA version assigned to certain students with disabilities. Subsequently, one of the changes staff made to the online quizzes in Year 3 was altering the conditions for simultaneous administration so as to reduce the number of student requests pertaining to differential access.

**Year 3: Introduction of the Blended Learning Model**

The changes to the course in Year 3 were highlighted by the transition to the BL model, which featured the introduction of the learning labs and small-group instruction. Although the functionality of the quizzes remained largely the same as in Year 2, changes were made to the time limit, access period, and total number of quizzes. The time limit was shortened to 45 minutes (down from 50 minutes in Year 2). Based on an analysis of differences in students’ scores (described later in this chapter), this change had little
impact on students’ quiz completion (i.e., most students finished well within the revised time limits). Access to the quiz was broadened; students had a one-week window to complete each quiz. Evidently, the coordinator considered this change beneficial to students, since students could take a quiz when they felt ready, but course staff would also benefit by removing the need for the early access version (and student rescheduling requests). The BL model restructured course content into fewer units, and as a result, students were assessed fewer times than in Year 2.

The coordinator explained that the change in time limit (lowering it to 45 minutes) was intended to make the quizzes more challenging for students while also making it slightly more difficult for them to cheat; however, as will be discussed later, the reality did not reflect this expectation. Students did indeed take their quizzes throughout the week with the widened access window, but while course staff attempted to keep the administration of quizzes secure and consistent, challenges (e.g., student cheating) became more widespread. Overall, in Year 3, the relaxed conditions in terms of access allowed for a greater degree of efficiency, but effecting these changes also created academic integrity issues and delayed the return of feedback to students.

**Year 4: Refocus to Formative Assessment and Student Engagement**

In the final year of this study, with the BL course structure established, staff made further changes to the online quizzes, seemingly to reflect a firmer emphasis on formative assessment. Staff realized that both student cheating (an *interquiz* issue) and accessibility (e.g., timing, an *intraquiz* issue) remained unresolved issues. The changes in Year 4 removed all the rules and conditions that governed the online quizzes, as it was recognized that these restrictions interfered with the purpose.
With these changes, students were assessed more frequently throughout the course, and students had unlimited time and unrestricted attempts over a two-week period for each quiz. The increased number of quizzes created an incentive for students to use the feedback while the module was still being taught, and each quiz assessed a narrower scope of material. Further, the same multiple-choice items were used on reattempts. Students were also allowed to use any approach they wished when taking the quizzes: In addition to the use of any learning materials while they took the quizzes, students could also collaborate with others (although course documents reminded students that the quizzes would be more helpful to them if they attempted them on their own).

Staff thus addressed the persistent issues of cheating and accessibility simply by removing all of the conditions rather than trying to secure the quizzes through other means. The presumed benefits brought efficiency, feedback, and inclusive accessibility in one fell swoop. Staff did not have to manage the quizzes as actively; students received more feedback from being assessed more frequently; and there were no longer any timing or scheduling conditions that restricted access. As a result, only a single version of the quiz for all students was needed.

The progression of the online quiz program that unfolded over the course of this study suggests that although the conditions of the online quiz were modeled on the conditions used successfully during in-class assessments, the unstructured nature of the online environment created challenges in implementation and the fulfillment of the online quiz purposes, as instructors and students alike attempted to adapt to this structure.
Analyses of Differences in Online Quiz Characteristics

Although the provision of accommodations is typically limited to students with physical or cognitive disabilities, nondisabled students were also accommodated in PSYC-100 for various reasons including temporary physical disabilities (which were under the purview of the DSO), but also unrelated matters (e.g., assessment scheduling conflicts). Consequently, both nonspecific (e.g., ETA) and specialized supports (e.g., reading text aloud, large print) were used in the course. This section describes the changes to the provision of nonspecific accommodations during online quizzing. Next, \( t \)-test analyses compared differences in performance between students who received ETA and students who did not receive accommodations in Year 2 and Year 3.

Differences in the Number of Accommodated Students

The coordinators stated in a discussion (during the planning of this study) that approximately 10% of the students enrolled in PSYC-100 required some type of accommodation during the midterm tests in Year 1. Subsequently, moving to online quizzes appears to have reduced the number of accommodated students, which means that more students were taking assessments as originally designed. With each successive year in this study, fewer students were administered a variant of the quiz (e.g., early access, ETA, proctored paper-based).

The number of students taking early access versions of the quiz varied greatly in Year 2; for instance, the greatest need for early access was in Quiz 1, with 66 students in this category and represented some 4% of the student population in the course, but in Quiz 5, there were only two students. The ETA version was based on the conventional
practice of 150% of the standard time limit. The LMS was essential to making the management of timing and scheduling accommodations easier for staff.

**Quiz Score Differences Between Accommodated and Nonaccommodated Students**

*T*-test analyses were used to compare student performance on ETA and regular (nonaccommodated) versions of the quiz. Because the early access version was a temporary accommodation for students with scheduling conflicts, and not exclusively for students with disabilities, student data from this version were combined and reported with data from the regular version. Not surprisingly, in Year 2, students receiving ETA (up to 75 minutes) spent significantly more time than those who did not receive ETA (*p* < 0.05, see Table 4). Effect sizes for the factor of time on each quiz, calculated using Cohen’s *d*, ranged from .06 to .61. In spite of the differences in the mean time, score differences were not significant (*p* > .05, see Table 5).

In Year 3, the time limit was 45 minutes and students were given one week to take their quiz, with up to 70 minutes allowed for students given the ETA version. Similar to the Year 2 results, the time limit in Year 3 did not pose a barrier to quiz completion either (i.e., there was sufficient time for all students to attempt and submit their quizzes). Although students who received the ETA did take significantly longer than their nonaccommodated counterparts, the mean time difference for students receiving ETA generally was smaller than in Year 2 (see Table 6). With the exception of one quiz, the differences were statistically significant (*p* < .001). Students who received the ETA version did not perform differently (*p* > .05) than nonaccommodated students (Table 7). Collectively, the findings suggest that the time constraints did not impact students’ abilities to complete the quizzes, nor did the ETA unfairly advantage students.
Table 4

*Time Spent by Students With and Without Extended Time During Year 2 Online Quizzes*

<table>
<thead>
<tr>
<th>Quiz</th>
<th>n</th>
<th>M (min)</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>12</td>
<td>45.82</td>
<td>9.03</td>
<td>2.26</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1422</td>
<td>39.10</td>
<td>10.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>20</td>
<td>45.38</td>
<td>17.90</td>
<td>2.66</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1399</td>
<td>34.71</td>
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</tr>
<tr>
<td>3</td>
<td>A</td>
<td>18</td>
<td>59.38</td>
<td>13.66</td>
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</tr>
<tr>
<td></td>
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</tr>
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<td>A</td>
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<tr>
<td></td>
<td>B</td>
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<td>5</td>
<td>A</td>
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<td></td>
<td>B</td>
<td>1333</td>
<td>30.17</td>
<td>12.61</td>
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</tr>
<tr>
<td>6</td>
<td>A</td>
<td>18</td>
<td>46.75</td>
<td>16.47</td>
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<td>&lt; .001</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1343</td>
<td>30.39</td>
<td>12.01</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.* Group A = extended time accommodation
Group B = no timing accommodation or only early access accommodation
Table 5

*Online Quiz Scores of Students With and Without Extended Time in Year 2*

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Group</th>
<th>n</th>
<th>M (%)</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>12</td>
<td>62.00</td>
<td>17.68</td>
<td>-1.28</td>
<td>.20</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1422</td>
<td>67.53</td>
<td>14.87</td>
<td></td>
<td></td>
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<td>2</td>
<td>A</td>
<td>20</td>
<td>73.60</td>
<td>16.74</td>
<td>-1.70</td>
<td>.09</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1401</td>
<td>79.23</td>
<td>14.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>18</td>
<td>74.22</td>
<td>14.85</td>
<td>.69</td>
<td>.49</td>
<td>–</td>
</tr>
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<td></td>
<td>B</td>
<td>1387</td>
<td>71.87</td>
<td>14.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>20</td>
<td>71.00</td>
<td>13.35</td>
<td>-1.57</td>
<td>.12</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1383</td>
<td>76.14</td>
<td>14.55</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>A</td>
<td>18</td>
<td>73.56</td>
<td>16.30</td>
<td>1.00</td>
<td>.32</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1333</td>
<td>69.52</td>
<td>17.08</td>
<td></td>
<td></td>
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<td>A</td>
<td>18</td>
<td>78.67</td>
<td>13.65</td>
<td>-.96</td>
<td>.34</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1343</td>
<td>81.66</td>
<td>13.13</td>
<td></td>
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</tr>
</tbody>
</table>

*Note.* Group A = extended time accommodation  
Group B = no timing accommodation or early access accommodation only

Table 6

*Time Spent by Students With and Without Extended Time During Year 3 Online Quizzes*

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Group</th>
<th>n</th>
<th>M (min)</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>7</td>
<td>59.62</td>
<td>10.58</td>
<td>-7.12</td>
<td>&lt; .001</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1558</td>
<td>29.03</td>
<td>11.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>7</td>
<td>53.57</td>
<td>15.93</td>
<td>-5.28</td>
<td>&lt; .001</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1547</td>
<td>28.53</td>
<td>12.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>6</td>
<td>52.25</td>
<td>18.05</td>
<td>-5.35</td>
<td>&lt; .001</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1533</td>
<td>25.73</td>
<td>12.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>6</td>
<td>39.20</td>
<td>23.40</td>
<td>-1.44</td>
<td>.21</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1445</td>
<td>25.38</td>
<td>12.38</td>
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</tr>
</tbody>
</table>

*Note.* Group A = extended time accommodation  
Group B = no timing accommodation
Table 7

*Online Quiz Scores of Students With and Without Extended Time in Year 3*

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Group</th>
<th>n</th>
<th>M (%)</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>7</td>
<td>80.00</td>
<td>12.65</td>
<td>-0.08</td>
<td>0.93</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1573</td>
<td>80.40</td>
<td>12.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>7</td>
<td>76.00</td>
<td>14.97</td>
<td>-0.49</td>
<td>0.62</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>1562</td>
<td>78.56</td>
<td>13.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
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<td>18.36</td>
<td>-0.80</td>
<td>0.43</td>
<td>-</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A</td>
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<td>88.68</td>
<td>11.15</td>
<td>1.18</td>
<td>0.24</td>
<td>-</td>
</tr>
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<td>1459</td>
<td>82.60</td>
<td>12.59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Group A = extended time accommodation
Group B = no timing accommodation

There was a significant difference in the quiz score average for Year 2 ($M = 75.96$, $SD = 13.22$) and Year 3 ($M = 83.28$, $SD = 9.86$), suggesting that the reduced time limit did not adversely affect quiz scores (mean difference = +7.32, $t = 16.96$, $p < .001$). These results should be viewed with caution as the number of quizzes and the quiz items were different, however, the items were based on the same course content (albeit with a different course structure).

In Year 4, the quizzes did not have time limits, and students were also permitted unlimited reattempts within an extended period. Moreover, given that a single version of the quiz was administered to all students, Year 4 quizzes were not comparable to those from previous years. (The items on Year 4 quizzes were also different, having been mostly sourced from the textbook publisher’s item bank.) Although one might expect higher scores as a result of the liberalized conditions, the results suggest otherwise. For each quiz, the mean score of students’ first attempts were lower than those obtained in
Year 3 (see Table 8). The results also suggest that for a particular quiz, a lower average mark on the first attempt was negatively correlated to the frequency of student reattempts ($r = -.93, p < .001$). The number of reattempts appears to decrease gradually as the course went on, with a significant difference when quizzes were grouped by term (Fall: Quizzes 1–6; Winter: Quizzes 7–12). As these data were only provided in aggregate form, it was not possible to determine statistical significance in the scores between the terms or between subgroups (e.g., students with and without disabilities).

Table 8
*Online Quiz Scores of Students in Year 4*

<table>
<thead>
<tr>
<th>Quiz</th>
<th>n</th>
<th>$M_{1st, attempt}$ (%)</th>
<th>$SD_{1st, attempt}$ (%)</th>
<th>$N_{reattempts}$ (average)</th>
<th>Score of all attempts (average, %)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1478</td>
<td>60.06</td>
<td>23.35</td>
<td>3.52</td>
<td>76.32</td>
</tr>
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<td>2</td>
<td>1428</td>
<td>63.00</td>
<td>22.43</td>
<td>3.02</td>
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<td>1447</td>
<td>57.86</td>
<td>23.93</td>
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<td>70.55</td>
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<td>27.24</td>
<td>3.74</td>
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</tr>
<tr>
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</tr>
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<td>76.19</td>
</tr>
<tr>
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<td>61.06</td>
<td>25.05</td>
<td>2.78</td>
<td>70.29</td>
</tr>
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<td>1080</td>
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<td>2.50</td>
<td>74.25</td>
</tr>
<tr>
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<td>1351</td>
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<td>31.14</td>
<td>2.27</td>
<td>73.03</td>
</tr>
<tr>
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<td>1291</td>
<td>69.89</td>
<td>33.61</td>
<td>2.57</td>
<td>69.52</td>
</tr>
<tr>
<td>12</td>
<td>1205</td>
<td>73.03</td>
<td>30.07</td>
<td>2.05</td>
<td>74.24</td>
</tr>
</tbody>
</table>

The mean scores of students’ first attempts in Year 4 (average score of 61.75%) were lower than the quizzes in Years 2 (Table 5) and Year 3 (Table 7). Compared with previous years, the standard deviation for the first attempt is larger, suggesting greater
variations in student performance. As expected, the marks on subsequent attempts were higher because students would have had opportunities to review their answers and retake the quizzes. Furthermore, since there were no penalties for reattempting, it is presumed that the vast majority of students would eventually obtain full marks on their quizzes.

Of the three years in which the online quizzes were used for marks in PSYC-100, scores were highest in Year 3 (the year in which BL was introduced), followed by Year 2 (consistent administration), and Year 4 (considering only students’ first attempts). Notwithstanding the effects of the course redesign in Year 3, the highest scores may be a consequence of being liberal in access (one week) but restricted in attempts (only one). In comparison, the Year 2 quizzes were restricted in both access and attempts, which reduced opportunity for some forms of cheating and thus provided greater score variation among the students. Although it appears that Year 3 students had greater opportunities to exploit the system than did Year 2 students, it is important to note that quiz difficulty was not accounted for in this comparison.

Students in Year 4, despite having the advantage of unlimited attempts, unlimited time, and the ability to use any course notes or collaborate with students, had lower scores on first attempts when compared to scores of their counterparts from other years. This finding suggests that in Year 4, students did not feel compelled to obtain the highest score on their first attempt, possibly because they knew that it would not be their only attempt. One approach would be to try the quiz with minimal study preparation to check what they knew in a closed-book situation, but another would be to refer to their course materials as they responded to items. Subsequently, a first-attempt score may be interpreted based on the approach taken by the student. That score is, by and large, useful
only to the student. With respect to the established quiz-taking conditions, any and all student approaches were an acceptable form of practice.

Outside of the term exams (where regular accommodation procedures were followed), the use of online quizzes enabled a continual reduction in the number of students in the course requiring accommodations. As the difference in students’ quiz scores between the ETA and regular versions was not statistically significant, the ETA version was redundant. Therefore, the decision in Year 4 to remove administrative barriers created by time limits and restricted attempts made the quizzes more inclusive and accessible, which in turn addressed social and cultural barriers associated with the single-sitting arrangement that exists in many assessments.

**Expectations and Experiences of Course Staff with the Online Assessments**

The value of a new assessment can be partially judged by the extent to which the actual experiences of course staff met their intentions and expectations. I interviewed one course coordinator, three instructors and a coordinating TA about their expectations for the online quizzes. These expectations were organized into four constructs (resource efficiency, feedback, self-directed learning, and accessibility). The course coordinator regarded these characteristics as beneficial to the purpose and operation of the quizzes. These expectations were then compared to her experiences after the implementation, along with the experiences of other course staff, on the basis of the four constructs.

**Resource Efficiency**

The course coordinator described the replacement of the midterm tests with online quizzes in PSYC-100 as resource efficient, because it established a basic structure to assess students throughout the year. Instructors perceived that administrators may have
cited improved student learning outcomes as the main benefit for implementing the online quizzes, but that economical reasons (i.e., cost savings) were likely as important a consideration for the department and university.

**Expectations.** The quizzes offered several desired characteristics pertaining to resource efficiency, including improved accuracy in gauging student learning; a reduced need for resources during assessments; and a quicker scoring and reporting process.

**Accurate gauge of student learning.** This expectation was premised on the use of a computerized adaptive testing (CAT) system in the course by using a large item bank with known item psychometric properties. Although computerized assessments are compatible with both traditional and adaptive testing frameworks, they are enhanced with the latter. The coordinators had plans to eventually offer all of the PSYC-100 course assessments using CAT. A basic online assessment was used in Year 2 to replace the midterm tests, but this arrangement has remained ever since apart from minor changes.

Despite the cancelled plans for CAT, the coordinator still envisioned its use in the future, as it offered a number of desired benefits not possible with the present model. She explained: “Ideally everybody would write on a computer, and we wouldn’t worry about time, it would be much more universal, I would love that . . . it would also be more efficient, because students wouldn’t have to do all the multiple-choice [items], they could get done much more quickly and we’d get a precise estimate of their ability, so I like that idea of adaptive testing.”

**Reduced resources for planning and development.** Planning and administering the paper-based midterm tests consumed time and resources. While ICT-integrated assessments may require more resources at the outset, it is hoped that there is an overall
net benefit through reduced management and the ability to reuse electronic materials developed for the assessment. The implementation plans for the online quizzes made it efficient; with a well-designed set of rules, the quizzes would be securely and consistently administered without the need for proctoring.

**Instant results and scoring.** Although the online quizzes used preexisting technology and a format similar to quizzes available as extra practice in previous years, online quizzes had never been used for marks. The coordinator saw multiple-choice items as a way to increase efficiency in the course because automated scoring would reduce marking activities for staff, and students could obtain their results (feedback) sooner.

**Experiences.** Instructors’ experiences suggested that the envisioned increases in resource efficiency benefits were successful, largely by enabling features with low barriers to implementation. Despite not having implemented a CAT framework, the move to online quizzes alone was thought to have fulfilled some of the goals, using the features that were already available within an LMS.

**Accurate gauge of student learning.** Plans to increase the accuracy in measuring students’ learning by implementing CAT were shelved because, as the course coordinator explained, “it looked like it was pretty resource intensive.” Therefore, concerns over the perceived cost were enough to justify the continued use of the basic online version. Even so, the coordinator acknowledged that the items used in the quizzes “weren’t great,” and that the staff adjusted the scores of students who were administered these poorly designed items. Still, Professor B heard from students about the score adjustments, and suggested that students’ learning was disrupted due to the way in which the quizzes were administered:
I’d say I’ve heard from approximately 35 students, and I know that’s a small piece of the pie. But almost to a person, all the students were very disappointed in the assessment that was done last year in the way it was conducted. They complained about grades shifting or moving, I’m not sure what happened there—I wasn’t a part of that—but something where grades were adjusted a couple of times, and it was chaotic.

Moreover, Professor B was dismayed with the management of the online quizzes. During the interview, he seemed to distance himself from these assessments because he did not think the quizzes offered a strong enough incentive to change existing student habits, nor were the quizzes effective at gauging students’ learning.

[If] the process of answering the questions and thinking about it is an important part you want to evaluate, then I supposed you should stop calling it an assessment, and just say it is an opportunity to learn, because it forces you to think about the questions. That’s been around for ages, these self-quizzes and self-tests, they have many resources. I don’t think it was supposed to be that way.

Professor A, who also thought that assessments should be able to differentiate students, thought that any differences in students’ quiz scores were related to effort in general and should not be used as a measure of actual learning:

I see those things as mostly mastery type things, and so, by and large, I doubt they differentiate much on ability… anyone who was willing to invest some time and effort can do pretty well. And so the people that were doing poorly in those things, [it] is that they just didn’t care. I’m interpreting—that’s probably an unfair
thing—or just had other things going on in their life. But the bottom line was just they didn’t want to invest time and work, it is [that] those components differentiated very little in terms of ability, they way we marked them.

Professor A was thus suggesting that the quality and conditions of the quizzes were not rigourous enough to fulfill the purpose of assessing students’ learning. He reasoned that while students participated in the quizzes, their scores were a reflection of their participation and not how much they had actually learned in that unit.

**Reduced resources for planning and development.** As the coordinators planned the online quizzes, they wanted the conditions used in all course assessments to be consistent. The resources involved in providing the ETA required only a minor reconfiguration of the LMS (create a version with a longer time limit). As anticipated, the reduction in resources came from the reuse of online assessment content.

**Instant results and scoring.** Although the online quizzes did not assess students to the same depth as the midterm tests, staff expectations regarding instant results and scoring were readily met. The LMS logged students’ data from each quiz (e.g., time and date of access, time spent on the quizzes) and provided students with their quiz scores upon submission. These scores were used in the calculation of the online quiz component of the course assessment. However, the validity (of these scores) was questioned by instructors, as will subsequently be discussed.

**Summary.** Staff envisioned that an online quiz program could fill the assessment gap in their course, and moved to implement a basic version soon after. Benefits derived from this implementation included the ability to create variants of the quiz for different student subgroups and automated scoring. However, perceptions that online assessments
were resource-intensive and questions raised about their ability to gauge student learning present challenges to further development, implementation, and application.

Feedback

The instructors described feedback as information from assessments that could be used to improve their teaching and/or students’ learning in the course, for example:

- Benefit to teaching: identifying course content needing revision or to evaluate the teaching strategies that were used.
- Benefit to learning: provide a scaffold for students to determine course material that students had mastered and the material that they needed to review.

I used these categories to organize instructors’ expectations of the feedback in regards to the online quizzes in addition to their experiences with the quizzes.

Expectations. An analysis of the instructors’ views suggests that despite the course’s increasing focus on learning outcomes through redesign, instructors’ expectations and descriptions for assessment feedback continued to emphasize teaching outcomes. This discrepancy appears to be shaped by the prevailing course philosophy or their prior teaching experiences; Professor A and Professor B showed perspectives consistent with the traditional learning model and teacher-centred (direct) instruction.

Teaching outcomes. The coordinator and Year 2 instructors presented viewpoints that supported the notion that feedback from assessment has the potential to inform teaching. Their views of assessment, however, appeared to focus only on the term exams as assessments, since the exams were understood as the best measure of students’ learning. The coordinator said that student performance on these exams provided feedback regarding teaching, but could also be used to identify difficult concepts.
encountered by students to determine what changes needed to be made for the following year. Similarly, Professor A said that results from the exams provided a starting point for him to evaluate his teaching strategies, providing clues about potential problems with teaching, student learning, or the assessment instrument. On the other hand, Professor B had an argument against the use of feedback as a way to improve learning, saying that assessment was not to benefit students, but to improve the course:

Assessment is basically to evaluate the depth of understanding and the content that has been delivered by the professor and/or by the materials provided. It’s to find out how effective the method of teaching has been in regards to [students’] ability to communicate the material that is put to them.

Professor B’s expectations for assessments appear to focus on finding out what students have learned in a controlled setting (i.e., summative purposes), while disregarding the process of student learning (i.e., formative purposes). Based on their understanding of assessment communicated during their respective interviews, both Professor A and Professor B had little to say about the online quizzes and how feedback might inform their teaching, since they did not appear to consider the online quizzes as assessments. For example, Professor B questioned the overall purpose of the quizzes if the process of regulating the administration was ineffective:

If it’s an assessment tool, then I think we got a real problem with having this, let’s call it cheating. I’m not assessing your performance, I’m assessing the six kids around you and your ability to tag team up on questions and get everything right. That’s what you’re assessing. So until you can isolate that and make sure that was actually happening, don’t fool yourself.
In sum, his explanation suggests that the online quizzes were not assessments because they did not meet his definition of assessment. Instead, the quizzes should be viewed as exercises that encouraged student collaboration.

**Learning outcomes.** The coordinator believed the online quizzes would provide students with feedback to identify weaknesses in their knowledge, and in turn encourage them to review their study materials, as she explained:

> We hope to assess students to give them feedback about the degree to which they’ve grasped the concepts that we want them to grasp, so the degree to which they’ve met the learning objectives, and we want to give them as much feedback, or to some degree, a fair bit of feedback so that they can adjust if they need to, any of their behaviour, so we want to do a lot of formative feedback in a distributed fashion.

The only feedback given to students after the quiz was their score, and despite the limited information of this feedback, the coordinator thought that the quizzes still promoted the intended behaviour better than the midterm tests on the basis that the quizzes were administered more frequently.

**Experiences.** Based on teaching and learning outcomes, there were differences between faculty experiences and course expectations of feedback from the quizzes; these differences included the acknowledgement that the quizzes did not elicit student learning as anticipated, and that staff-established rules failed to deal with improper student use.

**Teaching outcomes.** Consistent with their ideas about student assessment, instructors did not appear to find the feedback useful to teaching improvement. Professor
B appeared to be somewhat apathetic about the quiz items, explaining that his responsibility and involvement ended once he had finished creating items for his unit:

I just put it together because I was asked to put the questions together. I don’t know if there was an ultimate purpose. We had discussions about different things about the utility of these [quizzes] or usefulness but they decided to go ahead with them anyway and I don’t know the status of these things now because I don’t teach in the course anymore.

Therefore, Professor B complied with this responsibility as an instructor but avoided becoming too invested in the process, deferring this role to the coordinators. Professor A expressed being similarly disconnected from the assessment process:

I picked the items but I actually had nothing to do with the administration of it, nor its marking. PSYC-100 is very unusual for what typically occurs in our department. A course instructor’s responsibilities are that I pick the test items, I give some input into how they are scored—although I don’t even have complete say in that—and then I’m kind of removed from the process. Whereas in a normal course, it would just be me making all the decisions, so it’s a bit unusual in that way.

In a large-enrolment course, course coordinators can facilitate planning and operation, but instructors were not part of the entire process, either inadvertently or by choice. Nonetheless, the instructors were not engaged in the assessment, thereby limiting their opportunities to use the feedback for the improvement of their teaching practices.


**Learning outcomes.** In Year 2 and Year 3, scheduling of the quizzes appeared to be tied to the course organization and structure, which then appeared to overshadow the coordinator’s stated purpose of assessing students more frequently. This inconsistency was evident to the course coordinator, who recognized that the consequence was limited feedback to students. She said:

Last year [Year 3], it was really the emphasis of being formative or summative; it was much more summative than formative. If it was formative, once every six weeks, it was kind of late to learn that you misunderstood history [of psychology], taught five weeks ago, and you got feedback once everybody was done. We showed them the right answers, there was no incentive to fix them, no marks associated with that.

So even after the transition to online quizzes, the increased frequency of assessment did not make a noticeable difference to students’ learning. She suspected that students worked together on the quizzes because their short-term goal (to obtain a good score on the quiz) was judged to be more important to them than the feedback advising them about what topics they needed to review:

Students were going out of their way to work with other people. . . . We heard [that] they were getting together in groups and doing it, and of course it had a time crunch, so someone could, and we assume, that students would just be going, ‘Okay, the answer’s ‘B’, the answer’s ‘C’, they wouldn’t necessarily be understanding why, they would just try to get the best mark they could.
Hence by the end of Year 3, the coordinator acknowledged that the staff were altering conditions simply to control student cheating, but expectations of providing usable feedback were still not being achieved.

[Before], the emphasis—and we wanted it—was summative: We want you to do it on your own, we’re going to mix up the questions, we’re going to make it timed, we’re going to mix up the answers, everything we tried was to make it so that it was what they knew [as an individual].

Summary. The instructors’ notions of assessment feedback centred on the evaluation of instruction and course quality, which did not relate to improvement of student learning outcomes as the coordinators had set out in their course plans. Perhaps instructors were unfamiliar with approaches that focused on formative assessment, or they did not value this purpose in the context of PSYC-100. Despite their ability to identify the potential value of feedback on teaching, the instructors did not use feedback in the ways they described, such as to improve the quality of their teaching practices or to reteach concepts to students. Instructors’ limited involvement in course assessment decisions, in conjunction with untimely feedback, may be reasons for the reservations they had about the quizzes.

Self-Directed Learning

The online quizzes were changed to be a course requirement as a means to build students’ SDL skills. The coordinator anticipated that marks would be an incentive for students to use the quizzes in their own learning and practice. In contrast, instructors’ experiences suggest that the success of this approach was limited because their students did not possess the necessary skills for SDL.
**Expectations.** SDL was an alternative to the passive mode of learning that existed in the traditional lecture model, which contained few engagement opportunities for students. The course redesign was intended to address this problem by introducing learning activities beyond the lecture that encouraged students to study throughout the course. These activities (which included the online quizzes) would subsequently reduce students’ dependence on getting all of their teaching from instructors.

**Experiences.** Both Professor A and Professor B were concerned that the SDL philosophy in PSYC-100 was removing supports at a time when students were more likely to need additional supports. Both were concerned that the students had limited experience learning in a postsecondary environment and lacked time management skills. Professor B said: “I think the students call for structure. The students adapt to their new surroundings expecting structure, and they come in and they’re given this free reign. I think it’s dangerous, knowing the minds of 17- and 18-year-old students.” Professor A also thought that the coordinators’ expectations of SDL for their students were quite ambitious, describing the attainment of their goals as a gradual process that cannot be solely encompassed within a first-year course.

In all of the aspirations [the coordinators] have for PSYC-100, I too have for the students, but I see that as a work in progress that evolves over the course of their four years here. So every one of the things they want the students to be able to do at the end of PSYC-100, I also want them to do, but I don’t think the process gets that far in PSYC-100, it’s really just the starting point for the process.

It is apparent that the instructors agreed with the principle of SDL but remained skeptical about students’ abilities to develop these skills without direct, explicit
instruction provided by, for example, on-campus lectures. Professor B saw the quizzes (and other online learning activities) as incapable of adapting to the different learners’ abilities and unable to progress with students’ growing understandings of the course materials, asking, “What is the direction of a small online quiz? Is it to make sure students rehearse the material more often and more consistently? Just because it is online I don’t know if that makes it any better.”

Moreover, based on informal discussions, students told Professor B that cheating was one of their common strategies during the quizzes, which led him to question the value of this activity for individual learning.

Every student I talked to said, “That’s exactly what we did, but don’t tell anybody.” So I mean, for me, is that really testing an individual’s knowledge? Does that add anything to the course? No, it doesn’t. Unless you say, “Go work in groups, I don’t care.” So that it’s not actually a cheating thing. But if you say go work by yourself and do this . . . and they’re all doing it in clusters, they’re teaching them to cheat? I don’t know.

Because Professor B did not think students were successful with the SDL approach, his perceptions suggest that the quizzes only resulted in surface-level behavioural changes in a process where students were attempting to maximize their scores (i.e., short-term benefit). Consequently, the quizzes were not helping students generate a deeper understanding of concepts.

Summary. Instructors did not have high expectations of SDL because they perceived there was insufficient structure in the BL model to support first-year students, and that envisioned goals for the course were too ambitious. Further, the learning-related
purposes of the quiz were undermined by the prevalence of student cheating. Instructors noted this behaviour occurred during administration, inferring that students employed surface learning approaches to earn marks. Despite being designed to operate as a self-directed activity, the instructors did not think that the online quiz program was successful in SDL based on the way the quizzes were administered.

**Accessibility**

An accessible, universally designed assessment was expected to be mutually beneficial to students and staff. It would contain features to support learning for all students, regardless of whether students had testing accommodations granted to them or not. At the university, the standard procedure for students requiring assessment accommodations was to contact the DSO. Following approval, students notified course staff to work out accommodation details.

**Expectations.** It was expected that an online quiz would be more accessible to students through a common administration, so that fewer one-off instances of resource usage would be needed. Furthermore, a self-reliant assessment system could offer a platform that can withstand unanticipated changes in resource availability. It was hoped that employing an online assessment could simplify the operation so that staff could take a hands-off approach for most nonspecialized accommodations outside of major exams. The coordinator recalled the wide range of students who required accommodations in the past, which not only included students with disabilities, but also those who required rescheduling for religious observances or varsity athletics. When the quizzes were first scheduled outside of class time in Year 2, scheduling accommodations were needed for
some students and, like for the midterm tests, participation levels varied. To some extent, this need for rescheduling negated some advantages of online assessment.

With the shift to one week to complete a quiz in Year 3 (vis-à-vis the fixed time arrangement in Year 2), the coordinator believed students would have sufficient opportunity to take their quiz, explaining: “[We] wouldn’t worry when, like give them more opportunity, about when they went on. Day, night, if they had practice, if they’re not feeling well, that would make it fair.” Access to two common accommodations—extended time and separate room testing—eventually became available to all students, largely negating the need to individually provide these accommodations.

**Experiences.** While the ability to take the online quizzes offsite was a derivative of separate room testing, availability of the ETA version of the quiz prior to Year 4 was rooted in the standard procedures followed for accommodation requests. The coordinator’s perfunctory explanation for the status quo still appeared to be exclusionary: “We tried to be fair in the sense of timing, that if you required extra time according to what disability services said, then you got it, and that was programmed in the system.” Whereas the scheduling of online quizzes in Year 2 limited the extent to which accommodations-related challenges could be resolved, Year 3 was different. With the one-week access period in Year 3, the coordinator anecdotally noticed the difference in the magnitude of accommodations requests. As described earlier, the number of students needing accommodations dropped drastically: The change in structure enabled students to take the quiz with a more lenient time period without giving up a preferred location. As the coordinator noted, “they accommodate themselves.” Past accommodations that varied in presentation (e.g., size and colour of text and paper) and setting (e.g., venue, lighting)
were no longer needed with the online format. Moreover, since students controlled their testing environment, including the computer or computing devices they wanted to use, effects from the transition online were negligible. The online quizzes, however, did not eliminate the need for the paper format entirely; the coordinator stated that some students did not feel comfortable taking an online assessment (she did not provide an exact number), but it was scant in comparison to the hundreds of students who successfully took their quizzes using the LMS (Moodle).

**Summary.** Continuing challenges with accessibility led the coordinators to reconsider some aspects of how they administered the online quizzes. While some of the changes to access were beneficial to students, observed accessibility improvements in later years may largely be attributed to changes in the quizzing conditions. Incidentally, factors that were originally established to create consistency during administration also created barriers to accessibility. It was the removal of these factors—and not the intrinsic properties of the online quiz—that made the assessment more inclusive to students.

**Revised Expectations of Online Assessments by Faculty Members**

This section identifies the lessons the course staff learned from the first year of the blended learning (BL) model (Year 3), and their revised expectations about the online quiz that, after two years, were still not fully met. To uncover these revised expectations, I interviewed PSYC-100 staff from Year 3 and Year 4 of this study, including one of the course coordinators; Professor C, an instructor who had already taught one module in Year 4 at the time of the interview; and a Year 4 Coordinating TA responsible for handling student issues and accommodation requests. Expectations for the four characteristics—resource efficiency, feedback, self-directed learning, and
accessibility—are described based on the discussions with these faculty and staff members.

**Resource Efficiency**

Efficiencies were yielded from the simplification of the online quiz operation to make it self-managing. Allowing students unlimited time and attempts prevented the quizzes from being used to gauge students’ learning. An item bank that accompanied the course textbook was used to create these quizzes, to make better use of existing virtual resources. The coordinator stated that the need for most accommodations had essentially disappeared with this arrangement:

I have not had [an accommodation request] yet. There could be, if anything for accommodations, it might be able to use a computer: keyboard – students have JAWS³; two of our students have screen readers. Yeah, it’s been quite amazing, I don’t think I’ve had any for the quizzes.

This experience suggests that even specialized accommodations could also be provided with computer software that interacted directly with the online assessment. The decrease in the resources used for assessment planning and development allowed faculty efforts to focus on the learning labs and term exams to evaluate students’ learning; their efforts were reflected in the course’s redesigned teaching and learning activities.

**Feedback**

In Year 4, the online formative assessment was markedly different than in the previous two years. Professor C, who was new to her role as a course instructor, was

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³ A screen reader software program; JAWS is an acronym for Job Access With Speech (http://www.freedomscientific.com)
more receptive to the student-centred structure; both her and the coordinator’s expectations of the quiz feedback focused on the benefits to students’ learning. The refined version of the year’s quizzes was defined by distributed learning and repurposed assignment of marks.

**Distributed learning.** The quizzes were administered more frequently, giving students more practice items to work with within each course module. Increasing the number of quizzes reduced the time gap between instruction and assessment. In addition, the system was set up so that students had to master the quiz (obtain 80% or better) before they could attempt the next one. The coordinator believed this change fostered distributed learning, as students were given some feedback immediately before they could continue onto other quizzes, an arrangement that compelled students to access the quiz regularly.

[The idea of having a two-week window is saying, we want to get [student] feedback on that material before you go on to week three and four, so students are told, ‘you have two weeks to take this quiz, take it as often as you want, and you’re more than welcome to use the feedback—and we hope you will—to go back and learn the areas you didn’t’.

The coordinator thought that the quizzes in previous years assessed on too much material on each quiz, and students did not bother to look at the feedback. She explained:

Now, we’ve backed off and it’s much more formative. You perform, you take whatever resources you can get your hands on to perform the best you can, you can see how well you did, and it counts less than one percent to each quiz to your overall mark.

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Despite this perceived success, the coordinator admitted that the quality of feedback was still unsatisfactory, having remained unchanged from previous years (e.g., the score plus incorrectly answered items) but still reflected a balance between resources and feedback.

**Repurposing quiz marks.** Faculty expected that by allowing students to retake quizzes, quiz scores would improve and result in higher exam marks. This change repurposed the quiz into a motivational tool for students, and although it likely negated any potential benefits to instructors, Professor C did not appear to be bothered by this; she said: “The quizzes are marks that they receive as a tool to hopefully enhance the learning that will occur for reiterating that knowledge on the final. So it’s sort of helping them learn, and then [asking them] what do they know.” Despite the lack of feedback to instructors, she indicated that changes would not have impacted her teaching anyhow: “We’re not quite as interested in whether they did understand the material or notes, we’re hoping they used that to their own benefit.” Her explanation aligns with previous year instructors’ perceptions, which all ran contrary to expectation that the purpose of assessments should be used to inform instructors. Professor C’s view (that the quizzes were not worth much) may have influenced her to trivialize their usefulness to her teaching, but as lecturer, she did not see any benefit to receiving feedback. Therefore, the new approach to the quizzes may have unintentionally reinforced instructors’ beliefs about the lack of feedback. While the feedback was not much different compared to previous years, the change in Year 4 appears to have further relegated the role of course assessment to the midyear and final exams.
Professor C maintained the perception that marks were necessary on all assessments—even formative quizzes—because she recognized that although students were receiving information about their learning, they were ultimately mark-driven.

Motivating people extrinsically [by telling them that] ‘you’re going to get marks for this’ is beneficial in the end, I would say, and it’s not a huge proportion of their mark in the end, so it’s not like it would be overinflating people’s knowledge.

Similarly, the coordinator recognized students’ appetites for getting the highest score they could, but unlike in previous years, they now had an incentive to earn it.

[Students] tend to respond to 1% and 2%. That gets very important to them. So we’re hoping by saying we’re going to tell you your answer is wrong, we’re not going to tell you which one’s right, but if you go back and get it right, you can change your grade, instead of 19 out of 20, you’ll get 20 out of 20, so there’s a built-in incentive for them to actually follow through and figure out the right answer.

The coordinator added that students eventually got full marks on the quizzes, but data from first attempts and reattempts were still collected (presented earlier in this chapter), and used in further analyses. She still viewed feedback as an important role for the quizzes and was still interested in having students use the quiz feedback in their learning. Nonetheless, despite the changes, it is apparent that Professor C held similar views about the quizzes as her predecessors; that is, they were tools that assessed students’ abilities to find information within course material.
Self-Directed Learning

The course coordinators realized that by liberalizing the quiz conditions, more opportunity would exist for students to learn on their own. The changes to the Year 4 quizzes were thought to assist in this endeavour by addressing the mismatch between the rules (that asked students to work individually) and the behaviour that transpired (cheating). With unrestricted time and unlimited attempts, the quiz was changed to better reflect notions of SDL that were constrained by previous structures. In addition, related changes allowed students to use any resources. The coordinator was satisfied with the series of changes, as they represented progress in her understanding of the purpose she had for the online quizzes:

[Students are] also told it’s open book, it’s collaborative, they can use Google if they want, we want them to find out the answer however they can. Last year, we told them it was to be done without aids, all on their own, [but] we heard that wasn’t the case, they weren’t usually doing that. So we thought, let’s embrace this, then. How can we embrace the collaborative, they can talk to a friend, and make it a good learning experience?

While the unwanted student collaboration and use of materials during the quizzes in Year 3 spurred the need for change, she questioned whether it was the quiz rules or the student behaviours that needed to be changed. Similarly, the TA did not think that learning was adversely affected in spite of the changes, and that overall, the end purpose remained the same. According to her explanation, SDL meant that students were now free to do their own thing amongst themselves:
We tried to take away the testing connotation with the quiz, so rather than viewing this as something where they had to sit down and stress about and do as well as they could, they could just work with people, discuss it with everybody and try and work out their answers together, which they were doing anyway.

Although students now had a motivation to get the highest scores, it was to their advantage to review the feedback before reattempting the quiz, regardless of the strategy or studying approaches they used at first. The TA also suggested that this format also lessened anxiety, a problem former PSYC-100 students encountered during assessment.

Making it less stressful, make it like they’re not rebelling by doing this, [and] I think, makes it a little bit more relaxed, being able to do it to mastery is one thing we added, and that I think would help the most because they’re more likely to find out what the correct answers are. If they were to do it once, and they’re super stressed or frustrated, they might never look at those answers, and they’ll never learn what they did wrong, whereas if they’re continuing to do it until they get the answer right they’ll know the right answer in the end.

According to the TA, self-directed students would be able to earn the high scores on the quiz without course staff needing to be involved in the process. The changes appeared to cede to students’ behaviours as the needed change to make the quizzes more enticing. As the coordinator explained: “Let’s reduce that pressure, let’s face up to the fact that they’re [cheating] and embrace it as a good thing; collaborate, look up answers you don’t know, be able to fix mistakes.”

The changes recognized that the consistent settings for assessment used successfully for many years in PSYC-100 in the traditional learning model needed an
update: “I was still thinking in the mindset of [proctored tests], that it has to be individual work, that they can’t have time to be tempted to cheat.” Her concern about time limits during the quizzes suggests that timing was used as a strategy to control students’ behaviour, to make it more challenging for students who were looking up material and consulting other students; this original approach also meant that time limits were somewhat capricious. Moreover, the coordinator also thought that without an opportunity to reattempt the quizzes, the feedback did not present a complete picture to students about what they had learned:

It was always the case that students saw what they did wrong, and they got to see what the right answer was after the fact, but it wasn’t clear to us how much they would go back and look at their wrong answers and learn what the right answers were and why.

Despite making such collaboration acceptable, staff still advised students that they work individually and without study materials. By allowing students to work with others but recommending the opposite, one may question if SDL is actually happening, because both students who were self-directed and students who were simply trying to get the highest score with the least effort possible were both now within the bounds of acceptable quiz-taking. One thing is certain, though: Would-be student cheaters no longer existed, and issues relating to academic integrity were no longer necessary.

**Accessibility**

While no steps were made in Year 4 to specifically address accessibility, there were synergistic benefits. Being able to offer the same version of the quiz to all students made it inclusive to all students. While the coordinator was prepared with approaches she
employed in previous years, these approaches were not needed for the Year 4 quizzes. Similarly, the TA noticed accommodations only became necessary for the term exams:

[B]ecause our course doesn’t have any kind of written work that is evaluated during the year, most of the accommodations—I don’t want to say don’t apply—but we don’t have to really make many accommodations because the course is mostly the exam, and then those labs.

Professor C acknowledged that PSYC-100, despite having made some improvements toward accessibility, still contained barriers. As an example, she found the term exams (which emphasized essay-style questions) still posed challenges to students who had difficulty writing for long periods, while the online content was challenging for students with reading disabilities.

[For] a person with physical disabilities that makes it difficult movement-wise, having more material you can do flexibly from a different location would make it easier, but for anybody that has difficulties reading for whatever reason—dyslexia, for example—the onus is more on the individual to get that information themselves.

Excluding the changes that facilitated accessibility, the most noticeable benefit to staff was easier tracking and management of student participation, particularly for the online quizzes. The coordinator explained that extending the access period for the quizzes virtually eliminated all administrative activities relating to accommodations, such as verifying documentation for absences and missed quizzes:
We figured everyone can find the time within the two weeks. And if there was a reason, in the syllabus, if there was something that came up, this year it hasn’t even come up. Last year, occasionally we would have a student who didn’t do one at all, so let’s say there’s a death in the family, we would pro-rate it, we still wouldn’t penalize them, again with documentation, if something terrible happened, or you just got sick, well then don’t write that quiz, we’ll pro-rate it but I don’t even know this year, with two weeks, if it has even come up yet.

**Summary of Online Quiz Changes in Year 4**

The changes to the online quizzes made by course staff resulted in a different feedback structure to promote students’ learning. As a result, staff needed to reconsider the purpose of quizzes and how they were administered. The course coordinator reasoned:

We were doing [timed quizzes] because we didn’t want students [to cheat]. Which is another aspect to assessment, saying, ‘we want them to have this knowledge, it has to be fast, it has to be at their fingertips, we don’t want them to have time to look things up.’

At first, staff efforts were concentrated on timing and scheduling issues during administration, with the scores based on students’ abilities to answer quiz questions within a fixed time period. This approach was eventually questioned:

[Then] we thought why are we doing [timed quizzes]? Isn’t it more important at the end of the day that they understand these big concepts? Why don’t we let
them look stuff up? If they don’t know it by then, we need them to know before the end of that assessment.

The coordinator thus placed the responsibility to students (i.e., “we need them to know”) instead of having students rely on course staff, and began the process to foster this responsibility earlier than at the end of the first unit. The one-week access period in Year 3 created such advantages to course management that it was an easy decision for her to further extend access to two weeks in Year 4. The coordinator noted:

So we backed off the time and said they can have access to materials, they can look stuff up. It’s convenient for us, because [to date], I don’t think we have made any accommodations for any student not able to write a quiz, that I can recall.

The removal of time limits for online quizzes in Year 4 was declared an early success.

In summary, all of the enabled features within the LMS to manage testing conditions for the online quizzes in the first two years—time limits, random selection of items from an item bank, random arrangement of item distractors, limiting students to a single attempt, and extended time only for approved students—were removed because they created more challenges for staff, and were not sufficient to reinforce SDL behaviours in students. The features, all readily available in the LMS and originally seen by the course coordinators as necessary to maintain equivalence to in-class assessments turned out to obstruct the purpose of the quizzes. By reframing the quizzes to a “collaborative learning experience,” the coordinators readily abandoned all rules for the quiz. Hence the final product was, in essence, a revived version of the optional online quizzes found in Year 1’s auxiliary learning resources, with credit given to students for participating.
The Experiences of Undergraduate Students Using the Online Assessments

As most students in PSYC-100 students were in their first year of university, the learning expectations of the course differed from their recent high school experiences. For first-year students who experienced the BL model (Year 3) of the study, the differences were perhaps more marked, as this course structure appeared to demand greater levels of student self-motivation and independence. Based on interviews, focus groups, and an online survey conducted with students near the end of their course in Year 3, I mapped the four constructs identified by the coordinators—resource efficiency, feedback, self-directed learning, and accessibility—to the students’ experiences with the online quizzes (which was their interim assessment in PSYC-100). In addition, students provided suggestions to improve the online quizzes in relation to these characteristics.

**Resource Efficiency**

Although the implementation of the online quizzes greatly reduced the use of resources in the course, this change had implications for the facilitation of students’ learning. Not surprisingly, with their marks at stake, students tested the limits of rules and conditions established for the quizzes.

**Experiences.** As identified by the coordinators, the online quizzes were seen to increase resource efficiency by providing an accurate gauge of students’ learning, reducing the need for additional resources during administration, and providing quicker scoring and results.

**Accurate gauge of students’ learning.** The coordinators conceived the online assessment as equivalent to the replaced midterm test for measuring student learning. Yet there was evidence that students had concerns with their classmates’ honesty. This
sentiment of disapproval was more strongly felt among students who tried to follow the rules during the quizzes. One student perceived that the online format favoured students who were technologically savvy and thus able to take advantage of the system:

I don’t think the quizzes are any way to judge how much someone knows in the class whatsoever, because I know a lot of people who don’t attend the lectures, don’t do the readings and get 100% on the quiz because they sit there with all the modules open and search keywords and type in the answers. And a lot of people do that, so I’m glad they’re only worth 3%, because I actually try and learn and study and go up to it, and I don’t do as well because I’m not as good on a computer at finding answers, so it kind of sucks.

This student appreciated that the quiz was not high stakes; perhaps she was thinking of the possible impact of student cheating on course grades had the quizzes been worth even more. It also suggests that there is still disparity among student use of ICT, which may have factored into the quiz scores.

Reduced resources for administration. One of the motivations for the online quizzes was the prospect of offering students flexibility in choosing when and where to take the quizzes. Possible effects on interaction and performance arising from the students’ use of an online assessment (rather than a paper-based assessment) were negligible based on students’ described prior experiences with ICT. Students’ comments suggested that apart from minor technical problems, they had few issues associated with the online assessment. Students were receptive to being able to use their own resources, as the majority of students in the surveys reported completing the quiz at their home or
campus residence using their own computers, as opposed to a campus computer lab or library.

**Instant scoring and results.** The system communicated information about their quiz to students in a two-stage process. The first stage was returned immediately after the student submitted the quiz and contained the score, while in the second stage, students had access to the questions from their quiz accompanied by the correct answers. (As students were randomly assigned a subset of questions from the item bank, the answers provided to students depended on the items on each student’s original quiz.)

A score is the simplest (and arguably least informative) form of feedback that can be provided. While a score was the only initial feedback provided by the online quizzes, students did report that it was helpful in getting an idea about their performance. While more detailed feedback would have been appreciated, they understood the limitations of an online assessment with an administration that spanned one week. One student’s explanation illustrated this understanding: “[The system doesn’t] give you the answers, which makes sense because you can do it any time of the day, [and] other students may not have written it.”

**Suggestions.** Although the quizzes appeared to satisfy the department’s desire for resource efficiency, students also had suggestions about how the quiz could improve the learning experience for them. Their suggestions, which will be discussed in the context of the benefits to resource efficiency, were focused on imposing strict rules and conditions (some of which were previously used in the course) and avoiding the use of a self-administered assessment.
**Accurate gauge of students’ learning.** Students, especially those who diligently completed their quizzes, wanted better feedback about what they had learned after taking a quiz. However, accurate measures of students’ learning were of less importance to students who engaged in cheating. Nonetheless, both students who admitted and who did not admit to cheating wanted the quizzes to be offered in ways that would be fair for all students, agreeing that if the resulting scores are intended to be used as evidence of demonstrated learning, the assessment ought to be proctored.

Since instant feedback depended on the use of the multiple-choice format, some students thought the quizzes were not a good way to represent their learning. As the predominant question format on term exams was written response, some students wanted written response to be included on quizzes as well. For example, as one student commented:

I like writing more, and all the quizzes are multiple-choice, and I get that doing it online that’s easier to mark, but sometimes I am better at explaining a theory in my own words than answering some really specific multiple-choice questions about it.

**Reduced resources for administration.** Students did not have any issues with the quizzes, as they were more convenient than completing them on paper. A broader issue students had was with the BL course structure, which offered more self-directed activities that they had difficulty completing. Students wanted a proctored setting because it would pressure them into studying if the quizzes had to be taken in a proctored setting, ultimately benefitting their learning. Such a structure would require students to better prepare for the quizzes, as the opportunity to engage in inappropriate methods would be
greatly reduced. However, course staff would need to reinstate the resources they saved by going online, which they may be reluctant to do.

*Instant scoring and results.* The LMS had the ability to provide students with the quiz answers quickly, and not just the scores as was programmed. Students were willing to accept a reasonable delay—understanding the limitations of the system—but given their experiences waiting, they were frustrated with unexplained delays on the part of staff. One student explained: “I think after this 24-hour time lapse has happened, [course staff] should put the answers up, not just to your questions, but to all questions.”

It was evident that students expected the answers to be released in a timely manner (i.e., soon after the quiz ended for all students) because the quizzes could be scored automatically. Students also expected the course staff to compile all of the information from the quizzes for their use, including correct answers to every question. This dependence on staff for feedback suggests the great value students placed on explicit information given by course staff, an indication that students were not yet confident in their own study approaches.

**Summary.** Due to the large number of students enrolled in the course, one goal for the online quizzes was to make the assessment more resource efficient. Under the guise of distributed learning, rules and conditions, including time limits, a fixed number of items, and a simple item format were established for the quizzes without adversely affecting student access. In other words, minimizing management led to maximized efficiency. Students appreciated the flexibility to take the quizzes on their own time, but were concerned about the effects of their peers’ cheating on their grades.
Although going online freed up course resources, doing so conflicted with student suggestions for improvement. Students wanted a proctored quiz and a compiled list of answers to all items after each quiz. These demands were consistent with the purpose of using the quiz answers to prepare for the midyear and final exams. While quiz features related to resource efficiency were marginally beneficial to students, students wanted an assessment that could effectively support their learning, without giving up the benefits that made it easy for them to obtain good scores. Unfortunately they found that these quizzes did not allow for both.

**Feedback**

The online quizzes were intended to motivate students to positively adjust their learning (and by extension, achievement) by providing feedback more frequently to them. The feedback was preprogrammed into the LMS and did not provide students with details about their strengths and weaknesses, which limited how the feedback could be applied to their learning.

**Experiences.** Based on the intentions of the online quizzes, students expected that the feedback should be returned to them promptly, contain detailed feedback about each answer, and be conducive to follow-up and review activities with staff.

**Prompt return of feedback.** While some students found the score itself sufficiently informative, other students, who wanted to know more about the correct answers, were left hanging. As one student explained: “Once we finish writing the quiz, all we know is our mark and not which questions we got wrong, so we can only guess.” Students also found the availability of the correct answers just as unpredictable. The time gap between the completion of the quiz and the availability of the answers potentially
reduced the feedback’s effectiveness to substantively support students’ learning. Students said they sometimes had forgotten what was on the quiz by the time the answers were available:

[T]hey might have done something at the end, like a few weeks before the [midyear] exam they put something up, but not right away, and it’s all through your mind, you don’t even remember taking it. If you were able to see it right away, then you can be like, ‘Oh, I got that one wrong’, and you can go look it up in the book, and when you look something up, you kind of like are able to memorize something better.

**Detailed and quality feedback.** Students found the feedback provided a starting point to inform learning, but also thought that the feedback was limited in communicating the extent of their learning. Students perceived that the given feedback was not comprehensive enough to get them onto a path of corrective learning. One student described her experience with the feedback: “After it’s closed, then you get the answers for the 25 [items] you did, but it just highlights the answer, it doesn’t explain why.” Moreover, the limited release of the answers may have also diminished students’ perceived value of the quizzes as the year went on, as illustrated in this survey response:

I used them to give me an idea of what I needed to focus more on and also studying the specific questions when they were available (all questions that were used for the quizzes should be available with answers after marking is through, but this only happened after the first quiz).
Hence the quality and the timing of the feedback influenced the follow-up and students’ review processes.

**Follow-up and review.** Timing also appeared to determine how and when students interacted with the online quizzes. The one-week access window may have led students to become strategic as to when to take the quiz and when to review the answers. There was actually little incentive for students to take the quiz in the early part of the week, because at the earliest students would not be receiving their answers until the access period had ended. The access data logged by the LMS corroborates this differential usage. The gap between the time they accessed their quiz and second stage of feedback substantiates the strategy some students described that they used, which was to review quizzes only during preparation for summative assessments, such as final exams. As one student explained:

I don’t use [the answers] until the exam. I don’t have time to go over last week’s things; it’s over and done with. I mean it would be more beneficial to my studying. I think, but realistically I don’t have time to look over something when I already have this week’s stuff to catch up on.

Therefore, some students wanted the answers to support their learning and were not satisfied with having to wait, while others became indifferent about the feedback because it was irrelevant to them until the term exams approached. Both situations point to the need for a timely structure for student feedback.

**Suggestions.** Students were interested in receiving more information than just their score after each quiz; their suggestions for improved feedback focused on better quality and guided opportunities for review. Other students thought the score alone was
sufficient, and feedback was not needed provided that the quizzes contributed more to their course grade.

**Detailed feedback.** Students wanted the feedback to include supporting details from the course material, not just items with answers highlighted. One commonly expressed suggestion was to include an explanation for each distractor that linked the item and the course material; that way, students could be guided to the correct answer: “It could help me if I got something wrong, then you can see that [the answer chosen] was not the right answer and maybe you could have a page about how [it relates to the correct answer].” Although this feature would be feasible with more time and resources, this suggestion illustrates how students had continuing difficulties using the given feedback to learn independently. They were looking for quiz feedback that provides explicit instruction in a course that had fewer opportunities for instruction and reinforcement, a teaching approach they expected in their introductory course.

**More marks for quizzes.** Some students did not even care for the quiz feedback so long as the quiz was worth more marks, declaring that more marks would make them take the quizzes more seriously. One student said: “If it was worth a lot more, and had a lot more questions and [don’t] show the answers, then they’re going to be preparing for it like crazy.” Students also added that without the feedback, the value of each quiz should be increased accordingly since it would become more difficult for them to get a good score on the quizzes: “If we do them in class closed-book, then it should contribute more to our mark and decrease the amount the exams are worth. It has to even out there.” These comments suggest that for some of the students, there is a belief that they should be rewarded for having to study for the quiz.
Follow-up and review. Some students in the focus group suggested that the learning lab should be focused on activities that cannot be done online, such as reviewing answers to the quizzes. They perceived that such a review would be more valuable than the activities they were currently doing in the learning labs.

I feel like because it’s online, they can’t give you much feedback, but I think generally, if there was some way for someone to tell us how we’re doing, or what more we should know personally, even if it’s your TA, because I feel like in labs you’re not doing much anyway, and you’re not really getting feedback from someone who is supposed to be a teacher to you, that’s one of the things that’s a hindrance in this course.

Another student agreed that a review session should be offered after each quiz.

Yeah, like why can’t we go over the quizzes in the learning labs? Like each question, and not just ‘this is the answer’, because we all have access to that, but the why, the concepts behind it, that kind of stuff.

Students sought a learning environment (led by their TA, for example) in which time would be spent reviewing the quizzes, so that they would not have to review on their own. In addition, one student suggested online quizzes should be administered on campus:

I feel like running the quizzes in the learning lab could be beneficial because the week after the quiz is run, maybe you could go over the quiz in the learning lab groups or whatever, because you can tell me my answer’s wrong, but it doesn’t
mean I’m going to go to the textbook, look up why my answer’s wrong, and it would be good focus for the learning lab after the week the quiz was taken.

Overall, these students wanted an instructor or teaching assistant to directly reinforce information, as a structured learning approach appears to be most similar to the way they had been taught previously. These findings suggest that students wanted post-quiz activities that guided them directly to the “right” answers to study as they completed the course and prepared for their exams.

**Summary.** Despite having a formative purpose, students perceived that the usefulness of the quiz feedback was limited. They suggested the learning labs be used to review and explain the material assessed by quiz items. Students’ suggestions for improved feedback thus appear to be focused on getting in-depth information in a structured and passive way. Their strategy for success was to get accurate information in this way before they would be comfortable with their own study materials.

**Self-Directed Learning**

The changes made to the course structure in Year 3 compelled students to be more independent in their learning. In previous years, PSYC-100 students received much less formative assessment during the course itself. Hence the first-year students in Year 3 of the study, who were accustomed to a teacher-centred model of learning from high school, may have found SDL difficult. Students described how they valued interactions with instructors, a sentiment that highlights a potential challenge with first-year courses. With a fraction of the contact hours of a high school course, students in postsecondary courses have more responsibility for learning on their own. The instructional time difference is widened with the BL model, as there is even less direct instruction than in the traditional
learning model. In some core courses, the breadth of material leaves students little choice but to take greater responsibility for their learning.

The sudden transition into SDL may have been problematic for some students. As one student commented, “I didn’t realize I was supposed to learn it all myself.” Another student connected SDL with course marks, declaring that her classmates were not doing well in the course because of unclear course expectations and a lack of guidance:

I mean so many people don’t know what to expect, so I feel like it has a big thing to do with the fact that the marks are not so great. . . . Like it’s great to have the learning labs to boost everyone’s marks, but especially as a first-year course, it needs a lot more direction in that people don’t know what to expect and what to do.

By emphasizing SDL activities to increase engagement, the BL model was an opportunity for students to take more responsibility in their self-learning. However, students who were not accustomed to having this level of responsibility interpreted SDL as needing to be completely independent in their learning, and as a result may have had difficulty getting started in the process.

**Experiences.** Frequent feedback is one major feature an online assessment can offer to the SDL process. However, students’ experiences suggested that the PSYC-100 quizzes did not contribute to learning as much as staff may have expected because of course- and student-related issues. The low frequency of quizzes, the distant link between the quizzes and the exam, and students’ abilities to work on the quizzes independently resulted in the challenges students experienced with SDL.
**Quiz frequency.** The few number of quizzes, in addition to perceptions of minimal feedback, made it difficult to promote the quizzes as a form of SDL to students. As an example, one student said, “[I could] see that I got 80% [meaning] that I know a fair amount, but I don’t know what I know because [the quizzes] don’t tell you what I got right or wrong.” This student thus came away from each quiz with only a score as the immediate product of learning, and did not bother to conduct any subsequent review of the assessed material.

**Misalignment of quizzes with exams.** Students were interested in materials to assist their preparation for the exams, as the exams contributed the bulk of the course grade. The quizzes were one such tool, but while students described some benefits to the quizzes, they generally thought that both the content and difficulty of the quiz items were much different from the ones they saw on the exam. It was enough to make at least one student give up on using the quizzes as a learning tool:

I kind of used the first two quizzes to prepare for the midyear exam, but once I took the multiple-choice questions [on the midyear exam], they just had nothing to do with each other, so when I’m preparing for the end of the year exam I don’t think I’m going to refer back to the quizzes because it doesn’t seem to highlight the information that is important to the course.

A survey response indicated a similar belief: “I would like the quizzes to match more closely the types of questions that we had in the exam. I found the quizzes were easier than the [exam] multiple-choice questions.” Combined with the findings reported earlier, it appears that students used the quizzes to predict exam topics, rather than considering them as one of multiple available approaches to supplement their ongoing learning.
Students who relied on the quiz to help them quickly get organized in the course were likely disappointed when the items they saw on the midyear exam were dissimilar to the quiz items they studied. These quiz structures may have decreased the potential for the quizzes to direct students’ learning, becoming a vehicle solely useful to obtain better marks. Once again, it appears students wanted the course staff to take over some responsibilities of assessment (e.g., awareness of learning goals, taking ownership of their learning, etc.) that staff planned in the course to be the students’ responsibilities.

**Cheating.** While access and choice of location was intended to provide students with greater control of their learning during the quizzes, the students used this flexibility to their advantage. For example, students coordinated a time with their peers so they could work together (i.e., intentional cheating), or they freely used their course materials while they were taking the quiz. As three students noted: “It’s not so much do [the quiz] on your own time, it’s do it on everyone on your rez [student residence] floor’s time.” “I don’t even prepare for the quizzes because I have the textbook in front of me. So I don’t feel the pressure to do the readings beforehand, and I have other people.” “You can’t control Google . . . too much freedom on the Internet. In fact, that’s probably how I got most of my answers.”

These views illustrate that while students recognized that these learning approaches were not what was expected of them, they did so anyway because the quizzes were an easy opportunity to obtain valuable course marks.

Staff established quiz-taking rules with the expectation that students would follow them, but it was evident from at least some of the students’ experiences that this expectation was optimistic. Cheating was sufficiently widespread that all students in both
focus group sessions were aware that it was happening (even if they themselves did not engage in cheating), and none of them thought that the rules were an effective deterrent. As the LMS was not designed to (nor was it intended to) detect incidences of cheating, students took advantage of the system and skirted their responsibilities while they took the quizzes (regulation). One student felt that the staff’s lack of enforcement of the rules affected the credibility of the assessment program in the course and the university’s reputation as well. She described how many students were aware of the cheating and the ease at which it occurred:

    I kind of get that it’s an online-based course, it’s just the way the answers are being floated around, and people are copying and pasting the entirety of the quiz so that their friends can see the answers first and then go through it, it takes them like 30 seconds to do the quiz. I live in rez and so I know the people on my floor, they just pass back answers and questions and it gets spread around like that, and it’s not your mark, it doesn’t represent your success and your knowledge in the course, and I know [the university] is huge on academic integrity and I just feel this is a complete step away from that.

The priority for some students was to obtain their marks as easily as possible. While these students recognized that cheating was inappropriate (e.g., one student said that cheating was effectively penalizing students who take the quizzes honestly), the possible consequences from getting caught were not serious enough to deter her or her friends from doing it.

    **Suggestions.** Staff continually emphasized to students that the value of the quiz was in the learning process and not the marks they were worth. However, students’
intentions focused on the product more than the process, as they engaged with the quizzes for the short-term benefits (marks). Not surprisingly, their suggestions to increase SDL through the online quizzes aligned with their priorities to obtain higher marks in the course, including more quizzes and an increased value for each quiz. Students also recognized their own lack of skills to engage in SDL, and wanted changes to the administration so that everyone was being assessed on an equal footing.

*More frequent quizzing.* Students, particularly those who relied on the quizzes as study tools, wished for more quizzes to help keep them on track, since having a single quiz at the end of each unit was not providing enough opportunities to support learning. As one student remarked, being assessed throughout the course was imperative to learning the material:

> It needs to be a more consistent assessment, it can’t be just once every module, and it’s not enough to reinforce what you learned. It’s either everyone forgetting it by the end, or there are people who cram it all in the day before the test.

Students appeared to be interested in having increased access to resources that would support their learning and avoided the need for them to be self-organized. At the same time, they wanted to be assessed more frequently if it meant more opportunities to earn easy marks (and in turn made the term exams, perceived as challenging, worth less).

*Removing the flexibility to self-administer.* Rather than having the freedom to take online assessments at any location, students wanted them administered on campus, as they perceived this arrangement to be fairer. One student explained how this change should not even be a challenge to implement:
For the vast amount of people in [PSYC-100] I feel like I understand why it’s on the computer—it’s over a thousand students—but if they can accommodate everyone in a learning lab at a specific time period, I think everybody can do a quiz then.

She continued by saying that although this arrangement was not the easy way to earn marks, it would benefit her and her classmates’ learning in the long run, through better study habits; it would show students that the course staff were acting in their best interests.

Overall, it appears that a substantial proportion of the students did not see the online quizzes as fair, but in-class assessments with standardized conditions were. Frequent quizzing would not only compel the students to establish a study routine, but also enable faculty to identify students doing well academically in the course based on performance in a “fair” assessment environment.

**Addressing cheating.** Students identified cheating as a persistent reason for the problematic use of the quizzes, and thought that cheating would be a far less frequent occurrence had the quizzes been administered on campus. Having the quizzes on-site would not preclude the ability for students to use their own computers, and that the mere presence of a proctor would make most forms of cheating more difficult. On the other hand, another student perspective was recognizing that staff had little control over how students took their quizzes and if the quiz remained as an online arrangement, the quiz should be free of restrictions, which would make it easier for both students and staff:

You can tell people they aren’t allowed to use their notes, but you aren’t going to stop people from using their notes in any way. I haven’t met a person ever who
doesn’t use their notes when they do it, so . . . may as well say that they’re allowed to.

It appears that the coordinators preferred the online option, and they ultimately changed the quizzes in Year 4 to allow students to complete the quizzes however they wished.

**Summary.** Generally, students agreed that the quizzes should both contribute to their course grade and help them prepare for exams. Although the coordinators thought the quizzes accomplished both points, the infrequent level of quizzing, perceived misalignment with the exam questions, and cheating detracted students from fully engaging in SDL. Students’ inexperience with learning in a postsecondary environment may have further contributed to the lack of proper SDL behaviours. It also appears that some students did not think the quizzes accomplished these goals and resorted to cheating to raise their grades. These students had mark-driven behaviours and lacked the discipline to engage in learning. Not surprisingly, their suggestions related to this perspective; they indicated that the course should provide resources that compensated for learning activities they were unable or unwilling to do on their own. Hence there is a need for staff to address the mismatch between intended learning goals for students and students’ motivations for taking the quizzes.

**Accessibility**

The course coordinators worked out some aspects relating to accessibility prior to implementing the online quiz, which is related to a universal design approach. Since the quiz relied mostly on existing features in the LMS, it was straightforward to manage. Subsequently, students did not form any accessibility-related expectations about the standard version of the quizzes, as few (if any) students had difficulty interacting with the
quizzes. Nonetheless, the accessibility features of the online quiz or on the computing devices students used were not apparent to most of them as the survey results suggest their awareness of such features were low. While students suggested that while fair assessment and accessibility were important to them, the value of the assessments themselves and the impact on their course grade were paramount. For this reason, their suggestions for course improvement not surprisingly consisted of ways to make the quizzes more valuable (to their course grade).

**Experiences.** Students’ experiences of increased accessibility for the online quizzes were based on the premises of open access (availability), a reduced need to manage accommodations, and the same settings for all students.

**Open access.** In Year 3, students had one week to take their quizzes, the course coordinator treating this change as a concession for all students. Figure 1 illustrates the number of students taking the online quiz on a given day with the mean score for that day. Students took advantage of the weeklong timeline as the participation was distributed across the week; however, as the bar graphs illustrate, students may have purposefully waited for certain days where they thought it could work to their advantage before attempting the quiz. While access to the quiz was distributed throughout the week, it was not even; student attempts were consistently most frequent during the middle part of the period. The mean scores on each quiz also generally tended to peak during these days. Students who took the quizzes near the end of the access period did not do as well, as a decline in the mean scores was observed.
Figure 1. Students’ online quiz access and mean scores in Year 3, grouped by day.
Less management. ETA was the only accommodation explicitly provided on the quizzes. With timing being the only difference, and previous analyses suggesting that the time limit was not a barrier to completing the quiz, it was not surprising that none of the students in the focus group thought that this accommodation would benefit them during the quizzes. Therefore, while ETA is one of the most popular accommodations in education, the nonaccommodated students did not think they needed ETAs based on the quizzes they took. Nonetheless, the use of ETA on the quizzes led the coordinator to later question how important a factor were time limits in assessing students’ learning once the advantages and disadvantages of ETA were considered.

Same setting. The survey results suggest that students chose to work on quizzes at their preferred location, which can be considered analogous to the separate room testing accommodation. Students who took the standard version thought they had ample time, while students who had the ETA were comfortable with the version they used. Because of the generous time limit in the standard version, some students with disabilities even reported trying their own quizzes without additional time. Therefore, students with disabilities had control over the setting that worked best for their own learning situation.

Suggestions. Since the students did not encounter issues adversely affecting their ability to complete the online quizzes, they did not provide any suggestions to improve accessibility either. Their understanding of accessibility may have been limited, and what they considered “fair” may be actually less fair for students with disabilities. One example was the suggestion that the online quizzes be administered on-site to reduce cheating, but what the students saw as fair (i.e., assessing all students in the same situation) would not lead to an inclusive and accessible assessment.
Students were, however, unanimous in recognizing that determining the best accommodations for their disabled peers can be challenging. They appeared to be sympathetic towards staff who were responsible for providing the accommodations. As one student remarked: “I think it’s hard for someone without a disability to judge what’s fair for someone with a disability.” Similarly, the students with disabilities in this study also did not identify any accessibility or usability issues while interacting with the online quizzes. Therefore, the design of the system was sufficiently simple to use such that all students could access and interact with it.

The results also suggested that the software accessibility features available on most electronic devices were obscure to most students. The survey data showed that with one exception, none of the students knew that features for physical and sensory impairments (e.g., voice control, text and screen enlargement and reduction, colour contrast) existed on their devices, let alone used them. Students later explained that they would not have used these features even if they had known about these features because they did not encounter any issues interacting with the quizzes. These findings indicate that more work needs to be done to promote awareness of broader accessibility issues to all—including assessment developers, staff, and students—if the course assessments are to be recognized as being accessible.

**Summary.** Despite the basic interface and functionality of the online quizzes, the challenges relating to accessibility were largely addressed, particularly with time-based issues (e.g., time limits, scheduling time), which created intraquiz issues (affecting the standardization of a quiz administration) and interquiz issues (scheduling procedures that interfered with quiz score accuracy). Both accommodated and nonaccommodated
students were generally able to interact with the system without encountering access problems. While this model appears to satisfy the accessibility needs of the course at the moment, it was accomplished by changing the assessment purpose; to develop an accessible system that fully reflects the notions of universal design would require another large reconsideration of available resources.

Section Summary

The online quizzes were intended to be opportunities for students to engage in SDL. However, students were not prepared to use the process that aligned with the BL model; they faulted the inconsistent feedback from the quizzes for providing insufficient guidance. As a result, students ended up using the quizzes to collect marks instead of as an opportunity to self-assess their learning. Moreover, while accessibility was improved, some students were also able to cheat more easily by taking advantage of the lax security that existed in the accessible, self-administered assessment.

Students wished for a supervised environment that would motivate them to prepare for quizzes, as this structure all but removes the possibility of cheating as a quiz-taking strategy. They also wanted more detailed feedback or an opportunity to review the answers from the quizzes with an instructor or TA. More importantly to them, their grades would improve with more frequent in-class assessments and increased mark values. Students’ desire for proctoring suggests that they did not know how to learn using the online quizzes, their own inexperience a possible factor limiting their success.

Synthesis

The online quizzes were designed to focus on efficiency, feedback, SDL, and accessibility, but these benefits appear to be tempered by the application of conditions
typically devised for in-class assessments (e.g., time limit, no study aids, fixed date and time). These conditions were difficult for staff to enforce because the students were unsupervised and at different places and times.

Inherent differences between paper-based and online assessments appeared to be the focus prior to transition, as the quiz rules centred on potential fairness and equity issues. The features (item bank, generous time limit, low-stakes assessment) were intended to balance students’ rights and responsibilities (individual, no study aids), although in operation, staff experiences suggested that these issues unduly took away from the purpose of enhancing student learning. The conditions were subsequently refined in an attempt to find the balance between reduced management and increased student learning responsibility. Among the changes staff made to the quizzes, the access period for students was the only feature that kept changing from one year to the next. By lengthening the period of access, the LMS managed most aspects of the quizzes without staff involvement.

In this study, the removal of rules appeared to simultaneously make access more inclusive and resolve any cheating issues. In the most accessible and efficient format, students had autonomy in how they wanted to use the quiz and had an incentive to review and reattempt the quizzes, while staff could minimize the tasks of devising rules and managing accommodations requests. Although an assessment without any rules was not likely to be the final product envisioned by the course staff during its development, this configuration represented the most convenient and feasible approach to allow for the characteristics of efficiency, feedback, SDL, and accessibility.
Chapter 5
Discussion

The use of ICT in postsecondary education is providing students additional means to access course materials off-campus. To maximize learning opportunities, systems can be designed such that all students can interact with them equitably through the integration of access features. These features may be valuable during online assessments, as the results of students’ performance have academic implications. This chapter discusses the results for my research, and addresses the implications of the findings for research and practice. The purpose of the study was to identify how the operation and student use of the quizzes in a large, first-year psychology course impacted teaching and learning practices. The research also endeavoured to explore the challenges of implementing the quizzes. The study was framed by universal design principles, supporting learning for all students, and assessment for learning. I sought to understand how an online assessment program addressed course challenges in the areas of efficiency, feedback, self-directed learning (SDL), and accessibility. These constructs were the focus of four research questions (RQ1–RQ4), the answers to which are summarized as follows:

- **RQ1.** The universally designed online assessment’s characteristics were defined by changes made to administration. The changes focused on lessening managerial activities, including dropping the quiz variants that existed (intraquiz issues), and prolonging access for students, as the scheduling of the quizzes was found to interfere with the teaching and learning structure (interquiz issues).
• RQ2. Implementation of the online quizzes decreased the number of students requiring separate accommodations. While the extended time accommodations offered through the online quizzes did not result in significant score differences between students with and without disabilities, this arrangement constrained the accessibility and universal design within the quiz until the timing and scheduling conditions used to ensure consistency were removed.

• RQ3. Course faculty members’ initial expectations of the online quizzes focused on summative assessment, associated with ideas such as accurately measuring student learning and the use of standardized conditions. These instructors perceived the quiz to have low benefits to both students and themselves, even though the online quiz conditions were deliberately designed to maintain standardized conditions to the extent possible. Perhaps more importantly, these instructors’ perceptions run counter to the current trend of using such forms of assessment for formative purposes.

• RQ4. Students did not understand the purpose of the online quizzes in the way the course staff expected. Students disregarded the value the assessment had in supporting their learning and were more concerned about the implications to their marks from their peers working together or using their notes during online assessment (i.e., they exhibited mark-driven behaviours).

These results were obtained through data collected from semi-structured interviews with course staff, focus groups, and a survey with undergraduate students, and students’ quiz scores from the course. I analyzed the qualitative data to identify and describe the critical factors that were perceived by faculty members to be essential to the success of the online assessment, and then compared these factors to their experiences as
well as the experiences of students (RQ1–4). I analyzed quantitative data to investigate
time-related effects (timing and scheduling) on students’ quiz scores (RQ2). While the
study focused primarily on one year in which the online assessments were used (defined
as Year 3 in this study), I also included analyses of pertinent data in the year before and
the year after (i.e., Year 2 and Year 4) to better understand contextual factors. (Year 1
was only described for the purposes of background information.) The sections in the
chapter include a summary of key findings from this study, the implications of these
findings and the study’s limitations, and suggestions for future research and application.

Summary and Analysis of Findings

Course staff introduced the online quizzes as a replacement for the in-class
midterm tests, recognizing the potential to provide an accessible assessment, while
adding the provision of feedback throughout the course. However, during the course of
this research, staff encountered operational and practical challenges that necessitated
changes to the administration of the online quizzes. The findings suggest that despite the
introduction of the blended learning model to promote self-directed learning, around
which an assessment system was built that was efficient, offers feedback, and was
accessible, the traditional course structure still strongly influenced the operation of the
online quizzes (see Table 9).
### Table 9
**Summary of Study Findings**

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<th>Properties of the Quizzes</th>
<th>Accommodations and Universal Design</th>
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<th>Student Experiences with the Quizzes</th>
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<td>Staff desired online assessment’s benefits without adequately preparing for the limitations presented by the assessment conditions</td>
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<tbody>
<tr>
<td>• desired characteristics as existed in prior assessments (e.g., timing, scheduling)</td>
<td>• limited resources while higher student demand anticipated</td>
<td>• self-directed, engaged students</td>
<td>• value of feedback to students was inferior to value of marks</td>
</tr>
<tr>
<td>• difficulty enforcing quiz-taking conditions (cheating)</td>
<td>• lessened need for documentation and management of accommodations</td>
<td>• integration of ICT into blended learning model</td>
<td>• quiz-taking rules were substituting for a ‘proper’, proctored assessment</td>
</tr>
<tr>
<td>• summative assessment-type means</td>
<td>• automated management features of LMS</td>
<td>• more feedback through more frequent online quizzes</td>
<td>• quizzes viewed as discrete activities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Limitations of learning characteristics</th>
<th>Learning characteristics related to universal design</th>
<th>Faculty concerns about quiz to learning</th>
<th>Student concerns about the quiz to learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• quiz properties were unable to effectively generate SDL</td>
<td>• more access opportunities (lowered barriers) for students</td>
<td>• quiz fostered conditions that ultimately measured student effort</td>
<td>• quiz properties made it easy to focus on marks</td>
</tr>
<tr>
<td>• use of quiz feedback by students based on its quality</td>
<td>• learning features offered by LMS</td>
<td>• shifted instructor responsibility away from direct instruction</td>
<td>• perceived lack of structure that did not match preferred modes of learning</td>
</tr>
<tr>
<td>• formative assessment-type goals</td>
<td>• ideal solution for course had not yet been attained during period of study</td>
<td>• academic integrity problems evident</td>
<td>• course priorities did not sufficiently emphasize feedback or SDL</td>
</tr>
</tbody>
</table>
As shown in Table 9, data were categorized into four areas based on the study research questions: properties of the quizzes; accommodations and universal design; faculty experiences with the quizzes; and student experiences with the quizzes. The findings for each area are listed under the heading, and this finding was derived from two themes (in italic typeface). Each theme was based on two main ideas gathered from the qualitative data (bullet points). Each column therefore contains a finding based on the research question, two associated themes, and four main ideas. A detailed analysis of the findings is discussed next.

**Intraquiz and interquiz issues interfered with the online assessment operation.** Although feedback and self-directed learning were student-centred purposes of the online quizzes, the course staff’s subtle goal of making the quizzes self-managing was apparent. The first change addressed intraquiz issues with scheduling (multiple quiz variants and missed quizzes), while another change the following year was made to address interquiz issues with timing (unmanaged access and delayed feedback).

Intraquiz issues arose from the desire of staff to match the conditions of an in-class assessment within the online assessment. To accomplish this, the quiz had to be rescheduled for a number of students who were unable to write at the designated time, creating variation within a quiz administration. On the other hand, interquiz issues (control in how students took their quizzes) undermined the ability for the quizzes to provide students with instant feedback, thereby creating discontinuity between assessment and feedback. These problems—affecting course organization and student learning—illustrate the implementation difficulties of administering online assessments, especially outside of scheduled class time. Because of this discontinuity, students may
not have seen the value of the quizzes to their learning. It was not until all timing and scheduling restrictions that were carried over from the original midterm test conditions were removed (in Year 4) that a framework for consistent, immediate feedback from the quizzes was able to be established. This change also simplified the quizzes so that the quizzes did not need staff involvement.

Other studies have not reported the aforementioned challenges, likely because they deviated from conditions used in traditional paper-based assessments, including the use of notes (Davis, 2013; Dobson, 2008), ability to reattempt (Bälter et al., 2013; Kibble, 2007), and unlimited time or access (Stull et al., 2011). Assessment properties could also be altered, such as on-site administration (Peat & Franklin, 2002); making the assessment optional to students (Davis, 2013); or providing collaboration opportunities with classmates (Peat, 2000). Hence it was the use of assessment conditions focusing on consistency in measuring student learning that curtailed the potential to integrate good student learning supports.

The quiz accessibility was constrained by its assessment conditions. The facility with which course staff could assign students to the extended time accommodations version of the online quizzes greatly reduced the resources (and costs) needed to provide this accommodation in Years 2 and 3. No significant differences in scores existed between students receiving extended time and those who did not in the two years where this arrangement was used. However, this arrangement was the extent to which universal design principles were applied to the online quizzes. From this point, to increase quiz accessibility in accordance with other assessment conditions such as time
limits and the period of student access, the construct and tasks were ultimately modified; the assessment conditions played a role in this transformation.

Extending the quiz access to one week (in Year 3) obviated the need for scheduling accommodations, but did not appear to change students’ approaches to quiz taking. Not only were the differences between students with and without accommodations not statistically significant, but the quiz scores were higher compared to the previous year (it is assumed that overall quiz difficulty was similar in both years). One possibility is that the longer access period enabled students’ to maximize scores, masking any score variations between extended time and regular versions of the quizzes. In this case, students’ approaches to taking the quizzes likely had a greater influence on the quiz scores than any potential barrier to quiz accessibility. Students’ assessment-driven approaches saw marks as the most important purpose for taking the quizzes, instead of course concepts that could be learned from the quizzes.

When staff removed time limits altogether in Year 4, making the extended time accommodation unnecessary, it not only improved accessibility for all students during the quiz (i.e., no students needed accommodations), but these online quizzes progressed in following universal design principles (i.e., time limits were no longer a barrier to any students). As all students could now interact with the same assessment, the change suggests that course staff found it difficult to employ conditions for measurement consistency without creating barriers to accessibility. This iteration of the quiz returned to the previously used structure of noncredit practice quizzes, with the gratuitous addition of participation marks. The online quizzes no longer permitted the differentiation of students based on mastery, which is the purpose of an assessment (Thurlow et al., 2008).
Nonetheless, while the changes altered the purpose of the quiz, changing the purpose was the easiest way for course staff to make the quiz accessible, and led to an inadvertent adherence to universal design principles with the available course resources.

**Faculty and students understood the purpose of the assessment differently.** Feedback and SDL were key benefits of the online quizzes. Ideally, staff thought that SDL would provide students with alternative access to learning using ICT (including the quizzes). For the quizzes, an item bank and rules were used for security and regulation, while offering students an affordance (SDL opportunity). However, these intentions were incongruent with (a) instructors, who had a notion for assessment focused on measuring learning, as well as (b) students, who were concerned about the process and consequences of these quizzes. As a result, the students did not use the quizzes for SDL, and the instructors did not use the quizzes to create new learning opportunities for students.

Although feedback has the potential to benefit teaching and learning (Hattie & Timperley, 2007), the instructors and coordinating TA in the study did not appear interested in using the online quizzes to improve course instruction, relegating the quizzes as learning tools for students that primarily measured student effort and therefore not an assessment format they valued. Their perceptions implied that a true assessment would be a midyear or final exam, in which students were assessed under timed conditions and working individually. In contrast, uncertainty about how each student obtained their score existed within the online quizzes (e.g., accessing their notes, working with friends). Furthermore, some instructors did not see the feedback as a product that students would use to further their learning.
On the other hand, students misused the online quizzes as a result of mark-driven behaviours and inability to apply the quiz feedback to their learning. As an example, students disregarded quiz rules by consulting their notes or working with others, enabling them to get good quiz scores. One of the given reasons for doing so was because their peers were doing the same, and to abstain would put them at a disadvantage. Therefore, the feedback from the quizzes did not matter to students. Rather, it was the quiz marks and their peers’ behaviours they were concerned about. The dichotomy between summative and formative assessment is particularly marked in postsecondary education environments where summative assessments have been long regarded as the “traditional” form of assessment, and resources for other learning (such as formative assessment) may not be readily available (e.g., Nicol & Macfarlane-Dick, 2006; Yorke & Longden, 2004).

Students’ perceptions may stem from their lack of intrinsic skills needed to engage in self-directed activities such as the online quizzes. Poor time management skills or inability to keep up with course demands are both ever-present challenges for postsecondary students (e.g., Baldwin & Koh, 2012; Cook & Leckey, 1999). Furthermore, the lack of defined procedures to ensure student behaviours were consistent with the rules during the quizzes may have limited the effectiveness for learning.

These students’ behaviours are consistent with learning approaches that may have been acquired in high school (see Peat, 2000). In a recent study of another first-year course, students reverted to surface learning approaches in a reduced-resources blended class model (Leger et al., 2013). These students perceived a lack of guidance in that course, due to the excessive reliance on ICT to learn on their own. The conclusion reached by Leger and colleagues may also be true in the current study. Students described
the quizzes as not being useful to their learning, which led to increased use of surface learning approaches (Prosser & Trigwell, 1998; Struyven et al., 2005) for the purposes of completing the task and little more. In support of these findings, the course coordinators’ desires to engage students with the new course structure may require more resources than are currently available to them.

The findings from the study indicate that PSYC-100 students’ preferred to engage as relatively passive learners, a notion that course staff hoped the use of online assessment would counter. Further, students did not value the accessibility of the quizzes as much as equal assessment conditions. The interviewed students would have preferred closed-book, in-class assessments for all students if doing so ensured that no student would have an advantage. Students were focused on assessment equality (all students taking an assessment under the same conditions) rather than equity (giving students choice about where and when to take the assessment). Nonetheless, the changes in the final year of this study rendered most of these considerations moot, as students did take their quizzes under the same conditions.

Situating the Findings Within the Literature

This section describes the significant contributions of this study. It is now an expectation that activities in the learning environment of the modern university be designed for inclusivity of all students (Ofiesh et al., 2006). In conjunction with the principles of universal design (UD), the integration of ICT offers course staff one possibility to meet such expectations. My research examined just one aspect of ICT use to better meet the needs of university students, the use of online quizzes in large-enrolment, first-year courses. The findings of this study highlight both the opportunities
and the challenges of implementing an online quiz program in such contexts. While UD provides a promising framework, the findings highlight the incongruity between accessibility, which is resource intensive, and efficiency, generally an important consideration of institutional plans. The course staff’s approach to resolving this incongruity—to change the purpose of the quizzes—appears to defy Ketterlin-Geller and Johnstone’s (2006) idea of UD, which was to improve students’ demonstrations of knowledge without lowering standards. An assessment that is accessible, efficient, and reliable therefore rests on the investment of additional resources by institutions. While the availability of resources can be a limiting factor in the development of such assessments, the need for accessibility will increasingly drive assessment decisions in postsecondary teaching contexts.

The study also found that both instructors’ and students’ use of feedback from the online quizzes was not effective. Ineffective assessment feedback may inadvertently limit students’ engagement and hence the very purpose of formative assessment (Hattie & Timperley, 2007). The quality of feedback is essential to a well-planned task-performance-external feedback cycle to benefit students’ learning (Nicol & Macfarlane-Dick, 2006). However, Yorke (2003) noted that in recent times, interest about how faculty can promote students’ learning has become popular. Therefore, feedback also needs to be developed such that there is a focus on teaching faculty. Changing instructors’ assessment practices may require these instructors to understand the theories underlying these practices (Postareff et al., 2012). In Canada, postsecondary institutions are giving attention to the scholarship of teaching and learning, which has led to the establishment and operation of on-campus centres that work with all faculties to improve
the quality of teaching. In sum, a shared purpose among institutions, faculty, and students may ultimately be needed to improve learning opportunities for their students, which transcends the nature of using ICT itself. Feedback from online assessments can support the work faculty do with first-year students, for example, gradually developing students’ self-directed learning practices. This effort early on could be invaluable throughout students’ entire academic program, thereby benefiting the institution as a whole.

**Implications for Practice**

This section discusses the implications of this study, and provides a framework for the implementation of an online quiz program in a first-year undergraduate course. Online assessment offers four key characteristics to facilitate teaching and learning: efficient administration, frequent student feedback, a process for SDL, and an accessible platform. In addition, one of the major considerations of an assessment is to measure student learning reliably and consistently. A consistently administered assessment enables the intended construct to be measured by eliciting the intended learning behaviours from students, achieved by minimizing threats to security (e.g., item exposure) or by standardizing administration conditions.

This section also focuses on implications with respect to the three characteristics of online assessment discussed in this study, efficiency, feedback, and accessibility. An efficient assessment optimizes the use of course resources and time by shifting resource-dependent activities to ICT without adversely affecting learning outcomes. An assessment geared toward feedback promotes learning by providing information that is quantitatively and qualitatively sufficient, and in a timely manner (Gibbs & Simpson, 2004). An accessible assessment promotes equity by providing the necessary supports for
all students to participate, thereby reducing the effects of unintended construct-irrelevant variance on learning affordances (Thurlow et al., 2008).

The implementation of an online assessment program in a university course must be evaluated in the context of resource availability and student demographics. In combination with the steps listed in Thurlow et al. (2008), which help faculty to delineate how they expect to assess students and the creation of universally designed assessment tasks, faculty can determine which properties are most important to them and their institutional requirements by asking themselves the following questions:

• What is the purpose of the online assessment (i.e., is the online assessment formative or summative)? [consistency]

• Would it be possible to administer the assessment on-campus with a proctor? [consistency]

• Are resources available to integrate universal design for assessment principles into the assessment? [accessibility]

• Can the feedback be provided to students quickly and frequently to encourage a continual learning process? [efficiency]

Course staff’s answers to these questions can be placed on a matrix (Table 10) to determine which characteristics they think are priorities for them. In the absence of more resources to provide accessibility (e.g., through integrated accommodations), consistency (e.g., proctored administration), or efficiency (e.g., computerized adaptive testing, more detailed feedback for students), an online assessment can feasibly satisfy two of these characteristics. The third characteristic is a threshold that can only be met by the addition of resources.
### Table 10

*A Matrix of the Different Online Assessment Properties*

<table>
<thead>
<tr>
<th></th>
<th>ACCESSIBLE</th>
<th>CONSISTENT</th>
<th>ACCESSIBLE</th>
<th>CONSISTENT</th>
<th>EFFICIENT</th>
<th>ACCESSIBLE</th>
<th>CONSISTENT</th>
<th>EFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of assessment</strong></td>
<td>Summative assessment</td>
<td>Formative or summative assessment</td>
<td>Formative assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Purpose and advantages** | • Accurately (equitably) measure student learning  
• Universal design compatible | • Can obtain a measure of student performance under standard (equal) conditions, which can inform teaching  
• Assessments do not have to be redeveloped for accessibility | • Does not require a proctor, can be administered to students anytime, anywhere  
• Can allow students to reattempt indefinitely  
• Can provide feedback immediately  
• Inclusive; universal design compatible |
| **Challenges** | • Needs a proctored setting (e.g., on campus) to maintain academic integrity | • Needs a proctored setting (e.g., on campus) to maintain academic integrity  
• Additional accommodations needed  
• Delayed student feedback | • Cannot accurately measure student learning  
• Feedback is less useful to course staff  
• More resources needed to develop a good product |
| **Requirements to optimize use** | • Use of an item bank to reduce item exposure  
• Students are familiar interacting with the assessment | • Students are familiar interacting with the assessment | • Students know how to use feedback and learn independently |
Over the course of this study, each iteration of the online quiz appears to satisfy only two of three characteristics in any year, as changes made to strengthen one characteristic (in this case, accessibility) weakened another (administration consistency). Feedback was part of the assessment product and was present in all versions of the quizzes, but varied in how it was given. For instance, in Year 1 of this study, paper-based midterm tests were based on a consistent administration, but without ICT it was neither efficient nor accessible in the absence of further resources. In Year 2, the online quizzes were both consistent and efficient but not accessible (e.g., separate versions of the quiz were still needed). In Year 3, the quizzes were accessible, but compensated by becoming somewhat less consistent and efficient. In the final year of this study, a consistent administration process for the quizzes was not possible, but the quizzes were inclusive, accessible, and efficient in providing feedback to students. At the same time, allowing students to reattempt quizzes removed any incentive that in the past would have been considered to be cheating. Moreover, students could maximize their scores by retaking the quizzes in a timely manner, rather than doing this sort of review and practice only at the end of term (a strategy described by students who participated in the focus groups).

Scores from the final year of this study suggested that student behaviours had changed: First-attempt scores were lower, suggesting that the scores better reflected what students had learned compared to the interpretation of scores from previous years (which appears to have reflected effort). With respect to the UDL considerations described in Hall and Stahl (2006), the Year 4 quizzes offered flexibility in setting, scheduling and timing, and to a lesser degree, the method of presentation and response. This section
describes implications for first-year, large-enrolment courses where a transition to online assessment is being considered, described in relation to the four constructs in this study.

Efficiency. Frequency of assessment is an important factor in providing student access to learning. In this regard, efficiency was obtained during the quizzes at the cost of a less secure and consistent assessment (e.g., changes to quiz-taking rules). More frequent quizzing bridged the task-performance-external feedback cycle (see Nicol & Macfarlane-Dick, 2006) by reducing the time gap between assessment feedback and learning. The best way for students to improve their skills is to give them more opportunities to do it (Gibbs & Simpson, 2004). By permitting students to reattempt quizzes, they were empowered to take more initiative for their own learning, a characteristic found to be a strong predictor of course achievement (e.g., Huon et al., 2007). For faculty looking to implement a formative online assessment where security is the least important issue, the configuration used in Year 4 could be considered as an efficient model.

Feedback for teaching improvement. Faculty need to understand the different aspects of assessment (e.g., formative assessment) and how each can contribute to students’ learning (Postareff et al., 2012), beyond assessment under standardized conditions for summative purposes. That is, there ought to be a focus on better learning rather than a better measurement of learning (Miller, 2009). Greater instructor involvement with the quizzes could address their perceptions of their students being ill-prepared to learn, as well as allay concerns about the increased use of ICT as a replacement for their role in teaching and learning. For institutions, this may involve improving instructor readiness to use ICT (Lopes & Dion, 2015), and helping them become experienced designing assessments that complement their teaching. Formative
assessments should be informative enough to shape teaching (Nicol & Macfarlane-Dick, 2006), while more instructor involvement in the course assessment may be beneficial to improving teaching (e.g., McKenzie et al., 2013). Often, instructors only have past experiences to draw from when using assessments, so additional support may also be needed (Thurlow et al., 2008).

Feedback for students. Allowing students multiple attempts (rather than limiting them to one attempt) may enable students to come to the self-realization that they need to study sooner (Davis, 2013). If the purpose is to promote self-directed learning, Bälter et al. (2013) suggested that minimal feedback was all that was needed for students; however, students who possessed good study habits may have moderated this finding. Conversely, feedback for first-year students ought to be more structured. Nicol and Macfarlane-Dick (2006) note that feedback should be timely and not only focus on performance strengths and weaknesses, but also advise students about how to correct their work, and to provide them with an opportunity to do so. Therefore, an increased frequency of quizzing (and therefore feedback) plus the ability to reattempt may be beneficial (Miller, 2009). Feedback may also translate to more time on-task (Gibbs & Simpson, 2004). The findings of the current study suggest that first-year students require more guidance on building good study habits and being able to further their learning through the effective feedback. In turn, course developers will need to ensure that the associated resources for self-directed learning are available to students, both on campus and online.

Self-directed learning. While the coordinator acknowledged the feedback component of the online quizzes still needs improvement, the quiz was redeveloped in
Year 4 to better encourage SDL. In past years, the mismatch between what and how students were assessed may have affected the utility of the quiz. Resources developed to help students become familiar with procedural aspects of the quiz (e.g., a guide to using the system and a practice quiz), were seldom used, suggesting that course staff should place an emphasis on providing guidance to students to familiarize them with the process of assessment for learning (Dopper & Sjoer, 2004; Lopes & Dion, 2015).

For universities considering an online assessment, direct and explicit instruction at the beginning may be beneficial (discussed in Nicol, 2009) to promote student use of the quizzes. Making the quizzes available to students early may be important, in conjunction with efforts (e.g., a transition program) to guide students to develop SDL responsibilities. Gibbs and Simpson (2004) have discussed how additional support may be needed for first-year students who are more likely to take a passive role in learning, especially since these students rely more heavily on explicit instructions detailing what to study. Extending a student suggestion to add an teaching component to the quizzes, initial sessions could be used as an opportunity for students to engage with course staff (Bälter et al., 2013), and make connections between feedback and SDL.

**Accessibility.** Improvements to assessment accessibility in this course were partially driven by the need to increase efficiency, but were also expected to change student access to learning. Previous research has described the possibilities of a universal design framework facilitated by the use of a computer-based assessment system (see Wilson et al., 2011). The course developers and instructors made steps in achieving this goal by removing timing and scheduling restrictions for all students. For example, a relaxed time limit became a general feature that made the quizzes more inclusive, since
the participation of students with disabilities would not be affected. Simple changes such as giving control of timing to students can reduce anxiety (Cassady & Gridley, 2005), and the assessment system itself required few access skills, which raises the level of accessibility (Thurlow et al., 2008). However, difficult-to-implement features (that would result in a more consistent administration) were dropped (e.g., security features, adaptive testing technology, specialized accommodations, etc.), because the associated resources were not available or financially prohibitive.

The external factor of cost cannot be overlooked in online assessment development; features that reflect universal design principles have a larger upfront cost, with the idea that future costs will be reduced. Ultimately, the success of universally designed assessments will depend on acceptance by staff; the ongoing use of the current iteration of quizzes, in spite of the limited features for student access, suggests that staff were satisfied with the extent to which the quizzes fulfilled their immediate needs.

**Study Limitations**

The limitations that arose during the research occurred mostly during the data collection process. First, this study centred on one of the first courses at the university to use a blended learning model. The course structure was modeled after a first-year psychology course at another Canadian university (cf. Sana et al., 2011). As a pilot project the need for further refinements should be anticipated. Because of the rapid turnaround in course operation, I did not have the opportunity to interview students from Year 2 (the final year of the traditional learning model, whose instruction and assessment were conducted exclusively on-campus). These students’ experiences with the online quizzes may have allowed me to better compare their approaches to preparing for the
quizzes with students in Year 3, whose course was structured with the blended learning model. Nonetheless, with the future in the course rather heavily invested in the blended learning model, even had I been given the opportunity to include the participation of these students, I do not think my study findings would have turned out much differently.

With a small window of time between the last of the online quizzes and the end of term, when most students would not be on campus, participant recruitment was challenging. Therefore, the sampling procedure used may have limited the generalizability of my findings. Although every student receiving accommodations in the course was invited to participate, I was not able to recruit enough participants and therefore did not conduct any focus group sessions with them. I anticipated that a focus group discussion might have provided more detailed insights about their unique approaches and challenges with the online quizzes. A number of these students did participate in a brief online survey, which allowed me to obtain an overview of their perceptions. Based on the responses, their concerns were much the same as those of their nondisabled peers, which were focused more on marks and success in the course and not physical and technological challenges to access. Ultimately, I combined the views of both groups in the analyses.

The assessment data provided to me did not make it possible to link students’ scores to where they completed their quizzes, which would have provided an indication of accessibility effects. Moreover, it was not possible to determine the prevalence of cheating, since the quizzes were not proctored; self-report data may not be reliable, since students may be reluctant to admit to cheating. Although time was logged by the system, it was not possible to determine how students spent their time, whether they were actively
engaging with the quiz, looking up information in their course materials, or engaged in some other activity. The limitations to the timekeeping accuracy by the LMS were communicated to me by a systems analyst at Information Technology Services (ITS).

Finally, there were limitations with the interpretation of the results in this study. The assessments between years could not be compared since the difficulty of and content assessed on the quizzes varied. Moreover, given that faculty have much autonomy over grading practices as well as assessment (e.g., frequency of assessment), the exam marks and course grades were adjusted where necessary at the end of the course to ensure a reasonable distribution of grades. As the implementation of the online quizzes preceded the transition to the blended model, the confounding of these factors made it difficult to discern the effects of instruction mode on students’ quiz scores and achievement.

**Suggestions for Future Research and Closing Remarks**

This study provides insights into the implementation challenges of an online assessment program in a large-enrolment, first-year undergraduate course. The intentions of the assessment were to be efficient, accessible, and able to provide frequent feedback to students. Nevertheless, the challenges that arose redirected the course’s development plans, as evidenced by the progression from initial discussions about an accessible, computerized adaptive testing framework to the product, a simple, self-administered formative assessment. Hall and Stahl (2006) state that an assessment’s purpose “should be to demonstrate the achievement of standardized goals, not to standardize the means for demonstrating those goals” (p. 74). In the march toward this ideal, some possibilities for future exploration and research based on the results of this study are discussed, depending
on whether the online assessment would be for summative or formative purposes. Another suggestion based on student assessment preferences is also provided.

For summative assessment, one possible focus could be on the implementation of on-campus online quizzes within the blended learning model. Establishing a designated time and location on-campus to administer the quizzes would motivate students to prepare for them. Students who participated in the focus groups expressed a preference for in-class assessments, reasoning that it would both encourage them to study and reduce incidences of cheating. Although some access flexibility (i.e., efficiency) would be lost, these students explained that attendance was already mandatory in learning lab sessions, and students would still to be able to use their own computing devices. Insight into study preparation techniques used by students for quizzes could also be valuable.

An assessment can be more highly perceived by students if it is seen as valuable to them. Given that feedback is the primary form of information provided to students about their learning in a blended learning model (i.e., self-directed learning), a possible future study based on formative assessment could be to look at how students use the provided feedback, and associate it with how well they do on the assessment. Moreover, if the quiz is designed to allow multiple attempts, a study could seek to understand how students use the quizzes during their first attempts, the study strategies they employed before taking the quiz, and how their use contributes to a deep learning approach.

Lastly, exploration into student behaviours and preferences during online assessment (i.e., how students spend their time interacting with the quizzes) can bring the level of accessibility to one compatible with learning methods used by the course population. As an example, a basic survey at the beginning of the course can help
instructors become aware of their students’ ICT skills as well as their assessment preferences. A clearer understanding of students’ interactions with the online assessment program can be valuable, providing insight to course developers. An accessible and efficient system that equitably supports all students will further integrate the relationships amongst teaching, learning, and assessment.
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Appendices

A. Letter of Approval from the General Research Ethics Board

B. Recruitment Notice – Students

C. Letters of Information
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Appendix A

Letter of Approval from the General Research Ethics Board

December 12, 2011

Mr. King Liu
Ph.D. Candidate
Faculty of Education
Duncan McArthur Hall
Queen’s University
511 Union Street
Kingston, ON K7M 3R7

GEDUC Ref #: GEDUC-586-11, Romeo #: 6006391
Title: "GEDUC-586-11 A universal design approach to support assessment for all in postsecondary education"

Dear Mr. Liu,

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "GEDUC-586-11 A universal design approach to support assessment for all in postsecondary education" for ethical compliance with the Tri-Council Guidelines (TCP5) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at http://services.queensu.ca/romeo_researcher and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://services.queensu.ca/romeo_researcher and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

John Stevenson, Ph.D.
Professor and Chair
General Research Ethics Board

cc: Dr. Don Kinger, Faculty Supervisor
Dr. Lesly Wade-Woolley, Chair, Unit REB
Eria Wickham, C/o Graduate Studies and Bureau of Research
Appendix B
Recruitment Notice – Students

Email message sent to the PSYC-100 course coordinator

From: King Luu
To: [redacted]
Date: February 27, 2012

Dear Professor:

I hope the term has been going well for you. I am writing to update you on my dissertation research project on the blended learning model being used in PSYC-100. The proposal has received ethical approval, and I am now seeking your assistance in recruiting students for focus groups. Their participation will be essential in obtaining the student perspective.

I would like to conduct four focus groups with a selection of PSYC-100 students, two with students without disabilities, and two with students with disabilities (and receiving accommodations). Each focus group would have 5-7 students (i.e., 20-28 students in all).

I would like to hold the focus groups during the week of March 12, and it would be advantageous to begin recruitment as soon as possible.

As I currently do not have access to the student list, I would like your assistance in carrying out the following procedure to recruit students:

A list containing student numbers of students without disabilities is provided to me. I will randomly select approximately 50 numbers from this list and send these numbers to you.

A member of the PSYC-100 team matches the student numbers to email addresses and sends out recruitment letters to these individuals by email using Letter 1 (attached).
(Every student who is receiving accommodations in PSYC-100 will be contacted, and since no selection process will be employed, these students can be contacted immediately with Letter 2, attached.)

Interested participants from each group will contact me directly and confirmed on an individual basis.

If this procedure is not possible, I would be happy to meet with you or someone from your team to discuss an alternative sampling procedure.

Also, as a heads-up, I would like to hold individual interviews with you and the PSYC-100 course instructors—perhaps at the end of term—to talk about the implementation of the model and perceptions of fair assessments. I will send you the letter of information at a later date.

In the meantime, I would appreciate it if you could let me know how to proceed with focus group recruitment as soon as possible. Please do not hesitate to contact me if you have any questions about this research. I look forward to working with you!

Sincerely,

King Luu
--- Letter 1. Focus group recruitment (students without disabilities, randomly selected) ---

Dear PSYC-100 student,

I would like to hear about your experiences with the instructional and assessment model used in PSYC-100 this year. You are invited to participate in a focus group to share these experiences. I will be conducting focus groups of approximately seven students on March 14 and 15, and should take about one hour. Your participation will not have any effect on your academic standing. If you are interested in participating, please let me know, by February 24, which date(s) you are available. I will send, by email, a Letter of Information to about the study and a confirmation notice. Ten dollars will be offered to you in appreciation for your time.

Availability (check all that apply):

__ Wednesday, March 14 at 5:00 p.m.
__ Thursday, March 15 at 5:00 p.m.

Name:
Email address and/or phone number:

If you are interested in participating but cannot attend either of these dates, please send an email to the address below and we can try to make alternative arrangements. If you have any other questions about this study, please contact me at king.luu@queensu.ca, or call 613.533.6000, ext. 77758.

Sincerely,

King Luu
Doctoral candidate, Faculty of Education
Dear PSYC-100 student,

I would like to hear about your experiences with the instructional and assessment model used in PSYC-100 this year. You are invited to participate in a focus group to share these experiences. I will be conducting focus groups of approximately seven students on March 12 and 13, and should take about one hour. Your participation will not have any effect on your academic standing.

If you are interested in participating, please let me know by February 24 date(s) in which you are available. I will send, by email, a Letter of Information to about the study and a confirmation notice. Ten dollars will be offered to you in appreciation for your time.

Availability (check all that apply):
__ Monday, March 12 at 5:00 p.m.
__ Tuesday, March 13 at 5:00 p.m.

Name:
Email address and/or phone number:

Please identify your disability (optional):

If you are interested in participating but cannot attend either of these dates, please send an email to the address below and we can try to make alternative arrangements. If you have any other questions about this study, please contact me at king.luu@queensu.ca, or call 613.533.6000, ext. 77758.

Sincerely,

King Luu
Doctoral candidate, Faculty of Education
Appendix C.1  
Letter of Information – Staff

Study name  
An online-based approach to support assessment for all in postsecondary education

Principal investigator  
King Luu, doctoral candidate  
Faculty of Education, Queen’s University  
613.533.6000 ext. 77758 or king.luu@queensu.ca

Faculty Supervisor  
Dr. Don Klinger, Professor of Education  
613.533.3028 or don.klinger@queensu.ca

This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.

Purpose

The purpose of my study is to explore how the implementation of the blended learning model in the PSYC-100 course is being used to support the learning of all students (including students with disabilities). Through your participation in an individual interview, I hope to explore your perceptions of fairness, some of the instructional ideas you had for the course, the challenges that arose, and how you handled them.

The study

If you agree to participate in the study, the interview will take approximately one hour in all. I will ask about your experiences teaching PSYC-100 and your perceptions of the blended model as it is being offered this year. You will not have to answer any questions that make you uncomfortable.

I will be audio recording the interview to obtain an accurate transcript of our conversation, which will later transcribed. All documents will be password-protected on a portable storage device. The data will be retained for five years, after which time it will be destroyed.

Risks

The risks involved in your participation are minimal. You do not need to answer any questions that make you uncomfortable or that you simply do not wish to answer. Your participation is voluntary, and you can withdraw at any time without consequences. Upon withdrawal, you may request removal of all or part of your data.

Confidentiality

Your unique position as PSYC-100 instructor may make the protection of your confidentiality all but impossible. As a result, you may be easily identifiable through the experiences you describe. However, only I (K. Luu) and my faculty supervisor (D. Klinger) will have access to the data.
As part of the qualitative data analysis, quotations will be drawn from transcripts and reported in support of themes that arise. These quotations may be published or presented in the dissertation, at conference presentations, or in journal articles. Any data used for secondary analysis will contain no identifying information.

**Benefits**

Improved accessibility to learning tools is an important step to inclusive education practices in postsecondary settings. Findings from this research may spur further improvements and features in blended models that could support and promote learning for all students, in fair and equitable ways.

**Questions about the study**

Any questions about study participation may be directed to King Luu (king.luu@queensu.ca) or Dr. Don Klinger (613.533.3028 or don.klinger@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board (613.533.6081 or chair.GREB@queensu.ca).
Appendix C.2

Letter of Information – Students

Study name: An online-based approach to support assessment for all in postsecondary education

Principal investigator: King Luu, doctoral candidate
Faculty of Education, Queen’s University at Kingston
king.luu@queensu.ca

Faculty Supervisor: Dr. Don Klinger, Associate Professor of Education
613.533.3028 or don.klinger@queensu.ca

This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen’s policies.

Purpose

The purpose of my study is to explore how the implementation of the Moodle course management system used in the PSYC-100 course is being used to support the learning of all students, particularly the module quizzes you have been taking. Through your participation in a focus group, I hope to obtain a better picture of the ways in which students use the course Moodle to prepare for exams.

The study

If you agree to participate in the study, you will sit with four other students in a focus group lasting approximately one hour. I will ask about your experiences in PSYC-100, your perceptions of the usability of the Moodle platform and how you interacted with the online quizzes.

None of the questions I ask will involve specific personal issues, such as academic performance in the course. Nonetheless, you will not have to answer any questions that make you uncomfortable.

I will be audio recording the focus group to obtain an accurate transcript of our conversation, which will later transcribed. The original recording will be deleted once the transcript has been generated. All documents will be password-protected on a portable storage device. The data will be retained for five years, after which time it will be destroyed.

Risks

The risks involved in your participation are minimal. You do not need to answer any questions that make your uncomfortable or that you simply do not wish to answer. Your participation is voluntary, and you can withdraw at any time without consequences. Upon withdrawal, you may request removal of all or part of your data.
Confidentiality
Every effort will be made to protect your confidentiality to the extent possible. I (K. Luu), my faculty supervisor (D. Klinger), and a transcriber who has signed a confidentiality agreement will have access to the data. A pseudonym will be assigned to each of the participants in my research. While I will not report your name or any identifiable information, it is entirely possible that you may be identifiable through the experiences you describe. I will inform you immediately if there is a breach of confidentiality.

As part of the qualitative data analysis, quotations will be drawn from transcripts and reported in support of themes that arise. These quotations may be published or presented in the dissertation, at conference presentations, or in journal articles. Any data used for secondary analysis will contain no identifying information.

Benefits
Better accessibility to learning tools is an important step to inclusive education practices in postsecondary settings. By providing some insight as to how different student populations use online learning systems, the findings may spur further improvements and features in online course management systems that could promote increased learning.

Remuneration
All focus group participants will be offered ten dollars for their participation.

Questions about the study
Any questions about study participation may be directed to King Luu (king.luu@queensu.ca) or Dr. Don Klinger (613.533.3028 or don.klinger@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board (613.533.6081 or chair.GREB@queensu.ca).
Appendix D.1
Consent Form – Instructors and Course Coordinator

An online-based approach to support assessment for all in postsecondary education

Name of participant (please print): __________________________________

I have read and retained a copy of the letter of information. Any questions have been answered to my satisfaction.

I understand that I will be participating in the study called “An online-based approach to support assessment for all in postsecondary education,” and that the purpose of this study is to explore how the blended model can support students’ learning.

During the 60-minute interview (with no follow-ups), I will be asked about the successes and challenges I experienced teaching the PSYC-100 course. The interview will be audio recorded to facilitate transcription for data analyses.

I understand that my participation in this study is voluntary, and that I do not need to answer any questions that I do not wish to answer or that make me feel uncomfortable.

I have the right to withdraw at any time, and if I decide to withdraw, I understand there will be no consequences to me. Upon withdrawal, I may ask that all or part of my data be removed.

I understand that confidentiality of the data may be difficult, given the unique nature of my position. However, the only individuals who will have access to the data gathered would be the principal investigator (K. Luu) and his faculty supervisor (D. Klinger).

The data, specifically related quotations from the interview, may be published in professional journals or presented at conferences. I understand that it is entirely possible that I may be identified through the information I provide.

I am aware that if I have any questions, concerns, or complaints, I may direct any questions about study participation to King Luu (king.luu@queensu.ca) or his supervisor Dr. Don Klinger at 613.533.3028 or don.klinger@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613.533.6081 or chair.GREB@queensu.ca.

I have read all of the above statements and freely consent to participate in this research.

Signature X ___________________________________ Date __________________

I wish to receive a summary of the findings. Please send it to the email or mailing address provided on the line below.

________________________________________________________________

Please sign one copy of this consent form and return to King Luu. Retain the second copy for your records.
Appendix D.2
Consent Form – Students (Focus Group)

An online-based approach to support assessment for all in postsecondary education

Name of participant (please print): _____________________________________

I have read and retained a copy of the letter of information. Any questions have been answered to my satisfaction.

I understand that I will be participating in the study called “An online-based approach to support assessment for all in postsecondary education,” and that the purpose of this study is to explore how the blended learning model is used by students to support their learning.

During the 60-minute focus group (with no follow-ups), I will be asked about my study strategies in the course, my experiences with the learning system, and suggestions of other resources that might benefit my learning. The focus group will be audio recorded.

I understand that my participation in this study is voluntary, and do not need to answer any questions that I do not wish to answer or that make me feel uncomfortable.

I have the right to withdraw at any time, and if I decide to withdraw, I understand there will be no consequences to me, including to my status as a student at Queen’s. Upon withdrawal, I may ask that all or part of my data be removed.

I understand that every effort will be made to maintain the confidentiality of the data to the extent possible. The only individuals who will have access to the data gathered would be the principal investigator (K. Luu), his faculty supervisor (D. Klinger), and potentially a transcriber who has signed a confidentiality agreement.

_____ [initial here] I will respect the confidentiality of other participants and agree not to share their names and comments with others.

The data, for example, relevant quotations from the focus group, may be published in professional journals or presented at conferences. While my name or any identifiable information will not be reported, I understand that it is entirely possible that I may be identified through the information I provide.

I am aware that if I have any questions, concerns, or complaints, I may direct any questions about study participation to King Luu (king.luu@queensu.ca) or his supervisor Dr. Don Klinger at 613.533.3028 or don.klinger@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613.533.6081 or chair.GREB@queensu.ca.

I have read all of the above statements and freely consent to participate in this research.

Signature X_____________________________ Date ____________________

I wish to receive a summary of the findings. Please send it to the email or mailing address provided on the line below.

________________________________________________________________

Please sign one copy of this consent form and return to King Luu. Retain the second copy for your records.
Appendix D.3
Consent Form – Students (Interview)

An online-based approach to support assessment for all in postsecondary education

Name of participant (please print): ________________________________________________

I have read and retained a copy of the letter of information. Any questions have been answered to my satisfaction.

I understand that I will be participating in the study called “Computer-based assessment approach for all in postsecondary education,” and that the purpose of this study is to explore how the blended learning model is used by students to support their learning.

During the 30-minute interview (with no follow-ups), I will be asked about my study strategies in the course, my experiences with the learning system, and suggestions of other resources that might benefit my learning. The interview will be audio recorded.

I understand that my participation in this study is voluntary, and do not need to answer any questions that I do not wish to answer or that make me feel uncomfortable.

I have the right to withdraw at any time, and if I decide to withdraw, I understand there will be no consequences to me, including to my status as a student at Queen’s. Upon withdrawal, I may ask that all or part of my data be removed.

I understand that every effort will be made to maintain the confidentiality of the data to the extent possible. The only individuals who will have access to the data gathered would be the principal investigator (K. Luu), his faculty supervisor (D. Klinger), and potentially a transcriber who has signed a confidentiality agreement.

The data, for example, relevant quotations from the focus group, may be published in professional journals or presented at conferences. While my name or any identifiable information will not be reported, I understand that it is entirely possible that I may be identified through the information I provide.

I am aware that if I have any questions, concerns, or complaints, I may direct any questions about study participation to King Luu (king.luu@queensu.ca) or his supervisor Dr. Don Klinger at 613.533.3028 or don.klinger@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613.533.6081 or chair.GREB@queensu.ca.

I have read all of the above statements and freely consent to participate in this research.

Signature X ______________________________ Date _______________________

I wish to receive a summary of the findings. Please send it to the email or mailing address provided on the line below.

________________________________________________________________________

Please sign one copy of this consent form and return to King Luu. Retain the second copy for your records.
Appendix E.1

Interview Guide – Instructor

- Time of interview:
- Date:
- Place:
- Interviewee:
- Position of interviewee:

(distribute Letter of Information/Consent Form; once signed, begin recording)

I am studying the blended course model that was used in Psychology 100 this past year, and the purpose of this interview is to gather perspectives from you - as an instructor using the blended course model - about the instruction and assessment components in the course.

Questions:

I1. I would like you to describe what your responsibilities were as an instructor for PSYC-100 last year.

I2. Describe the process you took to develop assessment items for (i) the module quiz; and (ii) the midterm and final examinations.

I3. What, if any, considerations do you make for the students with disabilities in PSYC-100?

I4. What is your personal philosophy on assessment?

I5. Now I would like to know about your personal notions of fairness. Describe the characteristics that make up a ‘fair’ assessment for students.

I6. In your opinion, how fair were the assessments in PSYC-100 this year (including the Moodle quizzes, learning lab assignments, and major exams), with respect to your description of fairness?
17. Were there any unanticipated events in the course that challenged your notion of fairness? What lessons have you learned to mitigate the effects of these challenges in the future (if it is possible)?

18. In your opinion, what improvements are needed so that every PSYC-100 student perceives the assessments in the course as fair opportunities to demonstrate his or her learning?

19. What benefits do you see to the blended course model, compared to previous years:
   (a) for the students, with respect to assessment and learning
      1. in general?
      2. for students receiving accommodations?
   (b) for the course instructors, with respect to instruction and planning?
   (c) for other groups (e.g., the university)?

110. What challenges, if any, did you encounter this year during the preparation and delivery of the course?

111. Do you have any other suggestions that you think would improve the blended course model?

That concludes our interview. I would like to thank you for participating in my study. Your responses will be valuable to the research I am doing. Please be assured that your responses will be confidential.

*(end recording)*
Appendix E.2

Interview Guide – Course Coordinator

Time of interview:
Date:
Place:

(distribute Letter of Information/Consent Form; once signed, begin recording)

The purpose of this interview is to gather perspectives from the Psychology 100 instructional team about the blended model format first used last year.

Questions:

C1. Describe your role as a PSYC-100 course coordinator.

C2. What do you think is the purpose of assessment in a first-year undergraduate course such as PSYC-100?

C3. Describe the challenges of assessing students in PSYC-100 prior to the introduction of the blended model.

C4. Could you provide me with a description of how the blended model came to be in Fall 2011?

C5. What ideas, literature or resources were consulted in support of this format?

C6. Describe what comes to mind when you hear the word ‘fairness’.

C7. What characteristics make up a fair assessment for students?

C8. How were the course assessments constructed for the blended model?

C9. Based on the way you described fairness, how fair were the assessments in PSYC-100 last year?

C10. How well do you think the online quizzes fulfilled their intended purpose?

C11. How do you ensure that your course is designed with all students’ needs in mind?
C12. What considerations did you make for students with disabilities in PSYC-100 last year…

   (a) …in general?

   (b) …for assessment?

C13. How did you address any challenges for the course this year?

C14. How closely do you think the course in general fits your notion of fairness?

That concludes our interview. I would like to thank you both for participating in my study. Your responses will be valuable to my research.

(end recording)
Appendix E.3

Interview Guide – Teaching Assistant

Time of interview:
Date:
Place:

(distribute Letter of Information/Consent Form; once signed, begin recording)

Questions:

T1. Tell me how you became involved in the PSYC-100 course.

T2. How long have you been a TA in this course?

T3. What sorts of responsibilities do you have as an administrative TA?

T4. Describe your interaction with students…
   (a) …online
   (b) …in person
   (c) …for student accommodation requests

T5. Are you familiar with past offerings of this course (e.g., before the redesign)?
   If so, what were the strengths of the previous offering?

T6. How are PSYC-100 students being prepared to succeed in this course?

T7. How do you think each component of the blended course model (e.g., lecture, learning lab, online learning, assessments) supports student learning?

T8. What challenges have you observed that students have in this course this year?

T9. What challenges does the blended learning model pose in managing the responsibilities you have?

T10. What suggestions can you think of, that would help to address these challenges?

Thank you for your participation!

(end recording)
Appendix E.4

Interview Guide – Students Receiving Accommodations

Time of interview:
Date:
Place:

(distribute Letter of Information/Consent Form; once signed, administer Pre-Interview Survey; once all surveys have been completed, begin recording)

I am a graduate student from the Faculty of Education studying the interactions between instruction, learning and assessment in Psychology 100 this year. The purpose of this interview is to gather perspectives from you, as a user of the blended course model, about the assessment component in the course.

Questions:

S1. First, I would like to know about your perceptions of the course structure and its impact on your learning.
   (a) What parts of the course did you find useful to your learning?
   (b) What parts of the course did you find challenging? How did you deal with the challenges?

S2. What things need to be in place to make a course fair?

S3. I would like you to think about PSYC-100 in relation to other undergraduate courses you have taken or are taking.
   (a) What areas of PSYC-100 were fair to you?
   (b) What areas were unfair to you?

S4. Was there anything about the assessments that prevented you from demonstrating your learning (e.g., time, content, etc.)?

S5. What value did the quizzes have to your learning (e.g., benefits and challenges)?
Tell me about your strategy for quiz preparation.
S6. How did you use the feedback from the quizzes…
(a) …immediately upon receiving it?
(b) …when preparing for the midterm (or intend to prepare for final exam)?
(c) …for other learning activities?

S7. If you had the opportunity to redesign the assessments in PSYC-100 that would make them fair to every student, what supports or features would you change? Describe how you think each change would benefit other students in your class as well.

S8. In terms of the learning supports you received in this course, how well did they fulfill your expectations? How could the process be improved?

S9. Are there any university support staff (who you found to be helpful for any aspect of your studies in PSYC-100) that you think I should talk to?

That concludes our interview; I would like to thank you for your participation. Your responses will be valuable to the research I am doing and be assured that your responses will be confidential. Best of luck in your future studies!

(end recording)
Appendix E.5
Interview Guide – Students (Focus Group)

Time of interview:
Date:
Place:

(distribute Letter of Information/Consent Form; once signed, administer pre-Interview Survey)

I am a Faculty of Education graduate student and I am studying the interactions between interaction and assessment in Psychology 100 this year. The purpose of this focus group is to gather perspectives from you, as users of the blended course model, about the instructional and assessment components in the course.

Questions:

S1. First, I would like to know about the general perceptions you have of the course structure and its impact on your learning.
   
   (a) What parts of the course did you find useful to your learning?

   (b) What parts of the course did you find challenging, and how did you deal with them?

S2. What things need to be in place to make a course fair?

S3. (a) What areas of PSYC-100 were fair to you?

   (b) What areas were unfair to you? Were the things you found challenging the things that were unfair?

S4. Was there anything about the assessments that prevented you from demonstrating your learning (e.g., time, content, etc.)?

S5. What value did the quizzes have to your learning (e.g., benefits and challenges)? What do you think of having them online?
S6. How did you use the feedback from the quizzes…

(a) …immediately upon receiving it?

(b) …when preparing for the midterm (or intend to use in preparation for final exam)?

(c) …for other learning activities?

S7. If you had the opportunity to redesign the way assessment is done in PSYC-100 to make them fair to every student, how would you do it? Describe how you think each change would benefit the other students in your class as well (within a computer-based assessment system).

That concludes our focus group. I would like to thank you all for coming to participate in today’s focus group. Your responses will be valuable to the research I am doing. Be assured that your responses will be confidential. Best of luck in your future studies!

(end recording)
Appendix F

Pre-Interview Survey for Students (Focus Group and Interview)

I am a __ first-year __ second-year __ third- or fourth-year __ other (please specify)

My major is __________

Where do you work on the online components of PSYC-100?
__ home or residence
__ library
__ other (please specify): _______________

Please describe the technology you use during assessment in PSYC-100:
________________________________________

What do you know about the built-in accessibility features in your operating system (e.g.,
text magnification, text-to-speech, contrast, etc.)?
__ I am not aware of them.
__ I am aware of them but do not use them.
__ I am aware of them and use them.
Appendix G
Online Questionnaire (for Students Receiving Accommodations)

Q1. I am a __ first-year __ second-year __ third- or fourth-year __ other (please specify)

Q2. My major is __________

Q3. I am __ male __ female

Q4. Where do you work on the online components of PSYC-100?

Q5. What do you know about the built-in accessibility features in your operating system (e.g., text magnification, text-to-speech, contrast, etc.)?

Q6. What part(s) of PSYC-100 did you find useful to your learning?

Q7. What part(s) of PSYC-100 did you find challenging?

Q8. Describe your approach to dealing with any challenges you faced.

Q9. In your opinion, what does a fair course look like?

Q10. What part(s) of the course do you think were fair?

Q11. What part(s) of the course do you think were unfair?

Q12. Was there anything about the assessments in this course (e.g., testing conditions, exam format) that prevented you from demonstrating your learning?

Q13. How accessible were computer-based components to you, with respect to your ability to use them (including the module quizzes)?

Q14. What value did the module quizzes have to your learning (e.g., benefits and challenges)?

Q15. How did you use the module quizzes (or the feedback) to support your learning in this course?
Q16. If you could make the assessments in the course fairer for everyone, what changes would you make?

Q17. How well did the learning supports you received in this course fulfill your expectations?

Q18. Do you have any ideas or suggestions about how to improve accessibility to the course, or how to remove barriers that currently exist in this course?

Q19. If there were any services or people at the university who you found helpful to your studies in PSYC-100, please identify them in the box.

Q20. If you are willing to share your experiences about the course confidentially in a brief telephone conversation or email chat, please provide your contact information. You may also provide any additional comments in the box.