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Exploring Local Level Factors Shaping the Implementation of a Blended Learning Module for Information and Geospatial Literacy in Ontario

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Abstract

The objectives of this research study were to examine local level factors shaping the implementation of a blended pedagogical approach for geospatial- and information-literacy, and to understand implementer satisfaction. As such, we addressed the following research questions: What local-level factors shape the implementation of the blended learning model? and How satisfied are implementers (faculty, administrators and library instructional/support staff) with the new blended learning model for geospatial and information fluency?

Focus groups (n=7) plus one interview (total n=22) were conducted with key stakeholders (e.g., staff, faculty, administrators) to better understand facilitators, barriers, and/or issues related to module development, in addition to perceptions about how the modules are utilized by teaching assistants (TAs), instructional assistants (IAs), and instructors. Participants were identified according to their status as either discipline-specific instructional staff (i.e., instructor, TA, IA) or staff who supported the development of modules (i.e., library instructional staff, library management, administrators). From an ontological standpoint that privileges an individual perspective on the nature of reality, while epistemologically seeking to understand the relationship between the "knower" and what can be known, we adopted a theory of constructivism to support this inquiry. Transcripts were imported into a qualitative analysis software package (NVivo 8.0) for organization, coding and analysis.

Instructors found value in the online modules, particularly in a blended learning setting. Instructors felt that having the material in advance, in-class time could be better focused on interaction, assignments, and assessments and resulted in reduced anxiety in busy lab environments. Several key themes emerged, including: (a) instructor expectations (time constraints, sustainability, and collaborative nature of development process) and assessment (student grades and performance); (b) implementation benefits (course content consistency, more lab time devoted to instructor support, provision of additional course resources, and opportunities for student reflection; (c) implementation challenges (inadequate support for information literacy, perceptions of an increase in student workload, and definitional issues surrounding blended learning); (d) course-tailored modules (dichotomy of needs – course tailored vs. generic modules, value in a quiz component, and changing context of lab environment); and (e) key areas for improvement.

Focus group respondents illustrated the importance of engaging students in the process of blended learning model development. Future iterations of blended learning modules should explicitly incorporate student feedback through focus groups during their development.

Les objectifs de la présente étude de recherche étaient d'examiner les facteurs au niveau local qui affectent la mise en oeuvre d'une approche pédagogique hybride pour l'acquisition des connaissances en littératie géospatiale et en littératie informationnelle, et de comprendre la satisfaction de ceux qui exécutent cette approche. À cette fin, nous avons examiné les questions de recherche suivantes : Quels sont les facteurs au niveau local qui affectent la mise en oeuvre du modèle d'apprentissage hybride? Et : Dans quelle mesure les personnes qui exécutent ce modèle (les professeurs, les administrateurs et le personnel enseignant et de soutien de bibliothèque) sont-elles satisfaites du nouveau modèle hybride d'apprentissage pour en arriver à la maîtrise de la littératie géospatiale et de la littératie informationnelle?

Des groupes de discussion (n=7) plus une entrevue (total n=22) ont été organisés avec les acteurs principaux (personnel, professeurs, administrateurs) afin de mieux comprendre les facilitateurs, les barrières et/ou les problèmes liés au développement des modules, ainsi que les perceptions sur la manière dont les modules sont utilisés par les chargés de cours, les assistants pédagogiques et les instructeurs. Les participants ont été identifiés selon leur statut : personnel enseignant spécifique à une discipline (c'est-à-dire instructeurs, chargés de cours, assistants pédagogiques) ou personnel qui soutient le développement des modules (c'est-à-dire personnel enseignant de bibliothèque, gestionnaires de bibliothèque, administrateurs). D'un point de vue ontologique qui privilégie une perspective individuelle sur la nature de la réalité tout en recherchant de façon épistémologique à comprendre la relation entre celui qui « sait » et ce qui doit être su, nous avons adopté une théorie de constructivisme pour aider à mener à bien cette enquête. Les transcriptions ont été importées dans un logiciel d'analyse qualitative (Nvivo 8.0) pour l'organisation, l'encodage et l'analyse.

Les instructeurs ont apprécié la valeur des modules en ligne, en particulier dans le cadre d'un apprentissage hybride. Les instructeurs ont déclaré que le fait d'avoir accès à la documentation à l'avance permettait de mieux utiliser le temps passé en classe pour l'interaction, les devoirs et les évaluations et que cela avait eu pour résultat une diminution de l'anxiété dans les laboratoires débordants d'activité. Plusieurs thèmes clés ont été identifiés : (a) attentes des instructeurs (contraintes de temps, durabilité, nature coopérative du processus de développement) et évaluation (notes et résultats des étudiants); (b) avantages de la mise en oeuvre (uniformité du contenu des cours, davantage de temps en laboratoire consacré au soutien par les instructeurs, ressources de cours supplémentaires, opportunités de réflexion pour les étudiants); (c) défis présentés par la mise en oeuvre (soutien inadéquat pour l'acquisition des connaissances en littératie informationnelle, perceptions d'une augmentation de la charge de travail des étudiants et problèmes de définition concernant l'apprentissage hybride); (d) modules conçus spécifiquement pour des cours donnés (dichotomie des besoins – cours conçus spécifiquement versus modules génériques, valeur apportée par les tests de contrôle, contexte changeant dans les laboratoires); et (e) domaines clés pour l'amélioration.

Les répondants des groupes de discussion ont illustré l'importance d'engager les étudiants dans le développement du processus d'apprentissage hybride. Les éditions futures des modules d'apprentissage hybride devraient explicitement incorporer la rétroaction des étudiants par le biais de groupes de discussion pendant la phase de développement.

Blended learning pedagogical approaches are often applied at the course-level. Attempts have been made to define blended learning quantitatively based on the proportion of traditional face-to-face instruction that is replaced by the use of technology-mediated instruction. For example, Allen, Seaman, & Garrett (2007) and Glazer (2011) consider instruction to be blended when 30-79% of instruction is delivered online. The Ontario Ministry of Advanced Education and Skills Development (formerly the Ontario Ministry of Training, Colleges and Universities/MTCU) suggests a slightly modified set of criteria for defining blended (hybrid) learning, resulting in a hybrid pedagogical approach, with the objective to increase the, "Percentage of courses that involved extensive use of technology-enabled learning, including online delivery, blended learning or flipped classroom approaches…" (MTCU & McMaster University, 2014). The MTCU's definition of a blended course structure is consistent with emerging predictions of a "dramatic increase in the number of hybrid (that is, blended) courses in higher education" (Graham, 2006, p. 3).

For the purposes of this study, a more theoretical definition of blended learning was used, as proposed by Garrison and Vaughan (2008): "The thoughtful fusion of face-to-face and online learning experiences... such that the strengths of each are blended into a unique learning experience ... Blended learning is a fundamental redesign that transforms the structure of, and approach to, teaching and learning" (p. 5).

Blended learning is, in varied ratios, composed of both face-to-face and computer-mediated instruction. Blended learning involves a fundamental redesign of a pedagogical approach, including: (a) a shift from lecture- to student-centered instruction in which students become active and interactive learners; (b) increased interaction between students and their instructor, fellow students, content and outside resources; and (c) integrated formative and summative assessment mechanisms for students and instructors (Graham, 2006). In addition, "Blended learning should be viewed as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technology enhanced active learning possibilities of the online environment" (Dziuban, Hartman, & Moskal, 2004, p. 3).

At its core, blended learning is part of an ongoing, iterative convergence process whereby two learning environments: traditional face-to-face learning and distributed learning environments are merged. Maintaining an appropriate balance between these two learning environments is critical, particularly given existing evidence that many faculty and students lament the loss of face-to-face contact that occurs in a fully online learning environment. As such, blended learning is often referred to as the "best of both worlds" (Dziuban et al., 2004).

The objectives of this research study were to examine local level factors shaping the implementation of a blended pedagogical approach for geospatial-and information-literacy modules, and to understand the barriers and facilitators of such a process.

Research Context: Module Development

Online information-and geospatial-literacy modules were developed in 2012 by the McMaster University Library, in collaboration with faculty members, staff, library, students, faculty administration, and pedagogical staff from the teaching and learning centre on campus. Consistent with recent research, a literature review at McMaster University highlighted student and instructor dissatisfaction with the previous pedagogical approach adopted for information-and (geo)spatial-literacy. At McMaster University, while there is overlap between the skills taught in information- and geospatial-literacy modules, they are taught as separate sets within

two courses. Just-in-time instruction is an interactive engagement pedagogy (Novak, 2011), requiring that students answer questions related to upcoming class materials prior to class via an online learning management system (Simkins & Maier, 2010). A new blended learning model was developed with two objectives: (a) to replace face-to-face instruction by library staff with a blended approach in specific courses; and (b) to create online learning resources that could be accessed by all students, fulfilling a perceived desire for just-in-time instruction and 24/7 access to instructional materials.

Information literacy module content was written by a small group of McMaster University librarians and a postdoctoral fellow, two instructor faculty members, library staff with expertise in geospatial literacy, and an undergraduate student in the Integrated Science Program (see Appendix A). Throughout the modules' development, input was solicited from Faculty members, undergraduate students, instructional designers and e-learning developers. This process involved drawing on disciplinary expertise and practical experience from faculty, students and staff. Module development provided an opportunity for instructors to gain practical experience sorting through the nuances of implementation of on-line and blended learning modules, while giving instructional designers and e-learning developers insight into some of the practical challenges of delivery. Ultimately, the content and direction of modules were developed over several years of pedagogical collaboration and on-going communication between library instruction staff and course instructors.

The eleven information literacy modules contain 158 slides and 19 self-tests that included the following different topics: an introduction to the McMaster University Libraries, the Evaluating Information, Refworks™, connecting from home, and Creative Commons Copyright (McMaster University Library, 2015). Self-tests were automatically graded through the online system, to give students a sense of how much knowledge they had gained during review of the slides. This 40-minute online lesson is intended to take the place of a traditional two-hour lecture delivered face-to-face by a librarian. Ideally, the modules encourage students to become more advanced users of the library and be able to ask advanced questions of library staff.

Geospatial literacy modules were created through a similar partnership, with content developed by library staff with expertise in geospatial literacy along with an undergraduate student. Modules consisted of 93 slides and an additional 10 self-tests that included the following topics: characteristics of a map, projections, map referencing systems, topographic maps, contour lines, historical resources for studying land use change: fire insurance plans and city directories (McMaster University Library, 2015). The modules replaced traditional hour-long, pre-lab instructional sessions given by library staff in first-year Human Geography courses, and included enough additional material to support an extra hour of traditional instruction.

Modules were developed using Articulate™ software (Articulate Global Inc., 2013) to create Flash-based modules that are interactive and self-contained, including narration, information slides, multimedia elements, animation and quizzes, and space for note-taking (see Appendices B and C for module screen shots). They could be viewed linearly (reviewing content from the beginning of a section), by using an embedded navigation menu, or by playing controls to select a page, or by using a pointer within the presentation modules. The modules were initially hosted by McMaster University's course learning management (CLM) system. Through the CLM, students who had completed courses using the modules had access to them on-line to accommodate their use in courses beyond their initial purpose over their University career (McMaster University Library, 2015). They can now be assigned as "readings" for any course whether at McMaster University or elsewhere.

Throughout the development process, input, feedback and assistance were solicited from faculty members, undergraduate students, instructional designers and e-learning developers, to adapt material to an online environment. Modules were integrated into their target courses by blending them with in-class activities, where concepts and skills were applied and refined. In first-year Geography courses, students were required to complete a quiz on the geospatial module content prior to attending a related hands-on lab session in the McMaster University Map Library. During the lab exercise, students applied the concepts and skills introduced through the modules into their work. Given the content and role of modules in this study an overview is provided of recent trends in geospatial and information literacy, and the role of academic librarians

Information and Geospatial Literacy

Information literacy is "about understanding information and how it works" (Badke, 2010, p. 130). It encompasses a complex set of understanding and skills, which requires a great deal of instruction and practice and to date has been adopted, albeit with some trepidation, in higher education institutions (Badke, 2010). A survey of over 100 colleges and universities in Canada and the United States revealed that fewer than 6% of institutions required a one- or two-credit course in information literacy in order to meet graduation requirements, and only 25% had an information literacy component built into basic writing and composition classes (Badke, 2010).

Information literacy helps students in a variety of ways: it introduces them to a range of forms of information available, it helps them to determine the type of information they need in particular contexts, it supports them to find and evaluate information, and it shows them how to use information effectively and ethically (Badke, 2016). Information literacy is taught predominantly as a single, abbreviated (one- or two-hour) session; however, research indicates that it takes time for students to develop capacity for information literacy (Badke, 2010) and that capacity building is heightened through hands-on activities (Duncan & Varcoe, 2012). Research also indicates that some faculty members see limited value in librarians as instructors, and often do not consider them full academic colleagues (Badke, 2010). Despite this, potential exists for academic librarians to collaborate with faculty instructors to integrate information literacy instruction into faculty members' courses, and thus can play a key role in supporting students to build their capacity for information literacy (Mounce, 2010).

Various modes of instructional delivery can heighten student skill development. Fitzpatrick and Meulemans (2011) recommend a combination of librarian-led instruction along with computer access as the most useful method for teaching students given the diverse range of learning styles. Such an approach lends itself to a blended pedagogical approach. In another study, Bishop, Yonekura and Moskal (2013) cite the value of an online information literacy module for improving student knowledge. Much like information literacy, spatial literacy involves a process by which strategies are learned and knowledge is acquired over time. A recent study by Walton and Hepworth (2013) delivered a blended information literacy teaching and learning intervention to first year undergraduate students in the United Kingdom. They found that an intervention incorporating social media learning was the most successful for building the capacity of students for information literacy, including critical engagement with information (Walton & Hepworth, 2013).

"The term spatial literacy is rarely explicitly described; rather it is more often discussed with reference to spatial abilities and spatial thinking" (Jarvis, 2011, p. 294). Though evidence supports that the baseline level of an individual's spatial ability is innate, spatial skills must be actively encouraged and practiced to promote student development (Jarvis, 2011). A comprehensive definition by Bednarz and Kemp (2011) describes spatial literacy as the ability of an individual to:

> Capture and communicate knowledge in the form of a map, understand and recognize the world as viewed from above, recognize and interpret patterns, know that geography is more than just a list of places on the Earth's surface, see the value of geography as a basis for organizing and discovering information, and comprehend such basic concepts as scale and spatial resolution. (p. 19)

There is growing recognition among geographers and in other disciplines that being able to think in, with, and through space (i.e., to be "spatially proficient") is necessary for success in geography and the geosciences (Andrews & Moon, 2005; Jones, 2009). Recent research reaffirms that spatial aptitude, measured by concrete two-dimensional and three-dimensional visualization and critical reasoning tasks, is invaluable for success in science, technology, engineering and mathematics (STEM) education (Bednarz & Kemp, 2011).

Method

According to Vaughan, Cleveland-Innes, and Garrison (2013), blended learning is an approach that responds to the educational needs of the program or course through fusion of the utmost appropriate online and face-to-face activities. Therefore, in this context, it is the experiences of those designing, developing and administering the newly refined course that are paramount. As such, from an ontological standpoint that privileges an individual perspective on the nature of reality, while epistemologically seeking to understand the relationship between the "knower" and what can be known (Guba & Lincoln, 1994), we adopt a theory of constructivism to support this inquiry. A theory of constructivism aims to produce an understanding of the lived experiences through individual reconstructions, aiming for knowledge based on shared or refined understanding of an inquiry (Guba & Lincoln, 1994). Miller and Crabtree (1999) state, "There is no ultimate truth; there are context-bound constructions that are all part of the larger universe of stories" (p. 10). Therefore, this research seeks to draw upon and thematically interpret local level factors shaping implementation through exploring the experiences and perceptions of individuals involved in developing and implementing new blended learning teaching modules.

Focus groups were conducted with key stakeholders (e.g., staff, faculty and administrators) to better understand facilitators, barriers, and/or issues related to module development. Focus groups also explored perceptions about how the modules are utilized by teaching assistants (TAs), instructional assistants (IAs), and instructors, all of whom are involved in module implementation. A total of 22 participants took part in seven focus groups plus one in-depth interview. Focus group participants were grouped according to their roles: discipline-specific instructional staff (i.e., 9 instructors, 4 TAs, 2 IAs) and 6 staff who supported the development of modules: (i.e., 4 library instructional staff, 1 library management staff, 1 administrator).

A member of the research team (lead author), who was not part of the instructional team or involved in the development or implementation team, recruited focus group participants by email, and facilitated all data collection activities. The lead author did not supervise any of the focus group participants, during or following data collection. There was therefore no power relationship between the participants and the lead author, who was contracted to conduct the focus groups as an impartial researcher. After agreeing to participate, each participant was forwarded an information letter and consent form for signature. Focus groups took place in private on-campus meeting rooms; the one in-person interview took place in the participant's office. The focus groups and interview were digitally recorded (with written permission) for verbatim transcription (by an outside firm) and subsequent analysis. The interview and focus groups lasted between 45 and 70 minutes. Every participant received a $25 hospitality gift card as a token of appreciation.

Drawing on a theory of constructivism (Guba & Lincoln, 1994), we developed a semi-structured interview guide, to provide opportunity to capture reconstructions of individual experiences of module implementation. In doing so, the guide was informed by general themes resulting from a previously conducted online student survey (results reported in McMaster University, 2014), relevant literature and current research objectives.

Key interview guide topics varied based upon research participant role. First, discipline-specific instructional staff were asked to discuss the following topics: their role in module development, effectiveness of the modules compared to the traditional face-to-face model, extent to which modules were tailored to the courses, possible improvements to modules, whether the modules and face-to-face model represented a form of blended learning, and the perception of academic grades as an outcome measure. Second, staff and/or administrators who supported module development were asked about strengths and weaknesses of the modules, cost-benefit analysis of face-to-face vs. blended learning model, challenges and benefits associated with both, differences in resource use between models, and perceptions of students' and faculty members' experience with the modules. The decision to develop separate interview guides based on the participants' role (i.e., discipline-specific instructional staff and staff and/or administrators who supported module development) was informed by results from the previous student survey data (McMaster University, 2014). While the interview guides differ slightly, as per a semi-structured interview guide, and in alignment with a constructivist theoretical framework, many of the same themes emerged from both types of roles.

During data collection and analysis, we operated under the principle that the focus group itself, not the individual participant, was the unit of analysis (Brown, 1999). In alignment with a theory of constructivism (Guba & Lincoln, 1994), specifically, by adopting an inductive approach to data analysis, we attempted to draw key themes that emerged from each focus group. While the themes are consistent with queries, topics and probes from the interview guide, analyses led to a refined understanding of the experiences of individuals involved in the development and implementation of new blended learning modules. Data collection and interpretation occurred concurrently, through an iterative process, with individual researcher and research team interpretation. The interview guide was adapted as data were collected and interpreted, and new questions and probes were added if they were raised in earlier focus groups (Brown, 1999). An organizing phase of data helped to surface initial categories and ideas from three focus group transcripts. After all focus group data were collected, these categories and ideas began to cluster within major themes, until saturation was reached (Brown, 1999).

A coding template was developed based on the interview guide, and major themes that emerged in the first phase of data analysis (Miles & Huberman, 1994). An inter-rater reliability exercise was undertaken using one focus group transcript, which was 14 pages in length, and coded separately by two team members to determine the level of coding agreement, and to ensure confidence in the coding scheme template. Consistent with a coding dependability assessment procedure (Miles & Huberman, 1994) agreements were represented when the same code was applied to a similar section of text (margin of error of between five and 10 text lines accounted for differences in text selected for a given code). An inter-rater reliability score was calculated based on the percentage of the number of agreements divided by the sum of all agreements, disagreements, code-no-codes (where text is coded on one transcript, but not on the other) and second-level disagreements (where the same text is coded, with the same topic and main categories applied, but with different sub-theme codes) (Miles & Huberman, 1994). The inter-rater reliability score was 70%, indicating an acceptable level of agreement.

Transcripts were imported into a qualitative analysis software package (NVivo 8.0) for organization, coding, and analysis. The coding template was adapted marginally as transcripts were coded, as per an iterative process. During data analysis, sections of text were chosen to support and shape individual codes listed in the coding template (Miles & Huberman, 1994). This research study received clearance through the McMaster University Research Ethics Board.

Results

Focus group results were organized according to several key themes (Appendix D):

- instructor expectations and assessment
- benefits of online modules
- implementation challenges
- course-tailored modules
- key areas for improvement
- benefits of face-to-face instruction

Appendix D includes a count and frequency analysis of themes explored during the focus groups. The number of times a theme was mentioned and the percentage of focus groups within which a theme was mentioned are listed.

Other results are reported using quotations from individual participants. Given the possibility that labeling individual quotations by type of respondent could compromise anonymity, quotations are presented by focus group number only. Our findings indicate that implementation of these modules are impacted by similar factors, regardless of the type of module (information literacy or geospatial literacy), or type of research participant.

Instructor Expectations and Assessment

While collaboration between instructors and library staff took place over several years, the process of module development took place over a period of four months. Participants (administrators and discipline-specific instructors) agreed that these time constraints hindered their ability to elicit widespread student feedback on modules before implementation. Module design and development is an early component of the teaching presence (Vaughan et al., 2013).

In this way, it appears to have been a shared, developmental process, within which many stakeholders contributed. While a shared design process was present, one respondent cited inherent barriers:

> I think we probably suffered from a bit of a short timeline over the summer, and there were people away. I think the blended idea is great. I agree with it totally. I don't like to see replacement occur, and I would have liked to have seen more sort of involvement of the staff, and you know a bit longer timeline to prepare. (focus group 7)

The collaborative nature of the module development process was valued, including contributions from a range of stakeholders who helped to shape the modules. These contributions were necessary in order to meet the course learning objectives,

> It was a pretty collaborative process with contributions coming from Earth Sciences people, and then adding the materials from the people in the map collection was really helpful. [Principal investigator] worked to sort of bring it all together, and then using the McMaster staff. I think it all worked really well as a collaborative effort, which was good. (interview)

In addition, the sustainability of modules required that they be more adaptable and user-friendly, "shortening the production chain." One respondent said,

> I think the modules that we introduce are so heavy in the sense that they are really long, really text heavy, they are taking a huge amount of manpower to edit so they are not agile, they are not flexible, they are not something that can be changed on the fly. So as we want to develop the blended learning program, we have got to adapt more tools that allow us to do things quicker. (focus group 1)

An assessment of both the information- and geospatial-literacy modules was based on self-reported instructor perceptions. Several participants agreed that student grades had either not changed or had changed only to a small extent (either positively or negatively) in conjunction with the introduction of geospatial and information literacy modules. One respondent illustrated the complicated nature of assessing student performance as it relates to the modules:

> I feel in general that the averages tend to have improved a little bit. We compare the averages between fall and winter and what is improved, what stayed the same and it is pretty consistent now with marks, which is nice to see. We do have some of our 80's range, some in the 60's and that is to be expected but as for comparing it before when it was just face-to-face, I am not 100% [certain]. (focus group 2)

Benefits of Online Modules

Consistency in course content was a key advantage of the online modules. The usefulness in having pre-defined modules in place emerged:

In a class where there are so many TAs, and there is such a massive margin for miscommunication, not only sort of from the instructional assistant to the TAs and the TAs to the students, but sort of class to class, you know like there is so much margin for error and inconsistency that the modules help immensely with that. (focus group 4)

These skills are something that will continue on you know into the program, so it is good to introduce them to like the kind of skills at that time to kind of get them a taste of what geography, what it has to offer for them in the future. (focus group 5).

Online modules changed the classroom and lab experiences of instructors, making them available to provide additional assistance to students, which lead to the establishment of community and cohesion (Vaughan et al., 2013). By removing the course lecture:

We didn't have to worry about the presentation part, and we could be floating around in the lab available for questions. If we weren't busy and if someone came in we could go off to the side and help them with whatever they needed, so that worked well. (focus group 7)

In addition to a changing classroom context, making additional resources available to students was a key benefit of the online modules, leading to the development of inquiry dynamics (purposeful inquiry[1]) (Garrison, Cleveland-Innes & Fung, 2010). For example:

Instructors become more like resource people in the sense that you present problems, challenges, issues or whatever, and they go away and do the inquiry thing and then come back to the instructor and say, "Okay I have run into this roadblock," or "I don't know what to do now and then the interaction takes place." (focus group 6)

Focus group participants made a link between students having access to reference resources (i.e., modules) and critical reflection time, which helped to temper students' levels of anxiety in what had previously been a very busy lab setting. This perception is strengthened by the fact that over 80% of the over 1000 students with access to the modules watched them, with the majority doing so more than once:

I think now we have the good balance of having the face to face, even just a lecture. We will still talk about these concepts, they have time to go home and do them whenever they want, take notes and reflect on it. Make sure they have enough understanding if they need to ask questions they have lots of time to do so, and then they are showing up and begin to complete the assignment. I think that method is much more effective than it used to be. (focus group 2)

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[1] As part of a Community of Inquiry, purposeful inquiry has been described as involving three main responsibilities: (a) establishing curriculum content, learning activities and timelines; (b) monitoring and managing purposeful collaboration and reflection; and (c) ensuring that the community reaches intended learning outcomes through needs diagnosis and provision of timely information and direction (Garrison, Cleveland-Innes, & Fung, 2010).

Class size was perceived as an important determinant of module success. Blended learning modules implemented in smaller inquiry-based course settings (with 25-30 students) were seen as an ideal environment within which to engage in purposeful inquiry:

> I think the best way to do blended learning is to start with these smaller groups and see how we do that, and then there are some things that will lend itself to the larger class because there are two totally different entities [large vs. small class]. (focus group 6)

Smaller class sizes are more conducive than larger class sizes to unpack concepts that arose during the modules. This more intimate context may lend itself to more in-depth discussion, students posing module-related questions, and requests for clarification and examples.

Implementation Challenges

Discipline-specific inquiry instructors described an inadequate amount of support for information literacy – "library skills" – content delivery. While previous responsibility for delivering library skills was assumed by library staff, it was now instructors who delivered these course skills directly to their students. Findings indicate that course instructors may have felt ill-equipped to deliver these newly designed modules in addition to existing course lectures, despite the assertion that the removal of highly-qualified librarians from in-person course delivery was warranted on the basis that it would be more efficient. As one focus group respondent indicated:

> There was some real unevenness in the comfort of the instructors as to how confident they felt they could teach these library skills... That was quite a challenge in feeling they were kind of downloaded with all this responsibility with not a lot of support. So the absence of face-to-face or real in-person librarian involvement was quite significantly felt I would say by the instructor. (focus group 7)

In addition to confusion regarding its purpose, the burden (e.g., lack of time, capacity) associated with heightened instructor responsibility to provide library skills to students was acknowledged:

> I don't know how information literacy ties in with inquiry. I don't know anything about that at all, but in terms of the geospatial in our class, I think the question would be more applicable if it was the skills that they learned for the assignment that they have to do because they are nowhere near learning the skills that you need for our class in that one module. It is more for a particular assignment and a subset of what we learn within that class. So they are learning the skills for that assignment and not necessarily for everything else that we do within the class. (focus group 3)

These data indicate a lack of articulation on the part of the instructor related to the link between information literacy and inquiry for undergraduate students. This finding highlights the need for pedagogical resources to support instructors to engage in discussion with their students.

While some respondents agreed there were benefits associated with student access to modules, others did not. Given that first year students made up the majority of students who were accessing the online modules, some instructors were worried they would be seen as non-course-related resources, and thus, overwhelm students. Yet, data from a previously administered

student survey (n=181) provided evidence that students themselves perceived the modules as beneficial to their understanding of course material (see Table 1, Maclachlan et al., 2014). For example,

> The [advantages] tie into almost disadvantages in the fact that it is available as almost a separate resource for what is being done in class, and there is the possibility of it not being linked to the class material, and being perceived as something that is external and additional to the work that they are doing. (focus group 3)

Table 1
Student Responses Regarding Course Modules

	% of respondents				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
This module improved my overall understanding of the course material.	24.80	53.20	19.90	1.40	0.70
My overall satisfaction with this course is greater as a result of this module.	17.00	29.80	37.60	13.50	2.10
This module helped me achieve a better grade in this class.	21.00	37.70	29.70	9.40	2.20
This module was helpful with coursework beyond this course.	18.70	30.90	27.30	15.10	7.90

Note. Retrieved from Maclachlan et al., 2014.

Responses were mixed about the extent to which the modules offered a form of blended learning, a finding that related to the fact that most respondents were somewhat unclear about what constituted blended learning in of itself. However, despite being uncertain about the definition of blended learning, focus group respondents still believed it was useful:

> This module was great obviously because they didn't [ask] any questions, but I do have those quiet students who will approach me to meet and clarify concepts. It is again proof that this module was very effective because those quiet students who usually do ask questions [and] asked to meet with me, didn't ask about this one. (focus group 4)

This finding may indicate the extent to which the modules supported students' cognitive exploration, integration and resolution of material.

Course-Tailored Modules

The modules were meant to be used by anyone with an interest in the material so while they are not intimately tied to the course material, they are, by default, tied to the course material simply by the nature of the topic. In many first-year Geography courses geospatial literacy is a core topic and is seen as an important aspect of an education in Geography (Bednarz & Kemp

2011). Ideally class material is developed to enhance learning from the modules through both quizzes and assignments.

While participants agreed that having generic modules available was useful, discipline-specific instructors also valued course-specific modules. This is an appropriate request as specific topics, such as exploring the usefulness of fire insurance plans, may be less important to some users. In addition, many instructors supported tailoring modules even more to coincide exclusively with their course content.

Balancing instructor and student needs played a key role in the development of learning modules. In addition, instructors perceived value in having a quiz to complement the online modules. In this way, the quiz acted as a key checkpoint whereby instructors could track whether students were engaging with and absorbing the content of modules. Modules require a higher level of student responsibility for their learning, in part, through a plan for critical reflection and discourse (Vaughan et al., 2013), as described:

> I guess one thing that I definitely observed is that you do notice a difference for the students who have taken this time to actually go through the modules. Go through the practice questions, and then use that for the prelab test too. (focus group 2)

A changing student lab environment – an important objective of the online geospatial literacy modules – meant that more time was available for lab work and higher-level discussion with the instructor and other students, if students reviewed modules prior to class time. Building in time for critical reflection and discourse was a clear priority, as described by one discipline-specific instructor:

> We have homework assignments, but we also have homework tests that relate to the lab material. So one of the first homework tests they have is to watch the library modules and answer a few questions that we have developed based on it, and that kind of goes hand in hand with the student responsibility contracts we have as well. (focus group 2).

Key Areas for Improvement

Participants identified several changes that would improve modules, including making them more interactive, thereby improving information exchange and the application of new ideas. For example:

> If they were more interactive I would call it more blended learning where they are actually doing samples for geospatial, like you can really see maps. I don't find it replaces at all a lecture face-to-face, you are more learning how to blend it into your class to be able to use it than it being a standalone tool on its own. (focus group 3)

Another participant agreed, citing the value of interactivity of the modules:

> I think most people were leery of it, but it turned out really, really well. The modules are semi-interactive and we have taken these modules to be sort of a first step that hopefully we will keep adding to and making them more interactive for students. (focus group 6)

It was also suggested that modules continue to be available on a more long-term basis to upper-level students. One course instructor proposed:

> I can at least make that available for my students in their coming years, and I know several of them have said to me, "Oh am I ever so glad that the library modules are still there when I am ready to do my presentation or doing my paper." (focus group 2)

Benefits of Ongoing Face-to-Face Instruction

Teaching library skills had become somewhat of a challenge at the course level, and as a result, training by a liaison librarian was offered to students. In most cases, at the discretion of the course instructor, a short librarian-led, face-to-face information literacy discussion was used to compliment the online modules, while in other cases students relied solely on the online modules, without the added librarian-based discussion. Ongoing librarian support would help to extend and facilitate information exchange, augmenting in-class and online instruction. As one respondent highlighted:

> It is different when you are actually looking for journals online or in databases versus actually seeing stacks or pulling out a journal and looking at it. It is a totally different experience, and I think the hands-on part of it would be beneficial for them. So we need to have somebody in the library that can still do at some level some of that training, guiding students through some of this. (focus group 3)

Within the same context, another instructor took the initiative to invite a teaching librarian to participate in a short question and answer period related to the library skills module, which was:

> Helpful and the students liked it because they were comfortable enough. I did it towards maybe two-thirds of the way through the term, so the students were already comfortable enough with each other I think to ask questions. So overall I think it is great. (focus group 6)

Conclusions and Implications

This study addressed the implementation of geospatial and information literacy blended learning modules for three first year courses at McMaster University. In doing so, qualitative focus group interviews and one in-depth interview were conducted in Winter 2013. Several key themes emerged from the data, including: (a) instructor expectations (time constraints, sustainability, and collaborative nature of development process) and assessment (student grades and performance); (b) implementation benefits (course content consistency, more lab time devoted to instructor support, provision of additional course resources, and opportunities for student reflection); (c) implementation challenges (inadequate support for information literacy, perceptions of an increase in student workload, and definitional issues surrounding blended learning); (d) course-tailored modules (dichotomy of needs – course tailored vs. generic modules, value in a quiz component, and changing context of lab environment); and (e) key areas for improvement (increasing interactive nature of modules, developing skill-specific modules, providing ongoing access to modules for upper year students, and increasing the

amount of liaison librarian support). Results help to inform a series of implications and opportunities for pedagogical design and practice, in addition to future research directions.

Focus group findings reveal the perception of a burden on course instructors who have adopted a blended model of instruction. It is not that the instructors are unwilling users of blended learning, but that instructors would like more input and time to reflect on how changes in course delivery can be most effectively incorporated into their courses. This suggests that support services and long-term planning are a critical component of blended learning, both for students (e.g., computer access, software, Internet connection) and instructors (e.g., course development needs, technical assistance) (Garrison & Kanuka, 2004; Vaughan, 2007). An early exercise in setting the course curriculum and methods by establishing inquiry dynamics may help to improve teaching practice. Providing instructors with the opportunity to further develop the cognitive presence of this model would be useful, through an appropriate plan to shape constructive exchange between instructors and students whereby new ideas can be applied, and issues can be resolved (Vaughan et al., 2013). In this context, cognitive presence refers, in part, to the exploration of relevant information/knowledge, making sense of and integrating ideas, in an environment of reflection and discourse (Garrison, Cleveland-Innes, & Fung, 2010).

Course instructors discussed the potential discomfort of instructors who may feel the instruction of information literacy may take them out of their comfort zone. While it has been well documented that there are many effective methods for information literacy instruction and that students can learn as much online as in face-to-face instruction (Anderson & May 2010), there is a need to ensure continued institutional support is available.

An opportunity exists to explore potential support services for this blended learning model, particularly as it relates to local, timely technical support in order to update the digital resources (Davis & Fill, 2007). In a recent study of institutional adoption and implementation of blended learning in higher education, the findings of Graham, Woodfield, & Harrison (2013) indicate the need to create training opportunities to assist new and existing faculty members in implementing blended learning models of instruction. For example, the authors suggested providing technical training opportunities for teaching assistants to support their professors in implementing the online portion of the blended learning model. These types of support opportunities are valuable, particularly if there is a plan to expand the current blended learning pilot model to large-scale courses. These findings also point to a need to further explore the "shelf-life" of blended learning modules. It may be useful to consider the implementation of a scheduled review cycle. Beyond the important, yet administrative driven, question of budgeting for improvements to modules there is the important question of for what length of time are they effective for students? With technological changes in both software and hardware, questions remain, about what point modules look dated and potentially ineffectual? Do students learn more effectively if modules are continually altered to look up to date?

Focus group respondents illustrated the importance of engaging students in the process of blended learning model development. This result supports Moskal, Dziuban, and Hartman's (2013) finding that a number of factors are needed to implement a successful blended learning program. These factors include soliciting student input throughout the blended learning development and implementation process to inform effective practice, and ensuring the existence of a reliable and robust infrastructure (i.e., campus teaching and learning support, regular communication between instructional staff and librarians) to support students and faculty. Exploration of information exchange approaches (both online and face-to-face) and the integration of ideas can also help to facilitate a more robust blended learning pedagogical model.

Future iterations of this blended learning module would benefit from incorporating student feedback via focus groups in order to explore constructs associated with personal self-projection, the extent to which an open learning environment is present, and characteristics of group cohesion and identity (Vaughan et al., 2013).

Limitations

Focus group session participants indicated that online modules were used inconsistently amongst course instructors.

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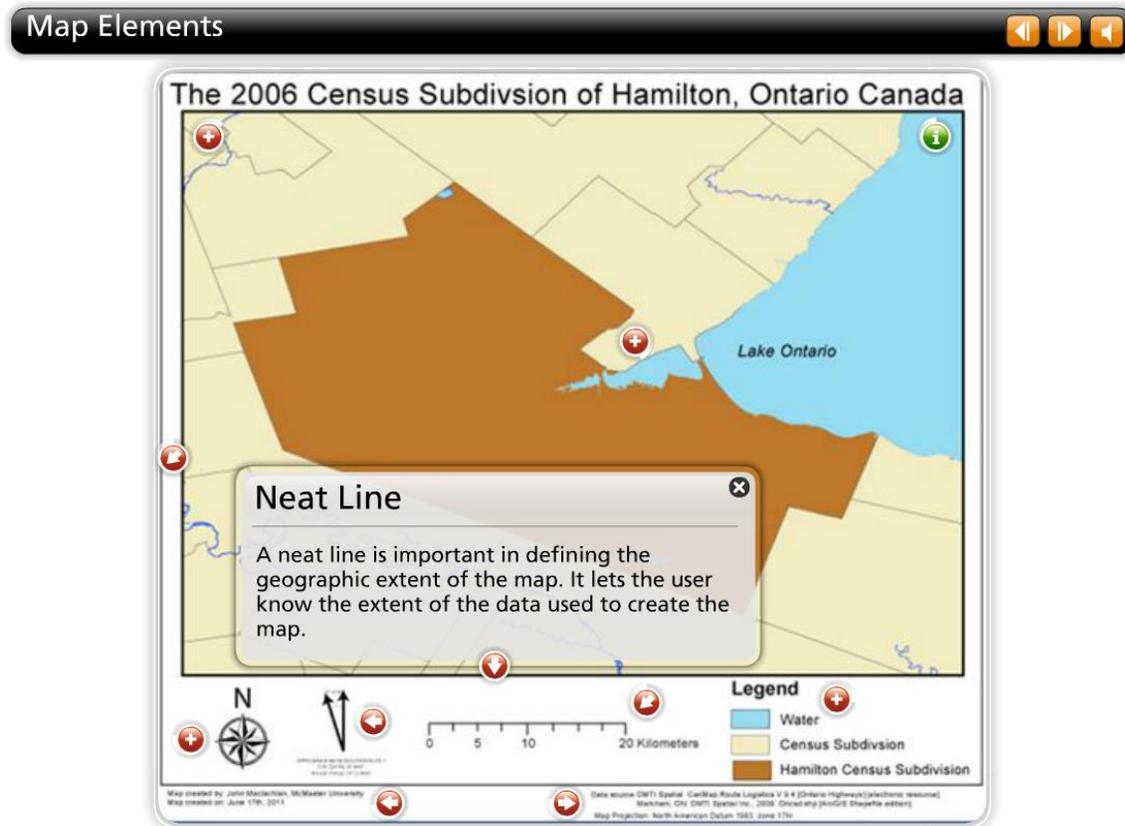
Appendix A
McMaster University Blended Learning Project Team
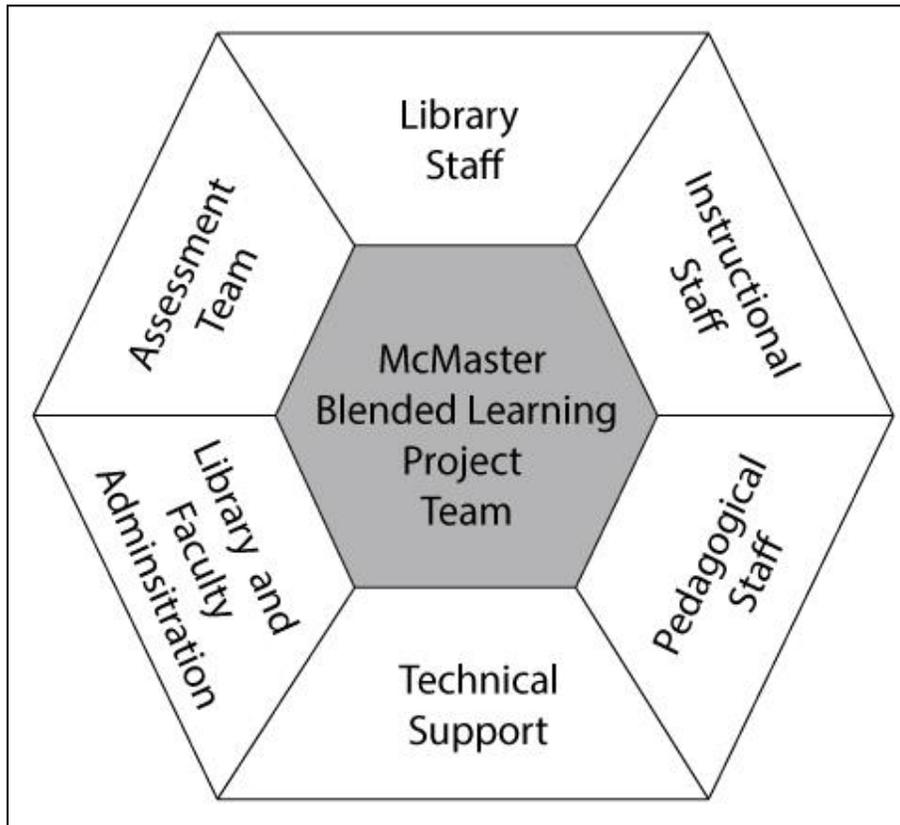
Numerous groups of contributors were required to ensure the successful creation and implementation of both the Geospatial and Information Literacy blended learning modules. Each of the teams contributing to the project had the potential to include Faculty, students, instructional designers, e-learning experts and library staff.

Appendix B
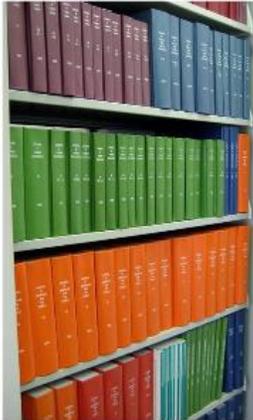A Screenshot from the Geo-Spatial Literacy Module:

Appendix C
A Screenshot from the Information Literacy Module:

Appendix D
Focus Group Theme Count

Theme	# of Mentions	# of Focus Groups/ Interview (%)
Instructor expectations		
Positive expectations of modules	16	6 (75%)
Initial instructor trepidation about modules	9	4 (50%)
Cost of blended learning vs. face-to-face model		
Staffing cost	7	4 (50%)
Challenges of online modules		
Issues related to online quiz content	14	5 (63%)
Difficult to ensure student is viewing content	12	6 (75%)
Length of time to develop modules	10	4 (50%)
Benefits of online modules		
Students complete basic work before the class	23	7 (86%)
Instructors available for higher-level questions in class	15	7 (86%)
Students begin to take responsibility for their learning	15	5 (63%)
Modules free up instructors' time to support students in class	14	7 (86%)
Module content as building blocks for subsequent years	9	5 (63%)
Instructors learn how to teach by drawing on modules	9	4 (50%)
Benefits of face-to-face instruction		
Personal connection between instructor and student	28	6 (75%)
Improvements to online modules		
Course-specific modules	11	6 (75%)
Make modules more interactive	7	3 (38%)