Leveling Up Learning: Game Based Learning Initiatives in Canadian Higher Education

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Abstract: Game based learning (GBL), the use of game design elements within non-game contexts such as education, became increasingly popular in the early 2000s, yet empirical evidence about the benefit of games on student learning remains inconclusive. The potential impact of GBL can be influenced, for example, by design elements, context, and discipline. In Canadian higher education, GBL may be housed within departments, the library, or centres for teaching and learning. At our institution, GBL initiatives have only recently begun to surface; for example, the Department of English and Drama has recently launched a games studies minor for undergraduate students, the library has an extensive collection of video games available to borrow, and the academic skills centre has a large collection of board games that are used primarily for social game cafés. While opportunities for curricular connections may exist, our academic skills centre currently lacks staff who have both capacity and expertise in GBL pedagogy. Exploring possibilities for expansion, we aimed to understand the landscape of GBL initiatives across Canadian post-secondary institutions. To achieve this aim, we conducted an environmental scan of over 100 Canadian post-secondary institutions, gathering data such as the existence of GBL programs, category and level of programming (curricular, co-curricular, or research), initiative types, research development, faculty involvement, and availability of additional resources. Findings indicate inconsistencies in definitions used to promote GBL and a concentration of GBL initiatives at the curricular and research levels. The majority of GBL in Canada is led by faculty through course and degree-level programs at both undergraduate and graduate levels. This research gives us insight into GBL program development, challenges, and opportunities for higher education in Canada and globally.

Key Words: Game Based Learning, Game Enhanced Learning, Gamification, Pedagogy, Higher Education

1. Introduction

Game based learning[1] (GBL), the use of game design elements within non-game contexts (Deterding et al, 2011) such as education, became increasingly popular in the early 2000s. GBL approaches have been suggested to positively transform student learning (Gee 2004). It has been argued that games—board games, video games, multi-player role-playing games—require players to use complex thinking skills and to develop argumentation skills (see Gee 2003; Steinkuehler & Duncan 2008). Further, GBL can be beneficial in promoting social interaction as students may be motivated to learn and can explore goal-driven challenges (DeLisi & Wolford 2002). GBL may also help encourage students to share, discuss, and apply knowledge within peer learning groups (Prensky 2006).

Recent research in GBL has focused on a multitude of topics, including use of augmented reality in language acquisition (Hung & Yeh, 2023); the use of games to promote mental health and well-being (Sort et al, 2018); and the use of GBL in flipped classrooms (Hung, 2018). Research has also shown that GBL is not limited to one discipline in higher education. Studies in GBL have been situated in fields such as pharmacy (Bangalee et al, 2021), theology (Oliver, 2018), and business (Emblen-Perry, 2018). Further, these studies have pursued the understanding of GBL through various theoretical frameworks including, constructivism (see e.g., Chan et al, 2017) and activity theory (see e.g., Ek-Ming, Mingfong, & Shao-han 2013). While there has been a plethora of published research, empirical evidence about the benefits of GBL on student learning remains inconclusive on account of influences such as learning context, discipline, and game design elements (see, e.g., Huang et al, 2020; Karakoç et al, 2020).

In Canadian higher education, GBL may be housed within departments, the library, or centres for teaching and learning. At our institution, GBL initiatives have only recently begun to surface; the Department of English and Drama has recently introduced a games studies minor, the library has a new collection of video games available for lending, and the academic skills centre has a large collection of board games used primarily for social game cafés. To determine the possibilities for GBL program expansion at our institution, we determined it was necessary to understand the context of GBL in general and, more specifically, in Canadian post-secondary institutions. Since GBL has not gained much attention in our own institution, we were curious about the

[1] Game based learning is used here, but other related terms include game enhanced learning and gamification.

existence of GBL programming elsewhere in Canada. We thought that by looking at Canadian higher education institutions, we would gain insight into the opportunities for GBL programming in our institution.

In this paper, we report our methods and findings from an environmental scan of over 100 Canadian post-secondary institutions. We then discuss these findings, paying particular attention to the opportunities for GBL program development and the needed support for such development. We end with a presentation of limitations and suggestions for future research.

2. Research Question

Given the lack of research about GBL programs in Canadian institutions of higher education, we were guided by the following research question: What GBL programming exists in Canadian post-secondary institutions?

3. Context

The first author—Jordana Garbati—is the director of the academic skills centre at our institution. As director, she oversees the academic programming of the centre. She began in this role in 2022 and prior to this time, one staff member was primarily responsible for initiating the development of the centre's GBL initiatives. With his retirement, there was a void in GBL programming. At the time of this research, the one initiative that the centre continued was the game café. Game cafés are primarily social in nature where students gather in a large community space for a few hours to play board games. One centre staff member coordinates about a dozen cafés throughout the academic year. While opportunities for curricular connections may exist, our academic skills centre currently lacks staff who have both capacity and expertise in GBL pedagogy. As we thought about GBL opportunities for our own institution, we thought it was important to learn from GBL initiatives across Canadian post-secondary institutions. The second author—Nicole Skrepnek—was completing a Master of Teaching at our institution at the time of this research. We previously completed a pilot study where we employed an environmental scan to identify GBL programs in one province only.

4. Methods

An environmental scan provides a means to identify and assess a given situation or context, so we used this method to identify current practices and programs in GBL across Canada. To begin our cross-Canada environmental scan, we adopted the methods that we used in our pilot study of one province. We identified all accredited post-secondary institutions in Canada (see UniversityStudy.ca). We documented and organized data by province and by institution. We collected information in two ways. First, we accessed the official websites of each institution. We then inputted keywords into the website's search bar to conduct a search of each institution's website. Keywords used were: game-based, game-based learning, gamification, gamified, game-enhanced learning, game-enhanced pedagogy, games, board games, video games, serious games, and jeux serieux and jeux de société (for French-language institutions in Quebec). Second, we used the Google Search Engine. Here, we inputted the full name of each institution along with keywords used in the first approach. This dual approach search method ensured comprehensive access to information online. With these two approaches, we gathered data from a range of webpages and documents. These included: webpages of the institutions; published faculty research articles; records from academic symposia organized or advertised by the institutions for faculty professional development; course offerings and syllabi; workshop resources; inventories of games; faculty-student projects; graduate student publications (e.g., thesis submissions); and links to external webpages published by the institutions for faculty professional development or to promote awareness of GBL initiatives.

We collected and organized our data in one, shared Google Sheet with one tab for each province and territory in Canada. We documented the following information for each institution: name of institution; website URL; identification of GBL programming; categorization of program: curricular (e.g., course, program, major/minor), co-curricular (e.g., game café, game night), or research initiatives (e.g., faculty research); existence of a related GBL definition (e.g., GBL, game-enhanced learning, gamification); type of GBL initiative (e.g., teaching strategy, research project, game night); research; stakeholder groups (e.g., faculty, undergraduate and graduate students, campus partners; and resources available (e.g., funding opportunities, technological infrastructure). We collected descriptive statistics about number of initiatives per category.

These methods allowed us to systematically capture and organize a large quantity of data collected from institutions' websites.

5. Findings

5.1 Higher Education in Canada

Canada has 10 provinces and three territories. Provinces and territories are responsible for all levels of education, including post-secondary education. In Canada, post-secondary institutions include universities and colleges. In universities, students typically earn a three- or four-year bachelor's degree, and in colleges, students typically earn a one- or two-year diploma or certificate. This study collected data from accredited post-secondary universities (see University Study, 2024). Table 1 shows the number of universities in each province and territory in Canada.

Table 1: Universities in Canadian provinces and territories

Region	Province	Number of institutions (n=108)	Number of institutions With GBL Initiatives (n=75)
West Coast	British Columbia (BC)	12	10
Prairie Provinces	Alberta	9	8
	Saskatchewan	6	4
	Manitoba	6	4
Central Canada	Ontario	34	21
	Quebec	26	21
Atlantic Canada	New Brunswick	4	2
	Nova Scotia	9	3
	Prince Edward Island (PEI)	1	1
	Newfoundland and Labrador	1	1
The North	Yukon	0	0
	Northwest Territories	0	0
	Nunavut	0	0

All 10 provinces have universities with number of universities ranging from one (e.g., Prince Edward Island/PEI and Newfoundland and Labrador) to 34 in Ontario. The three territories (e.g., The North region) have no universities. Provinces with the highest number of universities and GBL initiatives are Ontario (34 and 21, respectively), Quebec (26 and 21, respectively), British Columbia/BC (12 and 10, respectively), and Alberta (9 and 8, respectively).

5.2 Adoption and Integration of GBL

Provincial variation exists in the adoption and integration of GBL across Canadian post-secondary universities. The data collected from the environmental scan indicates a robust trend towards embracing GBL, with many provinces adopting game-based pedagogy within their teaching and research frameworks. British Columbia and Alberta are the two provinces that are leading in the adoption rates. In British Columbia, 10 out of 12 (83.33%) of institutions reported the existence of GBL initiatives, with projects ranging from curricular program integrations (such as the OMEGA+ program housed in Athabasca University) to game-based faculty research. Alberta showed a slightly higher adoption rate, with 8 out of 9 (88.89%) institutions reporting the existence of GBL initiatives, ranging from faculty integrating GBL pedagogy into their classrooms to internal grants being utilized to fund institution-based GBL projects, such as the Educational Gaming Fund housed in MacEwan University (MacEwan, 2024). Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland exhibit varying degrees of GBL adoption within their respective institutions

(see Table 1). As noted in Table 1, the latter provinces range in GBL existence, from 3 out of 9 (33.33%) institutions in Nova Scotia and 1 out 1 (100%) institution in Prince Edward Island.

5.3 Defining GBL and Gamification

The conceptualization of GBL across accredited Canadian universities is varied across the country. In provinces such as Ontario, Saskatchewan, British Columbia, and Alberta, universities explicitly separate GBL from gamification, with formal definitions underscoring the application of game principles to enhance educational experiences. These definitions commonly highlight the motivational aspects of games, such as their ability to captivate and sustain student interest, thus enriching the learning journey. For instance, in Ontario, the University of Waterloo defines GBL as "involving the design of learning activities so that game characteristics and principles are inherent within the activities themselves" (University of Waterloo, 2024). This is contrasted with their definition of gamification, which is described as "the integration of game elements like point systems, leaderboards, and badges into conventional learning activities to increase engagement and motivation" (University of Waterloo, 2024). In Saskatchewan, definitions also emphasize integration, but with a focus on the seamless inclusion of games in learning. The University of Saskatchewan defines GBL as "the integration of games into the learning experience. It includes a spectrum of approaches that range from high-fidelity simulation to gamification, which is the integration of classic game elements into traditional learning activities'' (University of Saskatchewan, 2024); it defines gamification as "the integration of classic game elements into traditional learning activities'' (University of Saskatchewan, 2024). In British Columbia, universities present a similar bifurcation in definitions. For example, The University of British Columbia defines GBL as "the integration of games or gaming mechanics into the educational experience" (UBC Blogs, 2024), highlighting a direct application of gaming elements in teaching. Meanwhile, Vancouver Island University provides a more detailed description of gamification, noting it as "the integration of game-like elements into the design of your course that integrate rewards for students as they engage with the topics of your course" (Vancouver Island University, 2024). In stark contrast to universities in these four provinces, universities in Quebec, New Brunswick, and Nova Scotia present a lack of definitions for GBL and gamification; in fact, none of the universities in these provinces provide a definition of gamification.

The environmental scan showed variances in the presence of GBL definitions amongst regions and institutions. For instance, in British Columbia, 1 out 12 (8.33%) institutions provided a definition of GBL and gamification. Similarly, in Alberta, 1 out of 9 (11.11%) institutions provided a definition of GBL, and 2 out of 9 (22%) provided a definition of gamification. In Saskatchewan, 1 out of 6 (16.67%) institutions provided a definition of GBL and gamification. Manitoba, Quebec, New Brunswick, and Nova Scotia, all lacked explicit definitions of GBL or gamification; none of the institutions in these provinces provided clear. In contrast, Ontario, of the 34 institutions, 4 (11.76%) provided a definition of GBL, and 8 (23.53%) provided a definition of gamification.

5.4 Curricular Applications

Data collected from the environmental scan show that the curricular integration and application of GBL can be understood through two perspectives: macro and micro. The macro perspective on GBL integration encompasses institutional-level efforts, including comprehensive curriculum design, structured program and course development, and overarching institutional support. This approach reflects a systematic incorporation of GBL into the educational fabric of the institution. Conversely, the micro perspective focuses on individual faculty initiatives and course-specific efforts. This includes the integration of gamification methods, such as the use of GBL platforms, game labs, and other innovative teaching tools within the classroom. This perspective largely highlights the contributions of individual educators and their localized applications of GBL to enhance student engagement and learning outcomes.

The application of GBL within curricular initiatives varies amongst institutions and provinces. Curricular integration is notably prominent in British Columbia and Alberta, where 66.67% of institutions in each province include GBL initiatives within their curricula. In British Columbia, the Advanced Game Development Program - Diploma (96 credits) at Kwantlen Polytechnic University (2024) gives rise to programs that directly support and encourage the use of GBL in academia and career advancement. This program not only teaches game development but also incorporates industry standard GBL practices and tools (such as game rendering, programming, etc.), preparing students for careers in the gaming industry (Kwantlen Polytechnic University, 2024). Data from British Columbia institutions, such as Simon Fraser University, show that faculty have reported that incorporating gamification within lessons enhances student learning and engagement, even when no academic grade is assigned (Simon Fraser University, 2024). Alberta's curricular integration is equally robust,

featuring programs such as game design minors and courses emphasizing game-based pedagogy to foster academic success. For instance, Athabasca University houses the OMEGA+ project, where students in the Master of Science in Information Systems program have created the platform to help other learners "develop their metacognitive skills through gaming" (Athabasca University, 2023). Additionally, in Nova Scotia, Saint Mary's University provides resources and instructional guides to faculty that encourage the incorporation of GBL and "Game Maps" directly into their course webpages via the Brightspace Learning Management System (Saint Mary's University, 2024).

In contrast, provinces like Saskatchewan, Manitoba, and Nova Scotia show lower rates of classroom integration, with many institutions lacking structured initiatives; instead, there exists individual faculty efforts and ad-hoc applications of game-based tools. For instance, in Saskatchewan, 66.67% of institutions have the existence of GBL initiatives, primarily emerging through isolated faculty-procured course descriptions and projects rather than institution-wide programs. For example, at St. Thomas More College, Dr. Saeed Moshiri (professor) integrated the MobLab online learning platform into his course ECON277.3 as a response to the COVID-19 pandemic drastically limiting in-person and face-to-face interactions that could take place amongst students (St. Thomas More College, 2020). This platform allows students, in various streams of social science, to run experiments to determine the cause-and-effect of variables, similarly to how "explorations" are conducted directly in the field (St. Thomas More College, 2020). Manitoba's integration efforts are similarly limited, also with 66.67% of institutions having the existence of GBL initiatives, with resources largely stemming from faculty research and serious game certificates, such as the one offered at the University of Winnipeg as part of Continuing Education (University of Winnipeg, 2024). Nova Scotia, having 33.33% of institutions with GBL initiatives, have yet to see a broad adoption or a systematic approach to integrating these methods into their educational framework, with initiatives largely consisting of co-curricular blogs, student research, and Brightspace Learning Management System toolkits.

5.5 Student Engagement

Student engagement within GBL initiatives varies across educational levels and provinces. In British Columbia, both undergraduate and graduate students are involved in GBL initiatives, with 58.33% of undergraduate students and 50% of graduate students participating. These initiatives range from graduate student research to faculty integrating gamification strategies into courses. Alberta shows similar trends, with 77.78% of undergraduate students and 55.56% of graduate students involved in GBL initiatives. Examples include GBL introduced within faculty of law classrooms at the University of Alberta (2020) and simulated field trips for students in the Department of Geoscience at the University of Calgary (2022). Ontario also reports good engagement with 52.94% of undergraduate and 23.53% of graduate students participating. For instance, WoodsworthONE courses at Woodsworth College at the University of Toronto, offer students the opportunity to engage with courses that are central around class discussions and participation, while integrating GBL strategies (University of Toronto, 2024). In contrast, Manitoba, New Brunswick, Nova Scotia, Saskatchewan, and Quebec report lower student engagement with undergraduate student involvement ranging from 0% to 57.69% and graduate student involvement ranging from 0% to 16.67%.

5.6 Co-Curricular Initiatives

Data show that GBL at Canadian universities extends beyond curricular applications. Co-curricular initiatives offer additional opportunities to engage with educational content in innovative ways. Co-curricular GBL initiatives are notable across several provinces, each showcasing diverse approaches to enhancing learning experiences. For example, in Alberta, institutions have implemented GBL within co-curricular settings. For instance, The King's University (2024) offers a recreational gaming club facilitated by the Students' Association (TKUSA), providing a platform for students to explore and engage with gaming as a learning tool. In Ontario, there are multiple co-curricular GBL initiatives. Carleton University has curated an academic library collection comprising over 400 video games and 50 board games, which primarily supports learning in computer game development and is accessible to students across various disciplines (Carleton University 2024). The Health and Wellness Lounge, housed within the University of Ottawa (2024) incorporates Virtual Reality (VR) and video games to promote student mental health and wellness. Additionally, the University of Toronto Mississauga (2024) offers an extensive board game inventory suitable for interdisciplinary study and hosts Game Cafés through the Robert Gillespie Academic Skills Centre (RGASC), fostering interactive and engaging learning experiences. In Quebec, the Université du Québec en Outaouais (2024) supports co-curricular GBL initiatives by maintaining a board game collection within its library, which students can access to enhance their learning

through gameplay. Conversely, provinces such as British Columbia, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland exhibit limited co-curricular GBL initiatives. Institutions in these regions primarily focus on curricular or research based GBL applications.

5.7 Research Applications

Research applications of GBL, while less prevalent than curricular integrations, are notable within certain provinces. In Alberta, 55.56% of institutions engage in GBL-related research. Noteworthy projects include a Scholarship of Teaching and Learning (SoTL) study conducted by faculty at Mount Royal University, which investigates the impact of an online role-playing game on adult criminal justice students at a western Canadian university (Fantazir & Bartley, 2021). Additionally, research at the University of Lethbridge focuses on updating a web-based card game used for teaching programming, cybersecurity, and software development (Tareque, 2021). Ontario also demonstrates considerable research integration, with 35.29% of institutions involved in GBL-related research. For instance, Eunsik Kim, a researcher at the University of Windsor's Faculty of Engineering, applies gamification strategies to provide virtual rewards for social isolation competencies and tasks such as social distancing, handwashing, and self-isolation during and beyond the COVID-19 pandemic (University of Windsor, 2020). New Brunswick, where 50% of institutions engage in GBL-related research, also showcases faculty-led initiatives. At Université de Moncton, Caitlin Furlong and colleagues have highlighted the use of technology-based games to enhance student motivation within mathematics (Furlong et al., 2018). However, other provinces like Saskatchewan, Manitoba, Quebec, and Nova Scotia show little to no research development, with research engagement ranging from 0% to 22.22%. Most initiatives in these regions stem from graduate student research. For example, a graduate student at Acadia University in Nova Scotia authored a paper on the use of games as a tool for teaching programming concepts to fulfill degree requirements (d'Entremont, 2015).

6. Discussion

While all the Canadian universities in our data set included instances of GBL, their approaches varied widely from the definitions used to the programs offered. The lack of consistency in terminology or presentation of definitions is surprising as this could indicate weakness and uncertainty within the field of GBL. The number of terms used—GBL, game-enhanced learning, gamification, serious games—created some complication in our data collection approaches, which could also indicate a lack of clarity for students and administrators. A clearer description of the terms, their uses, purposes, distinctions could lead to a more unified approach to program administration.

Our environmental scan shows that GBL initiatives primarily exist in curricular and research endeavors led by faculty. Many readers may not be surprised by this. The possibilities, however, to work with other campus partners on GBL are great. Libraries, students' associations, and academic skills centres could be ideal partners and leaders in GBL, and it seems that their value has not yet been tapped. That said, if institutions wish to expand GBL initiatives, our data show that faculty involvement is likely necessary.

There is great variation in existence and type of GBL initiatives across Canadian provinces. British Columbia, Alberta, and Ontario, for example, show a variety of initiatives in our identified categories whereas there was more variation of offerings in other provinces. This may because these are the provinces with the highest number of universities and show high faculty participation. Further, universities in these provinces may have more GBL courses, programs, and research initiatives than in other provinces because of funding and student enrolment.

7. Limitations

There are two primary limitations of this research. First, in terms of data collection, we collected data solely from published information provided by the institutions. We recognize that the published information may not capture all GBL initiatives within each institution. In addition, since each institution adopted different ways to present their GBL activities, we may have missed information in our website search. Second, we were limited by the information available and accessible on public websites. This meant that if a website did not have a "search" feature, we had to try to locate the needed data by other means. We also encountered broken links or pages that were redirected incorrectly, which resulted in missing data.

There is value in extending this research by conducting qualitative research (e.g., interviews, focus groups) with those involved in GBL to learn more about their programs.

Second, we limited our search to universities in Canada. To get a better view of the landscape of GBL in Canada, it would be interesting to also include colleges. This might give researchers and administrators a more comprehensive view of the place of GBL in higher education in Canada. To begin, an environmental scan could be completed. This work could be extended through qualitative research approaches as noted above.

8. Conclusion

This research contributes to our understanding of GBL in Canada. There are several practical outcomes of this research. First, it is the first environmental scan of GBL in Canada that is publicly available. Faculty and administrators can now use this scan as they explore GBL opportunities in their institutions. Second, we have identified a need for those involved in GBL to increase awareness by defining GBL more explicitly and clearly. Third, we have proposed that to increase GBL initiatives, faculty involvement is necessary, but cross-campus partnerships would bring additional opportunities.

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