

Simulating the Sustainable Development Goals: Scaffolding, Social Media and Self-Reported Learning Outcomes Amongst Entry-Level Students

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Introduction

Simulation-based Education (SBE) has become a fixture of experiential learning in the social sciences. Role-play simulations ask students to adopt a character and represent this role within an approximation of the real world as part of the learning process. By recreating life-like scenarios, the use of role-playing exercises in classrooms enables students to hone skills (Cutler and Hay 2000), build knowledge (Schnurr et al. 2015; Levin-Banchik 2018), gain a deeper understanding of complex issues (Williams 2015; Sterman et al. 2015), and apply course-based content (Shellman and Turan 2006, Schnurr and Macleod 2021).

This article explores how careful scaffolding and social media can enhance an immersive role-play simulation in an introductory social science survey course. We draw upon three years of data to showcase self-reported learning outcomes amongst students during a multi-week simulated negotiation of the United Nations' Open Working Group on the Sustainable Development Goals (SDGs). First, we argue that running a successful simulated activity for entry-level students hinges upon careful design and scaffolding. Second, we demonstrate how thoughtful integration of social media tools can help to make the learning experience more accessible. Our findings should be of particular value for instructors in the social sciences who are seeking to create a more immersive and educational simulation experience for their students.

Literature Review

Scaffolding Simulation-Based Education

SBE requires students to step outside of their comfort zone by engaging in unscripted and immersive live-action scenarios. Simulated negotiations in political science and international studies teach students about the political and legislative processes that underpin negotiations (Blackstone and Oldmixon 2019) traditional skillsets such as public speaking (Crossley-Frolick 2010), communication (Hammond and Albert 2019), critical thinking (Dengler 2008; Shellman and Turan 2006), and writing (Lawless and Brown 2015), as well as skillsets that are not typically targeted within the conventional classroom such as lobbying, negotiation, policy writing, and coalition building (Schnurr, De Santo, and Craig 2013).

The concept of scaffolding is useful in conceptualizing how to guide student learning, particularly for entry-level students. Scaffolding emphasizes the importance of controlling the amount and complexity of information and tasks given to the learner to reflect their current capacities (Van de Pol, Volman, and Beishuizen 2010; Sharpe 2016). Over time, as their knowledge base and capacities expand, the instructor can gradually withdraw the level of support and transfer a greater share of the responsibility of learning to the student (Dansie 2001).

Cognitive Load Theory (CLT) provides a useful lens for developing strategies that ensure students do not feel overwhelmed or intimidated by SBE. CLT examines how individuals acquire, process and store new information (Sweller 1988). It is based on the understanding that our working memory has a limited capacity, and if the cognitive resources required to process new information exceed that limit, the cognitive load system will fail (Sweller, Ayres, and Kalyuga 2011). The right balance can be achieved by avoiding extraneous material and aligning information with prior knowledge.

The tenets of CLT can be mobilized by effective scaffolding in various ways. Simulation scaffolding that helps students break down and understand abstract concepts can help to lower

the cognitive load and deepen engagement (Turan, Meral, and Sahin 2018; Kempston and Thomas 2019). Likewise, simulations structured to allow for more flexibility and that enable students to work at a level that is appropriate for their knowledge and capabilities, will lower the extraneous load (Reedy 2015). Consideration of scaffolding and extraneous cognitive load is particularly relevant for early-year students who tend to lack the preparatory knowledge that is often needed to run a complex simulation. Sugino (2018) demonstrates how scaffolding her simulation using preparatory materials and scripts helped early-year students grasp the complexity of the learning exercise.

This fear of overwhelming student cognitive load within SBE has led to an emphasis on what Baranowski and Weir (2010) refer to as a ‘bare bones’ simulation; that is, a simulation contained within a single class. This more compartmentalized approach to SBE is considered to be particularly appropriate for entry-level students as it requires little foundational knowledge or advanced skills (Bovill, Bulley, and Morss 2011; Catling et al. 2016).

Two recent studies expose the limitations of the single session approach, which often precludes students from synthesizing strands of knowledge and skills that have accumulated throughout the semester (Baranowski and Weir 2015; Shaw and Switky 2018). We wonder whether a more immersive approach—one that spans multiple weeks and multiple learning forums, including face-to-face and online platforms—might prove more beneficial for entry-level students because it provides more opportunity to scaffold learning.

Social Media Technologies

The introduction of social media technologies into the classroom can play an important role in reducing student cognitive load. These technologies include online platforms and social media sites such as Facebook, Twitter, and Instagram, as well as more collaborative platforms like

blogs, Wikis, and Slack. More and more simulations have begun to incorporate social media platforms in order to create scenarios that mirror the complexities of real-world processes (Alon and Herath 2014; Anderson, Swenson, and Kinsella 2014; Dengler 2008; Schnurr, De Santo, and Green 2014).

The benefit of integrating social media technologies into the classroom is contested. Blended learning environments that combine online tools and face-to-face teaching have been shown to support self-directed study and stimulate competence (Sriarunrasmee, Techataweewan, and Mebusaya 2015; Schneckenberg, Ehlers, and Adelsberger 2011). Social media tools have also been shown to enhance communication, editing, and writing skills (Rutherford 2015).

Despite this potential, integrating these technologies into the classroom does not always run as smoothly as intended. Some attempts have fallen short of intended outcomes (Judd, Kennedy, and Cropper 2010). In one example, students rejected the potential merits of social media technologies when they proved to be more complicated than the alternatives (Brodahl, Hadjerrouit, and Hansen 2011). In another simulation, social media tools were only maximized by top-tier students (Caliendo, Chod, and Muck 2016). These failings do not discredit the integration of new technologies in the classroom, but rather underscore the need for careful instruction, support, and integration into classroom activities (Bennett et al. 2012; Lumby, Anderson, and Hugman 2014). Preliminary research suggests familiarity with the technology might aid in decreasing the cognitive load, thereby encouraging successful integration into classroom activities (Clarke, Ayres, and Sweller 2005; Lambert, Kalyuga, and Capan 2009).

Our aim is to explore to what extent the scaffolding of the SDG simulation helped to enhance the self-reported learning outcomes for students in INTD 2001. We set out to test two hypotheses: (1) Role-play simulations can enhance student learning when they are accompanied

by careful scaffolding, and (2) Integrating social media tools with which students are already familiar will facilitate deep learning and decrease cognitive load.

The Sustainable Development Goals (SDG) Simulation

The Sustainable Development Goals simulation took place within three successive iterations of INTD 2001, the introductory survey course in International Development Studies at Institution 1 in [CITY, PROVINCE REDACTED] Canada. The class is designed to help students understand and interrogate different interpretations of development, serving as the launching pad for more specialized offerings delineated by geographical region or thematic areas that students encounter in upper-year study. Like most large first- and second- year classes at Institution 1, INTD 2001 meets twice a week for regular lectures and once a week for a tutorial session led by two full-time Teaching Assistants (TAs). Over the course of the three iterations discussed here (Year 1 – 2015, Year 2 – 2016, Year 3 – 2017), the average annual enrolment was 150 students.

The setting for the simulation was the United Nations' Sustainable Development Goals (SDGs). Students were tasked with representing delegations attending the UN's Open Working Group, where they would negotiate indicators for the SDGs. Launched at the UN's 70th anniversary in September 2015—the same month in which this version of INTD 2001 was first delivered—this set of 17 global goals and 169 targets was unanimously adopted by member states as the central platform for creating a more prosperous, equitable, and sustainable world by ending extreme poverty, eliminating inequality, and addressing climate change by the year 2030. The SDGs represented an ideal forum for an international development simulation targeting students with no previous exposure to the discipline. It was timely and relevant to the course learning objectives, in that it offered a real-life forum for operationalizing some of the course's foundational concepts including the eradication of poverty, gender inequity, and human rights. A

second important attribute was its breadth: the SDGs are so wide-ranging and all-encompassing that they catered to a student cohort with varied experience and interests. The SDGs enabled students to grapple with some of the more pressing challenges and complexities of ‘doing’ international development without requiring significant expertise or experience with the subject matter.

The SDG simulation seeks to replicate the Open Working Group (OWG), the forum charged with formulating the thousands of indicators used to monitor and evaluate progress on these global goals. In real-life, the OWG spent the two years leading up to the announcement of the SDGs and much of the time since establishing indicators that are measurable, achievable, realistic and time-bound in order to assess whether headway is being achieved towards each one of the 17 SDGs.

This is where real-life ends and the simulation begins. The SDG simulation recreates the OWG by reopening debate on the indicators used to assess four of the most contentious SDGs: Goal 1 on No Poverty, Goal 5 on Gender Equality, Goal 10 on Reducing Inequality, and Goal 17 on Creating Partnerships. Limiting the scope of the simulation to less than a quarter of the SDGs’ actual coverage was a deliberate decision to privilege depth over breadth: we wanted to ensure that students had the necessary expertise to engage thoughtfully with these complicated issues, thus we limited their options in order to steer their learning deeper rather than wider. The four chosen goals correspond with four themes that anchored much of the course itself: lectures and tutorials introduced competing measures of poverty, gender inequity vs. gender inequality, inequities in wealth, both between nations and within nations, and the role of partnerships in international development.

The simulation revolves around the OWG indicators. Students form delegations representing nation-states, Non-Governmental Organizations, and multilateral development organizations. Delegations are tasked with modifying or creating indicators for each of the four goals under debate, and then negotiating, adapting, and ultimately agreeing upon versions that can be endorsed by at least two-thirds of all delegates. The intended outcome for each delegation is the same: a negotiated settlement that is acceptable to all. Students advance their delegation's perspective through lobbying, argument and, above all, negotiation. The balance for each delegation is to remain steadfast to the broad ideals of the organization they represent while searching for common ground with others.

The simulation ran during the final three weeks of the semester and served as the course climax. The overarching course architecture was designed to ensure students acquired the content, knowledge, and skills they would need to succeed within this demanding exercise. Course components including lectures, readings, tutorials, and assignments served as scaffolding that builds towards this exercise. Students were exposed to the foundational concepts, history, and debates underlying each of the four goals that would anchor the simulation via lectures and readings that took place early in the course. Weekly tutorial sessions were structured as skill development workshops designed to expose and allow students to practice skills that they would require to succeed in the simulation, including how to engage audiences effectively, how to analyze and present quantitative data, how to undertake effective group work, and how to create an effective social media strategy. The first assignment for the course was an individual task that required students to evaluate the effectiveness of a development organization's engagement strategy, which served as a springboard to their later crafting of their organization's own engagement strategy.

The preparatory learning took place before the simulation was introduced in class (See Figure 1). We decided to release information incrementally to avoid students feeling overwhelmed or intimidated and to reduce the cognitive load. Students were first introduced to the simulation in Week 4, following a lecture on the SDGs. The following week students self-assembled into groups of 5-7: larger groups were favoured due to the multifaceted range of skills required for this simulation and to reduce workload and expectations placed on each individual. Studies demonstrate that allowing students to self-select their groups can lead to a positive group dynamic and greater satisfaction and comfort for students (Chapman et al. 2006; Ciani et al. 2008). In Week 6, each group registered for the delegation they wished to represent using a first signed-up, first served basis. The list of delegates was carefully compiled to ensure congruence with multiple criteria. First, we wanted to give students range in choosing organizations and positions in order to allow the generalist student cohort the freedom to represent the range of development institutions they had been introduced to throughout the course, compiling a list that included nation-states, Non-Governmental Organizations, and multilateral development actors. Second, we wanted to ensure that each delegation had existing background materials that could provide a solid base from which a position could be articulated.

[Insert Figure 1. Simulation Scaffolding]

The weeks that followed were devoted to self-directed learning, as students began researching their delegation's position under the supervision of the TAs. Next, they were introduced to the second course assignment, which required each delegation to create an online portal that effectively and engagingly communicated their stakeholder's position and drummed

up support for their position amongst the other stakeholders. The centrepiece for this online platform was a website created through WordPress.com, a tool favoured by development professionals because it is both open-access and user-friendly. This initial assignment allowed students to familiarize themselves with other bargaining positions prior to entering into the OWG. Students were encouraged to populate their website and social media with graphs, infographics, or other visual representations of quantitative data that supported their negotiating position, prompting them to engage in research, design, and numeracy. They were graded on the quality of research and the content presented, the overall persuasiveness of their engagement strategy, as well as the usability of the website and associated social media tools. Students completed this website in advance of the simulation. The sites went live on the day the simulation opened, allowing each delegation to canvass other sites and get a sense of the range of positions upon entering the debate.

In terms of technology, we adopted a flexible approach that incorporated social media alongside the institutional Learning Management System (LMS). This was a deliberate decision: our concern was that the LMS architecture was too rigid and inflexible to replicate the real-world dynamic of international negotiation (Stern and Willits 2011). LMS' play a vital role in supporting course delivery, but they are not well suited for educational interventions like simulations that seek to recreate the messiness of real-world interactions. We gravitated towards social media tools precisely because they offered the nimbleness and the creativity necessary to navigate competing political positions. In addition, we felt the students' familiarity with some social media tools might reduce the overall cognitive load (Clarke, Ayres, and Sweller 2005). Social media's major downside relative to the LMS is that it is an unprotected learning space, and thus runs the risk of overlapping with students' private lives. We took this risk seriously,

mandating that students create separate online accounts for this specific purpose to ensure that their personal and class-based activities remained bounded from one another (Chromey et al. 2016).¹

In the weeks leading up to the simulation the cognitive load steadily increased. Tutorials were devoted to planning and website creation – out-of-role so students could be led by the TAs. A week-by-week release of documents accompanied by verbal explanations during lectures (with lots of time for questions) underpinned this progressive release of information. Subsequent weeks introduced students to the scope of the simulation’s debate, the formal rules of procedure governing face-to-face negotiations, and the multiple forums for negotiation (plenary sessions vs. working groups vs. online). Students were further introduced to the participation component of the simulation, worth 10% of their final grade and assigned as a group. Participation was rewarded both for in-person contributions (substantive contributions to formal debate, drafting proposals, protest or organized dissent, forming coalitions, advancing their position via lobbying and negotiation) as well as online (creating new digital content, updating blogs and social media in inventive and appropriate ways, using their online presence to advance their position among other delegates).

The SDG simulation spanned the final three weeks of the semester, including plenary sessions (lectures), working group sessions (tutorials), and online negotiation (social media). The simulation opened with each delegation’s website going live, giving others the opportunity to assess how their objectives and priorities aligned with the indicators proposed by their peers. At

¹ For example, we mandated that their social media presence had to be novel, stand-alone, and not linked to private accounts. We also created all of the Wordpress pages, shared these log-ins and passwords with relevant delegations, and then deleted these pages each year to prevent content spillover.

this point the in-person and online forums began to feed into one another: in the formal plenary sessions and informal working groups delegates justified their positions, lobbied others to join their efforts, and sought out consensus. Delegates employed social media tools to advance their particular indicators, amalgamate theirs with others that have similar positions, and amend them based on feedback received. Indicators that were created as part of their websites were shared, lobbied, critiqued, revised, and edited. At the end of the three weeks those indicators that managed to secure support from a broad base of other delegations were included on the agenda for voting, which took place during the final plenary session.

The final component of the simulation was an individual debrief assignment, undertaken out-of-role and due a week after the simulation ended. This assignment asked students to reflect on what they have learned from the exercise, prompting students to think critically about how their own experience changed their perspective on international negotiation and development goal setting.

Methods

This research draws on three years of self-reported student data to assess whether the simulation achieved its learning outcomes and the role social media played in supporting these learning outcomes. Surveys comprising a mix of quantitative and qualitative questions were administered in class immediately upon the completion of the negotiation, prompting students to reflect on what, if anything, they learned from this exercise and whether/how social media technologies enhanced the learning process. Some questions were altered slightly from year-to-

year to elicit clearer and more consistent responses. Response rates were 40% in Year 1 (2015), 72.5% in Year 2 (2016) and 81.1% in Year 3 (2017).²

A research assistant administered the survey and the process of obtaining informed consent without the instructor present, in order to avoid perceived coercion, protect student privacy, and minimize bias in the results. [REDACTED] University's Research Ethics Board approved this study.

Results and Discussion

Results for Hypothesis #1: Learning Outcomes

The first hypothesis set out to assess student perceptions of their learning within the simulation. Students were asked to assess their perception of key learning outcomes on a Likert Scale (1 = strongly disagree, and 7 = strongly agree). Quantitative results point to four key learning outcomes related to understanding of course material, interest in the subject matter, skill development, and appreciation of complexity.

(1) Understanding of course material: The first learning outcome sought to assess whether the SDG simulation gave them a more nuanced understanding of the course material. Mean student responses were 5.2 in 2015, 5.7 in 2016, and 5.6 in 2017. As Figure 2 shows, 79% of students selected 5 or above in 2015, 85% in 2016, and 85% in 2017, suggesting that the simulation positively impacted their understanding of key concepts. Qualitative responses confirmed these findings. Students repeatedly mentioned that the simulation helped to increase their knowledge and awareness of the SDGs. One student remarked, "before I had taken part in this simulation I

² To adhere to ethical guidelines set out by the university's Research Ethics Board, participation in the survey was voluntary. This accounts for the difference in response rates across all three years. See Schnurr and Taylor 2019.

had no idea what SDGs were. Therefore, it had helped me to better understand the amount of effort it takes to find consensus on the goals”. Another student suggested, “I don’t think I can ever forget SDG goals 1,5,10 and 17. [The simulation] gave me more understanding of working relations and diverse needs of different groups”. Another expressed how the simulation “enabled me to understand what realistic targets and indicators look like”, while still another found the simulation helped to “better understand the background of the SDGs and how they differ between different nations”.

[Insert Figure 2: Understanding of Course Material]

(2) Simulating interest in the subject matter: The second point of inquiry sought to assess whether the simulation sparked student interest in the subject and course material. We asked students to rank how strongly they agree with the statement: “I am interested in learning more about the negotiation of international agreements”. Mean student responses were 5.6 in 2015 and 5.6 in 2016. 85% of students selected 5 or above in 2015 and 81% selected 5 or above in 2016 (See Figure 3). Several students highlighted how the simulation piqued their interest and promoted further inquiry. One student remarked how “The simulation was engaging which made me more interested in researching and understanding the course material”, while another relayed that “it forced me to do further research into topics I would not normally be interested in”. Another student concluded that the simulation made the material “far more engaging than it would be if it were to be just a lecture”.

[Insert Figure 3: Simulating Interest in Subject Matter]

(3) Application of course-based knowledge: The third criteria sought to measure whether the simulation enabled students to operationalize their course-based knowledge in an immersive scenario. Again, quantitative data captured over three years were positive: mean student responses were 5.1 in 2015 (71% of students selected 5 or above), 5.2 in 2016 (69% of students selected 5 or above), and 5.5 in 2017 (89% of students selected 5 or above) (see Figure 4). Qualitative data corroborated this trend: one student described how “becoming the stakeholders and not simply looking at them from a detached third-person stance, it helped one to really own the course material and what it means in real life to solve global development issues collaboratively”. Another reflected on how the simulation also allowed them to apply the skills they learned in class: “The simulation gave us the opportunity to apply what we have previously learned in more tactical, fast-paced way. Using our research skills and critical thinking skills allowed for a deeper understanding of course material”.

[Insert Figure 4: Application of Course-based Knowledge]

(4) Understanding complexity of international negotiation: Students were asked to rank how well they understood the complexity of international negotiation after the simulation. Mean student responses were 5.8 in 2015 (90% of students selected 5 or above), 5.8 in 2016 (90% of students selected 5 or above), and 5.9 in 2017 (93% of students selected 5 or above) (See Figure 5). One student described how “the simulation helped to give a real-life context to the information we have been learning in class. It provides an interactive environment to make the information more fun”. In the same vein, another indicated that “it helped me gain an

understanding of the proceedings of international negotiations and the complexity of reaching a consensus or agreement”. This personalized appreciation of complexity figured prominently in students’ self-perceived learning outcomes. One expressed how the simulation “helped me to understand how delegates cooperate, and why delegates do not always push their goals to the full extent that they wish”, while another remarked that “the simulation gave me a better understanding of how real-life negotiations work – the technicalities and frustrations involved”.

[Insert Figure 5: Understanding Complexity of International Negotiations]

Discussion for Hypothesis 1: Learning Outcomes

The first finding suggests that SBE can have a positive impact on student learning. However, these overall results mask significant differences across the three years of the simulation’s life cycle. In particular, many students expressed frustration with the simulation’s execution in Year 1, which is reflected both in lower quantitative scores and within the qualitative responses. According to one student, “we were given bits of information at a time which made it hard to understand the project as a whole and made starting on the project a bit more difficult”. Other comments reflected this same frustration, “I do believe that releasing all, or at least more, information prior to the simulation would better help many of the students”. Others felt that the timeline was too ambitious. One student reported that “it felt rushed because we were only given the information about the simulation 2 weeks prior,” while another said, “I thought it was too much work in a short amount of time”.

In response to this evident frustration we radically overhauled the simulation scaffolding after Year 1 by introducing material earlier, creating more building blocks to ensure an

incremental delivery of information, and showing examples of previous work so that students could see a blueprint for what was expected of them. The major change related to background materials: initially we had rolled these out incrementally, in order to avoid students feeling overwhelmed or intimidated. But students were adamant that they wanted more information sooner. We adjusted the release of materials to make it earlier, tweaking the build-up in lectures and the assignments to ensure a steady, incremental build of information.

In sum, we revamped the lead-in to the simulation to manage student cognitive load more carefully. We rearranged the lead-in to provide a more structured learning environment that builds knowledge steadily, allowing students the time to encode knowledge and gradually take on more difficult and complex tasks (Josephsen 2015; Reedy 2015; Schilling 2017).

This emphasis on structured scaffolding resonates with other scholarship that stresses the unique burden of information that can easily overwhelm entry-level students (Briggs, Clark, and Hall 2012). Stevens (2015) recounts a situation where students felt they had insufficient background knowledge to succeed in a simulation, prompting the instructor to distribute materials earlier in the term. Barr and Jackson (2018) embarked upon a redesign with the explicit aim of deepening the interconnections between the various course components in order to better cater to the diversity of academic backgrounds typical in entry-level courses. And the most established set of simulations employed for entry-level students—the much-heralded *Reacting to the Past* series—embraces a heavily structured approach that revolves around prepared materials and self-paced learning (Weidenfeld and Fernandez 2017). These experiences suggest that a more structured approach that relies heavily on pre-prepared materials can help entry-level students overcome some of the barriers to SBE.

A second strategy employed to help manage student cognitive load related to group work. When structured appropriately, group work has been found to ease the cognitive load on individual students (Kirschner et al. 2018). The SDG simulation required students to engage with a wide range of skills and competencies, including a social media strategy, online debates, and public speaking in front of hundreds of other students. We mandated that students form groups of between 5-7 individuals because we were concerned that entry-level students would not feel comfortable participating in each of these varied formats on their own. Our positive experience with group work is confirmed by other studies that found small groups conducive to learning in entry-level courses as they facilitate peer learning and social integration (Brooman and Darwent 2014; Kangas, Rantanen, and Kettunen 2017). Yet there are significant risks associated with group work in this setting: Morosanu, Handley, and O'Donovan (2010) reported frustration amongst entry-level students related to not being able to choose their partners and the inequitable division of work – complaints that were sprinkled amongst our own student responses to instruction as well.

Results for Hypothesis #2: Role of Social media

The second hypothesis explores whether integrating social media technologies that students are more familiar with will encourage students to adopt these tools during the simulated negotiation and lower the cognitive load. To explore this theory, we asked three key questions: (1) Which forum did you participate in most actively? (2) Why did you prefer that particular forum for participation? (3) What online tool did you utilize the most?

(1) Which forum did you participate in most actively? We asked this question to assess student preferences for online versus face-to-face learning. We compared student responses both

within and across year 1, 2 and 3 for three forums (lectures, tutorial, and online) using a two-proportion z-test. Within each year there were statistically significant differences in the mode of instruction favored by students (see Figure 6). In 2015, tutorials were more frequently chosen by students as the forum they participated in the most when compared to lectures ($z = -4.17, p < .05$) and online ($z = 3.66, p < .05$). In 2016, tutorials ($z = -3.42, p < .05$) and online ($z = -2.26, p < .05$) were more frequently chosen by students as the forum they participated in the most when compared to lectures. And in 2017, tutorials ($z = -3.97, p < .05$) and online ($z = -4.38, p < .05$) were more frequently chosen by students as the forum they participated in the most when compared to lectures.

There were no significant differences in the proportion of students who chose lecture or tutorial as the forum they most actively participated in across 2015, 2016, and 2017. However, between 2015 and 2017, there was a significant difference in the proportion of students who chose online as the forum they most actively participated in, such that more students selected online in 2017 than 2015 ($z = -2.60, p < .05$). These results lend credence to our hypothesis that revamped scaffolding increased the utility and viability of the social media tools.

[Insert Figure 6: Which Forum did you Participate in Most Actively?]

(2) Why did you prefer that particular forum for participation? The second question sought to unpack this stated preference. We posed an open-ended question asking students to elaborate on why they preferred one forum over the others. In 2015 and 2016, students preferred tutorial because it was a small group setting that offered a more comfortable and less intimidating atmosphere. One student put it this way, “I found tutorials to be the most useful for the

simulation because it had smaller amounts of people as it was easier for everyone to have a turn to speak”. Several students reiterated this point. Other students corroborated this sentiment; “tutorials are smaller and less intimidating than lectures”, said one, while another disclosed, “I felt more comfortable speaking in tutorials”.

But in year three, student preference shifted to social media. Students overwhelmingly praised social media as tools that helped to advance their bargaining positions. Many students talked about how social media allowed them to communicate with their team and other groups without the same time and logistical constraints imposed by lectures and tutorials. For example, one student explained how “it allowed us to weigh in and create coalitions in a smaller setting where we could have lengthier discussions than lecture our tutorial can allow”. Likewise, another felt that “it was easier to get a hold of everyone online and not worry about when to meet up or where”. Online tools made communication easier, “you could send vast amounts of delegates/people the same message in a way that would be much too time consuming in person”. For other students, this forum was beneficial because they felt nervous speaking in class: “Since I am not comfortable speaking in front of people, online I could take the time to say everything I needed to without nerves getting in the way”.

(3) What online tool did you utilize the most? The third question sought to explore which social media tool students used most. We compared student responses within and across year 1, 2, and 3 for three categories (Wordpress, Twitter, and Other) using a two-proportion z-test. Overall, there were statistically significant differences in the frequency of online tool selection in each year of the simulation’s operation (see Figure 7). In 2015, when compared to Other, Wordpress ($z = 3.57, p < .05$) and Twitter ($z = 3.63, p < .05$) were more frequently chosen by

students as the online tool they used most. In 2016, Twitter was the most frequently chosen by students as the online tool they used most when compared to Wordpress ($z = -2.13, p < .05$) and Other ($z = 6.57, p < .05$). In 2017, when compared to Other, Wordpress ($z = 4.65, p < .05$) and Twitter ($z = 6.20, p < .05$) were more frequently chosen by students as the online tool they used most.

Students explained that they preferred WordPress because it was a useful tool for displaying large amounts of detailed information. As one student explained, WordPress “made retrieving and adding information simple to exchange between group members”. In the following two years the trend reversed, Twitter was preferred by 50% of students in 2016 and 51% of the students in 2017. Students favoured Twitter because of its utility as a communication tool. As one student put it, “Twitter is a very good tool because you can instantly connect with other stakeholders”. Another stated, “it was the simplest and most effective way to get the attention of other stakeholders”. Still another described how Twitter was the “fastest, clearest and most accessible way to output and receive information. It gives clarity to the position of many different groups”.

[Insert Figure 7: What Online Tool did you Utilize the Most?]

Discussion for Hypothesis #2: The Role of Social Media

The first two findings support the results reported in the previous section: increased investment in scaffolding—in this case, a more careful introduction to the power and potential of social media as a tool that can help delegates accomplish their simulation goals, alongside examples from previous years—helped students feel more comfortable and confident in exploring the more experimental online forums relative to the more familiar face-to-face interactions. This trend of

increasing confidence with online tools underscores the importance of carefully managing cognitive loads in order to avoid students' feeling overwhelmed or intimidated.

Our second finding is more surprising: the online tool that was used most was not the one that students were most familiar with. While most delegations opted to integrate ubiquitous platforms like Facebook and Instagram, they ended up relying more heavily on WordPress and Twitter, two tools most students reported little fluency with prior to the simulation's opening. These results suggest that students choose technology based on its usability as opposed to its familiarity (see also Deed and Edwards 2011).

These results underline the experimental value of social media technologies, as well as student motivation to embrace new technological options outside of their pre-existing portfolios (George and Dellasega 2011; Teixeira and Hash 2017; Greenhow and Gleason 2012). This willingness to experiment lends credence to the claims that students are able to manage a wider breadth of technological options than those contained within each institution's LMS. Indeed, the successful running of the SDG simulation showcases how social media can complement an LMS approach: the discussion board housed within the LMS system served as an anchor for broad-based communication, while the social media platforms were favoured as tools that enabled delegations to connect with one another directly and nimbly articulate their particular positions, both before and during the debate. The take-home message here is that our students are digitally flexible enough to recognize the value of each technological tool and mobilize them to suit their learning needs, as long as the scaffolding facilitates the integration of these tools (Alexander 2008).

Conclusion

Our conclusions stem from our tested hypotheses. First, role-play simulations have the potential to enhance self-reported student learning, though they require extra care with respect to set-up and scaffolding in order to manage student cognitive load. International negotiations are inherently messy, complex, and crowded spectacles, full of delegations furthering their own strategic interests. We found that our students embraced this complexity and learned from it, but only when it was carefully managed. The changes we incorporated throughout the intervention's lifespan included a more thoughtful and structured scaffolding design geared to manage student cognitive load and help students avoid feeling daunted or overwhelmed.

Second, social media played an important role in helping students navigate this immersive exercise. The uptake of social media technologies in the simulation was guided by functionality rather than familiarity, while also hinging upon the design and scaffolding of simulation activities. Instead of flocking to popular tools like Facebook and Twitter, students selected tools that helped them achieve their particular negotiation goals. The SDG simulation shows the potential for social media to be incorporated alongside Learning Management Systems and serves as a call for instructors to cast their net wide when searching for the right technological tools to enhance SBE, while remaining mindful of how best to integrate these tools within the broader framework of the activity.

Limitations

Our findings demonstrate the need for instructors to consider scaffolding and cognitive load when they undertake simulation design, particularly with respect to the integration of social media technologies. But several limitations remain. First, our findings are based on self-reported learning. The debate on using self-reported data to report learning outcomes is mixed. Overall, the validity is deemed to be high (Pike 2011; Cole and Gonyea 2010), however students have

been shown to over-report their scores, especially in the case of long-term data (Bowman 2010). We have taken the view of Gonyea and Miller (2011) who conclude that when using self-reported data, researchers should clearly reiterate that findings are based on student perceptions. Second, we did not have the option to establish a control group as part of this project, which limits the validity of our data as we cannot truly assess whether students learned more than they could have without the simulation component. More research is needed that directly compares SBE with conventional lecture-based approaches.

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Schnurr, M., & MacLeod, Anna. (2021). Simulations and student learning. Toronto, Buffalo;
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