USING CHATBOTS TO AID TRANSITION

Sofy Carayannopoulos
Wilfrid Laurier University
Canada

Abstract

This paper examines how chatbots can be used to support students as they transition into university. We propose that chatbots can be a useful tool for helping first year university students deal with two key issues that affect their motivation and success: navigating the volumes of information that confront them, and feeling socially disconnected. This paper reports the results of applying this tool in a large first year class. Findings indicate that chatbots can play a valuable role in assisting students without increasing the demands on instructors. We conclude with proposed improvements for future chatbot iterations.

Introduction

This paper brings together two streams of research that have been explored separately, and more recently have been combined: students transitioning into first year university, for example Hillman (2005), and the use of information technology in education, i.e., Dahlstrom Walker and Dziuban (2013).

A great deal of literature has examined the difficulties students face when starting university. Briggs, Clark, and Hall(2012) outline a few large studies including Tinto's (1987) seminal work on this topic, which indicated that the causes of attrition can be largely attributed to both social and academic challenges. Among the causes most frequently cited are a sense of being disconnected from other students and from the instructor and the difficulties of navigating a new environment with new expectations and structure (Jones, Edwards, & Reid, 2009). Related to this, but not directly examined, are the significant volumes of information to sort through, absorb, and act upon. A review of the information management literature reveals that high quantities of information may have unintended negative effects such as confusing and frustrating the recipient, leading to information anxiety and diminished performance (Eppler & Mengis, 2004).

Technology has been proposed as a possible tool that can be harnessed to deal with the above issues. In particular, it has been examined as a tool to connect with and assist students both socially and academically (Rau, Gao, & Wu, 2008). The research shows that tools such as e-mail, text-messaging/short-messaging systems (SMS) and instant messaging (IM) can be effective for sharing information with students, answering their questions, and helping them feel connected to the instructor (Lauricella & Kay, 2013; Rau et al., 2008). Their benefits from a student perspective are the potential for a quick response, convenience, ease-of-use and a sense of greater connection with the instructor. However, the problems associated with IM are that it can be frustrating for the student if the instructor is not online, and the student

sometimes perceives it as breaching privacy boundaries. For the instructor, it demands greater availability and greater time spent responding to individuals.

A recent technology innovation that extends instant messaging is the chatbot. This is an automated response system that has some limited artificial intelligence capabilities and appears as a contact on the IM system. Its benefit is that the student can navigate through frequently encountered questions using an intuitive, conversation-like approach and locate information as it is needed, when it is needed. The chatbot can also send reminders or be used as a mass communication tool by the instructor to send messages. The fact that it resides on the student's mobile phone makes it convenient and, at the same time, may give the student the sense of being a little less disconnected from the professor, while at the same time not being too close.

This paper examines the literature on student transition, information overload and the use of chatbots to address the challenges from the intersection of these two issues. It is important to do so because student retention is a challenge that all universities confront, and we are constantly seeking tools and approaches that can make student transition and, therefore, student retention more successful. Mobile phones and the use of instant messaging are ubiquitous among university students, some studies showing that over 90% of students own them and frequently use IM to communicate (Jones et al., 2009). They represent an opportunity to reach students "where they live." However, the direct focus on IM in education is relatively scarce (Lauricella & Kay, 2013).

The paper describes the findings from the use of a rudimentary chatbot in a large first year class. It concludes by identifying areas of improvement for future iterations of the tool, as well as other applications.

Literature Review

Student Transition

A significant amount of research has engaged in understanding the challenges of student transition into first year university because the majority of student departure occurs during this time (Jones et al., 2009). The movement from a prescriptive, structured high school system to the independence of a university system makes students feel disoriented, and they often struggle to motivate themselves (Briggs et al., 2012; Harley, Winn, Pemberton, & Wilcox, 2007). They must also adjust to increased academic demands and altered teaching arrangements (Jones et al., 2009). Although information is one of five important aspects of successful transition, they often experience information overload on arrival (Briggs et al., 2012). Finally, they feel disconnected socially from peers and instructors, which also serves to reduce motivation and help-seeking behaviour (Harley et al., 2007).

Successful transition is, therefore, more likely to occur when the student can be an autonomous learner, access and absorb the needed information, and feel socially connected to instructors and peers (Briggs et al., 2012). While supportive university systems and information systems can enable adaptation and good decision making, research has shown that administrative information

sessions and online or in-class document provision systems are not sufficient (Harley et al., 2007). These sessions and document systems do not address the underlying cause of information overload, and indeed, may contribute to it. Information overload can lead to feelings of demotivation, frustration, and anxiety, and students must feel comfortable seeking help (Eppler & Mengis, 2004; Er, Kopcha, & Orey, 2015).

Furthermore, students do not take the needed actions to obtain clarification or assistance when feeling lost or confused. Er et al. (2015) examined college students' online help-seeking behaviour and found that students may avoid seeking help in order to uphold a positive social image; they want to avoid being viewed as appearing incompetent. Based on these insights they suggest that students are more likely to seek help if they are able to do so with anonymous identities and will use instructor supports when they are viewed as both useful and non-threatening.

With respect to the social aspect of transition, social presence is consistently associated with student motivation and it is also believed to influence motivation (Rau et al., 2008). Social presence is created by the intimacy and immediacy of interactions (Rau et al., 2008). Similarly, a sense of connection with the instructor, i.e., frequency and quality of contact, is a significant predictor of student persistence in the face of challenges (Tinto, 2002 in Jones et al., 2009).

Scholars have examined the use of text-messaging (SMS) to support transition to university. They demonstrated that the use of SMS has the potential to enhance support provided to students, facilitate the development of productive relationships for those who would otherwise be socially isolated and provide valuable assistance (Harley et al., 2007). Because students receive text messages in a device they consider personal – their mobile telephones – this mode of communication was a way of blurring the distinction between the academic and social aspects of university life, strengthening relationships between staff and students (Harley et al., 2007).

At the same time there are concerns that we want to develop independent learners and ensure they are not dependent on support structures and ensure that instructors are not over-burdened (Jones et al., 2009). From an instructor's perspective, as the number of students increases, it becomes more difficult to connect with students individually regardless of the mechanism. In addition, it is not reasonable to expect that instructors would be continuously available to students even if the technology allows it.

Scholars have noted that it would be a missed opportunity if universities didn't consider tools such as SMS and IM to support first year students given that students are already "conducting a substantial part of their lives" through these tools (Harley et al., 2007, p. 238). Our paper accepts this proposition and examines a new tool – the chatbot – and the role that it can play in supporting student transitioning while addressing some of the concerns associated with SMS and IM.

Technology in Education

Communication technologies such as text messaging, e-mail, and instant messaging have all been examined both as educational tools and for their impact on student-instructor bonding. In all cases it has demonstrated value in enhancing the experience and performance of the student. Lauricella and Kay (2013) examined how higher education students use text and IM for academic purposes with peers and instructors and found that students regularly used it for academic purposes with peers but did not use it as frequently with their instructors (Lauricella & Kay, 2013). E-mail, on the other hand, was rarely used for peer-to-peer communication and students did not report feeling positively about or bonded to the instructor when this technology was used (Lauricella & Kay, 2013). Those that did use IM to communicate with the instructor noted that it was more convenient than e-mail since they always have their mobile phones in-hand and appreciated that it allowed them to get in touch with him/her and get quick answers (Lauricella & Kay, 2013).

A 2009 study by Jones and colleagues showed that over 70% of students were interested in using their phones to receive deadline reminders and over 60% were interested in receiving questions from their tutors. Approximately 40% indicated they would appreciate being able to use their phones to find out information and keep in touch with tutors or asking questions. Students viewed the reminders and announcements of administrative changes that arrived in their phones were an effective aid to time management (Jones et al., 2009). Scholars have consistently shown that SMS is a personal way to reach students and let them know that they should look at materials available online (Rau et al., 2008).

In terms of information overload, research showed that using SMS to communicate with the instructor did not increase student pressure; when students received a message they felt they were being cared for and felt bonded strongly with the instructor and classroom activities. They were motivated to pay attention to information in their email or online when directed to do so in this way (Rau et al., 2008). Scholars propose that text messaging reminders of when assignments are due can help first year students adjust to academic life (Lauricella & Kay, 2013) by helping them manage their new and substantially increased workload. With respect to asking for assistance, students feel more comfortable doing so when using technology because of reduced social cues (Rau et al., 2008).

With respect to social bonding, informal communication is very effective in social bonding and social learning; adoption of informal interaction into education improves student–instructor relationships, promotes student motivation and reduces student pressure (Rau et al., 2008).

Messages are arriving to the student's mobile phone (an object perceived as "personal space")(Lauricella & Kay, 2013, p. 4). Furthermore, IM and SMS are viewed as less formal means of communication and more personal (Rau et al., 2008). As a result, when the instructor communicates with the student using SMS some students feel it made the instructor feel more approachable and friendly (Lauricella & Kay, 2013), and the distance between the two is

shortened resulting in a better relationship and higher student motivation (Rau et al., 2008).

On the other hand, some students resented when SMS or IM were used to communicate with faculty because they considered their mobile phones a personal technology and disliked faculty entering into their personal space (Lauricella & Kay, 2013). Students also noted the frustration and limitation of not being able to reach the professor if he/she was not online and that sometimes they simply did not want to appear visible to their instructor (Kay & Lauricella, 2015).

To our knowledge, the role that chatbots can play in addressing some of the above concerns has not been examined. Chatbots reside in instant messaging platforms and can assist with simple questions with basic artificial intelligence as well as providing a more intuitive navigation for finding information. They, therefore, offer the possibility of assisting with a student's information needs while, perhaps, feeling somewhat personal by virtue of being accessible through mobile phones.

Information Overload

Scholars summarizing prior work on information overload point out that there is no universally accepted definition of the term (Edmunds & Morris, 2000; Eppler & Mengis, 2004). It can mean having more information than one can assimilate or being burdened with a large supply of unsolicited information, some of which may not be relevant. However, they concur that overload occurs when supply exceeds processing capability (Eppler & Mengis, 2004).

Information overload is seriously affecting the ability of people to do their jobs and impinging on relationships and quality of life (Edmunds & Morris, 2000). Research has demonstrated that the quality of decision or reasoning has an inverted-u relationship with the amount of information (Eppler & Mengis, 2004). Beyond a certain point, the information is no longer integrated into the decision process, decision accuracy declines, and the individual becomes confused and has difficulty recalling prior information or using it effectively (Edmunds & Morris, 2000; Eppler & Mengis, 2004).

Emotionally and psychologically, overload is usually associated with loss of control over a situation and feelings of being overwhelmed (Bawden & Robinson, 2009). Psycho-emotional reactions of stress, anxiety and low motivation may also occur; as well as a greater tolerance of error, sense of loss of control or a false sense of security (Eppler & Mengis, 2004).

Information overload is caused by a combination of factors including the information (quantity, quality, frequency, etc.), recipient, and technology among other reasons (Eppler & Mengis, 2004). Overload has been exacerbated by two factors: the rapid advance of technology, which allows information to be shared in multiple forms and through a variety of channels, and the fact that our classical methods of handling information may be inadequate for the electronic forms which are prolific today (Bawden & Robinson, 2009; Edmunds & Morris, 2000).

Overload can be reduced by delivering information in the most convenient way for the user, and using intelligent information management systems that enable easier prioritization of information. Examples include simplifying information technology functions and using artificial intelligence search systems (Eppler & Mengis, 2004). Structuring is key to making it more manageable and more valuable (Edmunds & Morris, 2000). Solutions to information overload revolve around the principle of taking control of one's information environment (Bawden & Robinson, 2009).

At the same time, some propose that push technology can be useful because it can reduce the need to search for information or the risk that someone who needs the information might not be aware of its existence. Push technology works by "pushing" notices of pre-selected information to the user, thereby alerting him (Edmunds & Morris, 2000). However, this system is ineffective if the user does not want information pushed to him or if too much information is pushed, once again creating an overload situation (Edmunds & Morris, 2000).

The intersection of the above three streams of research motivate this paper and the creation of a chatbot for a large first year class. The design of the chatbot will be described below, as well as the results of a survey of students who used it. .

BU111 Bot Implementation

Chatbots are automated IM accounts that are programmed with chat-based logic. They appear in your IM contacts as any friend would and are accessed in the same way.

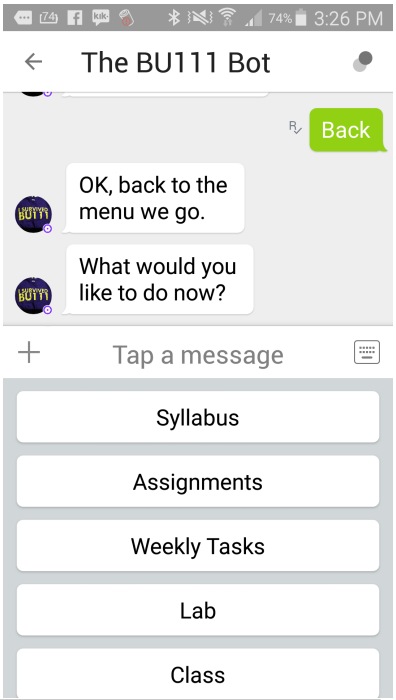
Chatbots have become popular due to two important trends: (a) billions of people worldwide now use IM apps, and (b) the app model of executing activities is problematic because you have to download and learn a new app for each activity you want to perform or you have to access a website. Chatbots offer the potential to provide support without requiring the individual to wander around an app or website, or learn how to use a new interface. For example, a chatbot could ask your criteria and suggest relevant things for you to look at. Bots represent a unique opportunity because many smartphone users find themselves in a state of app-overload. They have too many apps that do too many things and are often hesitant to download new ones, no matter how great they might seem. Bots solve this problem by providing access to new experiences and services from within a familiar and comfortable space: a chat app. Furthermore, the conversational interface that is used to help the user navigate through content or find desired content is very similar to a conversation one might have with another person, and is easier than hunting and clicking on a website.

In designing the chatbot for our course there were several points raised by scholars, in addition to the observations described above, that informed its creation and design:

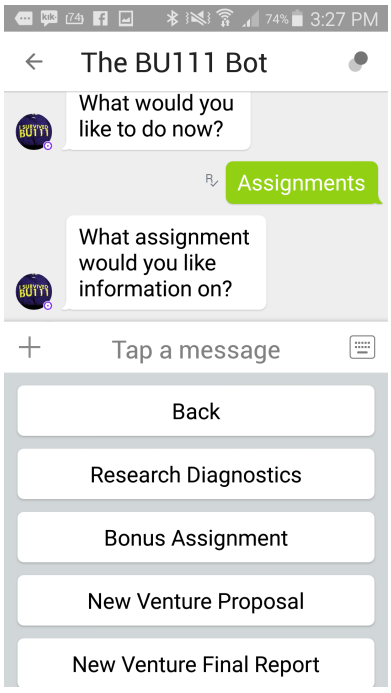
- Humans interact with media in inherently social ways (Veletsianos & Miller, 2007).
- An information retrieval system should be designed so as to reduce the risk of failure by the user and thereby increase his self-efficacy (Wilson, 1999).
- Although there is an abundance of information available it is often difficult to obtain useful, relevant information when it is needed (Edmunds & Morris, 2000).

We were therefore focused on developing a tool that would make information retrieval easy and convenient by enabling it to occur through mobile phones. Furthermore, by using a chat interface the hope was that the search for information would be more intuitive and less frustrating. Finally, by injecting a little humour into its interface it was hoped that the chatbot would feel"friendlier."

Figure 1 below illustrates the BU111 Bot in a user's phone. When the user first connects with the chatbot he sees the Main Menu options shown on the left in Figure 1. The student can choose among Assignments, Help, and other options that are likely to be the key areas of information he might be interested in. The image on the right shows both the conversational response and the options that appear if the user selects "Assignments" from the Main Menu. If the student selects a link that is attached to a document, the document will open in the user's phone.



What the user sees if he selects "Main Menu"



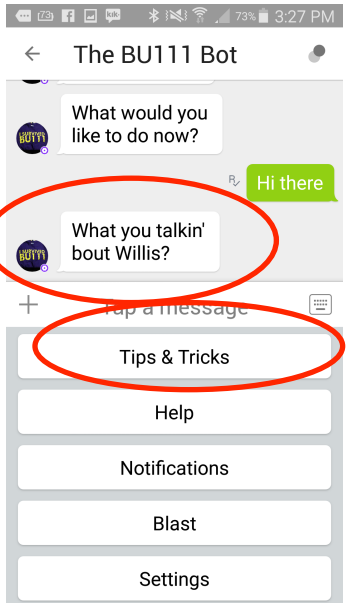
What the user sees if he selects "Assignments" from the Main Menu

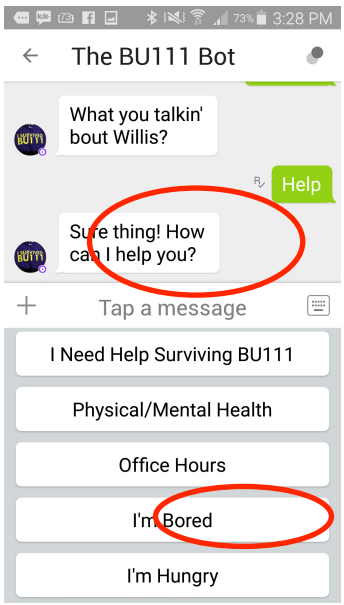
Figure 1 – List of main menu (on the left) and assignment menu options (on the right).

The chatbot provides organizational assistance to the student with three important features: (1) the *Weekly Tasks* allows the student to look up what is required in any particular week of the term; (2) the student can opt to receive notifications once per week reminding him of what is required that week, and (3) the instructor can send out "blasts" reminding and sharing information with students. To ensure that the students still developed some independence over time, the automatic weekly notifications changed over the semester from explicit tasks to *check your course outline* to *what should you be doing right now?*

The *blast* feature available to the instructor allowed her to send notifications, reminders, and words of encouragement to anyone who was using the BU111 Bot. From time to time this feature was used simply to send jokes, particularly during times when the instructor knew students would be feeling very stressed.

Figures 2a and 2b show some small personality elements that were in the bot. If a command was entered which the chatbot could not understand then the message *What you talkin' bout, Willis* appears. This is a well-known expression from a popular television series in North America. The *Tips and Tricks* option shown in Figure 2a is a collection of advice that was gathered from upper year students on how to survive the course, first year, and university in general. Each time a student selects this option he receives two random tips out of the collection. Notice that the conversational style of the chatbot is casual rather than formal, *Sure thing! How can I help you*" (Figure 2b).





Figures 2a and 2b – Elements of humour, "personality" and assistance

The *Help* categories illustrated in Figure 2b provide the students with some non-academic information. The *I'm Bored* option connects the students with student clubs and the athletic complex.

The BU111 Bot operated on the Kik messaging platform. It was created by two students of the business program. It was implemented in a large first year business class teaching roughly 1,900 students. The format of the class is two 1.5 hour 300-student lectures per week. In addition to lectures, students were required to attend weekly labs and prepare specific assignments and activities for the labs prior to attending. Course requirements are two exams, one online assignment, one individual case analysis write-up requiring extensive research, one large group project requiring the identification and validation of a new venture opportunity, as well as two group presentations (one case presentation and one presentation based on the new venture project).

Findings

A voluntary survey was conducted of the students who chose to use the chatbot. Approximately 1,700 first year students registered with the chatbot, and 315 responded to the survey, providing an acceptable response rate of 18.5%. Students were asked to answer questions and consider the impact of the chatbot in comparison to their other classes where no chatbot was used. It was also possible to view usage through a dashboard that is built in with the chatbot.

By using the dashboard it was possible to see that *Weekly tasks* was the most frequently used feature, followed by *Assignments*. Approximately 1,700 and 1,500 students used each feature frequently at the beginning of the term. Use declined over the course term, which was expected given that the assignment instructions were also available on a course website. The survey results validate this information, indicating that many students used the *Weekly tasks* feature throughout the term (see Table 1a).

With respect to student transition, the chatbot appears to have been valuable both directly and indirectly. Tables 1a and 1b show the features that were most valuable and most often used. Not surprisingly, *Assignments*, *Weekly Tasks* and *Notifications* were most frequently selected. The *Assignments* and *Weekly Tasks* features allowed students to look up the assignment requirements for each of their assignments, while the weekly tasks listed the requirements for their lab preparation each week. It should be noted that this information was always readily available on the course website and on the course outline. This suggests that the convenience of accessing the information on their phones as well as being able to find it more easily than searching through a website was of value to the students.

Table 1a

Chatbot Feature Use

Please indicate how often you used the listed chatbot features				
Answer Options	**Never**	**A few times over the semester**	**Weekly**	**Response Count**
Syllabus	101	200	13	314
Assignments	62	205	47	314
Weekly Tasks	53	181	78	312
Lab	134	140	39	313
Class	184	108	20	312
Tips and Tricks	150	147	17	314
Help	183	117	14	314
Notifications	86	141	87	314
Other i.e. formation of a group chat	227	66	17	310

Table 1b

Chatbot Feature Value

Which three features of the chatbot were the most valuable to you?		
Answer Options		**Response Count**
Syllabus	95	95
Assignments	189	189
Weekly Tasks	235	235
Lab	81	81
Class	15	15
Tips and Tricks	65	65
Help	28	28
Notifications	139	139
Other, i.e., formation of group chat	9	9

In terms of helping students meet course requirements, Tables 2a and 2b show that over 60% of students felt that the chatbot, at least somewhat, helped them meet lab preparation and course assignment requirements. Given that the chatbot only provided access to information on what should be prepared, it would be safe to assume that the students were reflecting the ability to easily find the information they needed and ensure that they had all information needed.

Table 2a

Assistance in Meeting Lab Preparation Requirements

Did use of the chatbot assist you in meeting the lab preparation requirements?		
Answer Options	**Response Percent**	**Response Count**
Yes	34.3%	106
No	38.2%	118
Somewhat	27.5%	85

Table 2b

Assistance Meeting Assignment Requirements

Did use of the chatbot assist you in meeting the course assignment requirements?		
Answer Options	**Response Percent**	**Response Count**
Yes	43.6%	134
No	30.6%	94
Somewhat	25.7%	79

The Notifications feature allowed students to opt to receive push messages on Sundays that reminded them of weekly tasks that were due in the upcoming week. The notifications evolved over the course of the term in order to encourage students to become autonomous rather than relying on others – at the beginning of the term the notifications provided a detailed list of what should be completed. Within a few weeks, the notifications reminded students to look at their course outlines for what was required, and at the end of the term they were simply messages to the effect of, *shouldn't you be doing something to prepare for BU111?*

Tables 3a and 3b show that over 50% of students found the chatbot aided them with time management in some way. More importantly, approximately 84% of students indicated that the notifications prompted them to work on course requirements, and in Table 2c we see that 18% of students perceived the notifications as "something I must attend to." Furthermore, as shown in Table 3c, 46.7% were relieved to be reminded, suggesting that the tool helped alleviate some of the stress of managing academic demands. Survey comments further confirmed that students appreciated the push notifications however, some expressed frustration at the fact that they became more vague over the term, and they wanted them to be more specific and prescriptive as they had been at the beginning of the term. It is fair to conclude that these students were resisting taking ownership of their learning and reinforces the concern that technology and support structures must be used judiciously so that students learn to self-organize to ensure their success (Briggs et al., 2012; Jones et al., 2009).

Table 3a

Prompt Value of Reminders

Did Notifications and reminders prompt you to work on course requirements?		
Answer Options	**Response Percent**	**Response Count**
Yes	45.2%	131
No	16.2%	47
Somewhat	38.6%	112

Table 3b

Time Management

Did the chatbot aid your time management?		
Answer Options	**Response Percent**	**Response Count**
Yes	22.7%	70
No	47.7%	147
Somewhat	29.5%	91

Table 3c

Perception of Notifications

If you used the Notifications feature, how did it make you feel when you received it (select all that apply):		
Answer Options	**Response Percent**	**Response Count**
relieved to be reminded	46.7%	129
this is something I must attend to	18.1%	50
they care about me	13.0%	36
they are watching me	6.2%	17
I can plan my own time	15.9%	44

The most interesting insights related to social connection are shown in Tables 4a and 4b. Despite the fact that the chatbot is not human, approximately 65% of students indicated that the chatbot at made the course feel more personal than other courses (Table 4a). In Table 3c we see that 13% of students felt cared for when they received notifications. Students taking the survey often commented on characteristics associated with humans, "Liked the motherly feel it had," "Liked the sass." Many students made statements such as "made the professor more relatable."

Table 4a

Social Perception of Bot

Did use of the chatbot make the course feel more social and/or personal than other courses that did not use a chatbot?		
Answer Options	**Response Percent**	**Response Count**
Yes	38.6%	120
No	34.4%	107
Somewhat	27.0%	84

Table 4b

Willingness to Ask Questions

Did you ask questions to the chatbot that you might not have asked your Professor or TA?		
Answer Options	**Response Percent**	**Response Count**
Yes	28.2%	88
No	71.8%	224

In Table 4b we see that 28.2% of students asked questions of the chatbot that they may not have asked their professor or teaching assistant. Although this may seem like a small number, it is important to note that these students had questions that would have either gone unasked or ran the risk of obtaining incomplete or incorrect information from peers.

In general, the chatbot appears to have been a useful transition tool as shown in Tables 5a and 5b. Just under 50% of students indicated that the chatbot increased their level of motivation in the course in some way, and approximately 69% indicated that it assisted them with the transition and adaptation to university.

Table 5a

Chatbot as a Transition Aid

In comparison to other courses, did you feel that the provision of a chatbot assisted you with the transition and adaptation to University academic expectations in BU 111?		
Answer Options	**Response Percent**	**Response Count**
Yes	28.9%	89
No	30.2%	93
Somewhat	40.9%	126

Table 5b

Motivational Impact

Did use of the chatbot increase your level of motivation in this course more than other courses that did not use a chatbot?		
Answer Options	**Response Percent**	**Response Count**
Yes	19.9%	61
No	51.5%	158
Somewhat	28.7%	88

Conclusions and Future Iterations

Future iterations of the chatbot will incorporate insights gained from this version. In reviewing the comments, some students liked the jokes and individual notifications and wanted more while others did not. As indicated in Table 2c, approximately 16% of students reacted to the notifications with "I can plan my own time." This reinforces the notion of individual information preferences and that "overload" is a very individual thing. Future iterations of the chatbot will allow students to subscribe and unsubscribe to receive notifications as well as jokes and individual review questions so that their individual information and communication preferences are more likely to be satisfied.

In addition, the chatbot will be developed for Facebook Messenger. Students already have Messenger and it is a cross-platform product whereas Kik has fewer subscribers, and it only works on mobile telephones. This created some resistance to its adoption.

We will also be experimenting with making the chatbot "friendlier" by incorporating photos and images. Images are more aesthetically pleasing than text alone, but we believe that visuals of faces and humour increase the "friendliness" of the product and, it is hoped, increases social bonding further.

Finally, we plan to harness more of its potential as an educational tool by pushing weekly or bi-weekly "food for thought" or review questions so that students are at least thinking about the material between lectures. At least one of the instructors also plans to use it to hold virtual office hours. Students often indicate that they are uncomfortable coming to the professor's office and find it intimidating. It is hoped that in allowing students to ask questions during a designated hour (so that the burden to the instructor is not increased), using social media will encourage more students to ask for assistance or at least feel that the instructor is in general more approachable.

Mobile telephones are prolific, and students and their phones are inseparable. Rather than lament their presence, the existing findings related to technology in the classroom suggest that they may represent an opportunity to both make students comfortable in their new environments socially and help them manage its complexity so that they can transition into university more successfully or at least more easily. The use of the chatbot represents an opportunity to assist students by providing information that can be quickly and easily found, as well as make them feel a little more comfortable and connected with the instructor. Importantly, both of these objectives are achieved without increasing the demands on the instructor. Indeed, the instructors of BU111 found that the student e-mails they received asking questions caused by information overload or an inability to find information declined significantly. Chatbots in education represent an opportunity to truly create an improved experience for both students and instructors.

Acknowledgement

The author gratefully acknowledges the contribution of Leanne Hagarty in designing the survey and providing some of the papers which motivated this research.

References

Bawden, D., & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of Information Science, 35*(2), 180-191.

Briggs, A. R. J., Clark, J., & Hall, I. (2012). Bruilding bridges: understanding student transition to university. *Quality in Higher Education, 18*(1), 3-21.

Dahlstrom, E., Walker, J. D., & Dziuban, C. (2013). *ECAR study of undergraduate students and information technology, 2013*. Educause Center for Analysis and Research. Louisville, CO. Retrieved from http://www.educause.edu/ecar

Edmunds, A., & Morris, A. (2000). The problem of information overload in business organisations: A review of the literature. *International Journal of Information Management, 20*, 17-28.

Eppler, M. J., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society, 20*, 325-344.

Er, E., Kopcha, T. J., & Orey, M. (2015). Exploring college students' online help-seeking behavior in a flipped classroom with a web-based help-seeking tool. *Australasian Journal of Educational Technology, 31*(5), 537-555.

Harley, D., Winn, S., Pemberton, S., & Wilcox, P. (2007). Using texting to support students' transition to university. *Innovations in Education and Teaching International, 44*(3), 229-241.

Hillman, K. (2005). *The first year experience: The transition from secondary school to university and TAFE in Australia*. LSAY Research Reports. Australian Council for Educational Research. Retrieved from http://research.acer.edu.au/lsay_research/44

Jones, G., Edwards, G., & Reid, A. (2009). How can mobile SMS communication support and enhance a first year undergraduate learning environment? *Research in Learning Technology, 17*(3), 201-218.

Kay, R. H., & Lauricella, S. (2015). Investigating and comparing communication media used in higher education. *Journal of Communication Technology and Human Behaviors, 2*(1), 1-20.

Lauricella, S., & Kay, R. H. (2013). Exploring the use of text and instant messaging in higher education classrooms. *Research in Learning Technology, 21*, 1-17.

Rau, P. P., Gao, Q., & Wu, L. (2008). Using mobile communication technology in high school education: Motivation, pressure, and learning performance. *Computers & Education, 50*, 1-22.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago, IL: The University of Chicago Press.

Veletsianos, G., & Miller, C. (2007). Conversing with pedagogical agents: A phenomenological exploration of interactingw ith digital entities. *British Journal of Educational Technology, 39*(6), 969-986.

Wilson, T. D. (1999). Models in information behaviour research. *Journal of Documentation, 55*(3), 249-270.

Author Details

Sofy Carayannopoulos
scarayannopoulos@wlu.ca