Effectiveness of a Study Abroad Advising Chatbot

in a Higher Education Institution

Noah Koubenec

University of South Carolina

CHAPTER 1

**National Context**

Academic advising, student affairs, and study abroad programming have expanded and evolved substantially at institutions of higher education (HEIs) since the 1960s (Durnall, 1967; Grites, 1979). While these disciplines are not necessarily related, they do, in practice, all influence the work of modern study abroad offices at HEIs. While study abroad (SA) was viewed mainly as an enrichment experience for foreign language students up until the 1990s, it is now often exalted as a high impact practice at any HEI prioritizing internationalization (that is to say, nearly all of them) (de Wit, 2013; Jiang, 2013; Rudzki, 1995). In addition, study abroad is often viewed by administrators as an important tool for managing inflow and outflow (Kouba, 2019). Given its growing priority for institutional leadership and its popularity among an ever-broader cross-section of students, study abroad draws considerable attention at many HEIs.

But for all its growth, study abroad presents a number of persistent challenges for faculty, staff, and students. These include addressing the unique logistical, administrative, and academic concerns of study abroad with program directors (*how many course credits should students receive for my four-week program?*), students (*how do I obtain a visa for study in Athens?*), and other stakeholders (*how can the institution support a student who has been the victim of a hate crime abroad?*). Other challenges are similar to those found elsewhere at HEIs, such as improving program application completion rates. Pressures to address these challenges come from many sources:

* stakeholder expectations rooted in the commercialization of study abroad (coinciding with the commodification of higher education) (Bolen, 2001)
* the high consequences and liability of potentially traumatic events abroad (Wright, 2016)
* unprecedented administrative emphasis on study abroad activity as part of efforts to reap the academic and reputational benefits of internationalization (Delgado-Márquez, 2013)
* record numbers of students in study abroad programs (Institute of International Education (IIE), 2018)

These demands on study abroad personnel will likely continue to increase, making the need for a response increasingly urgent. While technological solutions are often presented as the answer to the above issues and more, they may carry their own problems. Quality and support for proprietary educational software (generally software as a service or SaaS) is inconsistent, and costs can be prohibitive. In addition, systems which rely on dedicated apps rather than integration with existing systems may not be sustainable.

In countries or regions with emerging higher education sectors and high or expanding mobile device availability but potentially slower cellular data networks, information and communications technologies (ICT) which allow HEIs to reach and communicate with students in the absence of a broadband connection have particular relevance (Adam, 2003; Chetty, Sundaresan, Muckaden, Feamster, & Calandro, 2013). At all HEIs, such “lightweight” technological solutions with low cellular data and computing power requirements may make ubiquitous computing solutions accessible to low-income students unable to afford large data plans or flagship phones.

Technological solutions – commercial or otherwise – must also offer transparency on use, safeguarding, ownership, and interoperability of data. While the realities of procurement in HEIs often allow tools to be purchased without being thoroughly vetted in this area, that reality does not change the ethical responsibility of study abroad offices at HEIs that choose to implement a technological solution. (Best & Payne, 2018)

**Local Context**

In the local context of this research (a study abroad office at a southern Senior Military College), many of the problems expressed above are compounded by a small staff, financial constraints, or other factors. Personnel have minimal time to engage in intrusive advising to support study abroad application completion or remind students of visa deadlines. (Pedersen, Skidmore, & Aresi, 2014)

Study abroad program offerings are published on the office’s application portal, which is largely unfamiliar to students, unintuitive, and inaccessible on mobile devices. A non-comprehensive list of program offerings is also available on the institutional website, but that information is infrequently updated and difficult for students to locate.

The vast majority of face-to-face interactions between SA personnel and students at The Citadel are unscheduled “walk-ins.” Because of fixed demands such as pre-departure orientations and information sessions, students may have difficulty coordinating with office personnel to schedule convenient meetings. When meetings are scheduled, they frequently involve the discussion of basic information already available through the platforms described above. The prevalence of walk-ins complicates office efforts to capture reliable data on student queries, satisfaction, and staff effort.

Not all SA time and effort is spent on student walk-ins; a significant portion is devoted to responding to emails, many of which are requests for the same information already published information often requested during walk-ins. Other negative effects of excessive email correspondence include redundant communication encouraged by organizational responsiveness expectations (while the SA office does not employ electronic performance monitoring, there is still considerable social pressure encouraging prioritization of email responses at the expense of other tasks) (Paczkowski, 2016) and increased employee stress due to real email traffic versus desired email traffic “misfit” (Stich, Tarafdar, Stacey, & Cooper, 2019).

The promise of mobile communication as a means to more conveniently deliver instruction, schedule appointments, and advise students at HEIs has been hailed since the early 2000s (Kim, Mims, & Holmes, 2006). Technologies using mobile devices as at least one means of delivery could help to address scheduling challenges and increase access to general study abroad information, thereby reducing time spent by personnel on providing that information. Technologies using chat or natural language interfaces may also help supplement advising provided by SA personnel. While much of the research on chat-based advising has focused on human-human interaction (for example, in the form of chat-based office hours), the implementations that have been studied suggest that a human-machine chat interface for basic advising may help address issues such as lack of personnel availability for face-to-face appointments or student academic schedules interfering with meetings during the workday. (Li & Pitts, 2009)

**Statement of Problem**

Within the context of study-abroad advising and administration, learners (students) are generally seeking a grasp of study abroad program offerings relevant to their interests, an understanding of administrative processes such as passport or visa applications, or assistance with planning for the academic and logistical concerns of a study-abroad program. In their role as advisors, study-abroad office staff work with students to identify appropriate study-abroad opportunities or educate them on understanding or planning for study abroad experiences. When acting as administrative personnel, study-abroad office staff monitor and support students’ applications for programs, frequently coordinating with other entities on- and off-campus (Deyo, 2018). While important, much of this work involves answering predictable, recurring questions or reminding students of application statuses and deadlines, which prevents personnel from focusing on program development and administration (e.g. creating more affordable programs or alternatives such as project-based learning abroad), risk management and response (e.g. supporting victims of traumatic incidents abroad), or targeted student outreach and support (e.g. fostering “inclusive excellence” by dedicating resources to and raising funds for students from populations typically underrepresented in study abroad) (Sweeney, 2013, p. 2; Salisbury, Paulsen, & Pascarella, 2011; Parkinson, 2007; Wright, Smith, & Freyd, 2017).

**Action Research Purpose Statement**

The purpose of this action research will be to implement an intervention in the form of a study-abroad advising chatbot for students at The Citadel, a public military college in Charleston, South Carolina.

**Research Questions**

Research Question 1: What is the effect of a study abroad advising chatbot on study abroad heuristic knowledge?

Research Question 2: How does a study abroad advising chatbot influence student intent to study abroad?

**Subjectivities and Positionality**

Some characteristics of my positionality are predictable given the nature of action research: I work with some of the participants in this research, and I benefit from legitimacy and familiarity with participants. (Mertens, 2007). My relationship with co-workers, which includes typical disagreements, misunderstandings, or cliques, also informs my positioning (Acevedo, Aho, Cela, Chao, Garcia-Gonzalez, MacLeod, Moutray, & Olague, 2015). However, it is important to consider my positionality beyond just the research context and my identity as a part of that context. Positionality informs epistemology and research paradigms, affecting how researchers view the world, and therefore how they view their own problems of practice (Takacs, 2003). Because I have a transformative-pragmatic research paradigm that seeks to identify and address the root causes of bias and injustice wherever it may appear in my research, it is important for me to include my broader positionality. Therefore, my positioning – both broadly- defined and in terms of my relationship to my context and the research participants, is as follows:

I am a heterosexual white male, born in the United States, and raised in an evangelical protestant, mono-ethnic home. I am an alumnus of the military college where this research will be conducted, and I have worked in its office of study abroad for five years. Because of the rigid military structure of The Citadel, I will hold substantial authority over research participants and must take care not to present my own perspectives in such a way as to influence participants’ views or responses.

I have chosen to undertake this research as a means to address problems of practice in my own context, and part of my subjectivity is my perception of those problems. My subjectivity, if properly navigated through the course of this research, can provide valuable context into the complicated questions of what effect a text-based chatbot can have on student knowledge of study abroad as well as their perceptions of study abroad. (Ratner, 2002).

To address the challenges presented by my research-context-specific positionality, it is essential to communicate clearly, honestly, and respectfully with coworkers about the intent of my research and my interpretation of the problem. This is especially important because this research is focused on addressing inefficiencies within a study abroad office, and this could be viewed by participants as an audit of sorts – either of individuals or the office.

To address the challenges presented by my positionality more broadly defined, I will continually re-evaluate my approach to the research and participants, as well as my interpretations of data and the positionings of participants. Given my transformative-pragmatic paradigm, a key part of this strategy will be a conscious effort to elevate the perspectives of participants whose positionalities have historically meant their views are sought out or valued below those of others in my context.

Because I am an educational technology researcher, the positionality of many others will be fundamental to this work. These additional positionalities are part of the technological tools used and are thus injected into my own research, in which I will be implementing an intervention based on widely-used chatbot technology. Specifically, there is potential for bias in automated decision-making algorithms and training data – or, as pointed out by Dobbe, Dean, Gilbert, and Kohli at the 2018 International Conference on Machine Learning, there is even potential for bias in the very design of the software, libraries, or frameworks used by the bot (2018). While eliminating algorithmic or technical bias entirely is not possible, Ensuring the entire source code of the bot is open will make it possible for those vulnerabilities to be identified and addressed in the future.

**Definition of Terms/Operationalizations**

**Chatbot.** Chatbots may be generally defined as software programs that may be interacted with using spoken or written commands. Sansonnet et al. (2006) present several functional characteristics that may be used to distinguish chatbots from other programs: (1) a dialogic agent responsible for natural language processing (text or verbal), (2) a rational agent with access to a knowledgebase, and (3) an embodied agent designed to provide some degree of identity to the chatbot; this may be as simple as naming the chatbot.

Diagram, venn diagram

Description automatically generatedA growing number of modern chatbots may be interacted with using dialogue or natural language; chatbots of this type may also be called conversational agents. In this research, chatbot refers to a conversational agent using written dialogue (Jia, J., 2003; Dale, R., 2016). While chatbot is often shortened to “bot,” this usage is deliberately avoided in this research to prevent confusion with other superficially-similar programs with different purposes, such as social media bots designed to impersonate humans or non-conversational bots designed to handle repetitive tasks.

**Natural language processing**. Natural language processing (NLP) refers to any software approach to processing written or verbal input from a user into a machine-readable format. These approaches vary from basic pattern matching to machine-learning-driven statistical inference or neural network-based NLP.

**Pattern matching**. Pattern matching refers to the computer processing task of finding one text string within another text string using one of various algorithms, which is an essential capability for numerous software programs and has been discussed by scholars of computer science since the 1960s (Boyer & Moore, 1977; Dömölki, 1964; Knuth, Pratt, and Morris, 1977). Pattern matching may be used by chatbots as a relatively simple approach to processing user input.

CHAPTER 2

**Literature Review**

**Literature Review Methodology**

The methodology used for the literature review consists of database searches for literature on three main topics: chatbots, study abroad, and advising. Within these areas, variants with different degrees of intersectionality were used to ensure a complete capture of the literature relevant to a study abroad advising chatbot. In addition, because of the various fields informing both study abroad advising and chatbots, there are numerous other search terms which were used to locate relevant literature, including knowledge taxonomies, computers are social actors theory, and more.

**Chatbot searches**. For the chatbot literature searches, several queries were run on the JSTOR Arts & Sciences IV, Academic Search Complete, and Education Source databases with variations on “chatbot”.

**Study abroad searches**. Just as for the chatbot searches, multiple different queries were run on JSTOR Arts & Sciences IV, Academic Search Complete, and Education Source databases.

**Advising searches**. For the advising searches, the following queries were executed on JSTOR Arts & Sciences IV, Academic Search Complete, and Education Source databases.

This chapter reviews relevant literature in order to establish three key points. The first section describes academic advising and its theoretical foundations, argues for academic advising as learning, and provides a justification for study abroad as a critical area of concern for academic advisors both general and study-abroad specific.

The second section presents factors affecting student intent to study abroad as well as categories of heuristic or informal study abroad knowledge important to students considering study abroad. If, as established in the section on advising, study abroad is an important topic for advisors, this section argues what types of knowledge study abroad advisors should seek to develop among students considering study abroad.

The third section provides an overview of chatbots as well as a focused look at chatbots in education in order to argue for the relevance of chatbots both to various learning contexts generally, advising more specifically, and study abroad advising most specifically. Finally, this section relies on literature to establish that while existing scholarship suggests chatbots are effective in various learning contexts, there is a significant research gap with regard to the effectiveness of chatbots in advising.

**Academic Advising and Study Abroad**

Academic advising is widely considered by scholars and practitioners as a form of learning, and is frequently viewed as the constructivist process of working with advisees to build their knowledge of concepts critical to success. Study abroad is a key consideration for both general advisors and study abroad advisors given its status as a high impact practice and alignment with campus internationalization efforts at most U.S. institutions of higher education.

**Advising**. While there has not been a concerted effort among education historians to document the development of academic advising, there is sufficient research to allow for a basic timeline of the discipline to be mapped out (Gordon, 2004). Cook (2009) divides the history of advising into three phases: advising practiced but undefined (from the 16th to the mid-19th centuries), advising practiced and defined (from the mid-19th to the mid-20th centuries), and defined and examined (from the mid-19th century onward). Called-as-such academic advising at U.S. institutions of higher education can be traced to the late 19th century (Gordon, 2004). The discipline has also seen an increasing trend toward specialization by department (Gordon, 2004).

**Advising as learning.** Of the big three learning theories, Constructivism is commonly viewed as the dominant theory among educators (Phillips, 1997). Unsurprisingly, constructivism is also the dominant learning theory informing academic advising (Musser & Yoder, 2012; Hemwall & Trachte, 2005; Xyst, 2016). This dominance is due, at least in part, to the widespread preference among advisors to strike a balance of providing information and guiding student self-discovery, which aligns neatly with constructivist principles (Deyo 2018).

Constructivism is also referred to with varying degrees of interchangeability as social constructivism (Hruby, 2001; Creswell & Creswell, 2018). Drawing on theoretical works in the field of psychology and education by Dewey (1938), and others, Berger and Luckmann are frequently credited with setting the foundation for constructivism as a theory of learning with their 1967 work *The Social Construction of Reality* (Jaramillo, 1996). Vygotsky was also a key contributor to the development of social constructivist theory, which, while still falling within the boundaries of constructivism as a broader theory, added emphasis on the importance of social position for the creation of knowledge (Hruby, 2001), with their work built on by Gergen (1985). Among the tenets of constructivism are that the creation of knowledge is an effort with inputs both social and environmental (Creswell & Creswell, 2018). In short, collaboration or interaction with others is essential for the creation of knowledge according to constructivists, and this core principle makes the theory highly applicable to the person-to-person work of advising.

While constructivism is the most influential of the “big three” learning theories on the advising field, it should be noted that advising is influenced by many different theoretical influences (Xyst, 2016). At various points in the development of a community of scholarship around advising, there has been discussion of other learning-related sub-theories as foundational to advising, including progressivism and social constructivism (Hemwall & Trachte, 2005). In fact, there is skepticism among scholars of advising that a unified theory is necessary for the continued professionalization of the field, or that one will develop at all (Shaffer et al., 2010).

**Study Abroad Advising.** While there has been considerable scholarship on academic advising dating back to the 1970s which inform widely-adopted academic advising best practices, the scholarly and practical effort to apply those principles to study abroad advising is nascent (Jeschke et al., 2001; Perkins, 2015). Academic advising is frequently presented as a discipline of scholarly practitioners within higher education (Schulenberg & Lindhorst, 2008). Academic advising may be provided to students by faculty, professional advisors, or both, in what is termed the shared model (He & Hutson, 2016). Advising by study abroad professionals may be understood as a variant of the shared model. Just as with general academic advisors, there is also at least some evidence that academic advisors specializing in study abroad tend to view their role as providing the minimum knowledge and support required for student success while still allowing the student to construct their own knowledge, which aligns with the tendency of prominent advising researchers and theorists to present advising as learning – specifically, as a process of knowledge construction (Burton, 2012; Deyo 2018; Hemwall & Trachte, 2005).

***Study abroad as high impact practice****.* High impact practices (HIPs) entered the higher education lexicon in the late 2000s, formalized as a term in part by reports of the American Association of Colleges & Universities. However, the existence of a number of practices with particularly strong benefits for students has been recognized for decades prior (Association of American Colleges and Universities & National Leadership Council, 2007; Kuh et al., 2008). HIPs are widely regarded by university administrators and faculty as benefitting students by improving learning outcomes, promoting student engagement, and supporting persistence, at least some of which are supported by research (Brownell & Swaner, 2009; Hu & McCormick, 2012).

The formal declaration in 2008 of a set of high impact practices by the Association of American Colleges and Universities (AAC&U) set off a number of shifts in the focus of higher education leadership as well as changes to policies and priorities at individual institutions (Finley & McNair, 2013).

Study abroad is generally considered a high impact practice (Kuh et al., 2008; There is also recognition that academic advisors must have a firm grasp of HIPs in order to effectively promote them for advisees — especially for HIPs which may require planning for financial, academic, or other factors well in advance (Miller et al., 2018). Even when the status of study abroad as a high impact practice is ignored, it is also prioritized as a component of internationalization, which features in a sizable and growing majority of university mission statements and strategic plans and is thus an area of focus for advisors (Childress, 2006; Guri-Rosenblit, 2015; Helms & Brajkovic, 2017; Long, 2018).

**Study Abroad**

**Study abroad heuristic knowledge**. Researchers have proposed models of college student success based on informal or heuristic knowledge with potential applications for study abroad (Wirth & Padilla, 2008; Johnson, 2017; Whelan-Ryan, 2019).Still, categories of heuristic study abroad knowledge are little-studied. Practitioner resources such as online best practices guides or professional association-produced manuals for academic advisors, while not peer-reviewed, are the closest approximation of a categorized list of study abroad knowledge. A useful way to view existing descriptions of knowledge important for study abroad success may be categorizations of knowledge not in the sense of Bloom’s taxonomy, but rather a knowledge or information taxonomy more akin to what is used to structure knowledge management systems in organizations (Lambe, 2007). Additional insight on categories of study abroad informal knowledge may be found in the factors from theoretical frameworks on intent like the one described below.

**Study abroad intent.** In the context of research on study abroad, “intent” is generally used to refer to students’ expressed desire to participate in a study abroad program at some point in the future (Luo & Jamieson-Drake, 2015; Salisbury et al., 2009). It is also a term with significant theoretical underpinnings, as intent is a key component of prominent theories of behavior often applied to study abroad, particularly the Theory of Planned Behavior (TPB). Ajzen’s theory was built on the foundation of the earlier Theory of Reasoned Action (Ajzen, 1985; Ajzen, 1991). The theory seeks to explain behavior by presenting attitude as predicting intent, which in turn predicts behavior. TPB has been successfully applied to study abroad intent, with Goel et al. citing a number of factors influencing intent, with the most relevant to this intervention being the perceived behavioral control items (see table 1) (2010; Asare, 2015; BaileyShea, 2009).

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| --- | --- | --- | --- |
| Table 1.1  *Theoretical framework from Goel et al. (2010)* | | | |
| Framework element | Description | Literature | Factors identified |
| Behavioral beliefs and attitudes | Individual’s perception  of the degree to  which his/her  behavior will  influence a desired  outcome | Maringe & Carter  (2007) | Promise of international  higher education  experience |
|  |  | Relyea et al. (2008) | Perceived career value |
|  |  | Toncar et al. (2006) | Graduation dates, future job prospects |
|  |  | Cusick (2009) | Transformative learning experience |
| Subjective  beliefs and  perceived  subjective  norms | Individual’s perception  of a particular  behavior, as  influenced by the  judgment of  significant others | Pimpa (2003) | Family expectations |
|  |  | Curran (2007) | Employer expectations |
|  |  | Naffziger et al.  (2008) | Social obligations |
| Control beliefs  and  perceived  behavioral  control | Individual’s perception  of perceived ease or  difficulty in  performing the  behavior | Srikatanyoo &  Gnoth (2005) | Academic and  supporting facilities,  academic staff  performances,  environmental  conditions, entry  requirements,  academic reputation  of a country, and  academic reputation  of domestic  institutions |
|  |  | Salisbury et al.  (2009) | Socioeconomic status |

***Factors influencing intent.*** Only a small percentage of college undergraduates study abroad, and when participation in study abroad is compared with participation in other high impact practices including research with faculty, service learning, internships, or senior experiences, study abroad consistently ranks near the bottom even when the effect of especially low first-year student participation is ignored (Kuh et al., 2008; Laird et al., 2014). Given study abroad’s status as a high impact practice status, there is a relatively new but growing body of scholarship on student intent to study abroad, with much of that scholarship appearing after the broad acceptance of study abroad as a high impact practice (Salisbury et al., 2008; Phillips, 2014; Eder et al., 2010; Wang et al., 2016). Factors consistently shown to influence student intent to study abroad either positively or negatively include financial considerations, personal, professional, and academic support, language barriers and culture shock, temporal distance, and involvement in on-campus activities (Kelleher et al., 2016; Pope et al., 2014; Luo & Jamieson-Drake, 2015). Among the most extensive research on student intent to study abroad has been Salisbury et al’s (2008, 2010, 2011) series based on the Wabash National Study, a longitudinal mixed-methods study conducted by the Center of Inquiry at Wabash College on an initial sample of undergraduates from 19 colleges and universities across the United States (Pascarella & Blaich, 2013). Relying on data from the Wabash study, Salisbury et al. (2008) made a number of assertions regarding student intent and decisions to study abroad, which are incorporated into Goel et al.’s framework:

* That college choice theory, which seeks to explain why students enroll in or complete higher education, can also be applied to study abroad intent with minimal adaptation;
* That the study abroad advising process occurs over an extended period of months or years;
* That multiple forms of capital (social, cultural, and financial) influence student intent to study abroad.

Students and employers widely perceive career benefits to study abroad, and research suggests study abroad participants tend to earn more than those who did not participate in study abroad, although some of these may be due to exogeneity with other variables such as parents’ education and income level (Messer & Wolter, 2007; Stroud, 2010; Petzold, 2020; Petzold & Moog, 2017).

Financial considerations such as availability of financial aid are consistently cited as factors with a strong influence on student intent to study abroad, particularly for lower-income students (Lörz et al., 2015; Petzold & Moog, 2017).

Language – both student language skill and language spoken in-class on study abroad programs – has also repeatedly been indicated as a highly influential factor for student intent or participation (Dufon & Churchill 2006; Petzold & Moog, 2018).

Numerous other theoretical constructs or epistemologies from sociology, psychology, or other fields have also been applied to student intent to study abroad, ranging from the Bourdieuean social-class focus of Cultural Reproduction Theory to anti-behaviorist theory (Lörz et al., 2015; Stahl, 2016; Kelleher et al., 2016; Ajzen, 1991).

**Chatbots**

For all their diversity of design, chatbots are, without exception, programs designed to mimic human conversationalists with varying degrees of accuracy and complexity (Heller et al., 2005).

ELIZA, the pattern-matching chatbot designed to mimic a psychotherapist, is cited almost universally in scholarly research related to chatbots regardless of discipline. While some of these citations may be included, to borrow a term from Hjelm, “ritualistically”, it is difficult to imagine another field in which an early innovation has remained among the most notable implementations of a technology for more than half a century (2019, p. 224). This is a powerful testament to the state of chatbot scholarship and real-world implementations: fast-growing and increasingly capable, but largely nascent. Meta-analyses of educational chatbot literature are focused on the predominant use-cases of chatbots, particularly providing tutor-like capabilities (Quiroga Perez et al., 2020). Thus, it is inevitable that applications of chatbot technology to learning contexts are based largely on the reasonable extrapolation of existing applications or scholarship to those new contexts, as the present body of scholarship is too limited to provide a foundation perfectly matched to the floor plan of every implementation of chatbots for education.

The status of constructivism as de facto gospel of education predictably translates to a tendency to rely on the theory as an explanation for the effectiveness of a large number of learning technologies, with some less well-received than others (Gance, 2002). In describing theoretical bases for virtual learning environments using conversational agents, Baylor (2004) presents the concept of a constructivist-“instructivist” continuum, with the constructivist end of the continuum distinguished by higher learner engagement and the “instructivist” end of the continuum distinguished by a more dominant role played by the agent (p. 403). But just as advising is not exclusively informed by constructivism but rather the interplay of numerous paradigms and disciplines held together by the glue of constructionist ideas, so is a study abroad advising chatbot informed by thought from other disciplines such as the Computers are Social Actors (CASA) paradigm (Nass, 1994). Theories such as CASA have particular relevance for outlining the constructivist principles underpinning a study abroad advising chatbot. Recent research has demonstrated that chatbot users tend to follow social norms even when interacting with a known chatbot (Edwards et al., 2016).

***Presentation perspectives****.* There are numerous presentation possibilities for conversational agents, from embodied and animated to exclusively text-based, anthropomorphic to stylized, and highly formal to casual or informal. Evidence on which of these many variables might be combined to optimize the effectiveness of a study-abroad advising chatbot is mixed (Feine et al., 2019; Kim & Sundar, 2012; Ciechanowski et al., 2019; Rietz et al., 2019). However, some evidence points to particular effects of language employed by chatbots; use of personalized pronouns in delivery of instructional material has been shown to enhance information transfer (Dutke et al., 2016).

***Functional dimensions****.* Chatbots are used in production for a wide variety of purposes, from flight searches to simulated conversations with clergy (*U.S. Catholic*, 2017; Ramesh, 2017). Psychotherapy represents one of the most established (if still developing) sectors for production chatbots, and psychotherapy chatbot applications are one of the most-studied chatbot use cases (Bendig et al., 2019; Gratzer & Goldbloom, 2019; Vaidyam et al., 2019). The same conversational format which makes psychotherapy chatbots appropriate and relatively popular also suggests chatbots have clear applications in study abroad advising contexts.

***Technical and ethical considerations****.* Since the earliest chatbots, technology used for these programs has evolved from basic pattern recognition and matching to more advanced natural language processing and machine learning (Shawar & Atwell, 2007; Ciechanowski et al., 2019).

Algorithmic bias is widely recognized as an important ethical consideration for any software-based educational technology using algorithms, which includes most modern chatbots (Silva & Kennedy, 2017).

Just as for other computer programs that process and store student data, chatbots could present significant data security risks, not least because their novelty in production settings means there are few standardized security testing procedures developed as of the time of this writing (Bozic & Watawa, 2018).

***Factors affecting user attitudes****.* There is evidence that users have improved perceptions of chatbot usefulness when they exhibiting anthropomorphic characteristics such as humanized language (Cortes, 2012; Araujo, 2018).

**Chatbots for learning.** Widely-deployed production chatbots are relatively new to educational settings (libraries are an exception), and most scholarship on chatbot uses in education examines usage in limited contexts such as individual classes or explores technical design options. (Winkler & Söllner, 2018; Fryer et al., 2017; Ranoliya et al., 2017; Chopra et al., 2016; McNeal & Newyear, 2013). Among the reasons for the slow adoption of chatbots for education are the still-maturing state of key technologies like natural language processing as well as the need for above-average familiarity with programming and database design in order to develop a chatbot, which is borne out by the concentration of most education chatbot scholarship in journals focused on computer science or education information and communications technology or ICT (Lin, 2020).

***Evidence of effects on outcomes****.* Conversation is well-established as a powerful learning tool, whether of the teacher-learner, learner-learner, or learner-learners (discourse community) variety (McVittie, 2004), with recognition that “teachers who create spaces for student-talk are creating greater learning opportunities for their students” (McVittie, 2004, p. 489). Recent discussions of the role of conversation in instruction are, unsurprisingly, rooted in social constructionism (Ness & Strong, 2013; Too et al., 2018). Informal, conversational-style communication between learner and instructor has been established as a path to improving learning by improving trust between instructor and learner and supporting a sense of student control (Dobransky & Frymier, 2004; Nkhoma et al., 2018; Martin & Myers, 2006). A chatbot offers a conversational interface conducive to helping students form their own inquiries or the knowledge they seek in their own terms.

Pedagogical agents with varying degrees of embodiment or anthropomorphism are the most thoroughly-researched type of conversational agent in use in academia, and are often presumed to deliver learner benefits including reduced cognitive load and just-in-time instruction (Yung and Pass 2015; Woo 2008; ). It is important to note that the research on outcomes is more nuanced. Chatbots have been shown to support learning in various educational contexts, especially tutoring (Kerry et al., 2009; Aleven et al., 2004; Heffernan & Croteau, 2004; Beun et al., 2003). Chatbots and related technologies can reduce cognitive load (Brachten et al., 2020; Doering & Veletsianos, 2007). In keeping with this theoretical alignment, experimental research has found chatbots can facilitate the process of building on existing knowledge (Tegos & Demetriadis, 2017). Chatbots have also been successfully used to implement nudging in college courses (Rodriguez et al., 2018).

**Summary**

Academic advising is regarded as learning by practitioners and researchers, but it is also informed by institutional priorities and missions. The status of study abroad as a high impact practice and the priority of internationalization for most institutions of higher education make study abroad a critical area of focus for academic advisors.

Advising (including study abroad advising) borrows heavily from constructivism, and most practitioners consider advising a learning process with the advisee largely responsible for constructing knowledge with guidance and input from the advisor. These theoretical and practical attributes make dialogue-based instruction appropriate to the field of advising.

Existing research on chatbots in education suggests they are beneficial in a number of ways, but there is a dearth of scholarship on chatbots in advising contexts, especially with regard to specialized advising topics like study abroad.

CHAPTER 3

**Method**

The purpose of this action research will be to implement an intervention in the form of a study-abroad advising and assistance chatbot for students at The Citadel, a public military college in Charleston, South Carolina.

The research questions are intended to gather data necessary to evaluate the real benefit and effect on study abroad intent of the chatbot. Real benefit will be assessed using quasi-experimental pretests and posttests of study abroad heuristic knowledge without a control group. Interviews will be used to determine effect of the chatbot on study abroad intent. Given that use of the chatbot will not be mandatory, understanding attitudes toward the chatbot and its usefulness as collected in interviews will also be important for identifying potential barriers to use. This study will explore the following research questions:

Research Question 1: What is the effect of a study abroad advising chatbot on study abroad heuristic knowledge?

Research Question 2: How does a study abroad advising chatbot influence student intent to study abroad?

**Research Design**

This action research seeks both to understand problems with study abroad advising practices and tools in a higher education context and implement an intervention in the form of a

study abroad advising chatbot. Action research is appropriate for this study as it allows practitioners to incorporate findings into solutions to the problems of their own contexts (in this case, a study abroad office at a small public military college in the American South) (Mertler, 2017).

Beyond explaining the paradigmatic underpinnings of their work, researchers must explain the rationale for mixing methods and why mixed methods are most suitable for understanding a particular problem; for this research, the qualitative and quantitative data each illuminated different facets of the problem which could not have been identified through qualitative or quantitative data alone (Creswell & Plano-Clark, 2017). Qualitative data, which will be collected in the form of in-person interviews on The Citadel’s campus, offered insight on students’ impressions of barriers to applying for study abroad. Quantitative data, which will be collected in the form of study abroad application completion rates, webpage hit rates, and faculty and staff effort figures, offered insight on trends across the student population and measures of office productivity. Triangulation is especially appropriate to problems like this, as both qualitative and quantitative methods can be pursued simultaneously and combined. Beyond the functionality of triangulation as a “validation tool” (Hesse-Biber, 2012, p. 138), research designs with roughly equal balances of qualitative and quantitative data can also aid in elevating typically subjugated or ignored perspectives on the research problem. This benefit of triangulation is particularly relevant to an action research study undertaken in a military college context, where there is a substantial power imbalance between researcher and subject. Part of that power imbalance is found in any research involving students, but more unusual is the manner in which rigid expectations for behavior, stoicism, and institutional loyalty may deter students at a senior military college from criticizing policies or performance – especially when those students are also members of one or more other marginalized or subjugated groups. A mixed methods design was selected for its ability to offer what Mertens and Hesse-Biber described as a “more comprehensive explanatory framework” which incorporates subjugated voices more effectively than quantitative or qualitative data alone (Mertens & Hesse-Biber, 2012, p.76). However, the social justice aim of this research is not to identify particular causal relationships rooted in injustice (see Howe, 2012), but to elevate perspectives silenced by injustice.

**Setting and Participants**

**Setting**

This research and intervention took place at The Citadel, the Military College of South Carolina, a public four-year institution and one of six senior military colleges (SMCs) in the United States. The Citadel is one of two SMCs where nearly all full-time undergraduate students are members in a Corps of Cadets and are housed on-campus in barracks. Aside from a small number of graduate courses taught at a nearby consortium facility, all courses are taught on-campus in Charleston, South Carolina.

The Office of Study Abroad and Domestic Programs (OIDP) at The Citadel is responsible for most aspects of study abroad application and enrollment, program development, and student services and support abroad. Specific responsibilities of the office include:

* Marketing and recruitment for semester length faculty-led “Global Scholars” programs
* Oversight of student applications for all study abroad programs
* Study abroad advising
* Overseas or third-party program provider coordination and payment
* Logistical and financial guidance for faculty-led programs, both summer- and semester-length
* Direct management of semester-length “Global Scholars” programs
* Promoting general student awareness of study abroad opportunities, including third party study abroad programs or internships abroad
* Preparing and submitting information for reporting requirements such as Open Doors reports

Most engagement with students (the participants) in the OIDP occurs in the form of walk-ins, with scheduled appointments making up a smaller percentage of student engagements. Responding to email inquiries also makes up a significant number of student engagements. This research will take place in the OIDP building, a small on-campus office environment with five full-time employees.

**Participants**

The student population of 2,348 cadets accounts for nearly all study abroad participation at The Citadel. A small number of the graduate student population (846 in spring 2019) participate in study abroad programs, as do transient students enrolled solely for summer programs abroad (Office of Institutional Research, The Citadel, 2019).

The demographics of The Citadel’s students are markedly different from most colleges and the inverse of the gender distribution for the national study abroad student population. While 67.3% of study abroad students from the U.S. in 2016-17 were women, just 17.9% of study abroad students from The Citadel during the same period were women (Institute of International Education, 2018; Office of Study Abroad, International, and Domestic Programs, The Citadel, 2019). Nearly 80% of students at The Citadel are male, and approximately 75% of students are white (Office of Institutional Research, The Citadel, 2019). These characteristics are similar for students who participate in study abroad.

Given the demographic characteristics of both The Citadel’s student population and the study abroad student population, purposeful sampling is a requirement to ensure sufficient data on non-male, non-white students are collected (Patton, 2002; Teddlie & Yu, 2007). A minimum of 25 and a maximum of 40 students will be invited to participate in the research.

**Action/Innovation**

My intervention will be a conversational chatbot for study abroad advising, designed to improve student understanding of the study-abroad planning process, improve access to general study abroad information relevant to student interests and degree plans, and deliver timely updates on study abroad application statuses and deadlines (Kim, 2007). A bot which can achieve these objectives will (1) facilitate student access to, and understanding of, various types of study abroad information (2) help students learn how to incorporate study abroad into degree plans, and (3) understand how to complete the bureaucratic and logistical requirements for study abroad. While a chatbot specifically designed for study abroad advising and assistance will be novel, there is some evidence supporting both the effectiveness of and student preference for chatbots in other educational situations, including course registration advising (Chun Ho, Lee, Lo, & Lui, 2018), admissions (Gregori, 2017), and student services (Barrett, Branson, Carter, DeLeon, Ellis, Gundlach, & Lee, 2019).

The bot would allow conversational search of frequently-requested study abroad program offerings such as program locations, dates, and costs, as well as guide students to potentially-relevant programs based on student information collected in the conversation. The conversational agent will be developed in Node with Botkit and distributed via messaging platform (Twilio). The use of Twilio will permit students to interact with the bot using regular SMS and MMS applications, minimizing barriers to adoption caused by installing or learning an unfamiliar messaging app.

**Data Collection Methods/Data Sources**

To examine the problem, this action research will follow a concurrent triangulation mixed methods design (in Mertler’s parlance), or a concurrent fully-mixed equal-status design using triangulation (in Leech & Onwuegbuzie’s) (Leech & Onwuegbuzie, 2009; Mertler, 2017). There is no shortage of debate on the appropriate use of qualitative, quantitative, or mixed methods, and whether these differ meaningfully at all (Hammersley, 2018; Morgan, 2018a; Morgan, 2018b; Sandelowski, 2018). Still, the current state and commonly accepted use of MMR as a means to understand certain types of problems more comprehensively makes it an appropriate choice for this research. Another impetus for this choice is derived from the researcher’s hybrid paradigm – both the clear positioning of research that prioritizes justice under Mertens’ transformative “umbrella” (2010, p. 473) and the inherent pragmatism of mixed methods. Some underplay the significance of the paradigm for research or even argue for replacing it as the concept at the core of understanding or articulating perspectives and biases with the mental model, which bears some similarities to the paradigm but is fundamentally relativistic and non-judgmental of other perspectives (Greene, 2007). However, in the case of this research, paradigmatic influence is a significant motivator of research design.

This action research will employ mixed methods in order to triangulate insight on two main areas of chatbot effectiveness: impact on heuristic knowledge and effect on stated intent to study abroad. Data will be collected from pretest and posttests, semi-structured interviews, concurrent feedback, and metrics. Because user/chatbot interaction in higher education settings is still fairly novel and implementations have generally been restricted to trial deployments in specific college courses, it is important to collect assessment data on students’ content knowledge (heuristic knowledge) before and after chatbot use (Winkler & Söllner, 2018). It is also important to understand whether a chatbot is affecting expressed student intent to study abroad. Some chatbot research has sought to help users understand how to best interact with conversational agents, but the intent of this research is to reduce as much as possible any learning curve or friction for chatbot interaction so using the chatbot occurs as naturally as possible (Weisz, Jain, Joshi, Johnson, & Lange, 2019).

These data will be collected prior to, during, and after interaction, and qualitative and quantitative data will be collected at various times depending on the data source (not simultaneously collected) (Morse, 1991). Because of the nature of the intervention (a custom-developed chatbot hosted on Digital Ocean’s cloud infrastructure), data collected during conversations will be encrypted to the degree necessary to provide anonymity.

Table 3.1

*Research Question/Data Collection Alignment Table*

|  |  |
| --- | --- |
| Research Question | Data Sources |
| RQ1: What is the effect of a study abroad advising chatbot on study abroad content knowledge? | * Pretest/posttest |
| RQ 2: How does a study abroad advising chatbot influence student intent to study abroad? | * Interview * Concurrent feedback |

**Pretest/posttest.** Quantitative data from the pretest and posttest will be used to determine achievement of learning objectives for the intervention, including grasp of conceptual knowledge related to academic planning considerations for study abroad and factual knowledge of study abroad administrative requirements. The use of a pre-test and post-test will allow assessment of students with greater knowledge of study abroad, such as study abroad alumni.

The pretest and posttest will be administered to participants, with the pretest taking place prior to their first interaction with the chatbot and the posttest taking place after their completion of all study abroad requirements and before departing for their program.

**Interview.** To collect information on student knowledge or intent which would not be captured by the pretest/posttest, semi-structured interviews will be conducted. The purpose of the interviews is to clarify or elaborate quantitative data obtained from the pretests and posttests. The interviews will take approximately 15 minutes and will be conducted face-to-face in a meeting room at Daniel Library on The Citadel’s campus. Interviews will be recorded and transcribed to facilitate analysis. Interview questions will be focused on identifying students’ opinions or expressed intent to study abroad, which could not be determined from the content knowledge pretest/posttest.

**Concurrent feedback.** To help understand learners’ opinions of the helpfulness and other attributes of the chatbot during use, two types of data will be collected during conversations. The first will be key opinion indicators such as “thanks!” or “this isn’t what I needed.”. These opinions will be logged with timestamps for later extraction (Zhang & Liu, 2011; Shang, Wang, Dai, & Zhang, 2012; Zhang, Yang, Sun, & Liu, 2014). The second will be responses to a feedback question asked by the bot at the end of a conversation, such as “was this conversation helpful?”. Data will be stored in JavaScript Object Notation (JSON). The sample of students this data will be collected from will not be the same sample used for the pretest/posttest, as it will involve students’ self-selection (through providing feedback-related responses in conversation) or potentially refusal-related nonresponse (to “was-this helpful?” feedback questions) (Lavrakas, 2008).

**Metrics.** Research on effectiveness of chatbots for education often relies on logs and in-use feedback as an important source of quantitative information (Trevors et al., 2014). To capture information on heaviest chatbot use times, messages per hour, and similar information, middleware such as Keen.IO will be used. This data will be used to identify when students are most likely to interact with the chatbot and will help determine whether the chatbot is being used during periods when study abroad personnel are not available (e.g. holidays or after work hours).

**Data Analysis**

This research will analyze both quantitative and qualitative data collected primarily concurrently (Morse, 1991). To account for the interpretive nature of transcription and its tendency to incorporate the researcher’s own perspectives, interviewees will verify accuracy of transcripts (Sandelowski, 2018).

Table 3.2

*Research Question, Data Source, and Analysis Method Alignment*

|  |  |  |
| --- | --- | --- |
| *Research Question* | *Data Sources* | *Analysis Methods* |
| RQ1: What is the effect of a study abroad advising chatbot on study abroad heuristic knowledge? | * Pretest/posttest | * Inferential statistics (paired t-test) * Descriptive statistics |
| RQ 2: How does a study abroad advising chatbot influence student intent to study abroad? | * Interview * Concurrent feedback | * Inductive analysis |

**Quantitative analysis.** Scores from the content knowledge pretests and posttests will be analyzed using a paired *t* test in R, with R code included in an appendix. The *t* test will determine whether there was a significant difference in content knowledge scores from pretest to posttest, with an α of 0.05 and corresponding confidence level of 0.95 (“One-Group Pretest–Posttest Design”, 2017).

Chatbot metrics will be analyzed with descriptive statistics, also in R. Examples of metrics to be analyzed include usage timestamps, conversation length, and helpfulness feedback scores.

**Qualitative analysis.** Following the process described by Fereday, two coding manuals will be developed *a priori* by referring to the research questions – one for interview transcripts, and the other for chat utterances (Fereday, 2006; Saldaña, 2015). The interview coding process will involve two cycles and a hybrid (inductive/deductive) approach to coding (Saldaña, 2015).

The transcript coding manual will be used for the first codification cycle on the transcript data (a deductive approach). Inductive coding will be used in the second cycle to capture unanticipated or emergent codes. Potential code categories for transcript codes include:

* Communication habits
* Academic background
* Technological acceptance

The selection of an initial cycle of *a priori* coding using the coding manual was made to help provide structure to the transcription analysis process and help document (without suppressing) messy data in keeping with the focus on storytelling through data proposed by Daft (1983) and revisited by Sanscartier (Sanscartier, 2018; Melton, 2009).

The utterance coding manual will include primarily sentiment codes, which will be applied to utterances from conversations with the chatbot. Potential code categories for utterance codes include:

* Frustration
* Unfulfilled
* Completed
* Grateful

Given the potential for quantitized qualitative data to become unwieldy and potentially detract from the rigor of analysis applied to other data, qualitative data were kept strictly qualitative and analyzed via different methods than those used for quantitative data (Seltzer-Kelly, Westwood, & Peña-Guzman, 2012; Sandelowski, Voils, & Knafl, 2009).

**Integration.** Analyzing both quantitative and qualitative data which relate to both research questions will allow for crystallization of the research findings beyond what could be accomplished through the use of one method alone (Denzin, 2012). Specifically, mixed methods allow for the exploration of the effectiveness of the chatbot on heuristic knowledge as well as expressed intent to study abroad.

**Rigor & Trustworthiness**

Confirming the rigor of qualitative research methods is always important, but confirming the rigor of research conducted by those new to the field is especially so. To help ensure rigor, a number of methods will be used in this research. A statement on researcher subjectivity will be included as one of those methods, and a detailed description of the researcher’s subjectivity is required if this method is to strengthen the research (Peshkin, 1988). Prolonged exposure to the context and participants, not unusual for action research, will also be used. Finally, peer debriefing will help account for the researchers’ inexperience by inviting outside scrutiny and identifying weak points in the research.

**Prolonged Exposure**

Prolonged exposure is a useful method for rigor in research conducted by those new to the field, as it helps to ensure multiple viewpoints are collected over the course of the research (Baxter & Jack, 2008). As this research will be conducted in the researcher’s own context, prolonged exposure to the research problem is relatively easy to achieve, and will help ensure an effective relationship with research participants as well as an appropriate variety of participant perspectives is included.

**Peer Debriefing**

By inviting the scrutiny of third parties without conflicting ties to the research or the participants, peer debriefing is an established means of improving or confirming the rigor of qualitative research through outside perspectives, and is especially helpful for new researchers (Morse, 2015). Peers from The Citadel as well as the researcher’s degree program cohort will assist in identifying potential flaws in the research.

**Member Checking**

To guard against misconstruing interview data and to help alleviate the potential distorting effect of the researcher-participant power differential unique to The Citadel, participants will be invited to review their own transcripts for accuracy. Member checking can introduce a number of unique risks to trustworthiness and the researcher-participant relationship (Carlson, 2010). To mitigate those risks, the following steps will be taken:

* Participants will be told what to expect in their transcripts before transcripts are sent,
* Interview transcripts used for member checking will be edited according to Hickley’s transcription guide (2010),
* A member checking guide will be included with transcripts sent to participants,
* Participants will be offered the opportunity to listen to an audio version of their transcript and record audio comments in lieu of written transcripts and comments.

**Triangulation**

The use of multiple qualitative and quantitative data sources is appropriate when the problem and research questions are sufficiently complex that it may not be possible to adequately understand them with less varied data types (Bekhet & Zauszniewski, 2012). Multiple data types will be used in this research to reduce the risk of misinterpretation as well as to clarify any potential disagreement between expressed intent and study abroad knowledge pretest/posttest results. During the triangulation process, a matrix will be used to facilitate all-at-once comparison of qualitative and quantitative data (Onwuegbuzie & Weinbaum, 2016; Wendler, 2001).

**Plan for Sharing and Communicating Findings**

To ensure participants retain as much ownership in the collection and use of data as possible, they will be informed prior to, during, and after the action research process of the type of data to be collected and how it will be used to develop a study abroad advising chatbot. Verbal and written consent will also be collected to ensure data will not be shared or disseminated without respondent approval.

As the source code and knowledgebase for the chatbot will already be published on github, research findings used to develop the bot will be published along with the bot repository, as will the text of all queries used for the literature review. Using github as the repository for data as well as code will ensure data is available to participants in a persistent online format. In addition, research findings will be submitted for presentation to the Association of International Educators annual conference, as well as the annual conference of the Association for Educational Communications and Technology. As with data published on github, presentations will only incorporate anonymized data. While data ownership considerations may be generally addressed through collection of participant consent, some sharing and ownership concerns are more complex and are unique to types of data that are cooperatively constructed, such as interview data (Parry & Mauthner, 2004). As this research is founded on a transformative pragmatic paradigm, special attention was paid not just to how, but with who communication was occurring. The perspectives of those without power in this research context (students) must be captured if weaknesses and inefficiencies within The Citadel’s study abroad office are to be fully understood (Mertens, 2007).

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