Chapter 6
Social Network Applications for Education: The Case of College Connect

A. L. Chapman, M. Lei and C. Greenhow

Abstract In this chapter, the design, implementation, benefits, and challenges of using a Facebook application, College Connect, are presented. College Connect was designed to address the persistent educational problem of college access in the United States, part of which stems from students' lack of social capital, the human and information resources available to them in their social networks that can provide needed information, such as how to apply to, enroll in, and pay for college. College Connect, a social networking application which runs on Facebook, the parent platform, was designed to help address this problem by creating a network visualization of each student's Facebook Friends network and showing the student who within the network has college information in their Facebook profile. In this chapter, we explain the theory and procedures that led to the design of the College Connect application, the process of launching the application, and the benefits and challenges of implementing it with adolescent students preparing for college.

Keywords Social media · Social network sites · College knowledge · Design

A. L. Chapman (✉) · M. Lei · C. Greenhow
Counseling, Educational Psychology, & Special Education,
Michigan State University, East Lansing, MI, USA
e-mail: chapm276@msu.edu

M. Lei
e-mail: minglei@msu.edu

C. Greenhow
e-mail: greenhow@msu.edu

6.1 Introduction

In today's rapidly-changing world, people from across the globe are increasingly using social media for real-time information and connection in their everyday lives. Nearly 2.5 billion people, one-third of the world's population, use social networks, which cross geographical, cultural, and economic borders, numbers which are expected to rise as the usage of both mobile devices and social media grow worldwide [1]. In the United States, a full 78% of the population has a profile on at least one social networking site [1]. These social networking sites, including Facebook, Twitter, Instagram, Snapchat, YouTube, and Pinterest, find broad engagement in personal, professional, political, and entertainment domains. Facebook is the world's most popular social network site, though Twitter has experienced a drastic growth of users, which rose from 30 million active monthly users at the beginning of 2010 to 328 million active monthly users at the beginning of 2017 [1].

In this ever-increasing and diversifying social media space, individuals and communities involved in education—students, parents, teachers, administrators, policymakers, and other stakeholders—must better understand the affordances and constraints of this space in order to use it to an educational advantage. Social media, through online communities, communication tools, and a variety of modes and methods of communication, presents many possibilities for education. Social media can facilitate low-cost resource and information sharing, which may increase educational opportunities regardless of geography, socioeconomic context, or other barriers to educational resources.

Though the educational uses and potential of social media are considerable, educational applications that build on Facebook's features and affordances are rare. This chapter is concerned with the design, implementation, benefits, and challenges of one such Facebook application, College Connect, which was created to facilitate adolescents' college knowledge and help-seeking. Teenagers' development of college knowledge and help-seeking is important to advancing their college access, or whether students are able to and intend to attend college. Historically, in the United States, college access has varied among groups. In 1992, 42% of Whites, 35% of African Americans, and 26% of Latinos attended a 4-year college or university [2]. The disparity in college enrollment has existed between White students and students of color since the 1970s and has persisted into the new millennium [3]. Differences in college access have been attributed to socioeconomic status, but others have argued that income alone does not account for this gap [4]. Parents and students who play the "game of education," behaving in ways that are considered desirable and legitimate, have an advantage over those who do not [5, 6]. Therefore, a critical element of accessing college is possessing and activating the knowledge of college in the way that is determined by the dominant cultural group.

College knowledge includes, among other things, the process of applying to, selecting, and enrolling in a college; of understanding and choosing how to pay for college; and of understanding the academic and cultural differences between high school and college [7]. In choosing a college and preparing to attend college,

most students examine financial aid, standardized test and GPA requirements for admission, a college's graduation rate, and a college's reputation [8]. However, this information, and college knowledge more generally, is not always readily available to all high school students who are interested in attending college, and students' choices for schools may be based on incomplete information about their eligibility [9]. Students who have fewer resources in their immediate physical networks often are at a disadvantage in the college application and selection process [10]. Alternatively, social network sites have the potential to be effective information-seeking channels due to their technical and social affordances, such as the ability to broadcast content and aggregate one's contacts.

Recent scholarship suggests that social networks can provide the space and tools which help users more easily access resources that are not immediately apparent, particularly in the area of college access [11–13]. Although some research has examined how youth seek information through social media use, little is known about students' use of social media to develop college knowledge [14]. As adolescents are inclined to seek out others to meet their need for information, investigating their social media use regarding outreach to others in the college application process is an important extension to the literature [15].

In the case presented in this chapter, we examine the design and implementation of the College Connect application, which runs on the social media platform Facebook, built for the purpose of addressing the aforementioned gap in access to college knowledge among American high school students. The purpose of College Connect was to allow users to visualize their Facebook network and to identify who in their network has college knowledge. The application also has features through which users can ask Friends in their network questions about college generally or about a particular college more specifically. A design-based research approach guided this project's design and implementation efforts [16–18]. Design-based research helps bridge the research-to-practice gap by drawing on established research methods with the goal of informing not just the knowledge base but also improving educational practices [18]. Reeves advocates four steps in the design-based research process: (1) analyze the practical problem; (2) develop solutions; (3) implement the solution in situ, building in evaluation and refinement in successive iterations; and (4) reflect on findings to produce theoretical and practical insights [17]. In alignment with steps 1–3 of this model, this chapter describes the process undertaken to assess the problem by reviewing selected, previous research on college knowledge, help-seeking, social capital and social network sites, especially research which addresses the experiences of high school students, our target users. Moreover, the designed solution, in the form of an educational application built on Facebook is presented. From our testing and evaluation of College Connect, we draw insights on its benefits and challenges to inform future efforts.

In the following sections, we first seek to situate our work in the current landscape of relevant educational theory and research. Second, we present the design and implementation of the College Connect application, including why it was designed and the challenges of implementing that design as intended. Third, we conclude by offering practical guidance and recommendations intended to inspire designers

and researchers who seek to design similar applications, especially those targeting adolescents and academic contexts.

6.2   Social Network Sites

The College Connect application was designed to run on the social network site Facebook. Social network sites (SNS) are a form of social media, which differ from other types of social media and virtual communities by relying on user-created content and the links that users make with each other. Specifically, there are three hallmarks of social network sites. First, social network sites have profiles unique to each user which consist of user-supplied content, information provided by other users, and/or data which is supplied by the system. Secondly, social network sites have public connections which can be viewed and navigated by others. Thirdly, participants on social network sites can consume, produce, and interact with user-created content contributed by other users [19]. Interactions between users on social network sites have been shown to increase and diversify the connections that users make, as well as helping those users to create and sustain social ties [20, 21].

6.3   The Use of Social Network Sites in Education

Given the widespread and increasing use of social network sites, researchers have begun to explore and evaluate their educational uses. Kert and Kert, for instance, researched the use of social network sites by high school students and asked them about their perceptions of whether social network sites could be useful for education and learning [22]. This research showed that high school students often use social network sites to keep in touch with other similar-age peers, and that students who were surveyed felt it would be good to use these sites for educational reasons. Another study by Ekici and Kiyici showed that students who used social network site applications for specific educational purposes were more academically successful than students who did not have access to these social media applications and were educated without that technology [23].

In thinking about the educational uses of Facebook, Lin, Hou, Wang, and Chang argued that Facebook shows great potential for use in education because of its structure for creating applications, communication tools, and interactive interface [24]. Another important aspect of Facebook is how common and frequently it is used by high school students. A study by Cakir and Serkan Tan found that students spent on average 15 hours per week on Facebook [25]. These authors concluded that the educational use of applications built on social network sites was inevitable, as high school students are familiar with these sites and frequent users of them. However, recent work by Cakir and Tan, published in 2017, noted that of the first 10 applications with the most active users on Facebook, 7 are games primarily for entertainment

(e.g., Candy Crush Saga, Farmville, Angry Birds) and not for instruction. While the educational potential for applications built on Facebook is substantial, the creation, use, and evaluation of these applications has been rare in both educational research and practice [25].

6.4 Theoretical Perspectives

In the case of the College Connect application, we drew upon social capital research and theory from the field of sociology and the help-seeking literature from the field of psychology to guide the design and study of the application. Critical to the help-seeking literature is the identification of two types of help-seeking [26]. There is *executive help-seeking*, when the seeker is looking for another person to solve a problem. Alternatively, there is *instrumental help-seeking* when the seeker is asking for help which would allow the seeker to solve the problem [26]. Help-seeking can and should be seen as a sign of independence, but obstacles can preclude people from seeking the help that they need. These barriers include fear of a loss of credit when something goes well; the perception of a lack of competence; and a desire not to appear helpless. Adolescents' help-seeking processes are important to observe and evaluate because the processes can influence major life choices and affect identity development and later life experiences [27–29].

Social capital has been defined as the sum of resources available in one's network of relationships with other people [30]. Social capital can be generated by mutualistic relationships involving reciprocity and mutually-adopted norms [31]. According to Portes, some of the benefits of increased social capital are access to privileged information and increased access to economic resources. Social capital has been described as being distributed unequally among groups, particularly members of minority groups [32]. For example, individuals from a lower social class who have few connections would continue to propagate that lack of connections to future generations and be unable to acquire information for economic opportunities. This will be addressed in more detail in this section.

Social capital for any given individual comes directly from relationships with other people, and the nature of those relationships makes others a resource to the individual [31]. One example provided by Portes is the norm of "repaying one's debts." The knowledge one has of another's adherence to that norm becomes a resource which can be used to lend money with the peace of mind that the borrower will repay the loan. Moreover, social capital may also be seen as the sum of favors or obligations owed, which may be settled at some undetermined time and in an undecided form, also known as reciprocity exchanges [31]. Similar to the expectation of reciprocation, enforceable trust can be a source of social capital, where behaviors are community-enforced. For example, students may participate in class because of their fear of social disapproval for being quiet; therefore, a teacher may use this resource to ask more questions and build in more student-centered activities in the class. Moreover,

people in the same situation tend to be supportive of others in the same situation, which makes "bounded solidarity" another source of social capital [31].

Aside from the direct economic implications of social capital for students and young adults (e.g., improved opportunities for job-seeking), social capital can affect their college-going experiences. One part of many college applications, teacher recommendation letters, are produced through accessing social capital through reciprocity exchanges. In high school, students are supposed to be active learners in class, involved by asking questions, taking on challenges, and generally displaying interest for the subject matter. Accordingly, teachers are supposed to recognize these students and be prepared to reciprocate in response to the students' efforts by providing a well-written endorsement for the acceptance of that student into their college of choice. Students who are not aware of this dynamic would be significantly disadvantaged, as they would have fewer individuals, specifically teachers, who they could call upon to provide a recommendation letter. Similarly, bounded solidarity appears in schools as students provide support to their peers in the same situation. For example, students who are applying to the same competitive college may be more inclined to put forth their greatest effort on a group project in class, since both their chances of acceptance are dependent on their grades in the class. Furthermore, students who all identify as being first-generation college students may band together and form an organization to support each other and others in the same situation.

Bounded solidarity is one source of social capital that tools like College Connect may afford to students. By helping prospective students find current students or alumni from their school of choice, we are tapping into those individuals' inherent willingness to help students they feel are similar to themselves (e.g., I remember what it was like applying to that college, I think they should know about…"). Additionally, expanding a student's pool of social connections also increases access to sources of social capital. For example, while a student may not have any set of reciprocity exchanges for applying to college, a connection may have such a source of capital, which he or she could use to help the student.

Portes outlined three main types of effects due to social capital [31]. Social capital may serve as a way of controlling socially desirable behaviors, providing family-based support, and gaining support from contacts outside of the family. These effects can be influenced by multiple social factors, such as family structure (e.g., number of parents) and can be disrupted by life circumstances, such as relocation. When a family moves from one community to another, potential extra-familial supports may be lost, diminishing the family's social capital, which may explain the decreased probability of attending college among students from more mobile families [33]. Similarly, the number of years students have lived in their home has a positive effect on staying in school [34]. Within the family, the parents may or may not be able to help their children with the college-going process, based on their own experiences and resources. For example, parents who did not attend college were less likely to talk to their children about the college application process and were less likely to engage in activities related to applying to college, such as attending college visits and learning about financial aid [35].

The ways in which social capital benefits students is affected by the nature of the relationship, and may originate from the family, the school, and the community [36]. However, for students, the quantity and quality of relationships at home, in school, and in the community may vary greatly. Fortunately, for many students, their connections with others go beyond those people in their immediate microsystems, or people they interact with directly in their homes, school, or community [37]. Instead, with online social networks, students may cultivate weak ties, or relationships outside of one's immediate social circle, who may help one gain social mobility, such as employment prospects [38]. Therefore, the potential affordance of social media in the context of college access is its ability to help students access social capital from their extended social networks to help with the college-going process.

Furthermore, the help-seeking process in relation to college knowledge and the process of college-going is particularly important for high school juniors and seniors. College knowledge, what students need to know in order to successfully apply, select, and matriculate to college, includes obtaining practical information (such as application procedures and deadlines or financial aid), social information (such as the general community of a particular college) and the development of an identity related to college-going (such as learning to navigate college campuses and understanding the structures of college) [39]. In examining human resources who have college knowledge, it has been found that not all students have equal access to people with college knowledge [40]. Tornatzky, Culter, and Lee found that parents who had low socioeconomic status were the least likely (of low, middle, and high socioeconomic status parents) to have college knowledge [40]. This was also found to be true of parents who were first generation immigrants (compared to second and third generation immigrants) [40]. Both the low SES parents and the first generation immigrant parents had a far more difficult time in accessing college information; they were also far more likely to lack college knowledge themselves. However, this study also found that the use of interactive media was able to break many of the access problems that were experienced by low SES and first-generation immigrant parents [40].

When students look to online sources for college knowledge, one of the primary sources of information is a college's website [41]. However, college websites are limited in their applicability as sources of college knowledge. One such limitation is that websites do not often offer two-way communication. Prospective students independently locate blogs and message boards where they can interactively find information about a specific college, but most college websites do not help prospective students to find these sources of information [42]. The use of online sources of information for college knowledge seeking was the focus of a study by Brown, Wohn, and Ellison, who examined the role that online sources of help played in the college knowledge seeking process of students from low-income communities [43]. This study looked at how and where students accessed information about college online, how the students evaluated the information that they found, what human resources were available to these students in their college knowledge seeking process, and how online sources of information were used by the students [43]. The authors found that students used websites to get information about the cost, ranking, and programs of different colleges, but they used social media to connect with current college students

to gain insight into college culture [43]. The study also found that the students they surveyed posted on social media about college, but they did not use social media to ask questions or crowd-source information [43].

Seeking to advance this literature, the College Connect application was designed to examine whether using popular social network sites (in this case, Facebook) and specialized applications within those sites could facilitate students' process of acquiring college knowledge. First generation high school students especially may have fewer informational resources in their household regarding the college application process and other aspects of getting to college. Wohn, Ellison, Khan, Fewins-Bliss and Gray found that for first generation students, the extent to which students felt they could access information via Facebook played a large role in their efficacy regarding college-going [13]. In other words, the more students felt they could access information about college via their Facebook network, the more confident they felt about their knowledge of the college application processes (e.g., being Friends with someone on Facebook who graduated from or currently attends college contributed to students' perception of how successful they would be in attending and completing college). However, the same finding was not true for students who had parents that attended college.

In addition, high school students are often unaware of who knows what in their network. In their interviews with high school students, Wohn and colleagues learned that many students did not know who in their network attended college or what college they attended [13]. Some students did not know whether their parents had attended college. The College Connect Facebook application addresses two components of social capital: helping to identify sources of useful information and providing access to those sources (or connections). As Ellison, Steinfield, and Lampe suggested, Facebook can lower barriers for communication because it offers private and public messaging features and provides access to identity information via users' profiles [44]. These affordances allow students to determine who would be useful to talk to about a particular question, and also help them to find common ground.

6.5   Design of the College Connect Facebook Application

College Connect was a web-based Facebook application designed in 2013 with funding from the Gates Foundation's College Knowledge Challenge Grant competition. The application was created to help students identify useful people in their Facebook Friends' network and ask these people questions about college. The development of the College Connect application was a collaboration between researchers and software developers at Oxford University (Dr. Bernie Hogan and his team) and researcher-evaluators at Michigan State University (Dr. Christine Greenhow) and the University of Michigan (Dr. Nicole Ellison)[1]. After reviewing the academic literature on college access, social media, and social capital, these scholars decided to

---

[1] Jeon et al. [45]
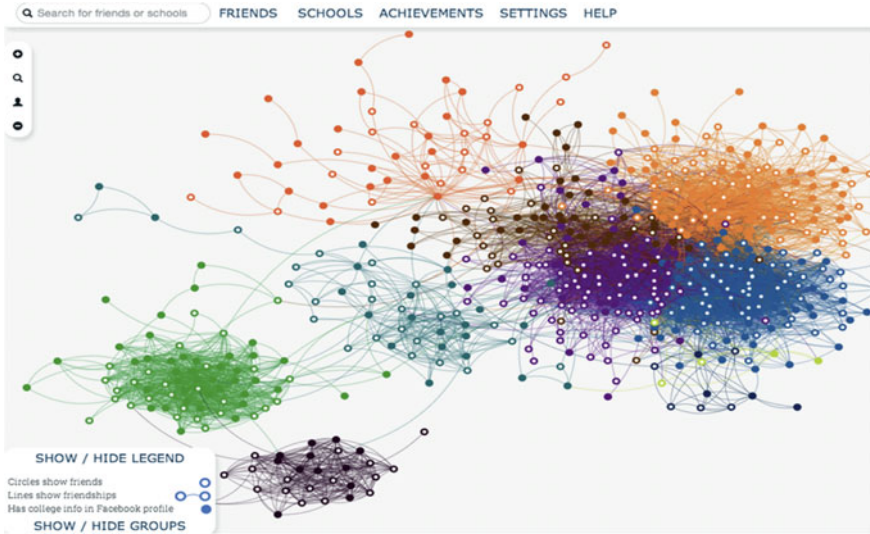
Fig. 6.1 Example of the College Connect network visualization

run College Connect on Facebook, because relationship and profile data available within Facebook could be harnessed to surface relevant social resources for teens as they envision their future and engage in the college application process [46]. The College Connect app draws upon data from Facebook and works most effectively when users reach out to other Facebook Friends. More specifically, College Connect visualizes a user's Facebook network, or the set of their Facebook Friends as well as the friendships between these Friends (See Fig. 6.1).

The designers used conventions from social network analysis to represent this network. A user is a 'node' signified by a circle. A Friend is an 'edge' signified as a line between two nodes. The arrangement of the nodes is automatically determined by a network layout algorithm. The coloring of the nodes is automatically determined by a community detection algorithm, such that likely members of a specific cluster have like-colored nodes. If the Friend has a college or university listed in his or her profile, the dot is colored-in; Friends who do not have a college or university listed in his or her profile are indicated by a dot that is not colored-in (See Fig. 6.2). College Connect users can explore their network visualization (e.g., by zooming in or clicking on specific nodes) for Friends that have college information in their profile, and they can search for specific Friends or colleges/universities in which they are interested (See Fig. 6.2).

Furthermore, the College Connect Facebook application was designed to include a list of suggested questions, that address common college-related information needs, which students could ask their Friends network (See Fig. 6.3). The app allows users to send inquiries to people in their network via Facebook's private messaging (See Fig. 6.4).
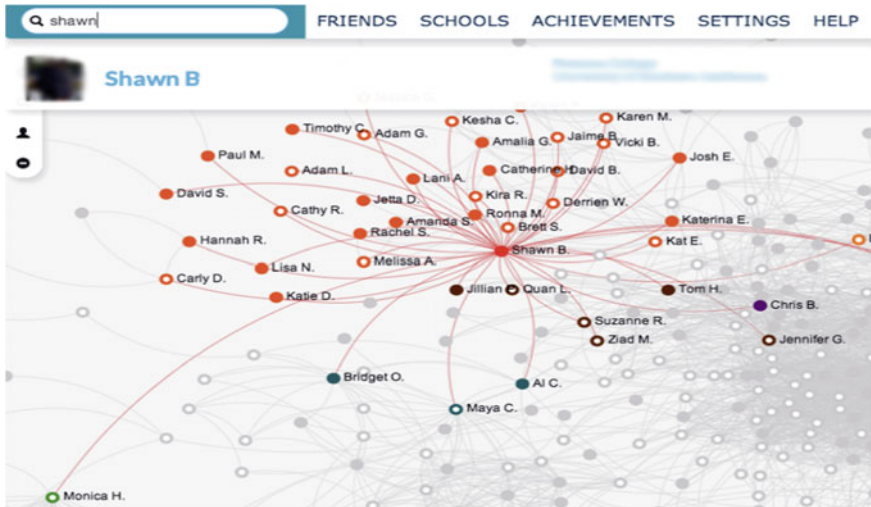
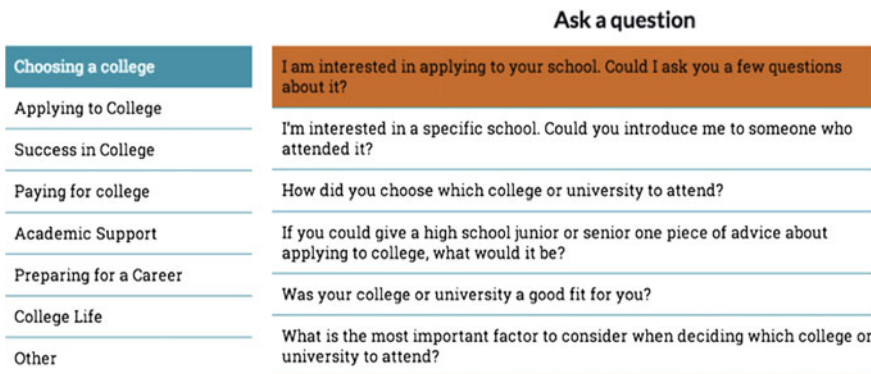**Fig. 6.2** Example of a highlighted friendship network

Fig. 6.3 Example of a list of suggested questions

The College Connect application connects to the Facebook Graph API (version 1.0) to access a user's Friends and the connections between these Friends. To use the API, the College Connect application must be granted explicit permission by the user to view Friends and Friend data. The ability for third parties to access this data was no longer available as of Facebook Graph API (version 2.0). Nevertheless, this work demonstrates what can be done with social network data, not exclusively with Facebook data in their current state.

The design of the College Connect Facebook application was fueled by research which found that Facebook use increases social capital when users are active and engaged [20, 47]. College Connect was designed to accelerate this process for a key demographic (i.e., high school students) at a critical time in their adolescent and
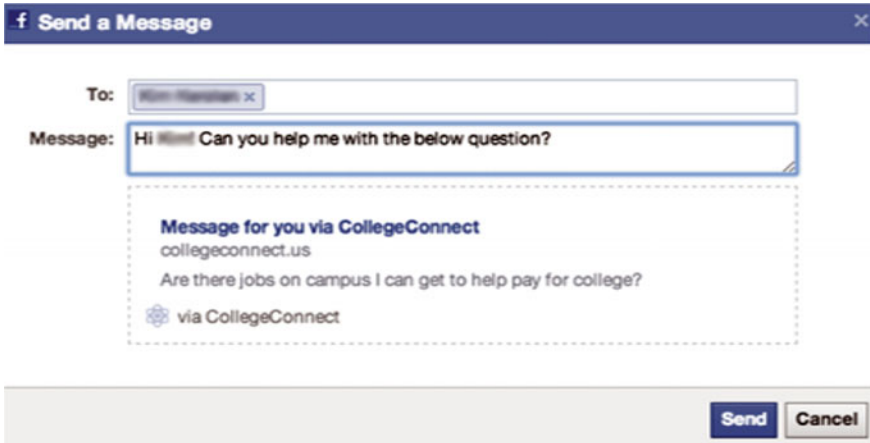
Fig. 6.4 Example of sending a question

educational development (i.e., transition between high school and college). Robelia, Greenhow, and Burton, in studying another Facebook app (HotDish), found that 16–24 year olds were more likely to adopt Facebook apps than use other online resources for educational purposes because: (1) they are easily integrated into their existing daily Facebooking routines, (2) Facebook provided an informal context with which they were already familiar and compelled to participate, and (3) they perceived people on Facebook as 'like-minded' and so felt comfortable interacting [48].

The findings of this prior research were taken into account during the development of the College Connect app, and thus the design of the app was unique; at the time it was developed, there were no other apps that did exactly what College Connect was designed to do. Although there were free, online apps that produced visualizations of users' Facebook networks (e.g., Touchgraph, Friendwheel), there were no applications that offered young people a compelling, easy-to-navigate visualization of their network which was tailored specifically to address information-based college access issues. The College Connect app was designed to provide students with a fun, engaging way to see who is connected to whom within their network and to surface relevant college-related information from these contacts.

The foundation and catalyst for the College Connect application was a Facebook application called NameGenWeb, developed by Hogan and his colleagues at the Oxford Internet Institute. This more generic Facebook application was the culmination of years of work trying to optimize the algorithms for interfacing with social network information on Facebook in a way that respects privacy policies, leverages API standards at Facebook, and keeps abreast of visualization technologies[2]. Using NameGenWeb, the average user could authorize the application, download their own network, visualize it, and begin exploring friendship relationships among their Face-

---

[2]Hogan [49]

book Friends. The application visualized network relationships in an enlightening way, inviting users to explore their network and the web of relationships that constitute it.

Moreover, to guide the development of College Connect, Ellison and Greenhow interviewed 45 high school students in rural Michigan. Students were shown a version of their own Facebook network visualized by a modified version of NameGenWeb, developed by Hogan, and were interviewed about it. These preliminary data informed the design of the College Connect app. Following these interviews, NameGenWeb was modified for the purpose of enabling high school students to visualize their Facebook network and important personal characteristics of their connections in relation to college-going.

Thus, the new application, College Connect, was a social network visualization and exploration tool that downloaded, processed, and represented Facebook personal networks. Most importantly, compared to NameGenWeb, College Connect was designed to have a stronger emphasis on deployment and usefulness for addressing the user's need for college knowledge as identified in preliminary interviews with high school students and in the educational research literature. Where NameGen-Web showed an individual's network with contemporary layouts and clustering, pan and zoom, and click-to-filter functionality, College Connect extended these tools in two significant ways to make it an app for prompting trust-based conversations about issues that are relevant to high school students' college-going. First, the app highlighted individuals in the student's network who either had college experience or "liked" a particular college. This capability was supposed to make the challenge of locating college-related resources in one's network easier, faster, and friendlier. Secondly, College Connect allowed users to easily reach out to Friends who may have college knowledge. This process of reaching out was facilitated through both technical and social affordances embedded in the College Connect app and in Facebook itself. With one click, students were able to send a message pre-populated with questions derived from the academic literature on barriers to college access. They could also type their own queries if desired. By embedding this conversation in the Facebook system, the project team hoped that users would be able to capitalize on shared common ground (as indicated in profile fields) and the shared connections between them. Our data from the interviews with high school students suggests students are more comfortable inquiring of a Facebook Friend or a "Friend of a Friend" than a complete stranger.

6.6   The Benefits and Challenges of the Implementation of College Connect

Upon launching College Connect in late 2013, we encountered several implementation benefits and challenges. First, we were pleased that the application provided key functions as intended. These included a network visualization of the students'

Friends network; an indication of who in-network had college information in his or her profile; the capacity to search the network for a college or university name, by geography, or by person; and the ability to message people a question related to college through Facebook's direct messaging. In beta-testing with a small group of high school juniors and seniors, we found that students generally understood the application's features and could see the utility of having a Facebook application devoted to messaging potential contacts about college-going issues.

However, we also encountered a number of implementation challenges that limited College Connect's utility and broad deployment. First, we found that students experienced long wait times for their network visualizations to be generated during beta-testing and follow-up implementation. This was the result of Facebook's design and API. For College Connect to function properly, it needed access to information from its users' profiles and social networks, for which users had to grant explicit permission. The process of collecting and representing this information was affected by the size of social networks. In cases when users had an excess of 700 connections, the process as long as 15 min. Given that the research has suggested the average size of adolescents' Facebook networks were around 500 Friends, this posed a significant hurdle to College Connect's utility [21].

A second implementation challenge we faced was that we did not have sufficient server space to accommodate more than a small number of College Connect users at any given time. While the metrics for the College Connect application (i.e., number of daily, weekly, and monthly users via Facebook insights) revealed an average of approximately 10 users per day in November 2013, resolving these issues was paramount if the app was to scale.

To that end, we requested supplemental funding, from the College Knowledge Grant program sponsored by the Gates Foundation, to help kick start the success of the College Connect (CC) application and increase its impact on students. In early 2014 funds were requested for additional development efforts to optimize the app's performance through a re-designed workflow. Specifically, while the generation and presentation of the College Connect network visualization was very slow and time intensive, much of the querying of the user's friends and the friends' schools was not. Thus, a re-designed work flow, we hoped, would expose search and browse by school and by friend while students were waiting for the network to load. As College Connect was originally designed, it did not provide a way for the user to do much of the querying by school and messaging without going through the network download step. Additional development efforts that focused on redesigning the workflow so that students could see and browse by school and message first and then see the network when it was ready would have been a significant improvement. This supplemental request was ultimately unfunded. Thus, a third implementation challenge we faced was in generating the additional resources (i.e., paid developers' time, improved server capacity, continued beta-testing and bug fixing, marketing to attract and grow a user base), beyond the initial pilot investment (i.e., $100,000). These resources were needed to improve the immediate feedback and engagement that student-users expected, while continuing to refine, grow and market the application.

6.7   College Connect as a Proof-of-Concept Pilot Study

In order to understand whether and how high school students perceived the application as helpful for their college going process, we conducted a small-scale pilot study with two groups of high school students in 2014. We recruited 12th grade students (n = 22) from two schools: a Minnesota high school, where they were involved in an afterschool program which aimed to help low-income students apply for and gain admission to a four-year college; and a Michigan public magnet school, which focused on college preparation. All students were high school seniors, had used Facebook for at least one year, and were actively using Facebook at least twice a week.

In trying out the College Connect app with this group of students, we were particularly interested in students' conceptions of *help* related to college information-seeking and the types of information, such as that related to the college knowledge literature, that students identified using College Connect. Participants completed an online survey prior to using the College Connect app; this survey asked them about their help-seeking practices regarding their searches for information related to the college-going process. As part of the survey, participants were asked to identify people from whom they could seek help regarding college information.

Following the online survey, participants completed one-on-one, semi-structured interviews about their help-seeking processes as they pertained to college knowledge. Within the interview, subjects participated in a think-aloud activity with a researcher while using the College Connect application. Participants were invited to navigate their individual Facebook networks using the College Connect app as the researcher asked open-ended questions about what they were seeing, how they were understanding the app, and whether and how it was useful. While results from this research have been published elsewhere, we point out here that although students did not view Facebook as a platform they would use for help with college-going, they did see value in a designed Facebook application for this purpose [50]. We are currently working on a more detailed analysis from this pilot data to report on the nature of their help-seeking with College Connect compared to their perceived use of Facebook generally and other online resources.

6.8   Conclusions and Recommendations

The College Connect Facebook application, from conception through design to implementation, was intended to be unique, helpful to high school students' college-going process, and piggyback on their existing Facebooking routines. Developing and implementing the app, however, presented several challenges, as described above. As a result of both the benefits and challenges to the design and implementation of the College Connect app, the authors seek to provide practical guidance and recommendations for designers of future social network site applications.

Creating a visualization of one's social network, and making it attractive, is not an idea unique to the College Connect app. However, to our knowledge, there have been few efforts to leverage people's initial interest and engagement in their visualized social network into long-term, strategic social interactions toward actionable goals (e.g., building a college-going peer group) that address pressing social problems (e.g., improving college access and college-going). By adding features such as messaging with identified 'experts,' or more knowledgeable peers in the network, we believe we have moved network visualizations beyond 'cool' to make them useful for students in addressing the college knowledge challenge. (Note that by using the term "experts," we do not mean those with privileged or rare information or skills, but rather someone who knows something that the user wishes to know more about.) This could be a particular school (e.g., Michigan State University), a particular major (Nursing), or a particular experience (e.g., being a Latina in a mostly White college). Our application is a novel consolidation of rapidly maturing visual technologies and access to Facebook's rich source of personally-meaningful data. Many applications can already display networks. Many applications can provide simple summaries of users' networks. However, the focused unification of these two aspects in a way that makes networks both visually appealing and actionable is a distinct novel experience.

Furthermore, one of the most significant challenges to the successful roll out of the app was the length of time required by the app to download user's Facebook data. This wait time negatively impacted user experience and the overall utility of the College Connect app. Going forward, future social network site apps should take into account not only user experience broadly but also specifics (as in our case, the need to download significant amounts of data) which can and likely will greatly impact user experience. We recommend that throughout the design process that researchers, developers, and educators work more closely with the Facebook developer community to ensure that the structures (including, but not limited to, hardware and financial considerations) which support the application being built can fully support that application.

We hope design teams might build on the insights we have generated in this small scale, exploratory project to engage with Facebook's development community over a longer time horizon to design similar, novel applications aimed at addressing persistent educational problems. Facebook is a global platform, and it continues to be the single largest social media platform adopted by today's young people, connecting billions of youth all over the world. Yet, educators and educational technology designers have not only under-examined Facebook's potential for K-12 students' learning and teachers' pedagogy, the Facebook parent platform remains largely un-leveraged by learning technology designers [51–53].

We offer this rich description of the process of developing and implementing the College Connect app as a case study for future researchers, designers, and educators, as well as the many people who are interested in the varied and interesting ways in which social media, and social network sites specifically, can be used in the field of education. In spite of the challenges that we faced in our initial implementation of the College Connect application, the applicability of social network sites in the field of education remains viable and substantial. Our focus on usability, a visually appealing

interface, and an academic interest in effective outcomes provides a template for future social network site applications to strive to be even more seamless, creative and usable as College Connect.

References

1. Social Media Statistics and Facts. (August 2017). Retrieved August 30, 2017, from https://www.statista.com/topics/1164/social-networks/.
2. Perna, L. W. (2000) Differences in the decision to attend college among African Americans, Hispanics, and Whites. *The Journal of Higher Education, 71*(2), 117.
3. Lucia, K. E., & Baumann, R. W. (2009). Differences in the college enrollment decision across race. *American Economist, 53*(1), 60–74.
4. Peng, S. S. (1977). Trends in the entry to higher education: 1961–1972. *Educational Researcher, 6*(1).
5. Lamont, M., & Lareau, A. (1988). Cultural capital: Allusions, gaps and glissandos in recent theoretical developments. *Sociological Theory, 6*(2).
6. Lareau, A., & Horvat, E. M. (1999). Moments of social inclusion and exclusion: Race, class, and cultural capital in family-school relationships. *Sociology of Education, 72*(1), 37–53.
7. Hooker, S., & Brand, B. (2010). College knowledge: A critical component of college and career readiness. *New Directions for Youth Development, 127*.
8. Hoxby, C. M., & Turner, S. (2015). What high-achieving low-income students know about college. *American Economic Review, 105*(5), 514–517.
9. Orfield, G. (1992). Money, equity, and college access. *Harvard Educational Review, 62*(3), 337–372.
10. Ellison, N. B., Wohn, D. Y., & Brown, M. G. (2014). Social media and college access. *Interactions 21*(4), 62–65.
11. DeAndrea, D. C., Ellison, N. B., LaRose, R., Steinfield, C., & Fiore, A. (2012). Serious social media: On the use of social media for improving students' adjustment to college. *The Internet and Higher Education, 15*(1), 15–23.
12. Gray, R., Vitak, J., Easton, E. W., & Ellison, N. B. (2013) Examining social adjustment to college in the age of social media: Factors influencing successful transitions and persistence. *Computers & Education, 67*, 193–207.
13. Wohn, D. Y., Ellison, N. B., Khan, M. L., Fewins-Bliss, R., & Gray, R. (2013). The role of social media in shaping first-generation high school students' college aspirations: A social capital lens. *Computers & Education, 63*, 424–436.
14. Forte, A., Dickard, M., Magee, R., & Agosto, D. E. (2014). What do teens ask their online social networks?: Social search practices among high school students. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '14)* (pp. 28–37).
15. Meyers, E. M., Fisher, K. E., & Marcoux, E. (2009). Making sense of an information world: The everyday-life information behavior of preteens. *The Library Quarterly, 79*(3), 301–341.
16. Barab, S. (2006). Design-based research: A methodological toolkit for the learning scientist. In R.K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 153–170). Cambridge: Cambridge University Press.
17. Reeves, T. C. (2006). Design research from a technology perspective. In J. V. den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Education design research* (pp. 52–66). London: Routledge.

18. Vanderhoven, E., Schellens, T., Vanderlinde, R., & Valcke, M. (2016). Developing educational materials and risks on social network sites: A design-based research approach. *Educational Technology Research and Development, 64*(3), 459–480.

19. Ellison, N. B., & Boyd, D. M. (2013). Sociality through social network sites. In W. H. Dutton (Ed.), The Oxford handbook of internet studies (pp. 151–172). Oxford: Oxford University Press.

20. Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "Friends": Social capital and college students' use of online social network sites. *Journal of Computer Mediated Communication, 12*(4), article 1.

21. Greenhow, C., & Burton, L. (2011). Help from my "friends": Social capital in the social network sites of low-income students. *Journal of Educational Computing Research, 45*(2), 223–245.

22. Kert, S. B., & Kert, A. (2010). The usage potential of social network sites for educational purposes. *International Online Journal of Educational Sciences, 2*(2), 486–507.

23. Ekici, M., & Kiyici, M. (2012). Using social networks in educational context. *Usak Universitesi Sosyal Bilimler Dergisi, 5/2*, 156–167.

24. Lin, P. C., Hou, H. T., Wang, S. M., & Chang, K. E. (2013). Analyzing knowledge dimensions and cognitive process of a project-based online discussion instructional activity using Facebook in an adult and continuing education course. *Computers & Education, 60*(1), 110–121.

25. Cakir, R., & Serkan Tan, S. (2017). Development of educational applications on the social network of Facebook and its effects on students' academic achievement. *Educational Sciences: Theory & Practice, 17*(5).

26. Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review, 1*(3), 224–246.

27. Nurmi, J. E. (1991). How do adolescents see their future? A review of the development of future orientation and planning. *Developmental Review, 11*(1), 1–59.

28. Clausen, J. (1991). Adolescent Competence and the shaping of the life course. *American Journal of Sociology, 96*(4), 805–842.

29. Sirin, S. R., Diemer, M. A., Jackson, L. R., Gonsalves, L., & Howell, A. (2004) Future aspirations of urban adolescents: a person-in-context model. *International Journal of Qualitative Studies in Education, 17*(3), 437–456.

30. Bourdieu, P. (1985). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). New York: Greenwood.

31. Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology, 24*(1), 1–24.

32. Loury, G. (1977). A dynamic theory of racial income differences. *Women, Minorities, and Employment Discrimination, 153*, 86–153.

33. Kim, D. H., & Schneider, B. (2005). Social capital in action: Alignment of parental support in adolescents' transition to postsecondary education. *Social Forces, 84*(2), 1181–1206.

34. Israel, G., & Beaulieu, L. J. (2004). Investing in communities: Social capital's role in keeping youth in school. *Journal of the Community Development Society, 34*(2), 34–57.

35. Choy, S. P., Horn, L. J., Nuñez, A. M., & Chen, X. (2000). Transition to college: What helps at-risk students and students whose parents did not attend college. *New Directions for Institutional Research, 2000*(107), 45–63.

36. Nelson, I. A. (2016). Rural students' social capital in the college search and application process: Rural students' social capital. *Rural Sociology, 81*(2), 249–281.

37. Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*(7), 513.

38. Granovetter, M. S. (1974). *Getting a job: A study of contacts and careers*. Cambridge, MA: Harvard University Press.

39. Hooker, S., Brand, B. (2010). College knowledge: A critical component of college and career readiness. *New Directions for Youth Development, 127*.

40. The Tomás Rivera Policy Institute. (2002). *College knowledge: What Latino parents need to know and why they don't know it*. Claremont, CA: Tornatzky LG, Cutler R, & Lee J.

41. Stoner, M. (2004). How the web can speak to prospective students. *The Chronicle of Higher Education, 50*(34), B10–B11.
42. Tucciarone, K. M. (2009). Speaking the same language: Information college seekers look for on a college web site. *College and University, 84*(4), 22.
43. Brown, M. G., Wohn, D. Y., & Ellison, N. B. (2016). Without a map: College access and the online practices of youth from low-income communities. *Computers & Education, 92*, 104–116.
44. Ellison, N. B., Steinfield, C., & Lampe, C. (2011). Connection strategies: Social capital implications of Facebook-enabled communication practices. *New Media & Society, 13*(6), 873–892.
45. Jeon, G. Y., Ellison, N. B., Hogan, B., & Greenhow, C. (2016). First-Generation Students and College: The Role of Facebook Networks as Information Sources. In *Proceedings of the 2016 ACM Conference on Computer-Supported Cooperative Work and Social Computing [CSCW'16]*. San Francisco, CA.
46. Ellison, N. B., Wohn, D. Y., Khan, M. L., & Fewins-Bliss, R. (2012). Reshaping access: An overview of research on access to higher education, social media and social capital [White paper].
47. Greenhow, C., &Burton, L. (2011). Help from my "friends": Social capital in the social network sites of low-income students. *Journal of Educational Computing Research, 45*(2), 223–245.
48. Robelia, B. A., Greenhow, C., & Burton, L. (2011). Environmental learning in online social networks: Adopting environmentally responsible behaviors. *Environmental Education Research, 17*(4), 553–575.
49. Hogan, B. (2015). From Invisible Algorithms to Interactive Affordances: Data After the Ideology of Machine Learning. In *Roles, Trust, and Reputation in Social Media Knowledge Markets* (pp.103–117). Springer.
50. Greenhow, C., Chapman, A., & Lei, M. (2017). Help from friends: Facebook's pPotential for adolescents' academic help-seeking. In P. Resta & S. Smith (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2017* (pp. 852–855). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).
51. Greenhow, C., & Askari, E. (2017). Learning and teaching with social network sites: A decade of research in K-12 related education. *Education and Information Technologies*, 1–23.
52. Manca, S., & Ranieri, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning, 29*(6), 487–504.
53. Manca, S., & Ranieri, M. (2016). Is Facebook still a suitable technology-enhanced learning environment? An updated critical review of the literature from 2012 to 2015. *Journal of Computer Assisted Learning, 32*(6), 503–528.