UNDERSTANDING AND SUPPORTING COLLEGE STUDENTS' HELP-SEEKING BEHAVIOR

by

ERKAN ER

(Under the Direction of Michael Orey)

ABSTRACT

Asking for help is a fundamental strategy that learners use to overcome barriers to learning in any context. The positive effects of help-seeking on student learning and achievement have been widely acknowledged. Help-seeking has gained further attention with the emergence of new blended instructional models that embrace student-centered approaches and place a greater responsibility on students. Among these emerging blended approaches, the flipped classroom model has been very popular in last years. The flipped classroom model requires students to independently study the instructional materials and various learning resources (e.g., video lectures) outside the classroom and develop a sufficient understanding of the concepts. While studying the assigned materials themselves, students may face various learning difficulties that can be resolved with the support of class members at any time, and in this way, they can become prepared for the upcoming in-class activities. Therefore, help-seeking is an essential activity for student learning in flipped classrooms.

This dissertation research focuses on college students' help-seeking behavior in a large-enrollment flipped science classroom over several semesters and aims to expand the current understanding of online help-seeking in several directions. The first manuscript (Chapter 2)

provides a detailed description of initial design and evolution of a web-based help-seeking tool (EchoLu). The second manuscript (Chapter 3) reports on an empirical study that uses a mediation structural equation model to investigate the effects of motivational and environmental factors on help-seeking. The fourth manuscript (Chapter 4) delineates the main study of this dissertation which investigates the role of instructors in help-seeking. Besides exploring the causal links between instructor-related factors and students' help-seeking perceptions and intentions, this study also examines the extent to which students' perceptions are influenced by instructor participation in students' online help-seeking. The findings suggest a substantial influence of instructors on help-seeking. In particular, their relatedness with students, their support for help-seeking, and the goal structure that they promote in the classroom are strongly associated with students' help-seeking perceptions and intentions. The findings also suggest a possible influence of instructor participation in online help-seeking environments. The implications and future research directions are discussed at the end (Chapter 5).

INDEX WORDS: Help-Seeking, Online Help-Seeking, Flipped Classrooms, Educational Design Research, Structural Equation Modeling.

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by

ERKAN ER

B.S., Middle East Technical University, Turkey, 2006

M.S., Middle East Technical University, Turkey, 2009

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by

ERKAN ER

Major Professor:	Michael Orey
Committee:	ChanMin Kim
	Theodore J. Kopcha
	Wendy Dustman
	Zhenqiu Lu

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
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DEDICATION

This dissertation is dedicated to my mother, Elmaz Zeki, my fiancé, Lu Ding, my siblings, Yildiz Er and Izzet Er, my father, Sukru Er, and my mother-in-law, Zhaodi He, as well as to my friends who have been a family to me.

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

As the demand for higher education has inevitably increased, it has been a challenge to deliver a high quality, engaging education to large numbers of students at the same cost. As a response to this challenge, there has been an increase in the use of blended classroom designs that can reach large numbers of learners and offer an engaging education cost-effectively (Johnson et al., 2016). These emerging blended classroom approaches embrace a student-centered approach and require students to play an active role in their learning process. One very dominant blended classroom approach has been the flipped (or inverted) classroom model (Alvarez, 2012). The flipped classroom model provides a specific type of blended learning that replaces lecturing in the classroom with problem solving activities and incorporates lecturing in the form of video lectures that students need to study independently outside the classroom (Pierce & Fox, 2012; Riismandel, 2013). More specifically, students are expected to individually study the video lectures along with supplementary learning resources and understand the concepts to become prepared for the upcoming problem solving activities in the classroom. Students, when initially studying the course materials independently, might experience difficulty in comprehending the concepts presented in video lectures, and the supplementary resources may not suffice to tackle learning difficulties. Therefore, in flipped classrooms, there is a strong learner need to interact with and seek help from peers and instructors at any time during self-study time. Addressing this need is essential to college students' learning and achievement in flipped classrooms.

Thus far, help-seeking literature has been dominated by research that has focused on the traditional classroom. Nonetheless, there have been some studies examining the role of technology in help-seeking (e.g., Puustinen & Rouet, 2009); however, these studies have mainly focused on replacing human helpers with technology (such as intelligent tutoring systems). In the last decades, with the rapid advances in Internet technologies and their increasing applications in education, facilitating online help-seeking among students has become an emerging topic. Traditional online discussion forums have been a common approach in online help-seeking research. So far, the findings have mainly centered on the fact that students are more likely to seek help in online environments than in face-to-face classroom environments. However, as highlighted by Karabenick (2011), further research is needed to improve the current understanding of online help-seeking. For example, the relationships between help-seeking and the influential factors that have been well established by previous research in classrooms need to be re-examined in various types of blended classes (such as flipped classrooms), where the help-seeking among students is facilitated online. The affordances of online environments for help-seeking (such as anonymous questions and asynchronous interactions) may redefine some of these relationships. Moreover, current help-seeking literature lacks theory-driven models and practical guidelines for online help-seeking. Such resources can assist practitioners and researchers in taking proper and effective advantage of rapidly emerging Web technologies for help-seeking.

Research Purposes

Given the gap in the literature, this dissertation research investigates college students' help-seeking behavior in a flipped science classroom. There are two broad purposes of this dissertation research. The first is to investigate the online help-seeking behavior of students and

advance the theoretical understanding of online help-seeking. For this purpose, a web-based tool, called EchoLu, was designed to support online help-seeking among college students. The initial design of EchoLu was based on the design principles generated from the existing help-seeking literature. Through several iterations of research that focused on understanding students' experiences of using EchoLu to seek help, EchoLu was refined. The theories underlying the design of EchoLu were informed by the results of each iteration, leading to new theoretical perspectives on online help-seeking. The second purpose of this dissertation research is to investigate the factors that influence help-seeking in flipped classroom. In particular, the influence of various factors were examined in two separate causal models via structural equation modeling. The influence of instructor involvement in students' online help-seeking activities (taking place in EchoLu) on students' relevant perceptions was examined as well.

Help-Seeking as a Self-Regulated Learning Strategy

The early literature suggested that help-seeking is a dependent behavior that demonstrates one's incompetence (Newman, 1998a). However, the later literature shows that help-seeking is a useful learning strategy (Nelson-Le Gall, 1981) and define it as students' efforts to "*regulate* the social environment to promote learning" (Schunk, 2012, p. 435). This study frames help-seeking as a self-regulated learning strategy that involves social interaction and that is influenced by the self and the environment.

Zimmerman (2000) defines self-regulation as "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (p. 14). This definition emphasizes that self-regulated actions might be influenced by one's beliefs and motives. For example, self-efficacy may influence one's use of help-seeking strategies. The social cognitive perspective views self-regulation as a triadic reciprocal interaction among

personal, behavioral, and environment processes (Bandura, 1986). In particular, the role of personal processes in self-regulated learning is considered in reciprocal relation to behavioral and environmental processes (Zimmerman, 1989). For example, students' use of help-seeking strategies can be determined not only personal perceptions (e.g., the perceived threats for help-seeking), but also environmental events (e.g., instructor's verbal support for help-seeking) and behavioral events (e.g., receiving positive reactions to help requests).

Accordingly, Zimmerman (2000) defines a three-phase cyclical model for self-regulation, which is distinguished by identifying the role of motivational and environmental factors in the enactment of self-regulated strategies. This model is composed of three phases: (1) forethought, (2) performance, and (3) self-reflection. In the forethought phase, students set the stage to ask for help under the influence of self-motivational beliefs. For example, after working on homework, a student may decide that the available resources are not enough to solve certain problems and that there is a need for help. Being aware of the need for help may not necessarily result in the help-seeking behavior since self-motivational beliefs such as self-efficacy may influence the student's decision to seek help (Aleven, Stahl, & Schworm, 2003). In the performance phase, students apply the help received to overcome the learning difficulty (e.g., solving a problem), and then evaluate the extent to which the help received is useful and to what extent they are able to use the help received on their own. In the last stage, self-reflection, students perform self-evaluation regarding their efforts in the performance control phase and determine if the received help was sufficient and if they need further help (Nelson-Le Gall, 1981).

This dissertation research approaches the help-seeking behavior from a social cognitive perspective and examines its interaction with the self and environment through three empirical studies. Brief information about these studies is presented as follows.

Dissertation Overview

This dissertation is a compilation of three manuscripts: one published, one ready to be published, and one ready to be submitted, each of which focuses on different aspects of help-seeking to advance the research purposes. The first manuscript (Chapter 2), *Exploring College Students' Online Help-Seeking Behavior in a Flipped Classroom with a Web-Based Help-Seeking Tool*, describes the educational design research project that involves three iterations of implementation to support students' help-seeking activities via EchoLu. This manuscript elaborates on how the EchoLu tool evolved through the iterative design cycles and provides an in-depth discussion on how the theories underpinning the design of EchoLu were informed and extended. At the end of this manuscript, a new principle for supporting online help-seeking and a new process-based model of online help-seeking is proposed.

The second manuscript (Chapter 3), *Understanding the Help-Seeking Behavior of Students in a Flipped Classroom: A Structural Equation Modeling Approach*, investigates the motivational and environmental factors that influence students' help-seeking behavior by using a structural equation modeling approach. In particular, besides the causal links between these factors and help-seeking, the indirect effects of these factors mediated by students' perceptions regarding the costs and benefits of help-seeking are examined as well. The implications of the results on supporting help-seeking in flipped classrooms are discussed at the end.

The third manuscript (Chapter 4), *Exploring Instructor Influence on College Students' Academic Help-Seeking in a Flipped Science Classroom*, focuses on the role of instructors in help-seeking. In particular, the causal links among students' help-seeking perceptions, help-seeking intentions, instructor support for help-seeking, instructor relatedness, and classroom goal structure are examined using a structural model of help-seeking. Additionally, the change in

instructors' participation in students' online help-seeking activities in EchoLu were identified, and the possible association between this change and the changes in students' relevant perceptions are discussed. The findings suggest a considerable influence of instructors on help-seeking. Implications for maximizing positive effects and minimizing the negative effects on students' help-seeking activities are discussed at the end of the chapter.

Finally, the last chapter (Chapter 5) highlights the key points from the three manuscripts, summarizes the implications, and presents future research directions in online help-seeking. Future research should investigate the digital traces accumulated when students seek help in online help-seeking environments (e.g., EchoLu), which can be achieved by interdisciplinary research (e.g., learning analytics).

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CHAPTER 2

EXPLORING COLLEGE STUDENTS' ONLINE HELP-SEEKING BEHAVIOR IN A FLIPPED CLASSROOM WITH A WEB-BASED HELP-SEEKING TOOL[1]

[1] Er, E., Kopcha, T. J., Orey, M., Dustman, W. (2015). Exploring College Students' Online Help-Seeking Behavior in a Flipped Classroom with a Web-Based Help-Seeking Tool. *Australasian Journal of Educational Technology, 31*(5), 537-555. Reprinted here with permission of publisher.

Abstract

Today's generation often seeks help from each other in online environments; however, only a few have investigated the role of Internet technologies and the nature of online help-seeking behaviour in collaborative learning environments. This paper presents an educational design research project that examines college students' online help-seeking behaviour. The context was a large-enrollment science course that implemented a form of blended instruction – the flipped classroom. This paper proposes design guidelines for promoting help-seeking and discusses the application of these principles in the design of a web-based help-seeking tool (EchoLu). The study involved three iterations of implementation to continuously refine the web-based tool, and therefore to better address the help-seeking needs of students in the context. The revisions incorporated between iterations helped improve the embodiment of design principles and led to positive changes in students' perceptions. The triangulated data revealed students' interest in information-seeking as an additional form of help-seeking. The results of this study provide insight into the theories that informed the design of EchoLu and the design principles themselves. A new model illustrating processes involved in online help-seeking is discussed, and an emergent principle for online help-seeking is suggested.

Introduction

In any learning context, a learner needs to ask for help from a more knowledgeable person (e.g., peer or instructor) when facing an academic difficulty (Ryan, Gheen, & Midgley, 1998). This behaviour is referred to as help-seeking behaviour – a self-regulated learning strategy in which the learner determines when help is needed and how to receive that help (Nelson-Le Gall, 1985). A considerable amount of research has been conducted on students' help-seeking behaviour in face-to-face classroom contexts (e.g., Butler, 1998; Kitsantas & Chow, 2007; Magnusson & Perry, 1992; Ryan et al., 1998). However, help-seeking activities now take place beyond the boundaries of classrooms thanks to the rapid growth of computer and Internet technologies in the last decades. Today, students can locate specific information from online resources (e.g., Wikipedia), ask a peer or an instructor for help via web-based communication technologies (e.g., email, video chat, and online discussion), or receive assistance from a stranger in an online forum or a social networking site.

The increasing affordances of Internet technologies for help-seeking have inspired research examining the impact of web-based communication tools on the help-seeking activities of students (e.g., Cheng, Liang, & Tsai, 2013; Puustinen, Bernicot, & Bert-Erboul, 2011). These studies indicate certain advantages of online tools for help-seeking. Foremost is that students are not restricted to seeking help at a certain time or in a specific location; rather, they can post questions online as they encounter them and take more time to formulate their questions. However, further research is needed to improve the current understanding of students' help-seeking behaviour in online settings. The current body of help-seeking research is based on a face-to-face model suggested by Nelson-Le Gall (1981). The affordances of Internet technology introduce new possibilities to this model, such as searching for questions as a form of help-

seeking about a particular concept. This suggests a strong need to examine both the tools and help-seeking behaviours of students in online settings.

Given the increasing interest and existing gap in online help-seeking research, this paper presents an educational design research project with the goal of exploring online help-seeking behaviour in a large-enrollment science classroom. In particular, this study aims to (a) generate principles for promoting help-seeking; (b) create and evaluate a unique web-based help-seeking tool, called EchoLu, based on help-seeking principles; (c) reveal the processes involved in students' online help-seeking behaviour; and (d) inform and revise both help-seeking theory and the tool itself through iterative research in a real context.

Barriers to Help-Seeking

Although help-seeking is an important learning strategy positively associated with academic achievement (Kitsantas & Chow, 2007; Magnusson & Perry, 1992), not every student uses it. According to the help-seeking literature, several factors underlie students' avoidance of help-seeking. First, students can perceive help-seeking as a dependent behaviour which they might avoid because of their desire for greater autonomy over their learning (Butler & Neuman, 1995; Deci & Ryan, 1987). Such students are categorised as self-autonomous learners and are more likely to adopt mastery goals (Butler, 1998; Newman, 1990). Self-autonomous students infrequently ask for help to obtain small clues from others, through which they can pursue their learning goals with a minimal dependence, thus promoting long-term autonomy (Butler & Neuman, 1995; Newman, 1990).

Other students may perceive help-seeking as a threat to self-worth, resulting in avoidance behaviour (Karabenick & Knapp, 1991). The perception that help-seeking is a threat may result from the concerns imposed by the self and by the environment. First, students who are concerned

with protecting their self-worth may believe that asking for help is evidence of their academic incompetence or lack of ability (Karabenick, 1998). For example, students may avoid seeking help in order to uphold a positive social image (i.e., social status-goal orientation) and maintain their self-worth (Ryan, Hicks, & Midgley, 1997). Furthermore, unsocial classroom environments may raise concerns about being judged by others and therefore may lead to higher perceptions of threat for help-seeking. For instance, students who avoid appearing incompetent (i.e., performance-avoidance goal oriented) are likely to avoid seeking help because of the potential judgments by others (Karabenick, 2003, 2004; Tanaka & Murakami, 2001). In short, perceptions of threat are an important barrier to seeking the needed help.

Supporting Help-Seeking in Flipped Classrooms

The present study focuses on college students' online help-seeking activities in a large science course that implemented a form of blended instruction called the flipped classroom. In flipped classrooms, students are provided with access to online and/or offline learning resources and tools to study the lectures themselves, usually at home (Woolf, 2010). Students are therefore encouraged to take responsibility for their own learning (Davies, Dean, & Ball, 2013). In flipped classrooms, in-class time generally is used for conducting problem-solving activities in groups. Thus, the flipped classroom model also flips the student role; passive listeners in traditional large-enrollment classrooms need to become active learning agents and take the primary responsibility for their learning. Such blended classes are likely to result in greater needs for help as students may need support to overcome academic difficulties such as understanding complex concepts and solving difficult problems when individual resources are ineffective (Mahasneh, Sowan, & Nassar, 2012).

Guided by the flipped classroom teaching model, the college science course was structured as follows: A learning management system and online podcasts were used to allow students to access course materials and study the lectures themselves outside the classroom, while in-class time was used to conduct group activities that were problem solving-oriented. In this course design, students were highly likely to have frequent questions during their individual study time. The web-based help-seeking tool, EchoLu, was developed to enable students to ask questions about the course content and receive the needed help while studying the lecture themselves outside the classroom. Providing a tool to receive answers to students' questions in a timely manner could contribute to their understanding of the concepts studied prior to class and therefore promote their learning both outside and within the classroom. Thus, help-seeking was likely to be an important strategy for student learning in the current study.

Below, the overarching educational design research (EDR) project framework is described. Key design principles are presented and operationalised in the design of the help-seeking tool, EchoLu. Next, the iterative design and data collection process used to evaluate and revise the EchoLu tool and underlying help-seeking principles is described in detail. Finally, the implications for online help-seeking are discussed.

Methodology

EDR is the overarching framework for the current study. EDR involves continuous design and development of interventions to solve real-world educational problems (Kelly, 2003; McKenney & Reeves, 2012). As such, EDR involves close collaboration between the researcher(s) and the practitioner(s), and this collaboration is considered the key to the continuous refinement of educational solutions until the contextual problems are best addressed (Reeves, McKenney, & Herrington, 2011).

Adapted from the generic model proposed by McKenney and Reeves (2012), the present study included an initial micro-cycle and three meso-cycles. As shown in Figure 2.1, the initial micro-cycle involved the review of help-seeking literature to understand why students avoid help, which yielded key design principles to promote help-seeking. In the first meso-cycle (i.e., study 1), EchoLu, was designed and developed according to the help-seeking principles and then tested in a real context.

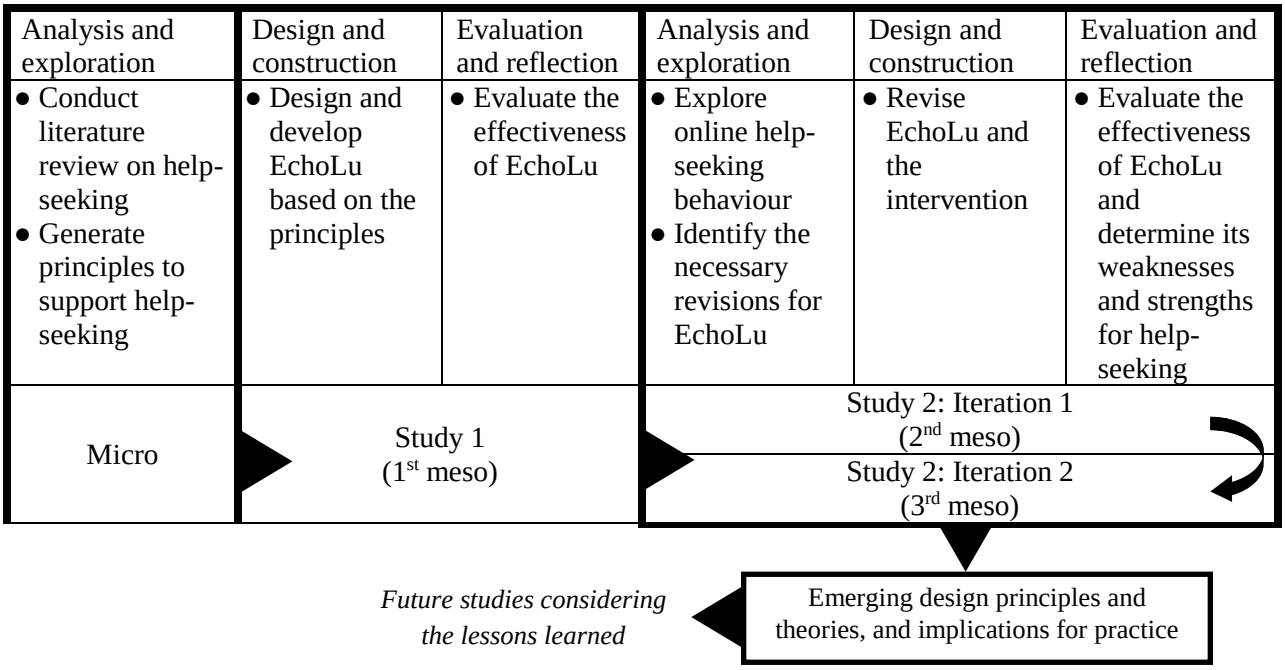

Figure 2.1. The research design adapted from the cyclic-model by McKenney and Reeves (2012)

Continuing with the second and third meso-cycles, EchoLu was further improved according to students' self-reported experiences of using it to seek help. Besides providing valuable information for improving EchoLu, these iterative cycles helped illustrate the complex nature of online help-seeking behaviour and revealed the processes that were not considered in earlier help-seeking models established through classroom interactions. Last, it is noteworthy that an active collaboration between the researcher and practitioner (i.e., the instructor) was established throughout the study. The instructor was the member of the research team throughout

the study and played an active role, particularly in interpreting the results of each iteration and identifying the needed revisions to EchoLu before upcoming iterations. The instructor was also the leader of the instructional team consisting of five teaching assistants, and she brought their experiences to the table when discussing the revisions to EchoLu. The instructor was not involved in any tasks related to data analysis.

Principles for supporting help-seeking and the design of EchoLu

Overall, prior research suggests that help-seeking behaviours may be constrained by personal or social concerns rather than personal academic goals. In this section, four principles for supporting help-seeking are identified and the implications of each for the design of EchoLu are elaborated. The four principles that support help-seeking are (1) address students' needs for privacy when seeking help, (2) increase students' awareness of instructor support for help-seeking, (3) promote observability of help-seeking activities by others, and (4) promote social support in the learning environment. The suggested principles particularly focus on encouraging help-seeking behaviour by removing or decreasing the barriers to help-seeking (i.e., threat to self-worth or being judged by others) for those who are more likely to avoid it. Figure 2.2 displays the four principles integrated into and embodied within the design of EchoLu.

Principle 1: Address the privacy needs of students when seeking help

Students may avoid asking for help because of their need to protect their self-worth against possible threats (e.g., looking dumb) (Karabenick & Knapp, 1991). An important factor in this avoidance behaviour is self-esteem, defined as "one's perceived sense of self-worth" (Schunk, 2012, p. 383). Self-esteem has been found to be related to the perceptions of threat for help-seeking, therefore playing a role in students' decision to seek help (Newman, 1990; Ryan et al., 1997; Ryan & Pintrich, 1997). Accordingly, studies reported that students with low self-

esteem are likely to avoid help-seeking as a result of the threat to self-worth (Karabenick & Knapp, 1991; Newman & Goldin, 1990; Ryan et al., 1997). However, when privacy needs are addressed, students' perceptions of threat are likely to decrease, and they are more likely to seek help when they need it (Keefer & Karabenick, 1998; Puustinen et al., 2011). This principle suggests that students should be able to seek help with anonymous identities.

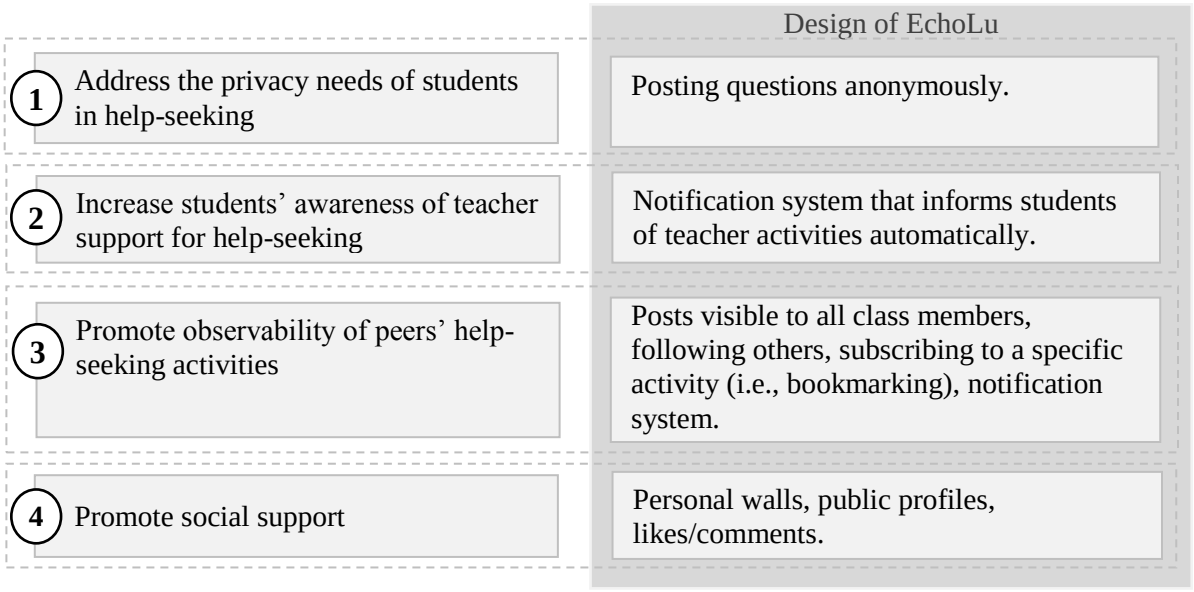

Figure 2.2. The design principles for help-seeking and their implications on the design of EchoLu

EchoLu embodies this principle by providing students with an option of posting on the wall with an anonymous identity (i.e., no photo or name). Because students also seek help by observing questions that are asked by peers (Nadler, 1998), all posts (i.e., anonymous or otherwise) are publicly available to all students. With this feature, a student can benefit from others' help-seeking activities without being actively involved in the activity, a behaviour called lurking (Dabbagh & Kitsantas, 2005).

Principle 2: Increase students' awareness of instructor support for help-seeking

This principle suggests that instructors should be supportive of help-seeking and students' awareness of instructor support should be promoted. Several studies have reported a correlation between perceived instructor support for help-seeking and the resulting help-seeking activities (Karabenick & Sharma, 1994; Newman & Schwager, 1993). For example, Newman and Schwager (1993) found that students who perceive instructor support for help-seeking are more likely to seek help when they need it. In a study among 1,327 college students, Karabenick and Sharma (1994) reported that increased student perception of instructor support resulted in a higher number of questions asked in the classroom environment. This suggests that instructor support helps decrease students' feelings of help-seeking as a threat, and may enhance the belief among students that help-seeking is a useful learning strategy (Arbreton, 1998).

EchoLu promotes students' awareness of instructor support for help-seeking in several ways. First, students can follow the instructor and receive notifications whenever the instructor posts something new. Additionally, when the instructor answers the students' own questions, the students are notified automatically. Of course, instructor support is promoted most directly through the active participation. The more frequently the instructor posts answers to questions or provides positive feedback, the more students will be aware of the instructor support.

Principle 3: Promote observability of help-seeking activities

Students can learn how to use help-seeking strategies by observing the help-seeking behaviours of model students. A student with low self-efficacy may avoid seeking help and may not even know how to effectively seek it. Upon observing the help-seeking behaviour of a model student, a student can become aware that those who have similar misunderstandings and knowledge levels can confidently ask for help, receive positive feedback, and improve their

learning (Karabenick, 1996; Nadler, 1998). Then, the student may try to seek help in a similar way to obtain similar outcomes.

EchoLu promotes the observability of help-seeking activities by making all posts (whether anonymous or otherwise) publicly available. This allows students to observe what others are seeking help for and what type of help is being sought. Next, EchoLu provides *follow* functionality. If a student follows a peer, then the student will be notified about the activities of that peer in the system. Also, EchoLu allows students to subscribe to and receive notification of updates on a help-seeking request initiated by a peer. These functions offer students a variety of ways to observe the help-seeking behaviours of peers within the system.

Principle 4. Promote social support in the learning environment

The literature on help-seeking highlights the importance of interpersonal relations and social interactions in students' decisions to seek help (Nelson-Le Gall & Resnick, 1998). Karabenick and Knapp (1988) noted that having higher numbers of friends positively influences help-seeking as students prefer not to seek help from strangers in academic settings. Similarly, Hertz-Lazarowitz (1995) found that help-seeking and help-giving behaviours are more likely to occur among students when peer interaction is promoted. Furthermore, Nelson-Le Gall and Resnick (1998) suggested that being a member of a learning community where help-seeking and help-giving are valued can help students develop a sense of belonging and foster active participation in help-seeking activities. Therefore, students may be more likely to seek help in environments that promote interaction with peers (Nelson-Le Gall, 1981) or increase students' sense of belongingness (Marchand & Skinner, 2007).

EchoLu provides many affordances for social interaction borrowed from popular social networking sites (e.g., Facebook, Twitter) such as posting, subscribing, commenting, *like*-ing

activities, and personal space. Alternatively, students can subscribe to a particular question by bookmarking it in order to receive updates on that question. In EchoLu, all students are given a personal profile that allows them to share personal information with others. This personal space is also the public profile (or wall) of students visible to others, and others can post on those public walls. Moreover, students can ask questions, share resources, (add to) bookmark(s), and like (or thumbs up) peers' activities on the wall. Figure 2.3 illustrates the main interface of the first draft of EchoLu before any revisions.

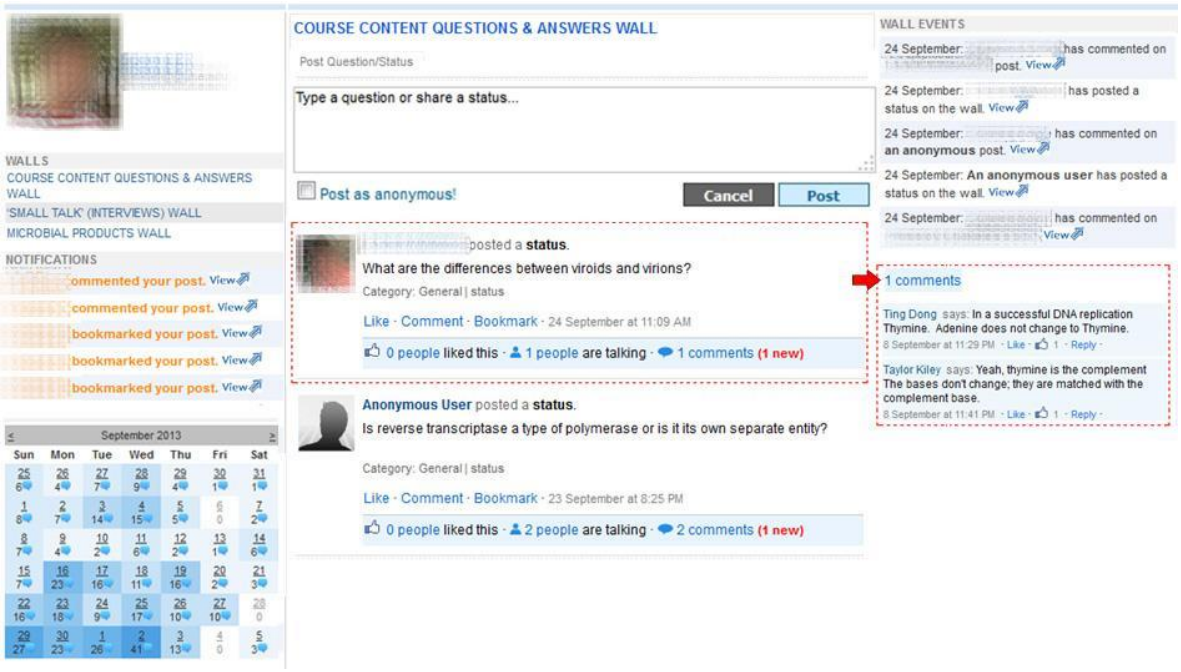

Figure 2.3. A sample screen shot from the first draft of EchoLu (used in Study 1)

Integrating EchoLu in a flipped science classroom: Two studies

The main goal of this EDR project was to explore the application of help-seeking principles in an online learning environment. Two separate studies were conducted in two consecutive school semesters in the flipped science course. Approval from the ethical committee of the university was obtained before the study started. The purpose of the first study was

primarily to evaluate the usability and functionality of EchoLu and improve it before the second study. The purpose of the second study was to evaluate the performance of EchoLu as a help-seeking tool and to improve its effectiveness with two consecutive iterations in the same semester. These studies are summarised in Table 2.1 and described in detail below.

Table 2.1. *The context and participants of Study 1 and Study 2*

	Study 1	*Study 2*
Context	Flipped microbiology class (Fall 2013)	Flipped microbiology class (Spring 2014)
Participants	387 students (154 male and 233 female)	356 students (139 male and 217 female)
Data collection	Email logs, and the notes from the face-to-face meeting with the instructor.	Online questionnaire composed of Likert-type items and open-ended questions
The role of instructor	Member of the research team	Member of the research team

Study 1: Towards a stable version of EchoLu

Study 1 was a pilot study conducted to collect feedback from 387 students (154 males; 233 females) about the technical aspects of EchoLu during the fall semester of 2013 and improve the EchoLu system accordingly. In the pilot study, EchoLu was integrated into the class as a learning tool where students were instructed to use it to ask questions and to share web resources and news outside the classroom. The instructor was involved when additional support was needed in answering the questions in EchoLu. Any form of student contribution such as asking a question, posting an answer, or sharing a web resource, was automatically credited towards the students' final grade. Improving EchoLu during this pilot study was critical to continue research

on the tool in that negative user experiences could be addressed and their potential to interfere with students' help-seeking activities could be reduced.

Data collection and analysis. Data sources for this study were the researcher's email communication logs with the instructor, email transcripts of technical problems reported by students, and the notes from the face-to-face meeting with the instructor at the end of the semester. These materials were read through and the revisions before the next study were determined.

Findings and revisions. Students reported the need to simplify the EchoLu home page; specifically, they found the layout of the discussion page crowded and confusing. The EchoLu discussion page contained these six features: a list of recent question walls, personal notifications, the web form for making a post, a calendar showing daily posts, questions posted on the wall, and the list of recent student activities. To simplify the interface and improve its usability, recent student activities were no longer included on the discussion page. Notifications about recent posts were hidden until students chose to display them. Additionally, 14 issues in programming were corrected (e.g., broken links, duplicated posts, issues related to posting a web link or a video).

The instructor suggested two new features to improve access to questions and answers. The first was a tagging feature. When posting a question, students would define one or more relevant tags indicating the topic to which the question is related. Later, the popular tags could be grouped semantically and displayed on the discussion page, and students could filter questions by the selected tag. The second was a search function that allows participants to search through posts with a keyword of interest and find related posts more efficiently. The suggested features

were based on the instructor's own difficulties with locating specific posts, as well as her observations on students' use of EchoLu during the semester.

The final issue was related to the instructor's role. The instructor observed that low instructor involvement contributed to low quality of content (i.e., trivial questions, repetitive questions, and insufficient answers) and low student participation. It was decided that the instructor, in collaboration with the teaching assistants, would reply to every single question posted by students to increase both the instructional value of EchoLu and students' perceptions of instructor support for help-seeking.

Study 2: EchoLu as a help-seeking tool

In the second study, the revised version of EchoLu was used in the Spring semester of the same course to facilitate help-seeking outside the classroom. Students were allowed to post questions related to the content of the course in EchoLu at any time. Students' contributions (i.e., questions or answers) were credited towards their final grades (5%).

This study included two iterations. The first iteration took place from the beginning of the semester to the middle of the semester (2 months); the second took place from the middle of the semester until the end (2 months). The goal of these iterations was to (a) determine the strengths and weaknesses in the design of EchoLu, (b) identify the affordances of EchoLu for help-seeking and student learning that were not foreseen initially, and (c) uncover the processes involved in students' online help-seeking activities. The first iteration also informed the design of the EchoLu; revisions were made prior to the second iteration. Data were collected at the end of each iteration.

Participants and data collection. The participants were 356 junior or senior college students (139 male and 217 female students). Participation in the questionnaires was voluntary.

Both iterations employed a mixed methods design. The primary instrument was a researcher-generated online questionnaire that was administered at the end of each iteration. Students provided an identification number to track responses so comparisons could be made between the iterations. The questionnaire was evaluative in nature and contained two open-ended questions and four Likert-type items. The open-ended questions asked students to describe the most useful features as well as the limitations of EchoLu for help-seeking. The Likert-type items examined how effectively the design principles were embodied in EchoLu as interpreted by the students. The items were: EchoLu encourages me to seek help when I need it, because (a) it allows me to post anonymous questions; (b) it allows me to observe questions asked by peers; (c) it makes me aware of instructor support for help-seeking; and (d) it provides a supportive and social environment. Items were rated on 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). These items were developed by the researchers to obtain specific information that can help make design decisions in EchoLu. The questionnaire was administered once in the middle of the semester (at the end of the second month) – iteration 1, and once at the end of the semester (at the end of the fourth month) − iteration 2.

Analysis

The open-ended items were analysed first to assess the strengths and weaknesses of the affordances of EchoLu. Students' responses were coded as positive or negative experiences, then grouped by code type. Within each code type, responses were then grouped into major themes. Next, a Wilcoxon signed-rank test was conducted on the questionnaire items to identify any statistically significant changes in students' perceptions of the help-seeking affordances of EchoLu over time. The qualitative and quantitative results were then triangulated to better

understand students' process of help-seeking using the online tool. Triangulation of data increases the credibility and validity of the results (Greene, 2007).

Iteration 1: Useful features, limitations, and affordances of EchoLu. The analysis of the open-ended items (*n* = 297) revealed three components that students found most useful. First, students (*n* = 44) noted the utility of searching through the posts and comments using a specific keyword. Second, students (*n* = 38) mentioned the usefulness of the tagging feature that allows them to filter questions and responses by a specific tag of interest. The other popular feature highlighted by students (*n* = 38) was the feature that allows them to post questions anonymously.

Students (*n* = 142) also pinpointed several limitations with the design of EchoLu. First, the overall page design (or the user interface) was confusing and difficult to use (*n* = 47). Similarly, students (*n* = 27) also reported navigational difficulties. In particular, students noted that it was difficult to keep track of questions that had been read, and that the way the answers were displayed was confusing. Third, students (*n* = 25) indicated that a better categorisation was needed to be able to locate the relevant questions effectively and to filter out irrelevant questions. Some students (*n* = 16) similarly noted that the search feature needed improvement. Last, students (*n* = 19) reported that the system runs slowly, contains some bugs, and crashes occasionally when many students connect to the website at the same time.

Student feedback also addressed specific help-seeking principles underlying the affordances of EchoLu. First, students (*n* = 49) found it beneficial to observe and examine the questions posted by peers. In particular, these students noted that observing peers' concerns was helpful for the identification of weaknesses in their conceptual understanding that would not otherwise have been brought to their attention. Related with this finding, some students (*n* = 18) noted that they were able to receive indirect help from EchoLu by solely reading the questions

and answers of other students and instructors. Second, students (n = 35) considered the availability of EchoLu for asking questions 24 hours a day, 7 days a week beneficial in supporting their learning outside the classroom. Third, students (n = 35) reported that getting answers to their questions using the whole class as a source of help was beneficial to their learning. Similarly, some students (n = 29) noted that it was beneficial to get help from or observe the verification of peers' answers from the instructors and teaching assistants.

The results of the first iteration suggest that the design of EchoLu was successful in several ways. Other than the anonymous post feature, other popular features of EchoLu were the ones that allowed students to access the relevant information in the system effectively (e.g., categorisation by tags, and search). Students also highlighted the benefits of a system where they could ask questions anytime and anywhere and receive support from the whole class or instructor –something that is not possible in a classroom setting. These findings support other studies that have reported students' desire for features that facilitate easy access to relevant information in web-based collaborative learning environments (Wang & Yang, 2012).

Revisions after Iteration 1. Revisions after the first iteration were decided in collaboration with the instructor. This provided the researcher with critical information about the interpretation of the results of the first iteration and the areas of EchoLu that needed improvement to better address student needs. First, the user interface was simplified by reducing the homepage elements to the three most popular (see Figure 2.4) − categorisation of questions (on the left-hand side), the questions and answers (in the middle), and the user profile and the notifications (on the right-hand side). Other elements (such as calendar and events feed) were removed from the page. In addition, navigation was improved by adding a separate menu that allowed students to easily access their own questions, questions to which they provided answers, and questions

that they had bookmarked. The homepage was modified to include a pagination feature that allows students to move through all questions more smoothly. These specific changes in the interface and the navigation of the system were primarily pinpointed by the instructor based on her own experience of using EchoLu. Additionally, AJAX (Asynchronous JavaScript and XML; see http://en.wikipedia.org/wiki/Ajax_(programming)) technology was used to prevent unnecessary page refreshes that previously caused students to lose track of the questions they had already read. To further enhance the clarity of the interface, a professional styling framework, Bootstrap (http://getbootstrap.com/), was applied.

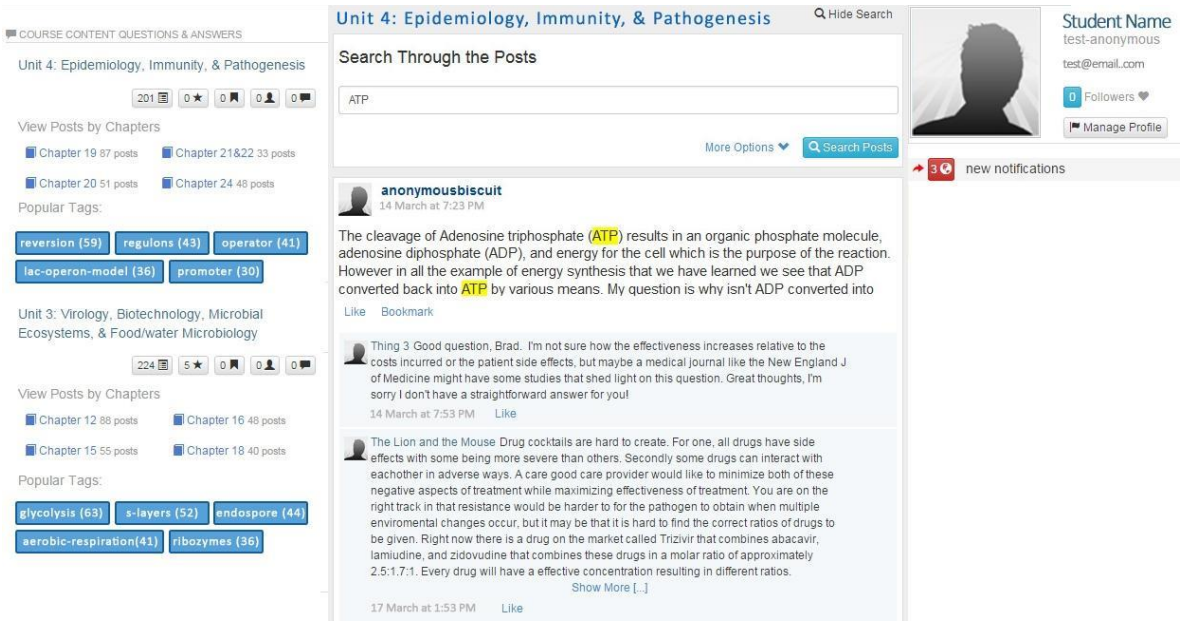

Figure 2.4. The revised version of EchoLu with the new page layout, and new or improved features (used in Study 2, Iteration 2)

Furthermore, the search function was improved. First, the keyword search was extended to query questions as well as answers associated with questions and the name of the students who asked the question. These changes were specifically requested by the instructor. Second, the keyword that was searched was highlighted with a yellow background in the results view

(questions or answers) in order to increase the prominence of the results for students, which was suggested by the researcher and agreed upon by the instructor. Last, in addition to the keyword field, start and end date fields were added to allow students to search through the questions asked within a specific timeframe. This improvement was suggested by the instructor to allow students to be able to retrieve the questions asked in a specific time period.

Other important changes involved improving the categorisation of questions for effective information access. The instructor played a primary role in determining the categories, which included: by phase of the course – one period for each examination, by book chapter, and by popular tags. It is also noteworthy that a default list of tags was created by the instructor for each chapter instead of allowing students to create their own tags. This was prompted by the instructor who observed that allowing students to create their own tags led to redundancy that created student confusion and produced an incomplete representation of posts related to a topic. The instructor also recommended that every student has a unique anonymous name to be used throughout the semester to improve the visibility of student contributions. This change in the anonymous feature was implemented for the second iteration. The revised version of EchoLu is illustrated in Figure 4. All revisions performed throughout study are summarised in Table 2.2.

Iteration 2: Useful features, limitations, and affordances of EchoLu. Analysis of the open-ended answers (n = 284) indicated that the number of positive responses increased overall since the first iteration. One hundred students in this iteration highlighted the usefulness of categorisation in finding relevant information compared to 38 students in the first iteration. Additionally, there was an increase in the number of students (n = 53) who reported that the anonymous post and comment feature was useful.

Table 2.2. *Summary of changes implemented in Study 1 and 2*

For Study 2, Iteration 1 (i.e., after Study 1 /Pilot)	For Study 2, Iteration 2 (i.e., after Study 2, Iteration 1)
• Simplify layout/navigation - Remove one element (i.e., recent activities) - Hide notifications until expanded by student	• Simplify layout/navigation - Display the three most popular elements - Add separate menu to improve access to questions they have posted, followed, or bookmarked - Paginate posts
• Add function to search through posted questions	• Refine search function - Allow searching of answers as well as questions - Allow searching by timeframe
• Add a feature for students to tag questions as they post them	• Limit scope of tags to instructor-generated tags • Categorise questions and answers by relevant indicators (e.g. phase of course, book chapter, popular tags) • Allow pseudonymity (i.e., posting under a false and unique name) • Improve technology functionality (e.g., AJAX to prevent page refreshes; Bootstrap to style page elements)

There was a decrease in student reports regarding the limitations of EchoLu (n = 140). The reported issues related to interface and the navigation of EchoLu decreased whereas there was an increase in the number of students who reported that the system runs slow and crashes (n = 43). This was probably due to the fact that recent revisions introduced new errors into the system and that limited testing was performed to correct these errors because of time and labor force constraints. Furthermore, students (n = 284) noted similar benefits associated with the affordances of EchoLu. The useful features and limitations of EchoLu reported by students in the first and the second iterations are summarised in Table 2.3.

The majority of the results in this iteration confirmed the results of the first iteration; however, there were also additional findings. First, there was an increase in the number of students reporting efficiency in finding relevant information through categorisation of questions

and the search feature. Compared to 82 students in the first iteration, a total number of 137 students in the second iteration highlighted the usefulness of question categorisations. The enhancement in the anonymous feature (i.e., unique anonymous names; anonymous comments) also appears to have increased its usefulness in the second iteration (from 38 to 53). The decrease in the number of incidents regarding the limitations of EchoLu suggests that the revisions made prior to iteration 2 were effective in a number of ways.

Table 2.3. *The comparison of results in iteration 1 and iteration 2*

	Iteration 1	Iteration 2
Useful features		
Categorisation by:		
Tags	38	72
Chapters	0	22
Examination	0	6
Search	44	37
Anonymous posting	38	53
Well-organised interface	0	11
TOTAL	140	201
Limitations		
Confusing interface	47	32
Navigation difficulty	27	12
Better categorisation needed	25	16
Search feature improvement needed	16	14
The system runs slowly	19	43
TOTAL	134	117
Affordances		
The ability to observe peers to determine one's own weaknesses	49	53
Receive indirect help by reading questions and answers	18	20
Ask questions 24 hours a day, 7 days a week	35	31
The opportunity to use the whole class as a source of support	35	34
The possibility of receiving direct help from instructors	39	28
TOTAL	176	166

Changes in students' perceptions over time: Study 2. The Likert-type items were analysed to detect the change in students' perceptions over time regarding the principles that informed the design of EchoLu. A total of 303 responses (out of 356) were included in the analysis; 53 were discarded because the participants did not submit questionnaire data for both iterations. Questionnaire responses from iteration 1 and 2 were matched by student identification numbers (i.e., 9-digit numbers), and after the matching, student numbers were removed for confidentiality. Also, the instructor was not involved in the data analysis. The questionnaire was found to be highly reliable in both iterations (α_1 = .872 and α_2 = .878).

Because an ordinal scale was used in the Likert items, a non-parametric statistical test called Wilcoxon signed-rank test was used to identify the significant changes in students' perceptions. As shown in Table 2.4, the results of the analysis indicate that the overall mean score of students' perceptions at the end of the second iteration is statistically significantly higher than that obtained at the end of the first iteration (M_1 = 3.52, M_2 = 3.68, Z = -3.250, p = .001). That is, after the revisions, the embodiment of design principles in EchoLu was more effective as interpreted by the students. When the questionnaire items were examined individually, a statistically significant increase was identified for each item: (a) posting anonymously (M_1 = 3.44, M_2 = 3.61, Z = -3.250, p < .001), (b) observing others' questions (M_1 = 3.72, M_2 = 3.84, Z = -2.220, p < .026), (c) promoting instructor support (M_1 = 3.59, M_2 = 3.76, Z = -3.119, p < .002), and (d) providing a supportive and social environment (M_1 = 3.35, M_2 = 3.52, Z = -3.010, p < .003). These results indicate that there was a positive influence in students' collective experience of EchoLu after the revisions to EchoLu. The effect sizes of the change in individual items were a small effect size according to Cohen's d (Cohen, 1988).

Table 2.4. *The change in students' perceptions over time and the Wilcoxon test results*

	M_1 (Iteration 1)	M_2 (Iteration 2)	Z score (Wilcoxon test)	p	d (Effect size)
Overall average	3.44	3.61	3.250	.001	
Q1	3.44	3.61	-3.250	.001	.13
Q2	3.72	3.84	-2.220	.026	.09
Q3	3.59	3.76	-3.119	.002	.13
Q4	3.35	3.52	-3.010	.003	.12

Discussion of Studies 1 and 2

According to iteration 1 results, although students favoured the use of tags in categorising the questions and the search feature for finding relevant information in the system, their feedback still indicated their desire for better information access tools in the system. This was because students did not use EchoLu only for asking questions; they utilised EchoLu as a learning repository. Students were able to (a) re-examine their understanding of a specific concept by reading numerous questions brought up by peers about that concept, and (b) locate existing answers to a question that was similar to theirs instead of spending time asking a question and waiting for an answer. This behaviour of reading the existing questions and answers has been reported as a beneficial learning strategy in online discussion research (Beaudoin, 2002; Mazuro & Rao, 2011).

The majority of the results in the second iteration confirmed the results of the first iteration; however, there were also additional findings. The improvements with categorisation and the change in the implementation of the tag feature (i.e., providing students with a list of tags to choose from instead of creating new ones) led to an increase in the number of students reporting efficiency in finding relevant information in the system. These findings further strengthen the argument that students might use the existing pool of questions and answers to

receive indirect assistance (such as finding relevant questions with a valid answer) in collaborative help-seeking environments besides pursuing help by directly posting their own questions. Additionally, in the second iteration, the enhancement in the anonymous feature also appears to have increased its usefulness in the second iteration. This is not unexpected. In a study examining the anonymity options in an online community, Kilner and Hoadley (2005) found that community members are more likely to prefer *pseudonymity* (i.e., a unique username not linked to real identity of the user) instead of complete anonymity because of their need for building and maintaining an identity and reputation. It may be that students who seek help may prefer their contributions to remain confidential while also being recognised in some way.

Furthermore, the results of the Wilcoxon test suggest that revisions made to EchoLu between iterations 1 and 2 positively affected students' collective experience of EchoLu. These revisions were linked mainly to two affordances of EchoLu: observing others' questions and answers (e.g., improving user interface, question categorisation, and search) and posting anonymously within the system. There were no revisions that directly relate to the remaining two affordances, instructor support and supportive and social environment. However, enabling students to monitor others' questions and answers, including responses from the instructor, may have indirectly promoted student awareness of instructor support and may have indirectly led to a more supportive social environment. One's perception of learning within an online environment is influenced by the manner in which instructors and peers interact within the system (Wei, Chen, & Kinshuk, 2012). First, in the revised version of EchoLu, instructors contributed to the learning environment by providing an answer to students' questions, confirming student answers, summarising the discussion, or sharing additional resources. These activities of the instructors are a form of teaching presence, which is an important factor in

students' perception of a learning environment (Anderson, Rourke, Garrison, & Archer, 2001). The increased presence of instructor responses likely contributed to the improved student perceptions of EchoLu for promoting instructor support. Second, the increase in students' perceptions of EchoLu as a supportive and social environment can be explained by social presence, defined as "the ability of learners to project themselves socially and affectively into a community of inquiry" (Rourke, Anderson, Garrison, & Archer, 1999, p. 50). Students' favourable comments about the information-seeking capacity of the revised EchoLu suggest that students were better able to find specific questions and answers that interested them. This may have led to greater awareness of the contribution of peers within the environment In addition, the improvements in user interface and navigation might have a positive influence on social presence. Well-designed user interfaces promote interactions among students in collaborative learning environments, and therefore enhance social presence (Wei et al., 2012). These improvements to the design of EchoLu may have contributed to a stronger sense of social presence and, in turn, students' perceptions of the learning environment.

Informing theory and design

EchoLu was developed around four principles for supporting student help-seeking: (1) address students' needs for privacy when seeking help, (2) increase students' awareness of instructor support for help-seeking, (3) promote observability of help-seeking activities by others, and (4) promote social support in the learning environment. These principles, however, were generated from face-to-face classroom interactions – the present project explored the application of these principles in an online learning environment. The results of this study provide insight into the theories that informed the design of EchoLu and the design principles themselves.

Revisiting help-seeking in the context of web-based collaborative learning environments

Student feedback provided insight into the decision-making processes associated with seeking help in a web-based collaborative learning environment. In particular, students in this study repeatedly noted the need to include and improve upon information-seeking functions within EchoLu – that is, the ability to search and locate both questions and answers within the system without posting a question of their own. Figure 2.5 displays a model of online help-seeking that is proposed from the results of the current study and supported by related literature. The model is unique in that it considers information-seeking an integral part of help-seeking. Information-seeking has been discussed in help-seeking research (Cheng et al., 2013; Puustinen & Rouet, 2009; Tsai, 2011); however, it was recognised as a distinct help-seeking strategy that students employ to seek the relevant information on the web, whereas in the proposed model, information-seeking is suggested as a component of help-seeking in collaborative learning environments. Students' self-regulated learning skills are likely to play an important role in the proposed model since students with self-regulation skills may more effectively use information-seeking techniques for academic help-seeking (Cheng et al., 2013).

In the model, a student begins by determining whether he or she has a specific question to ask. The student may then follow one of two different routes. In the first route, the student has a specific question and may seek an answer to that question by either directly asking for help (i.e., posting their questions anonymously or using their real names) or searching through the existing pool of questions and answers to locate a similar question with a valid answer.

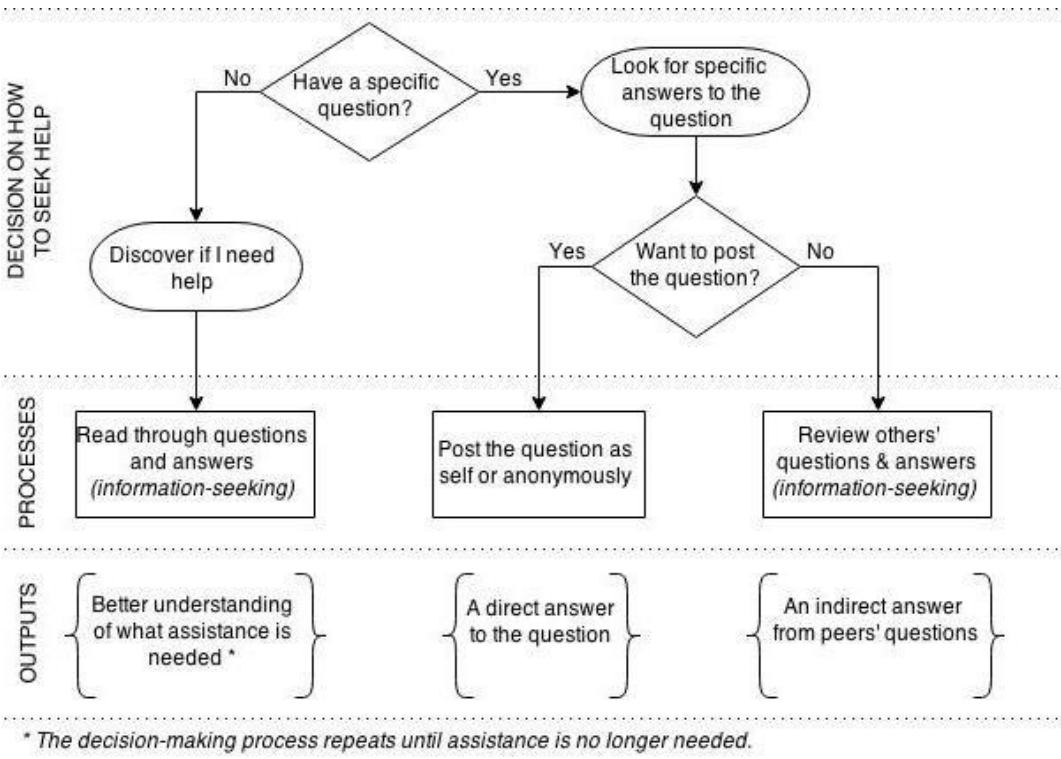

Figure 2.5. The decision-making processes for help- and information-seeking in a web-based collaborative learning environment

If the student prefers to get the needed assistance by directly posting their questions, then the help-seeking processes identified by Nelson-Le Gall (1981) will take place starting with the identification of potential helper(s) (in our study, the class members using EchoLu), the employment of strategies to elicit help (in our study, posting the question to the discussion page), and the reactions to the help-seeking attempt, which is the evaluation of the provided answers and the decision whether further help is needed. However, the student may prefer to engage in information-seeking instead of asking for help directly. When this is the case, a student may find an answer to a question within the existing pool of questions and answers (i.e., seeking the needed information). Previous research has reported students' use of existing questions in a discussion forum to find an answer to their own questions (Chang, 2002). In students' efforts to find the relevant questions and/or answers, the affordances of the media for effective access to

information is likely to play an important role (Wang & Yang, 2012). If a similar (or the same) question is located, then students will need to determine whether the answers to the question found are satisfying or not, and decide if further assistance is needed (Nelson-Le Gall, 1981).

Another help-seeking behaviour suggested by the results of this study is *question identification.* Students in EchoLu noted that they used existing questions and answers to determine if they were actually in need of academic help and what help they needed. This indicated the second possible route in the proposed help-seeking model. Others have similarly found that students may prefer to review their current understanding through scanning the existing pool of questions and answers, and as a result, improve their learning (Beaudoin, 2002; Cheng, Pare, Collimore, & Joordens, 2011; Mazuro & Rao, 2011). Once students locate the questions that signal problems in their own understanding, they can then determine if an existing answer to their question targets the problems in their conceptual understanding, or if further help is needed (Nelson-Le Gall, 1981). If students decide that further academic help is needed, then they can follow the first route, which supports direct or indirect help-seeking, and post a new question.

In summary, help-seeking in online collaborative learning environments may involve additional processes that are different from the previous help-seeking models based on face-to-face research. These new processes involve the search for useful information that can either answer students' existing questions, or help students review their current understanding of a concept. Therefore, collaborative online tools used for help-seeking should embody features to facilitate students' information-seeking activities. As described in the next section, the present study proposes a new help-seeking principle that underlines the importance of information-seeking when students seek help in web-based collaborative learning environments.

An emergent principle: Support students' information-seeking performances

When computer-supported collaborative learning tools are used to facilitate help-seeking among class members, a large accumulation of information occurs after a period of time. In the current study, this accumulation of information exposed students' interest in seeking help by pulling the needed piece of information out of the large pool of questions and answers. This *information-seeking* behaviour served as an alternative to formulating and posting their own questions. Thus, the results of this study suggest a new principle of help-seeking that emerged from the iterative development of research on EchoLu: Online help-seeking environments should embody specific access tools that improve the information-seeking performance of students.

There exist many theories on information-seeking behaviour such as information search process theory (Kuhlthau, 1990), principle of least effort theory (Zipf, 1949), information foraging theory (Pirolli & Card, 1999). Among these theories, the principles of least effort theory seems to be the best candidate to explain the information-seeking behaviour within the help-seeking context since this theory has been commonly used to explain the information-seeking behaviour of Internet users, including particular users in related fields such as library and information science (Chrzastowski, 1995; Griffiths & Brophy, 2005). According to the principles of least effort theory, individuals have a desire to find information quickly and easily, and therefore they are likely to pick the search technique that is the most advantageous (Zipf, 1949). Individuals who search for information on the Internet employ some of the strategies of the principles of least effort theory (Jansen, Spink, Bateman, & Saracevic, 1998). This search behaviour was observed when students sought help in EchoLu. The first iteration indicated students' need for further information-seeking tools (e.g., a better question categorisation

system), and the second iteration showed higher perceptions of the usefulness of these tools (e.g., categorisation by tags, chapters, and exams; improved search function) when seeking help.

Student information-seeking behaviours may also have served as a way to preserve one's privacy (principle 1). If students had difficulty understanding a concept they could search through the existing questions and answers by specific keyword or filter questions by a topic, concept (tag), or chapter of interest. This is likely to have improved their perception of privacy because they could pull information from the system without the risk of exposing their own lack of knowledge. With the affordances of current technology, designers of online tools for learning should consider ways to store each user's contributions and make those contributions easily accessible to others in the future.

Informing other help-seeking principles

This study informs the other principles of help-seeking as well. The designers initially conceived that allowing an option for anonymous posting would provide sufficient privacy for students. However, exercising this form of privacy proved a detriment to the principle of promoting social support – others in the online environment were unable to determine who was posting, and with what frequency. By allowing students to engage in pseudonymity, they could more easily see who was contributing to the discussion while preserving their own privacy. Designers of online discussion tools should consider developing functionality that allows unique but private usernames to be used. The introduction of this functionality in EchoLu corresponded with more favorable perceptions toward posting anonymous questions.

A primary focus of the revisions from iteration 1 to iteration 2 focused on improving student access to the questions and answers posted in the system (e.g., the question categorisation in multiple levels – tags, chapters, and exams, and the search feature). The

improved access is likely to have directly facilitated the observability of help-seeking activities by others, and indirectly promoted students' perceptions of instructor support and their perceptions of EchoLu as a social and supportive learning environment. The Wilcoxon test indicated significant improvements in students' perceptions of both. Open-ended responses similarly showed an increase in positive comments and a decrease negative feedback. These results suggest that designers on help-seeking features in online learning environments would benefit from refining the functionality associated with improving student access to and awareness of the contributions of others within the system.

The analysis in this study was performed primarily to improve the design of EchoLu as well as to inform the theory without much of concern on the generalisability of the results. Therefore, other researchers and practitioners should not expect to apply these help-seeking principles without considering their own contexts.

Limitations and future research

There were several limitations pertaining to the data collection. First, student contributions to EchoLu were graded, which might have influenced students' use of EchoLu and their perceptions. Therefore, the results might be biased to a certain degree. Second, the survey items were positively worded, which might have led to acquiescence bias in the results (Winkler, Kanouse, & Ware, 1982). Moreover, the quantitative questionnaire items contained only four specific items that evaluate EchoLu in terms of the proposed help-seeking principles. This might have not only limited the student perspective on the affordances of EchoLu but also raised validity issues.

However, the purpose of the study was not to generalise to the population but to improve and refine the embodiment of theoretical design principles in an applied context. With that in

mind, the study offers insight into key design choices that supported help-seeking. The small effect sizes associated with the Wilcoxon test suggested that changes from iteration 1 to iteration 2 were present but required more detailed analysis to identify them. Triangulating survey data with open-ended responses revealed a high level of consistency across data types and exposed students' interest in information-seeking as an additional form of help-seeking. Other designers may use this study to make informed decisions about the features integrated in EchoLu and their application in similar contexts.

Future research might examine student performance scores in relation to changes in student perceptions of using EchoLu. In this way, the influence of EchoLu on students' academic performances can be investigated. Future research could investigate the influence of pseudonymity and some trending information-seeking features such as hashtags. With such features implemented, the social networking emerging in EchoLu may be interesting to examine in flipped classrooms. The social networking in a flipped classroom where students have limited face-to-face opportunities to interact with peers might be influential in help-seeking. The interactions among students could be explored using social network analysis paired with data tracking in the form of student activity logs. This may provide a distinct perspective towards understanding the online help-seeking strategies of students. Moreover, future research could also examine instructors' roles and experiences in students' online help-seeking activities. Last, considering the importance of self-regulation in information-seeking (Cheng et al., 2013; Lee & Tsai, 2011), future research could examine self-regulation in relation to online help-seeking.

Conclusion

The present study explored college students' help-seeking behaviour in a web-based collaborative learning environment. Framed as an EDR, three iterations took place in this

exploration. Through iterative cycles of research, the help-seeking tool (EchoLu) was continuously improved, and the nature of online help-seeking behaviour was examined. The results of this study informed the help-seeking principles upon which the EchoLu tool was built, and led to the generation of a new theory explaining online help-seeking behaviour, and a new design principle for supporting help-seeking.

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CHAPTER 3

UNDERSTANDING THE HELP-SEEKING BEHAVIOR OF STUDENTS IN A FLIPPED CLASSROOM: A STRUCTURAL EQUATION MODELING APPROACH [2]

[2] Er, E., & Orey, M. Submitted to *Educational Media and Technology Yearbook*, 10/12/2016.

Abstract

Help-seeking has long been recognized as an important self-regulated learning strategy that is associated with students' academic goals and achievement. Although help-seeking is an important learning strategy that impacts achievement, not every student uses the strategy. The present research uses a structural equation modeling approach to examine college students' self-reported help-seeking behavior in a flipped classroom. The findings indicate a significant influence of instructor support for help-seeking, relatedness with peers, and personal achievement goal orientations on students' intentions to seek help and their preferences for the type of the help they prefer. Additionally, indirect effects mediated by the perceived costs and benefits of help-seeking were observed. The paper concludes with practical implications on promoting help-seeking in online environments.

Introduction

In any learning context, a learner needs to ask for help from a more advanced person (e.g., peer or teacher) when facing an academic difficulty (Ryan, Gheen, & Midgley, 1998). In the literature, this behavior is referred to as help-seeking (Nelson-Le Gall, 1985). Help-seeking has long been recognized as an important self-regulated learning strategy that is associated with students' academic goals and achievement (Karabenick & Newman, 2006). In help-seeking, students regulate their environments by using peers, teachers (or instructors), and parents as sources of support for coping with learning difficulties. The need for help emerges in response to the combination of a learning difficulty and insufficient personal resources to overcome the difficulty. For example, a student may have trouble understanding one aspect of a science concept and may not be able to solve some of the assigned problems in the textbook. The student may try such strategies as re-reading the relevant book section and revisiting the lecture notes. However, when these personal strategies are ineffective, the student may consult instructors, friends, or parents for help.

Even though help-seeking positively influences learning (Aleven et al., 2003; Lee, 2007; Newman, 2000), not every student uses it. The literature has been informative in revealing the determinants of students' help-seeking behavior, which broadly includes motivational factors (e.g., self-efficacy, self-esteem, achievement goal orientation, autonomy orientation), and environmental factors (e.g., classroom goal structure and instructor support). Besides these factors, the literature also notes that students' perceived costs (or threats) and benefits of help-seeking have a considerable influence on their decision to seek help (Newman, 1990; Ryan & Pintrich, 1997). These perceptions are particularly critical not only because of their direct influence on help-seeking but also because of their interaction with other factors. For example,

students with low self-efficacy are likely to feel threatened by asking for help (Ryan & Shim, 2006), and their perceptions of threat often result in their avoidance of help-seeking (Newman, 1990; Ryan & Pintrich, 1997). On the other hand, students with a mastery goal orientation are likely to perceive help-seeking as a beneficial strategy for their learning, and they tend to seek the necessary help (Karabenick, 2003; Ryan & Pintrich, 1997). Compared to the vast majority of help-seeking literature that has focused on examining the individual influences of various factors on help-seeking, there are a limited number of studies that examined the interactions among different factors. These interactions, when examined as a whole, can help to obtain a more complete picture of why students seek or avoid help.

The present study aims to explore the help-seeking behavior of students in a holistic way; a causal model is proposed and tested to explore the effects of environmental and motivational factors on help-seeking. The mediator role of students' perceptions regarding the costs and benefits of help-seeking is examined as well. It is also noteworthy that this study extends the existing literature beyond the traditional classroom, which has been the dominant context in help-seeking research. The research setting of this study is a flipped classroom, which is an implementation of blended instruction in which students study the lectures themselves, usually at home, and during class time they generally engage in problem-solving activities (Woolf, 2010). Understanding help-seeking behavior in flipped classrooms, which employ a relatively new form of blended instruction, can be valuable for informing the practices in such classrooms.

The Conceptual Model

This paper conceptualizes a mediation model of help-seeking (see Figure 3.1) that explores the direct and indirect effects of instructor support, relatedness, and goal orientation on help-seeking, in which students' perceptions of benefits and costs are selected as the mediator.

The model is composed of three main groups of constructs: 1) instructor support, relatedness, and students' achievement goal-orientation, 2) students' perceptions of benefits and costs for help-seeking, and 3) students' help-seeking intentions and help-seeking styles.

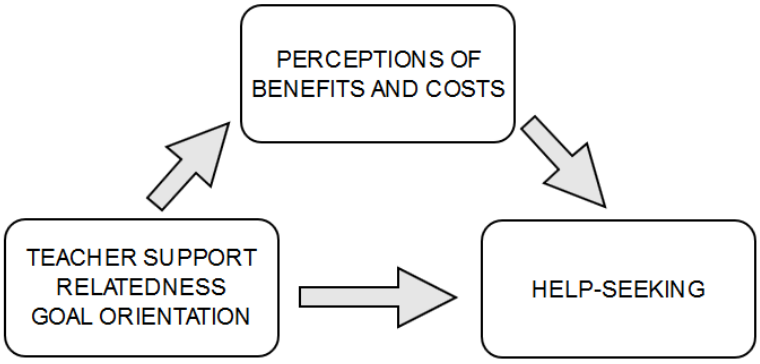

Figure 3.1. The conceptual model for studying help-seeking.

Help-seeking Intentions and Help-seeking Styles

In this study, we focus on students' intentions to seek help, as well as their help-seeking styles. Students often seek two types of help: executive (or expedient) and instrumental (or adaptive) help (Nelson-Le Gall, Gumerman, & Scott-Jones, 1983). The executive style involves reducing the amount of required effort by utilizing direct help from others. For example, students preferring executive help may solicit a direct answer to a science problem soon after their initial attempts. In contrast, instrumental help-seeking involves receiving minimal assistance from others and solving a problem more independently. Students preferring instrumental help may try to understand the concepts leading to the solution of a problem through hints from others and attempt to solve the problem by their own effort (Karabenick & Knapp, 1991).

Instructor Support for Help-seeking

Instructor support is included in the model as one of the environmental factors influencing students' help-seeking perceptions and intentions. Instructors' views have an effect

on students' attitudes toward help-seeking. Empirical studies reported a correlation between perceived instructor support and the resulting help-seeking activities (Karabenick & Sharma, 1994; Newman & Schwager, 1993). For example, Newman & Schwager (1993) found that students who perceive instructor support for help-seeking are more likely to seek help. Likewise, in a study among college students, Karabenick and Sharma (1994) reported that higher perceptions of instructor support resulted in a higher number of questions asked by students in a classroom environment. Arbreton (1998) added that instructor support for help-seeking results in instrumental help-seeking rather than executive help-seeking, especially in task-focused classrooms. In short, the literature informs us that instructor support helps in decreasing students' feelings of threat and enhancing the belief among students that help-seeking is a useful learning strategy (Arbreton, 1998). Based on this literature, we suggest in the conceptualized model that instructor support directly and indirectly (mediated by perceived costs and benefits) influences students' help-seeking intentions and styles.

Relatedness

Another factor considered in the conceptual model is relatedness, which is defined as the basic psychological need of an individual for establishing and maintaining bonds with others (Deci, Vallerand, Pelletier, & Ryan, 1991). The need for relatedness can be satisfied by promoting interactions among students and encouraging them to socially support each other. The help-seeking literature highlights the importance of interpersonal relations and social interactions among students in their decisions to seek help (Nelson-Le Gall & Resnick, 1998). Karabenick and Knapp (1988) noted that having higher numbers of friends positively influences help-seeking as students prefer not to seek help from strangers in academic settings. Nelson-Le Gall and Resnich (1998) suggested that being a member of a learning community where help-seeking and

help-giving are valued can help students develop a sense of belonging and encourage students to ask for help when needed. Similarly, Hertz-Lazarowitz (1995) found that help-seeking and help-giving behaviors are more likely to occur among students when peer interaction is promoted. Based on the findings from the previous research, it is hypothesized that there exists a significant association between relatedness and students' help-seeking perceptions and intentions.

Achievement Goal Orientation

The only motivational factor included in the model is students' achievement goal orientations. Students may have different achievement goals influencing their decision to seek help, which can be classified as mastery goals or performance goals (Nelson-Le Gall, 1985; Wolters, Yu, & Pintrich, 1996). Mastery goals (or task-focused goals, see Ryan & Pintrich, 1997 or learning goals, see Newman, 1998) refer to the desire of a student to learn and improve (Arbreton, 1998; Wolters et al., 1996). Students with mastery goal orientations value learning and spend effort to master a concept. Research shows that students with mastery goal orientations consider help-seeking a beneficial strategy, and they usually prefer the instrumental style (Cheong, Pajares, & Oberman, 2004; Karabenick, 2003; Ryan & Pintrich, 1997).

Students can also adopt performance goals, and these students are likely to have concerns about their abilities and compare themselves to others. Students with a performance goal orientation aim to achieve desirable grades not necessarily by mastery (Wolters et al., 1996). Performance goal oriented students feel threatened by potential negative judgments of others and avoid seeking help (Karabenick, 2004; Tanaka & Murakami, 2001). When they decide to ask for help, these students are likely to seek executive help (Butler, 1998; Cheong et al., 2004; Karabenick, 2003, 2004; Ryan & Pintrich, 1998).

Thus, we include achievement goal orientation in our model and propose that students' achievement goals play a direct and an indirect (mediated by the perceived costs and benefits) role in their help-seeking intentions as well as help-seeking styles.

Research Questions

This study aims to examine the relationships among the constructs in the hypothesized conceptual model by using a Structural Equation Modeling (SEM) approach. As shown in Figure 3.2, a causal model (or path diagram) is suggested based on the help-seeking literature. This path diagram suggests that (a) instructor support for help-seeking and relatedness have a direct effect on help-seeking and an indirect effect on help-seeking mediated by the perceived costs and benefits, and (b) the perceived costs and benefits of help-seeking have a direct effect on help-seeking.

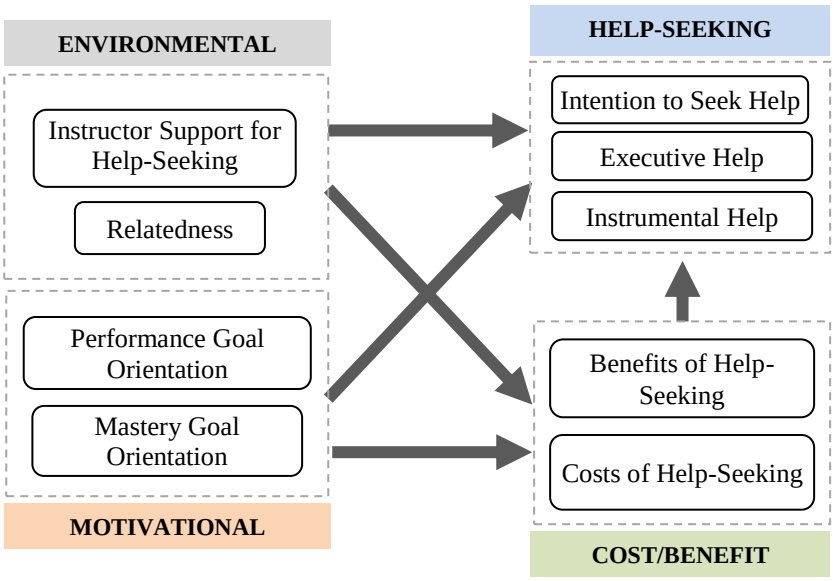

Figure 3.2. Hypothesized causal model of help-seeking

Based on the causal model, this study attempts to investigate the following research questions:

(1) Do instructor support, relatedness, and goal orientation influence students' help-seeking intentions and styles?

(2) Do perceptions of benefits and costs for help-seeking influence students' help-seeking intentions and styles?

(3) Do perceptions of benefits and costs for help-seeking mediate the indirect effects of instructor support, relatedness, and goal orientation on students' help-seeking intentions and styles?

Method

Context and Participants

The research context was a large-enrollment science course in a southern university in the United States. The course was taught with a flipped classroom approach; students were required to study the video podcasts and supplementary course materials (provided using the university's learning management system) themselves outside the classroom, and in-class time was used to conduct problem solving activities. Additionally, a web-based Q&A tool, called EchoLu, was integrated to allow students to post any course-related questions. The participants were 356 junior or senior college students (139 males and 217 females) registered in the flipped science course.

Instruments

A single Likert-type questionnaire was created by combining instruments measuring each individual construct in the causal help-seeking model. The details of these instruments are described as follows.

Perceived instructor support for help-seeking (ISFHS) scale. The ISFHS assesses the degree to which students perceive instructor support for seeking help. This measure consists of

items adapted from the Perceived Teacher Support of Questioning Scale (Karabenick & Sharma, 1994) (e.g., “The instructor generally feels good when we ask questions to request help”) and from the Students’ Perceptions of Teacher Support and Inhibition Scale (Butler & Shibaz, 2008) (e.g., “The instructor encourages us to ask for help any time, even after class”). The reliability of these questionnaires, using the Cronbach's alpha, were 0.82 and 0.79, respectively, indicating a good internal consistency.

Perceived relatedness (REL) scale. This instrument assesses the extent to which students experience satisfaction of relatedness needs in the class. The questionnaire items were adapted from the relatedness section of the Basic Need Satisfaction at Work Scale, which was used by Kasser, Davey, and Ryan (1992) and Baard, Deci, and Ryan (2004). The questionnaire includes such items as “People in the class care about me” or “The people in the class are generally pretty friendly towards me” to measure the extent to which students feels positive about their relationships with others in the class. Previous research reported high internal consistency with a Cronbach’s alpha value of 0.89.

Achievement goal orientation scale. This instrument assesses the extent to which students are performance or mastery goal-oriented. It is comprised of the items from the Goal Orientation and Learning Strategies Survey (GOALS-S), developed by Dowson and McInerney (2004), to measure students’ goal orientations. Four items measure mastery goal-orientation (MGO) (e.g., “I work hard because I am interested in what I am learning”) and six items measure performance goal-orientation (PGO) (e.g., “I want to learn things so that I can get good marks”). Reliability for the mastery-goal orientation subscale was 0.78, and it was 0 .87 for the performance-goal orientation subscale.

Help-seeking scale. The scale includes 15 items from the help-seeking instrument (Karabenick, 2001); the items are dispersed over five different subscales. The general intention to seek needed help (INTSH) measure asks students to rate three statements about their intentions to seek help (e.g., "If I needed help understanding the lectures in this class I would ask for help") on 5-point Likert scales. The perceived costs (threat) of the help seeking (COST) measure asks students to rate four items concerning the costs that they perceive regarding asking for help (e.g., "I would not want anyone to find out that I needed help in this class") on 5-point Likert scales ($\alpha = .84$). The perceived benefits of the help seeking (BENF) measure asks students to rate five items regarding the benefits of help-seeking that they perceive in the class (e.g., "Getting help in this class would increase my ability to learn the material") on 5-point Likert scales ($\alpha = .80$). The executive help-seeking (EXECHS) measure asks students to rate three items regarding their tendency to seek executive help (e.g., "Getting help in this class would be a way of avoiding doing some of the work") on 5-point Likert scales ($\alpha = .84$). Finally, the instrumental help-seeking (INSTHS) measure asks students to rate three items regarding their tendency to seek instrumental help on 5-point Likert scales.

Procedure and Data Analysis

The data analysis was carried out in several steps. First, confirmatory factor analysis was conducted to verify the factor structure of the observed variables. After the verification of the factorial structure, a model was created based on the hypothesized path model and estimated. Then, the model was assessed to check whether it fits the data. At the end, the model was re-specified to improve its fit, and then the model was finalized. The data analysis was run with Mplus software. Because of the skewness in the data, MLM (maximum likelihood mean

adjusted), an estimator that is robust to non-normality, was used as an estimator (Wang & Wang, 2012).

Results

Correlational Statistics

Correlational analysis among all measures revealed significant correlations among the constructs in the help-seeking model. First, the perceived instructor support for help-seeking was positively correlated with the perceived benefits ($r = .344$, $p < .01$) and was negatively correlated with the perceived costs of help-seeking ($r = -.515$, $p < .01$). Similarly, there was a positive correlation between the perceived relatedness and the perceived benefits of help seeking ($r = .194$, $p < .01$) and a negative correlation between the perceived relatedness and the perceived costs of help-seeking ($r = -.552$, $p < .01$). Considering the help-seeking behavior, the perceived instructor support for help-seeking was positively correlated with intention to seek help ($r = .461$, $p < .01$) and instrumental help-seeking ($r = .519$, $p < .01$), while it was negatively correlated with executive help-seeking ($r = -.329$, $p < .01$). Similar correlations were found between perceived relatedness and intention to seek help ($r = .431$, $p < .01$), perceived relatedness and instrumental help-seeking ($r = .338$, $p < .01$), and perceived relatedness and executive help-seeking ($r = -.302$, $p < .01$).

The perceived benefits of help-seeking was positively correlated with students' intentions to seek help ($r = .477$, $p < .01$) and with their preference for instrumental help-seeking ($r = .571$, $p < .01$). Conversely, the perceived costs of help-seeking was negatively correlated with students' intentions to seek help ($r = -.404$, $p < .01$) and with their preference for instrumental help-seeking ($r = -.421$, $p < .01$), while it was positively correlated with their preference for

executive help-seeking (r = .471, p < .01). The other correlations among the constructs are provided in the following table.

Table 3.1. *Correlations among the latent variables in the help-seeking path diagram*

[a] Variables	S.E.	INTSH	BENF	MGO	COST	REL	ISFHS	INSTHS	EXECHS
INTSH	0.053	1.000	-	-	-	-	-	-	-
BENF	0.050	**0.477	1.000	-	-	-	-	-	-
MGO	0.043	**0.614	**0.440	1.000	-	-	-	-	-
COST	0.058	**-0.404	**-0.173	**-0.241	1.000	-	-	-	-
REL	0.047	**0.431	**0.194	**0.295	**-0.552	1.000	-	-	-
ISFHS	0.033	**0.461	**0.344	**0.490	**-0.515	**0.524	1.000	-	-
INSTHS	0.026	**0.476	**0.571	**0.373	**-0.421	**0.338	**0.519	1.000	-
EXECHS	0.028	-0.073	0.101	-0.055	**0.471	**-0.302	**-0.329	-0.101	1.000
PGO	0.018	-0.027	-0.025	0.101	**0.272	**-0.178	-0.062	0.062	**0.424

** p < .01, [a] The abbreviated variable names were selected based on the instrument names measuring the latent variable (see the Instruments section and APPENDIX H).

Results of the Structural Model Analysis

Figure 3.3 portrays the hypothesized model that helps examine the relations among instructor support for help-seeking, relatedness, achievement goals, and help-seeking behavior (i.e., intention to seek help, instrumental help-seeking, and executive help-seeking). Relatedness, instructor support for help-seeking, performance goal orientation, and mastery goal orientation are the exogenous variables while students' intentions to seek help, instrumental help-seeking, and executive help-seeking are the endogenous variables of the model. The perceived costs and the perceived benefits of help-seeking serve as both the dependent (endogenous) and independent (exogenous) variables. The standardized regression coefficient (Beta) and coefficient of determination (r^2) for equations of endogenous variables are given in Figure 3.3.

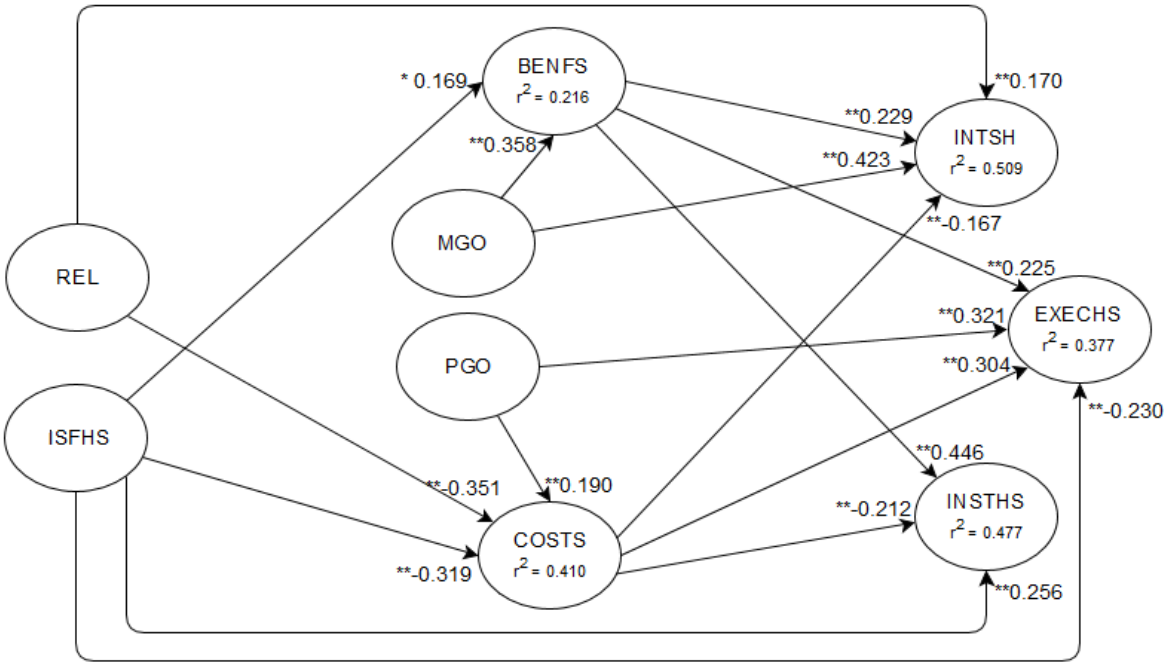

Figure 3.3. Results of SEM analysis explaining help-seeking behavior

* p < .01, ** p < .001.

The results of the overall model fit evaluation are presented in Table 3.2. These results indicate that the model fits the data well. In other words, the model supports the plausibility of the hypothesized causal relations among the latent variables.

Table 3.2. *Model fit indices indicating the goodness of the model fit to the data*

Chi-Square	DF	p-Value	RMSEA	CFI	TLI	SRMR
789.454	470	0.000	0.044[a]	0.955[b]	0.950[b]	0.071[c]

[a] 0.00-0.05 good model fit, [b] 0.95-1.00 good model fit, [c] 0.05-1.00 acceptable model fit.

The full model explained 21.6% of the total variance in the perceived benefits of help-seeking and 41% of the total variance in the perceived costs of help-seeking. The perceived benefits were explained by two variables. Instructor support for help-seeking (Beta = .169) and mastery goal orientation (Beta = .358) have positive influences on the perceived benefits for help-seeking. The perceived costs were explained by three variables, which are instructor support

for help-seeking (Beta = -.319), relatedness (Beta = -.351), and performance goal orientation (Beta = .190).

Table 3.3. *Indirect and direct effects of the independent variables*

Independent variables		Endogenous (dependent) variables				
		BENF	COST	INTSH	INSTHS	EXECHS
ISFHS	*Indirect*	-	-	**0.092	**0.143	-0.059
	Direct	*0.169	**-0.319	-	**0.256	**-0.230
	Total	**0.169	**-0.319	**0.092	**0.399	**-0.289
REL	*Indirect*	-	-	**0.059	**0.074	-
	Direct	-	**-0.351	**0.170	-	**-0.107
	Total	-	**-0.351	**0.228	**0.074	**-0.107
MGO	*Indirect*	-	-	**0.082	**0.159	**0.080
	Direct	**0.358	-	**0.423	-	-
	Total	-	-	**0.505	**0.159	**0.080
PMG	*Indirect*	-	-	*-0.032	**-0.040	**0.058
	Direct	-	**0.190	-	-	**0.321
	Total	-	**0.190	*-0.032	**-0.040	**0.379
BENF	*Indirect*	-	-	-	-	-
	Direct	-	-	**0.229	**0.446	**0.225
	Total	-	-	**0.229	**0.446	**0.225
COST	*Indirect*	-	-	-	-	-
	Direct	-	-	**-0.167	**-0.212	**0.304
	Total	-	-	**-0.167	**-0.212	**0.304
r^2		**0.216**	**0.410**	**0.509**	**0.477**	**0.377**

* p < .01, ** p < .001.

These results suggest that when students perceive instructor support for help-seeking, they are more likely to consider help-seeking beneficial and less likely to feel threatened when seeking help. Similarly, when students' relatedness needs are addressed, they are likely to feel less threatened by seeking help. Students' goal orientations also play a significant role in their perceptions regarding the benefits and costs of help-seeking. In particular, mastery goal oriented

students are more likely to perceive help-seeking as beneficial, while performance goal orientated students are more likely to perceive help-seeking as threatening.

The full model explained 50.9% of the total variance in students' intentions to seek help, 47.7% of the total variance in preferring instrumental help-seeking, and 37.7% of the total variance in preferring executive help-seeking. Mastery goal orientations (Beta = .423) had the strongest effect on intentions to seek help, followed by perceptions of benefits (Beta = .229), relatedness (Beta = .170), and perceptions of costs (Beta = -.167). Executive help-seeking was significantly affected by four variables in the model. While perceptions of costs (Beta = .304), perceptions of benefits (Beta = .225), and performance goal orientations (Beta = .321) had positive influences on executive help-seeking, instructor support for help-seeking had a negative effect (Beta = -.230) on executive help-seeking. Instrumental help-seeking was explained by three variables. Perceptions of benefits had the strongest effect (Beta = .446), followed by instructor support for help-seeking (Beta = .256). Perceptions of costs had a negative influence on instrumental help-seeking (Beta = -.212).

The exogenous variables in the model also had indirect effects on help-seeking mediated by students' perceptions regarding the costs and benefits of help-seeking. Instructor support for help-seeking had a positive indirect effect on intention to seek help (Beta = .092) and on instrumental help-seeking (Beta = .143). Similarly, relatedness had a positive indirect effect on intention to seek help (Beta = .059) and instrumental help-seeking (Beta = .074).

Discussion and Implications

The results of this study support and extend our understanding of students' help-seeking behavior in a flipped science classroom. The model presented projects a bigger picture than previous research and reveals various causal links influencing help-seeking. According to the

results, (1) students' intentions to seek help and their help-seeking styles were influenced by instructor support, relatedness, and goal orientations, and (2) their perceptions of benefits and costs of help-seeking were both determinants and mediators of help-seeking. Based on these findings, the implications for promoting help-seeking, particularly in flipped classrooms, are discussed below.

The current study showed that instructor support can predict not only students' perceptions of costs and benefits but also their help-seeking styles. In particular, instructor support can help promote the perceived benefits of help-seeking and decrease the perceived costs of help-seeking, an observation that has been reported consistently by previous research (Karabenick & Sharma, 1994; Kozanitis, Desbiens, & Chouinard, 2007; Nelson-Le Gall & Resnick, 1998). Instructor support was also influential on students' help-seeking styles: it positively influences instrumental help-seeking and negatively influences executive help-seeking. That is, when students perceive instructor support, they are more likely to utilize instrumental help and less likely to seek executive help. Previous research rarely looked into this relationship (e.g., Kozanitis et al., 2007); instead, a great deal of interest around help-seeking styles has been focused on achievement goal orientations. Indeed, this relationship can be inferred from the existing literature. Students with higher levels of perceived instructor support tend to be mastery goal oriented, and thus, they are more inclined to seek instrumental help rather than executive help (Butler & Shibaz, 2008).

Considering the importance of instructor support in promoting help-seeking, the practitioners should design their blended classes in a way that provides opportunities for students to ask questions and receive help. Enabling students to ask questions is an effective approach to promoting students' awareness of instructor support for help-seeking (Karabenick & Sharma,

1994). For example, in flipped classrooms, a web-based questions and answers (Q&A) tool can be integrated to allow students to ask questions outside the classroom, while they are studying the lecture materials. However, only including a Q&A tool may not necessarily promote help-seeking. Instructors may need to explicate that asking and answering questions is essential to learning; therefore, the active use of the Q&A tool is important for academic achievement in the class. For example, besides highlighting this point in the syllabus, instructors can provide instructional prompts throughout the semester to inform and remind students that asking questions and receiving the needed help is an important competence. Such prompts can call students' attention to the relevance and necessity of asking for help and encourage students to ask questions when help is needed (Schworm & Gruber, 2012).

Instructor participation in Q&A activities can affect students' use of help-seeking tools to ask and answer questions. First, instructors' positive attitudes toward students' questions and answers might help decrease students' feelings of threat. Help-seeking can be promoted when instructors react to students' help requests in a positive and encouraging manner, because positive instructor attitudes can help students feel safe when posting a question. Reactions from instructors toward students' questions have been found to have a positive influence on help-seeking (Kozanitis et al., 2007). If instructors provide such encouraging feedback as "Great question!" and "Great answer!" to both help-seekers and help-givers, students who were likely to avoid help-seeking before may perceive the instructor support and tend to ask questions when they need help. When using web-based Q&A environments, the instructor-student interactions can be observed by other students, resulting in a classroom-wide effect on students' perceptions of help-seeking. Therefore, it is important that instructors value students' attempts to ask for help in order to increase students' awareness of instructor support and reinforce the belief that help-

seeking is an important learning strategy. Furthermore, instructors' participation in Q&A activities is an important factor that can help increase the perceptions of teaching presence. Teaching presence, composed of instructional design, facilitation, and direct instruction, guides students in online learning environments and enhances the quality of interactions in these environments (Garrison, Cleveland-Innes, & Fung, 2010). Instructors' active participation in Q&A activities in terms of answering questions, confirming students' answers, promoting discussions with additional thoughts, supplying additional resources can support teaching presence and encourage students to ask and answer questions.

Given that help-seeking involves social interaction, interpersonal relationships among class members is likely to have an influence on help-seeking (Nelson-Le Gall, 1985; Ryan et al., 1998). According to the findings of the study, relatedness directly and indirectly influences students' intentions to seek help in flipped classrooms. Additionally, it has the largest influence on students' perceived costs of help-seeking. These results suggest that building positive relationships with class members has a diminishing effect on students' perceptions of threat and a positive influence on students' intentions to seek help. Similarly, previous research has also indicated that positive relationships with classmates decrease students' concerns about the negative judgments of others and encourage students to seek help when it is necessary (Marchand & Skinner, 2007; Nelson-Le Gall & Gumerman, 1984; Ryan, Patrick, & Shim, 2005). There was no influence of relatedness on either students' perceived benefits of help-seeking or their help-seeking styles.

In flipped classrooms, students, who spend considerable amounts of time studying the lectures themselves, should be provided with opportunities to build and maintain interpersonal relationships with peers. Today's college students, commonly called the millennials (Gloeckler,

2008), are very comfortable using social networking sites to build and maintain friendships (Salaway, Borreson & Nelson, 2008). Therefore, online help-seeking environments with specific affordances for social networking can appeal to today's college students and allow them to comfortably socialize with peers and build positive relationships (Hurt et al., 2012; Wang, Woo, Quek, Yang, & Liu, 2012). Thus, we suggest that specific affordances that promote social interactions and friendships among students (such as following, friending, bookmarking, *like*ing, exchanging gifts) should be implemented in new generation online help-seeking tools. College students could effectively take advantage of the social networking features in building and maintaining positive relationships with classmates, making them feel less threatened when asking questions. Additionally, considering that peers are a source of help frequently preferred by students (Hsu, 2005), increasing connectedness among class members would make this source of help more accessible and indirectly facilitate help-seeking. In this regard, features that enhance the presence of peers can be beneficial. For example, online help-seeking tools can indicate the number of online users. Furthermore, social networking features can assist students in actively observing peers' Q&A activities. Reviewing existing questions and responses may particularly help those who avoid asking questions because of concerns about being judged by others (Nadler, 1998). These students can keep track of the peers' activities and may observe positive reactions toward asking questions. This observation might help decrease the perceived threat about asking questions and encourage students to post their questions when needed.

Moreover, the results show that students' perceptions of help-seeking have a direct influence on both their intentions to seek help and help-seeking styles. In line with other studies, the perceived costs positively predicts executive help-seeking and negatively predicts intentions to seek help and instrumental help-seeking; the perceived benefits positively predicts students'

help-seeking styles and intentions to seek help. Interestingly and importantly, the positive influence of students' perceived benefits of help-seeking on executive help is a finding that is in contrast to other research. For example, Cheong and et al. (2004) and Arbreton (1998) found that students who perceive help-seeking as beneficial tend to prefer instrumental rather than executive help. This discrepancy might be due to the fact that students may not recognize different types of help and may consider help-seeking beneficial whether it is indeed executive or instrumental. To promote instrumental help-seeking among students, instructors can differentiate between these two help-seeking styles and encourage students to seek instrumental help (Cheong et al., 2004). Students can be exposed to this information via syllabus, as well as verbally during class time.

The results indicated that students' goal orientations also play a role in their help-seeking behavior in flipped classrooms. Mastery goal orientation was found to be positively correlated with perceptions of benefits and students' intentions to seek help, and performance goal orientation was positively correlated with perceptions of costs and executive help-seeking. These findings, consistent with previous research (Karabenick, 2003, 2004; Ryan & Pintrich, 1997; Tanaka & Murakami, 2001), suggest that mastery goal orientation should be promoted among students in order to support help-seeking. Classroom goal structure can determine students' goal orientations to a great extent (Arbreton, 1993; Butler & Neuman, 1995). Ames and Archer (1988) reported that when students recognize that the learning tasks are mastery goal-oriented, they use effective learning strategies, and prefer challenging tasks, because they consider achievement associated with mastery and effort. Instructors can emphasize mastery goals in their classroom activities rather than performance and competition. Instructors can discourage

students from executive help-seeking, and advise them to ask instrumental questions and solve academic problems mainly by their own effort.

Limitations and Future Work

The present study examined the role of instructor support, relatedness, and goal orientation in students' help-seeking behavior and tested the mediation effects of the perceived benefits and costs. The findings contribute to a better understanding of college students' help-seeking behavior in flipped classrooms and inform the design of these classrooms in terms of supporting help-seeking and, therefore, student learning. Although the results demonstrate interesting and pertinent findings, several limitations need to be acknowledged. First, the data analysis was conducted with data that were collected at a particular point in time. However, since students' help-seeking behavior is likely to change over time, a cross sectional analysis may not capture the relations among the variables completely. Future studies should examine students' help-seeking behavior over a period of time and capture its change in relation to the other factors. Second, other factors not included in this study may help better predict help-seeking. For example, classroom goal structure directly influences students' help-seeking intentions and styles (Butler & Neuman, 1995; Newman, 1998b; Ryan et al., 1998). Additionally, the specific types of performance goals (e.g., performance-avoidance and performance-approach goals) can have different effects on help-seeking (Karabenick, 2003, 2004; Tanaka & Murakami, 2001). Future research can examine the influence of these factors via different path models.

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CHAPTER 4

EXPLORING THE INFLUENCE OF THE PERCEIVED GOAL STRUCTURE AND INSTRUCTOR SUPPORT ON COLLEGE STUDENTS' ACADEMIC HELP-SEEKING [3]

[3] Er, E., & Orey, M. To be submitted to *British Journal of Education Technology*.

Abstract

Recently, the flipped classroom model has become a popular instructional approach in higher education. In flipped classrooms, the role of instructors in promoting and facilitating help-seeking substantially changes. However, the influence of instructors on help-seeking in flipped classrooms has rarely been studied. Using a structural equation modeling approach, the present study explores the relationships between several instructor-related variables and students' help-seeking behavior in a large-enrollment science classroom. Also, the influence of instructor participation in students' online help-seeking activities was examined. The results suggested a strong influence of instructor relatedness and classroom goal orientations and no significant influence of students' performance goal orientations as opposed to the existing literature. Additionally, there were significant increases in students' perceptions in accordance with the increased instructor participation in online help-seeking activities over time. The implications were discussed.

Introduction

Recently, higher education has been undergoing a transformation from instructor-centered classrooms to blended learner-centered instructional models that place a greater responsibility on students in their learning process. A popular example of these emerging instructional approaches is the flipped classroom model (Bergmann & Sams, 2012; Sankey & Hunt, 2013; Tucker, 2012). The term *flipped* refers to the replacement of classroom lecturing with problem solving group activities and the replacement of homework assignments with online learning materials, mostly video lectures, that students need to study and comprehend to become prepared for upcoming in-class learning activities (Chen, Wang, Kinshuk, & Chen, 2014; Davies, Dean, & Ball, 2013). Flipping these major course components engenders changes in students' and instructors' roles: Students who used to be passive learners in traditional lectures are expected to become active learners, instructors who used to play a dominate role in traditional classrooms are now expected to act as facilitators of student learning.

Being independent, active learning agents as demanded by the flipped classroom instructional model suggests a strong need for students to interact with and seek help from instructors and peers outside the classroom (Mahasneh, Sowan, & Nassar, 2012). Asking questions and receiving the needed assistance while or after studying the course materials can substantially contribute to students' understanding of the concepts, allowing them to be prepared for and fully benefit from in-class learning activities. Therefore, help-seeking is complementary to students' self-study efforts in the flipped classroom model, and when effectively used, it can promote learning gains before and during the in-class activities. That is, effective help-seeking is essential to student learning in flipped classrooms and needs to be effectively addressed so that learning can occur.

In flipped classrooms, the role of instructors in promoting and facilitating help-seeking substantially changes and goes beyond simply encouraging students to ask questions in classrooms. In flipped classrooms, online collaborative learning environments (OCLEs) such as online discussions are commonly used to support student interaction and allow students to ask questions outside the classroom (Sankey & Hunt, 2013). Besides the harmonious interconnection between OCLEs and other components of flipped classrooms, instructors' activities and interactions with students in OCLEs can largely influence students' help seeking-intentions and perceptions. The effects of the flipped classroom model on student learning have been frequently studied (e.g., Chen et al., 2014; Pierce & Fox, 2012; Riismandel, 2013); however, only a few studies have examined the factors influencing help-seeking (Er & Orey, In press) and the role of online help-seeking environments (Er, Kopcha, Orey, & Dustman, 2015) in flipped classrooms. To the best of our knowledge, there is to date no comprehensive study that examines instructor influence on help-seeking in flipped classrooms.

The present research aims to advance the current knowledge of help-seeking in flipped classrooms by investigating the effects of instructors on students' help-seeking intentions and their relevant perceptions. First, this study identifies the instructor-related factors that can play a role in help-seeking and examines these factors in relation to students' help-seeking intentions and perceptions. In particular, the structural equation modeling approach was used to study the effects of instructor relatedness, instructor support for help-seeking, and classroom goal structure (mastery or performance) on students' help-seeking intentions and perceptions. Second, this study investigates the influence of instructor participation in online help-seeking activities. We examined the change in students' perceptions in relation to the extent to which students were

exposed to instructor presence in a researcher-developed web-based help-seeking tool, called EchoLu.

Theoretical Background and Literature Review

As opposed to the early literature, which considers help-seeking a dependent behavior signaling one's incompetence (Newman, 1998a), the current literature frames help-seeking as a beneficial and necessary self-regulated learning strategy (Nelson-Le Gall, 1981). Help-seeking can be defined as an activity in which students "*regulate* the social environment to promote learning" (Schunk, 2012, p. 435). Help-seeking cultivates student understanding and learning when effectively used (Karabenick & Knapp, 1991; Nelson-Le Gall, 1981; Puustinen, 1998; Zimmerman & Pons, 1986). Research shows that students who seek the necessary help are likely to experience higher achievement (R. Ames & Lau, 1982; Kitsantas & Chow, 2007; Magnusson & Perry, 1992). Students seek either executive help or instrumental help (Nelson-Le Gall et al., 1983). In executive help-seeking, students look for ready-made answers from others and aim to overcome the learning difficulty with the least amount of effort. For example, students preferring the executive style may aim to complete a homework assignment by receiving direct answers from more knowledgeable peers without much concern regarding their learning. On the other hand, in instrumental help-seeking, students retain their responsibility for dealing with learning difficulties (Magnusson & Perry, 1992) and attempt to overcome a learning difficulty independently with mainly their own efforts. For example, in instrumental help-seeking a student may attempt to first make individual progress in solving a science problem and may later request a small hint that is enough for solving the problem independently (Karabenick & Knapp, 1991).

Help-Seeking Perceptions and Intentions

Students' help-seeking intentions are strongly associated with the degree to which they perceive help-seeking as a threat (e.g. others' judgements about one's competence) or a benefit (e.g., asking questions supports learning). The perceived threats (or costs) of help-seeking are diminished in caring, supportive, and friendly environments since positive relationships with others decrease students' concerns about others' negative judgments and encourage them to seek help when it is necessary (Marchand & Skinner, 2007; Nelson-Le Gall & Gumerman, 1984; Ryan et al., 2005). Similarly, the perceived benefits of help-seeking are promoted in learning environments that reinforce the belief that help-seeking is a necessary and beneficial strategy that contributes to learning (Newman & Goldin, 1990; Newman, 1990). These perceptions also affect students' help-seeking styles. In particular, students who perceive help-seeking as highly beneficial are likely to prefer instrumental style when seeking help (Arbreton, 1998; Ryan & Pintrich, 1997), whereas students who perceive help-seeking highly threatening are likely to seek executive help (Butler & Neuman, 1995; Karabenick, 2004). Based on the above arguments, the following research hypotheses were derived. These hypotheses are illustrated in Figure 4.1.

H1.a: *The perceived benefits of help-seeking (BENFS) has a positive influence on students' intentions to seek instrumental help (INST).*

H1.b: *The perceived benefits of help-seeking (BENFS) has a positive influence on students' intentions to seek help (INT).*

H2.a: *The perceived costs of help-seeking (COSTS) has a negative influence on students' intentions to seek help (INT).*

H2.b: *The perceived costs of help-seeking (COSTS) has a positive influence on students' intentions to seek executive help (EXEC).*

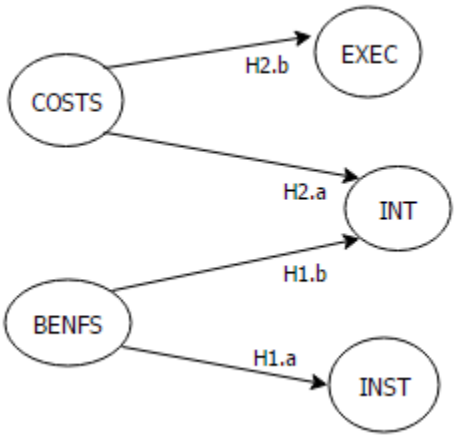

Figure 4.1. The structural model illustrating H1.a, H1.b, H2.a, and H2.b

Achievement Goal Orientations

Personal achievement goal orientations (i.e., mastery goals and performance goals) affect students' help-seeking behavior (Nelson-Le Gall, 1985; Wolters et al., 1996). Mastery goals reinforce students' motivation to learn and therefore encourage them to exert greater amount of effort to master concepts (Arbreton, 1998; Wolters et al., 1996). Mastery goal oriented students consider help-seeking a useful strategy that supports their learning and do not avoid seeking help when necessary, and in particular, they prefer instrumental help over executive help (Karabenick, 2003; Ryan & Pintrich, 1997).

Performance goal orientations, on the other hand, shift students' focus to performing well and obtaining good grades (Wolters et al., 1996). Students may have two types of performance goals (Tanaka & Murakami, 2001). Performance-avoidance promotes students' feelings of threat by the negative judgments of others and cause students to avoid appearing incompetent (Karabenick, 2004). Therefore, performance-avoidance oriented students tend to avoid seeking help due to feelings of threat (Butler & Neuman, 1995; Karabenick, 2003). The second type of performance goals are performance-approach goals which promote students' desire to exhibit their abilities and outperform others (Tanaka & Murakami, 2001). Studies consistently reported

that students with performance goal orientation are likely to seek executive help when they decide to ask for help (Butler, 1998; Karabenick, 2003, 2004; Ryan & Pintrich, 1998). The following hypotheses are proposed based on the role of goal orientations in help-seeking. These hypotheses are illustrated in Figure 4.2.

H3.a: *Mastery goal orientation (MAST) has a positive influence on students' perceptions regarding the benefits of help-seeking (BENFS).*

H3.b: *Mastery goal orientation (MAST) has a positive influence on students' intentions to seek instrumental help (INST).*

H3.c: *Mastery goal orientation (MAST) has a positive influence on students' intentions to seek help* (INT).

H3.d: *Mastery goal orientation (MAST) has a positive influence on students' intentions to seek executive help (EXEC).*

H3.e: *Mastery goal orientation (MAST) has a negative influence on students' perceptions regarding the costs of help-seeking (COSTS).*

H4.a: *Performance goal orientation (PERF) has a positive influence on students' perceptions regarding the costs of help-seeking (COSTS).*

H4.b: *Performance goal orientation (PERF) has a positive influence on students' intentions to seek executive help (EXEC).*

H4.c: *Performance goal orientation (PERF) has a negative influence on students' intentions to seek help (INT).*

H4.d: *Performance goal orientation (PERF) has a negative influence on students' intentions to seek instrumental help (INST).*

H4.e: *Performance goal orientation (PERF) has a negative influence on students' perceptions regarding the benefits of help-seeking (BENFS).*

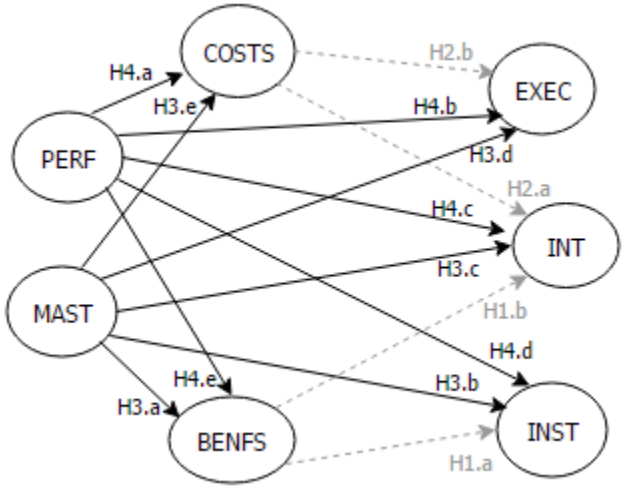

Figure 4.2. The structural model illustrating H3.a, H3.b, H3.c, H3.d, H3.e, H4.a, H4.b, H4.c, H4.d, and H4.e

Instructors' Role

Instructors can have a significant effect on forming and changing students' perceptions and intentions regarding help-seeking through their direct interactions with students, their instructional approaches, and their organization of the course components and activities. In particular, instructors will have a positive influence on help-seeking if they verbally encourage students to ask questions and positively react to student questions; value and emphasize student learning and minimize the threat of grading and comparison (i.e., mastery rather than performance); and if they consider help-seeking an integral component of student learning and provide tailored resources and tools to support it. That is, instructors' decisions, attitudes, and actions in a specific class can determine how students will perceive and use help-seeking. In this regard, the present study acknowledges three instructor-related factors − classroom goal structure, instructor relatedness, and instructor support for help-seeking − and examines these factors in relation to students' help-seeking intentions and perceptions.

Classroom goal structure. The goal structure of a classroom impacts students' help-seeking behavior. Arbreton (1998) discusses two types of classroom goal structure: task-focused classrooms (i.e., classroom mastery goal structure) and ability-focused classrooms (i.e., classroom performance goal structure). Task-focused classrooms prioritize learning and understanding, encourage students to ask questions, and apply different methods to strengthen students' understanding (e.g., using real world examples). In contrast, ability-focused classrooms prioritize grades and right answers, favor smart students, and make comparisons among students. Research has been informative in demonstrating the influence of different classroom goal structures on help-seeking (Butler & Neuman, 1995; Newman, 1998b; Ryan et al., 1998). When a task-focused goal structure is emphasized in a classroom, students perceive help-seeking as beneficial, and they are more inclined to seek help when needed, whereas when an ability-focused goal structure is emphasized, students tend to avoid help-seeking because of their perceptions of threat (Ryan et al., 1998). Similarly, there exists a positive correlation between avoidance of help-seeking and perceived teacher emphasis on student ability (Arbreton, 1993; Ryan et al., 1998). The interaction between a student's personal achievement goals and the classroom goal structure can have an effect on help-seeking. Newman (1998) examined students' help-seeking behavior in relation to the fit between contextual and personal goals. Results showed that students with performance goals are more likely to avoid seeking help in an ability-focused classroom. However, such students are likely to seek more help in a task-focused classroom. Thus, the fit between contextual and personal goals may also influence help-seeking, and classroom goals emphasized by instructors can override the effects of personal achievement goals. The hypotheses derived are listed below and illustrated in Figure 4.4.

H5.a: *Classroom performance goal structure (CPERF) has a positive influence on students' perceptions of costs for help-seeking (COSTS).*

H5.b: *Classroom performance goal structure (CPERF) has a positive influence on students' performance goal orientation (PERF), including performance-approach (PAPP) and performance-avoidance (PAVO).*

H5.c: *Classroom performance goal structure (CPERF) has a negative influence on students' mastery-goal orientations.*

H6.a: *Classroom mastery goal structure (CMAST) has a positive influence on students' perceptions regarding the benefits of help-seeking (BENFS).*

H6.b: *Classroom mastery goal structure (CMAST) has a positive influence on students' mastery-goal orientations (MAST).*

H6.c: *Classroom mastery goal structure (CMAST) has a negative influence on students' performance goal orientation (PERF), including performance-approach (PAPP) and performance-avoidance (PAVO).*

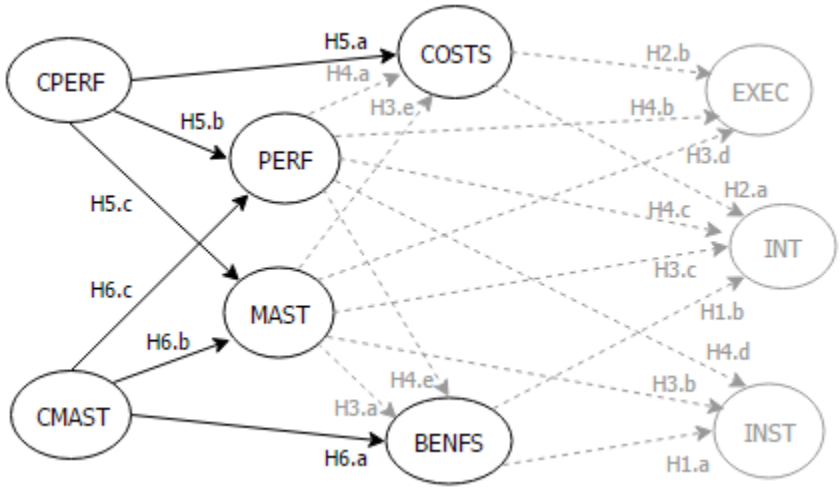

Figure 4.3. The structural model illustrating H5.a, H5.b, H5.c, H6.a, H6.b, and H6.c

Students' relatedness with instructors. Instructor relatedness refers to the extent to which students perceive a positive, caring, and supportive relationship with instructors (Shen, Mccaughtry, Martin, Fahlman, & Garn, 2012). Instructors' positive attitudes toward students and their willingness to interact with them and address their learning problems result in higher perceptions of instructor relatedness (Owens & Ennis, 2005). Existing help-seeking research has overlooked instructor relatedness and paid more attention to students' relatedness with peers (e.g., Marchand & Skinner, 2007). However, instructor relatedness is essential for creating a positive classroom climate (Turner, Gray, Anderman, Dawson, & Anderman, 2013), which is important for encouraging students to use help-seeking (Nelson-Le Gall, 1985; Ryan et al., 1998, 2001). Students' relatedness with instructors has been found to be closely associated with their perceptions of classroom goal structure (Patrick, Kaplan, & Ryan, 2011; Turner et al., 2013). Considering the influence of classroom goal structure on help-seeking, we suggest that students' relatedness with instructors will have some indirect effects on help-seeking.

Instructor support for help-seeking. In any learning setting, instructors' views on seeking help have an effect on student attitudes toward help-seeking. Empirical studies have reported a correlation between perceived teacher (or instructor) support and the resulting help-seeking activities (Karabenick & Sharma, 1994; Newman & Schwager, 1993). For example, Newman and Schwager (1993) found that students who perceive teacher support for help-seeking are more likely to seek help. Likewise, in a study among college students, Karabenick and Sharma (1994) reported that increased student perception of teacher support resulted in a higher number of questions asked in classroom environment. Arbreton (1998) added that teacher support for help-seeking results in instrumental help-seeking rather than executive help-seeking, especially in task-focused classrooms. Thus, teacher support helps in decreasing students'

feelings of threat and enhancing the belief among students that help-seeking is a useful learning strategy, which promotes help-seeking (Arbreton, 1998). Accordingly, we suggest that instructor support for help-seeking will promote students' perceptions of classroom mastery goals and decrease the perceptions of classroom performance goals, and therefore will have significant indirect effects on help-seeking.

The following research hypotheses are proposed to examine the influence of instructor-related factors on help-seeking. These hypotheses are illustrated in Figure 4.4.

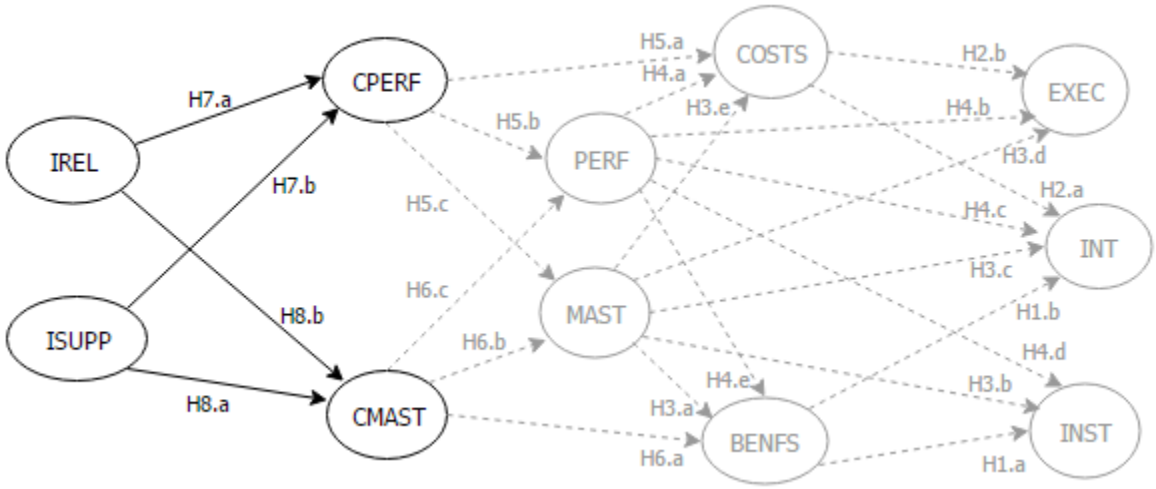

Figure 4.4. The structural model illustrating H7.a, H7.b, H8.a, and H8.b

H7.a: *Instructor relatedness (IREL) has a negative influence on students' perceptions of classroom performance goal structure (CPERF), including performance-approach (CPAPP) and performance-avoidance (CPAVO).*

H7.b: *Instructor relatedness (IREL) has a positive influence on students' perceptions of classroom mastery goal structure (CMAST),*

H8.a: *Instructor support for help-seeking (ISUPP) has a positive influence on students' perceptions of classroom mastery goal structure (CMAST).*

H8.b: *Instructor support for help-seeking (ISUPP) has a negative influence on students' perceptions of classroom performance goal structure (CPERF), including performance-approach (CPAPP) and performance-avoidance (CPAVO).*

Method

Research Context

The context of this study was a large-enrollment flipped science course offered at a southern US university. In this course, the instruction was delivered to students online at their homes through instructor-created videos in advance of face-to-face class meetings. The class meetings were used to conduct collaborative problem solving activities in groups, enabling students to practice what they had learned from the course videos. The university's learning management system (LMS) was used to organize and deliver the course materials. A web-based help-seeking tool, called EchoLu, was integrated into the LMS to enable students to post any course-related questions during their self-study time. Students' participation in EchoLu was graded. The participants were among the 377 junior or senior college students enrolled in the flipped science course. Additionally, the course instructor was changed at the beginning of the semester.

Measures

When studying the well-established constructs from the literature, using previously validated instruments to measure these constructs leads to high validity and reliability in the measurement model (Boudreau, Gefen, & Straub, 2001; Lee & Hubona, 2009). Following this principle, this study uses measures from the literature that have been previously validated. First, items to measure the perceived instructor support for help-seeking (ISUP) were adopted from The Perceived Teacher Support of Questioning Scale (Karabenick & Sharma, 1994) and The

Students' Perceptions of Teacher Support and Inhibition Scale (Butler & Shibaz, 2008). The Cronbach's alpha values from the original study were 0.82 and 0.79, respectively. To measure students' perceived instructor relatedness (IREL), three items were adopted from The Instrument For Classroom Psychosocial Environment at Universities and Colleges (Fraser, Treagust, & Dennis, 1986). The original study reported a range of 0.72-0.92 Cronbach's alpha values for all subscales of the instrument.

The Perception of Classroom Goal Structures Scales of PALS (Midgley et al., 1997) were used to measure students' perceptions of classroom goal structures: classroom mastery goal structure (CMAST, $\alpha = 0.76$), classroom performance-approach goal structure (CPAPP, $\alpha = 0.70$), and classroom performance-avoid goal structure (CPAVO, $\alpha = 0.83$). Students' achievement goal orientations were measured using Dowson and McInerney's (2004) Goal Orientation and Learning Strategies Survey, which contains four items to measure mastery goal-orientation (MAST) and six items to measure performance goal-orientation (PER). The original study reported Cronbach's alpha values of 0.78 for mastery-goal orientation and 0.87 for performance-goal orientation. Last, Karabenick's (2001) help-seeking instrument was used to measure the perceived costs (COSTS) and benefits (BENFS) of help seeking, and the intention to seek help (INT), to seek executive help (EXEC), and to seek instrumental help-seeking (INST). The Cronbach's alpha values for each subscale from the original study were above 0.80.

Data Collection and Analysis

The measures were compiled into two separate online questionnaires, and each of the questionnaires was administered once at the middle of the semester (time point 1 −TP1) and once at the end of the semester (time point 2 –TP2). Participants received an additional grade point for completing the questionnaires. Students' identification numbers were requested in the

questionnaires to be used for assigning the grade points and also for merging the results of the two questionnaires at each time point. The questionnaires were announced using the news feature of the LMS, and a one-week span was provided for completing the questionnaire. The questionnaires were administered on two consecutive weeks at each time point.

At TP1, 364 participants completed the first questionnaire, and 383 participants completed the second questionnaire, and at TP2, 352 participants completed the first questionnaire, and 337 participants completed the second questionnaire. Then, the data were cleaned (e.g., removing the missing data and invalid data based on the reverse-coded items), and the student records from the separate questionnaires at each time point were matched. The participant information obtained after this refinement process is given in the following table.

Table 4.1. *Questionnaire participation information*

Time points	Total participants	Male participants	Female participants
TP1	267	103	158
TP2	245	96	147

Next, confirmatory factor analysis (CFA) was performed to confirm the validity and reliability of all measures used in this study by using Mplus (version 7.11). Descriptive statistics, reliability analysis, and correlation analysis were conducted using SPSS. Structural equation modeling (SEM) was applied to explore the relationships between the instructor-related factors and students' help-seeking intentions and perceptions. Moreover, a longitudinal SEM technique was used to examine whether the same causal relationships hold overtime. More specifically, the MLMV (mean and variance adjusted chi-square statistic) estimator was used in the analysis which allowed us to perform the chi-square difference test to compare the models at two time points. Chi-square test is recommended for testing structural invariance across different time

points (Wang & Wang, 2012). Root-Mean-Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR) were used to assess the model fits (Hair, 2010; Hooper, Coughlan, & Mullen, 2008; Tabachnick, 1996).

In the next stage, the changes in students' help-seeking perceptions and intentions (13 variables) across time points were examined. Students' identification information was used to match the records across the time points, and then were removed from the data for confidentiality. The sample size decreased to 182 after pairing the records. In this analysis, the course instructors' participation in EchoLu (the online help-seeking system used in the research context) was also included. The online database of EchoLu was queried to obtain (1) the number of times a student's question was accompanied by an instructor comment (i.e., direct instructor-student interaction), and (2) the number of times a student's comment to a question was accompanied by an instructor comment (i.e., indirect instructor-student interaction). Because of the non-normality in the data, a non-parametric statistical test called Wilcoxon signed-rank test was used (Demsar, 2006) to detect the significant changes in the measured variables. The analysis was conducted using SPSS.

Results

Measurement model

First, CFA was conducted. According to the results of CFA, shown in Table 4.2. *The model fit statistics of the confirmatory factor analysis*, the measurement model demonstrated a good fit with the study data obtained at TP1 (RMSEA = .021, CFI = .968, TLI = .964, SRMR = .048) and TP2 (RMSEA = .022, CFI = .968, TLI = .964, SRMR = .042). Mean, standard deviation (SD) and Cronbach's alpha values as well as factor loadings for all measure items are

provided in APPENDIX A. The Cronbach's α values for all measures were above 0.6, which is a suggested threshold for an acceptable level of reliability according to Hancock and Mueller (2013). It is noteworthy that although the factor loading of the EXEC2 item was low, this item was preserved in the structural model following the principle that there should be at least three items to effectively measure a latent factor (Wang & Wang, 2012).

Table 4.2. *The model fit statistics of the confirmatory factor analysis*

Model	χ^2	**df**	**RMSEA** [a]	**CFI** [b]	**TLI** [b]	**SRMR** [c]
TP1	736.717	657	0.021	0.968	0.964	0.048
TP2	732.656	657	0.022	0.968	0.964	0.042

[a] 0.00-0.05 good model fit, [b] 0.95-1.00 good model fit, [c] 0-0.08 good model fit.

Mean scores, skewness and kurtosis values and correlations of the latent variables are provided in APPENDIX B for TP1 and APPENDIX C for TP2. Bulmer (1966) suggests that if skewness is higher than 0.5, there probably exists a moderate degree of skewness, and therefore non-normality in a distribution. The skewness values given in APPENDIX B and APPENDIX C for this study suggests non-normality in the data. However, maximum likelihood estimators, such as MLMV used in this study, are proven to be robust to non-normality (Bollen, 1989; Wang & Wang, 2012). Researchers reported no significant differences when running SEM analysis on samples with different kurtosis and skewness levels (Reinartz, Haenlein, & Henseler, 2009). Therefore, we assume no or minor effects of non-normality in the results.

The Analysis of the Full Model

The full structural model that contains all research hypotheses was evaluated using SEM. The details of analysis results for both time points are provided in APPENDIX D and APPENDIX E, respectively. The model fit indices indicate an acceptable model fit (RMSEA = .025, CFI = .925, TLI = .920, SRMR = .081 at TP1 and RMSEA = .025, CFI = .929, TLI = .924,

SRMR = .086 at TP2), suggesting that the model could be improved. Accordingly, not all hypothesized relationships were supported. The effects of students' performance goal orientations (including -approach and -avoidance goals) on students' intentions to seek help (whether instrumental or executive) were either non-significant or minor. Similarly, the performance goal orientations also had no or little effect on students' perceptions regarding costs and benefits of help-seeking. Therefore, to refine and improve the model, we decided to exclude the performance goal orientation from the structural model and discard the related hypotheses (i.e., H5.b, H5.c, and H4). For similar reasons, the classroom performance-approach goal structure was excluded but the classroom performance-avoidance goal structure was preserved since it was significantly associated with students' perceptions regarding the costs of help-seeking. Furthermore, instructor support for help-seeking had no significant influence on classroom performance goal structure, and classroom performance goal structure had no significant influence on students' mastery goal orientations. Therefore, these two paths were also removed from the structural model (i.e., H7.b and H5.c). After these modifications, the research hypotheses to be examined in the refined model were finalized (see Table 4.3). The refined structural model is depicted in Figure 4.5.

Table 4.3. *Refined research hypotheses*

H7.a	Instructor relatedness (IREL) has a negative influence on students' perceptions of classroom performance-avoidance goal structure (CPAVO)
H8.b	Instructor relatedness (IREL) has a positive influence on students' perceptions of classroom mastery goal structure (CMAST)
H8.a	Instructor support for help-seeking (ISUPP) has a positive influence on students' perceptions of classroom mastery goal structure (CMAST)
H5.a	Classroom performance-avoidance goal structure (CPAVO) has a positive influence on students' perceptions of costs for help-seeking (COSTS)
H6.a	Classroom mastery goal structure (CMAST) has a positive influence on students' perceptions of benefits for help-seeking (BENFS)

H6.b	Classroom mastery goal structure (CMAST) has a positive influence on students' mastery-goal orientations (MAST)
H3.a	Mastery goal orientation (MAST) has a positive influence on students' perceptions of benefits for help-seeking (BENFS)
H3.b	Mastery goal orientation (MAST) has a positive influence on students' intentions to seek instrumental help (INST)
H3.c	Mastery goal orientation (MAST) has a positive influence on students' intentions to seek help (INT)
H3.d	Mastery goal orientation (MAST) has a positive influence on students' intentions to seek executive help (EXEC)
H3.e	Mastery goal orientation (MAST) has a negative influence on students' perceptions of costs for help-seeking (COSTS)
H1.a	Perceptions of benefits for help-seeking (BENFS) has a positive influence on students' intentions to seek instrumental help (INST).
H1.b	Perceptions of benefits for help-seeking (BENFS) has a positive influence on students' intentions to seek help (INT).
H2.a	Perceptions of costs for help-seeking (COSTS) has a positive influence on students' intentions to seek executive help (EXEC).
H2.b	Perceptions of costs for help-seeking (COSTS) has a positive influence on students' intentions to seek help (INT).

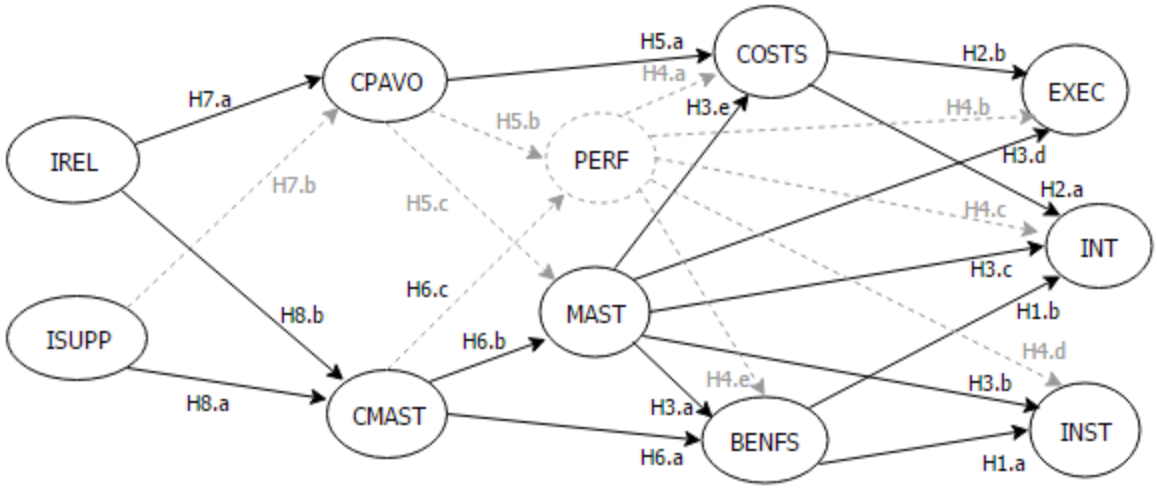

Figure 4.5. Refined structural model of help-seeking

The Analysis of the Refined Model

First, the structural invariance of the model across time was examined by using chi-square difference test. In other words, it was tested that if the same hypothesized causal

relationships hold at both the first and second time points. The chi-square calculated from the model with all parameters are set free across time points was compared to the chi-square calculated from the model where paths at TP1 and TP2 were constrained to be equal. According to the results of the chi-square difference test, no significant difference was found across time, χ^2 (16) = 15.833 p = .464, suggesting that the model is invariant across different time points and the same hypothesized relationships consistently hold over time. Therefore, we constrained the paths between the latent variables to be equal across time points when performing the SEM analysis, which allowed to calculate the path coefficients with a higher statistical power. As shown in Table 4.4, a good fit of the data with the model was obtained at the first time point (RMSEA = .22, CFI = .964, TLI = .961, SRMR = .071), at the second time point (RMSEA = .022, CFI = .966, TLI = .964, SRMR = .057), and when the model is constrained to be equal across time points (RMSEA = .017, CFI = .940, TLI = .938, SRMR = .059).

Table 4.4. *Model fit indices for the data at TP1 and TP2, and when constrained*

	Chi-Square	df	RMSEA	CFI	TLI	SRMR
TP1	771.265	683	0.022	0.964	0.961	0.071
TP2	762.432	638	0.022	0.966	0.964	0.057
Constrained	1616.180	1440	0.017	0.940	0.938	0.059

Table 4.5. *Standardized and unstandardized path coefficients* provides the unstandardized and standardized path coefficient values for the model evaluation with data at the first time point and at the second time point, and for the model evaluation when the paths were constrained to be equal across time points. According to the results of the constrained model, all hypotheses in the refined model were supported. Instructor relatedness positively effects

students' perceptions of classroom mastery goals (Beta = .410) and negatively effects performance-avoidance goal structure in classrooms (Beta = -.480), supporting hypotheses H7.a and H8.b. Instructor support has an positive influence on only students' perceptions of classroom mastery goal structure (H8.a, Beta = .178), which effects students' mastery goal orientation significantly (H6.b, Beta = .830). Students' perceptions of costs are negatively affected by their mastery goal orientation (H3.e, Beta = -.243) and positively influenced by the extent to which they perceive the classroom as being performance-approach focused (H5.a, Beta = .468). On the other hand, students' perceptions of benefits for help-seeking were positively associated with mastery goal orientation (H3.a, Beta = .306) and with the degree to which they perceive mastery-focus in the classroom (H6.a, Beta = .491).

Table 4.5. *Standardized and unstandardized path coefficients*

	TP1		TP2		Constrained		
	Unstd.	Std.	Unstd.	Std.	Unstd	Std. TP1	Std. TP2
H7.a: IREL → CPAVO	-.526	-.426	-.405	-.302	-.480	-.379	-.362
H8.b: IREL → CMAST	.285	.417	.489	.598	.410	.509	.564
H8.a: ISUPP → CMAST	.213	.337	.175[b]	.196[b]	.178	.253	.220
H5.a: CPAVO → COSTS	.408	.444	.504	.592	.468	.470	.587
H6.a: CMAST → BENFS	.451	.302	.565	.441	.491	.358	.356
H6.b: CMAST → MAST	.798	.531	.867	.648	.830	.611	.575
H3.a: MAST → BENFS	.394	.396	.195[b]	.203[b]	.306	.303	-.320
H3.b: MAST → INST	.094[a]	.133[a]	.330	.416	.217	.280	.294
H3.c: MAST → INT	.230	.173	.278	.259	.257	.190	.240
H2.a: COSTS → INT	-.232	-.193	-.295	-.286	-.273	-.233	-.258
H3.e: MAST → COSTS	.284	-.257	-.223	-.214	-.243	-.210	-.240
H1.a: BENFS → INST	.413	.577	.405	.488	.398	.519	.516
H1.b: BENFS → INT	.654	.489	.566	.505	.598	.446	.534
H2.b: COSTS → EXEC	.690	.710	.491	.471	.594	.679	.539
H3.d: MAST → EXEC	-.242	-.226	-.259	-.238	-.246	-.244	-.221

All coefficients are significant at p < .01. Exceptions are [a] p > .05 and [b] p < .05.

Furthermore, mastery goal orientation, and the perceived costs and benefits for help-seeking have significant effects on students' help-seeking intentions. In particular, mastery goal orientations positively influence intentions to seek help (H3.c, Beta = .257), to seek instrumental help (H3.b, Beta = .217), and negatively influence intentions to seek executive help (H3.d, Beta = -.246). Moreover, the perceived costs have a positive effect on intentions to seek executive help-seeking (H2.b, Beta = .594) while having a negative effect on overall intentions to seek help (H2.a, Beta = -.273), and the perceived benefits have a positive effect on students' intention to seek help (H1.b, Beta = .598), and particularly to seek instrumental help (H1.a, Beta = .398). The following figure depicts the refined structural model with the path coefficients according to the results of the constrained model.

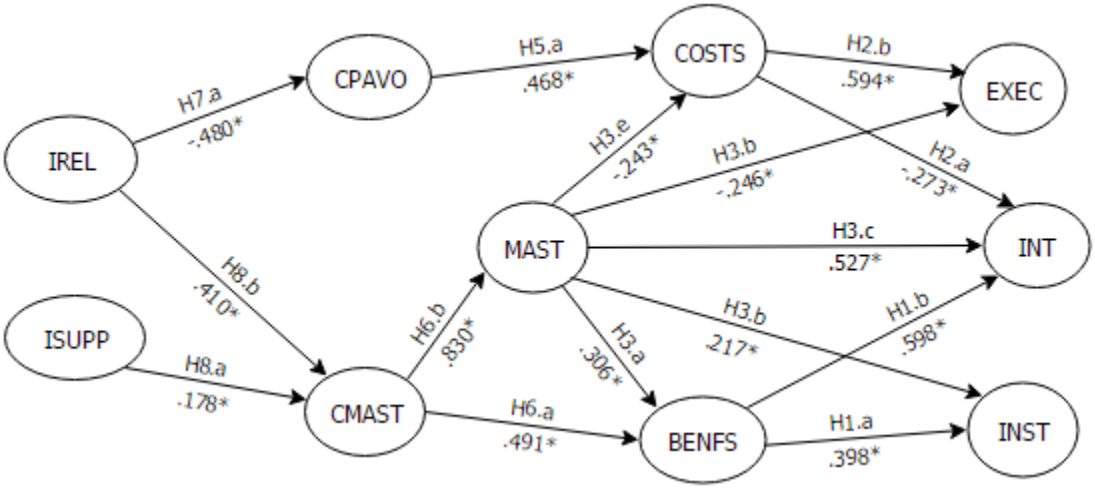

Figure 4.6. Path coefficients in the constrained model (* p < .001).

Besides the hypothesized direct relationships among the variables, there were also indirect associations, increasing the total effects of the independent variables. Table 4.6. *Indirect effects in the constrained model* provides the indirect effects among the variables in the constrained model. According to results, instructor relatedness indirectly influences students'

mastery goal orientations (Beta= .340), their perceptions regarding the costs (Beta = .308) and benefits (Beta =.305) of help-seeking, help-seeking intentions (Beta = .354), preference for instrumental (Beta = .195) and executive help-seeking (Beta = -.266). Compared to instructor relatedness, instructor support for help-seeking has small indirect effects with the range of Beta values from -.036 (on the perceived costs) to .148 (on mastery goal orientation). Students' perceptions of classroom mastery goal structure has the largest indirect effects on help-seeking. In particular, it indirectly affects students' perceptions regarding the costs (Beta =.202) and benefits (Beta = .254) of help-seeking, help-seeking intentions (Beta = .714), preference for instrumental (Beta = .476) and executive (Beta = -.324) help-seeking. Moreover, perceptions of performance-approach focus in classrooms indirectly influence students' intentions to seek help (Beta = -.128) and preferences for executive style (Beta = .278). Besides its direct effects, mastery goal orientation has also indirect effects on students' intentions to seek help (Beta = .249) and preferences for instrumental (Beta = .122) and executive style (Beta = -.144). These results suggest that students' perceptions of instructor relatedness and the mastery goal structure in the classroom are the two factors that have substantial impact on their help-seeking that are mediated by other factors in the model.

Table 4.6. *Indirect effects in the constrained model*

		MAST	BENFS	COSTS	INTSH	INSTHS	EXECHS
ISUP	*Indirect*	.148	.133	-.036	.127	.085	-.058
	Direct	-	-	-	-	-	-
	Total	.148	.133	-.036	.127	.085	-.058
IREL	*Indirect*	.340	.305	-.308	.354	.195	-.266
	Direct	-	-	-	-	-	-
	Total	.340	.305	-.308	.354	.195	-.266
CMAST	*Indirect*	-	.254	-.202	.714	.476	-.324
	Direct	.594	.491	-	-	-	-

	Total	.594	.744	-.133	.714	.476	-.324
CPAVO	*Indirect*	-	-	-	-.128	-	.278
	Direct	-	-	.486	-	-	-
	Total	-	-	.486	-.128	-	.278
MAST	*Indirect*	-	-	-	.249	.122	-.144
	Direct	-	.313	-.224	.257	.217	-.246
	Total	-	.313	-.224	.506	.339	-.390

All coefficients are unstandardized and significant at p < .001.

According to the results (see Table 4.7), the model explained 28% (at TP1) and 42% (at TP2) of the variance in students' mastery goal orientations, 51% (at TP1) and 58% (at TP2) of the variance in students' perceptions of mastery-focused classroom, 18% (at TP1) and 9% (at TP2) of the variance in students' perceptions of performance-avoidance focus in the classroom, 29% (at TP1) and 43% (at TP2) of the variance in the perceived costs for help-seeking, 37% (at TP1) and 35% (at TP2) of the variance in the perceived benefits for help-seeking, 46% (at TP1) and 62% (at TP2) of the variance in students' intentions to seek help, 43% (at TP1) and 61% (at TP2) of the variance in students' intentions to seek instrumental help, and 66% (at TP1) and 34% (at TP2) of the variance in students' intentions to seek executive help.

Table 4.7. *The variance explained at two time points*

	TP1	TP2
MAST	0.282	0.420
INT	0.462	0.629
BENFS	0.375	0.352
EXEC	0.660	0.346
INST	0.436	0.610
COSTS	0.299	0.434
CMAST	0.518	0.589
CPAVO	0.181	0.091

Changes in Students' Perceptions Over Time and the Instructor Role

The Wilcoxon test was run to identify the significant changes in students' help-seeking perceptions and intentions. According to the results (see Table 4.8), both the direct and indirect student-instructor interaction at TP1 are significantly higher than those at TP2 (M_1 = 0.558, M_2 = 0.845, Z = -3.487, p < .000; M_1 = 0.491, M_2 = 0.723, Z = -2.662, p < .008). Similarly, there is a significant increase in students' perceptions of instructor relatedness (M_1 = 3.990, M_2 = 4.108, Z = -2.445, p < .014) and instructor support for help-seeking over time (M_1 = 3.983, M_2 = 4.104, Z = -2.642, p < .008).

Table 4.8. *The change in students' perceptions over time and the Wilcoxon test results*

	M_1 (TP1)	M_2 (TP2)	Z score (Wilcoxon Test)
Instructor relatedness	3.990	4.108	2.445 (p<.014)
Instructor support for help-seeking	3.983	4.104	-2.642 (p<.008)
Mastery goal orientation	4.231	4.144	-2.302 (p<.021)
Performance-approach	3.514	3.384	-2.684 (p<.007)
Performance-avoidance	3.517	3.374	-3.087 (p<.002)
Classroom performance-approach	4.238	4.014	-4.316 (p<.000)
Direct instructor-student interaction	0.558	0.845	-3.487 (p<.000)
Indirect instructor-student interaction	0.491	0.723	-2.662 (p<.008)

Non-significant results pertaining to the other variables are excluded.

On the other hand, there is a significant decrease from TP1 to TP2 in terms of students' mastery goal orientations (M_1 = 4.231, M_2 = 4.144, Z = -2.302, p < .021), performance-approach orientations (M_1 = 3.514, M_2 = 3.384, Z = -2.684, p < .007), performance-avoidance orientations (M_1 = 3.517, M_2 = 3.374, Z = -3.087, p < .002), and their perceptions of performance-approach focus in the classroom (M_1 = 4.238, M_2 = 4.014, Z = -4.316, p < .000). In short, in parallel to the

increase in instructor participation in EchoLu, anticipated changes were observed in students' relevant perceptions, except for students' mastery goal orientations which decreased slightly at TP2.

Discussion

This study investigated the structural relationships between instructor-related variables and the variables regarding students' help-seeking perceptions and intentions. Additionally, this study examined the change in these variables over time in relation to instructor involvement in students' online help-seeking activities in EchoLu.

Structural Model

The complete structural model was examined to test all hypothesized relationships among the variables. The model was generally supported by the empirical data. Yet, some of the hypothesized relationships were non-significant, and some variables had either non-significant or minor effects in the model. In particular, students' performance goal orientations were negligibly or non-significantly associated with students' perceptions regarding costs and benefits of help-seeking. This finding is incongruent with the existing literature, which suggests strong links between these constructs (e.g., Tanaka & Murakami, 2001), but is supported by a recent study reporting a small effect of performance goal orientation on the perceived costs in a flipped classroom (Er & Orey, in press). Low effects of performance goal orientations on help-seeking intentions (including intentions to seek executive help) were also observed, which contradicts previous research findings (e.g., Karabenick, 2004). A probable reason for these contradictory findings is the inclusion of classroom performance goals (particularly performance-avoidance). Considering the correlations among these variables (see APPENDIX B and APPENDIX C), the variability explained by performance goals is probably largely accounted for by classroom

performance goals (Hinton, 2014). These findings suggest that classroom performance goals embraced and promoted by instructors have stronger influence on help-seeking compared to students' own performance goal orientations. Therefore, regardless of the performance goals of students, instructors should aim to minimize the classroom threats raised by students' performance concerns and should encourage students to try even if they are making mistakes. Researchers studying students' help-seeking behavior should pay more attention to classroom performance goals rather than students' own performance goal orientations.

Complementarily to the previous finding, the results of the full model analysis showed that classroom performance-approach goals do not have significant effects, whereas classroom performance-avoidance goals are significantly associated with students' perceptions of costs of help-seeking and indirectly associated with students' intentions to seek executive help. Previous research (e.g., Ryan et al., 1998) identified similar effects of performance-focused classrooms. The current study contributes to the existing literature by pointing out the effects of particular types of classroom performance goals. These results suggest that the emphasis on achieving good grades is insignificant for students' help-seeking behavior, whereas instructors' stress on avoiding performing poorly and making mistakes may undermine help-seeking.

According to the results of the refined structural model, instructor relatedness, which has been largely discarded in the help-seeking literature, plays a very important role in help-seeking. In addition to its direct influence on classroom goal structures, instructor relatedness is indirectly but strongly associated with every other construct in the structural model. On the other hand, instructor support for help-seeking has relatively limited, yet significant direct and indirect effects, which is slightly in contradiction to previous research consistently reporting a strong influence of instructor support on help-seeking (e.g., Karabenick & Sharma, 1994). This

situation might be explained by the strong correlation between these two constructs, and therefore the common shared variability (i.e., multicollinearity). These findings suggest that in flipped classrooms instructor support for help-seeking is warranted via online tools for help-seeking, and the relatedness toward instructors is essential for encouraging students' use of these tools for asking questions. Therefore, instructors' positive relationships with students and their caring attitudes toward students are likely to have a stronger impact in promoting online help-seeking in flipped classrooms.

One well-established finding in the help-seeking literature is that the perceived costs, performance goals, and executive help-seeking are closely related (Tanaka & Murakami, 2001), and similarly the perceived benefits, mastery goals, and instrumental help-seeking are closely related (Butler & Shibaz, 2008). The current study presents some contradictory findings by suggesting that the influence of students' performance goals on help-seeking are negligible and students' mastery goals have larger effects. More specifically, students' mastery goal orientations directly influence their help-seeking perceptions (i.e., decrease the perceived costs and increase the perceived benefits) and help-seeking intentions (i.e., promote help-seeking intentions and instrumental help-seeking and decrease executive help-seeking), besides mediating the indirect effects of classroom mastery goal orientations. According to these findings, promoting mastery goals can support effective use of help-seeking strategies by students. One powerful way of promoting students' mastery goal orientations is through classroom mastery goals (Greene, Miller, Crowson, Duke, & Akey, 2004; Urdan, 2004), confirmed in the current study as well. Additionally, the results of this study indicate that students' perceptions of classroom mastery goals depends on the degree to which students feel close to instructors and perceive their support for help-seeking. Therefore, there exists an

underlying chained relationship among these constructs that determines the consequent help-seeking behavior of students to a great extent. That is, instructor support and instructor relatedness promote the mastery goal structure in the classroom, which enhances mastery goal orientations among students, which in turn promotes help-seeking.

In summary, this study advances the current knowledge in help-seeking by revealing the effects of instructor relatedness in supporting help-seeking. Moreover, this study suggests no considerable effects of students' performance goals and classroom performance-approach goals on help-seeking, and highlights the importance of instructor relatedness, classroom mastery goal orientations, and mastery goal orientations.

The Influence of Instructor Participation

The analysis of the log data of EchoLu showed that course instructors have increasingly participated in EchoLu, which has yielded a significant rise in students' direct and indirect exposures to instructors over time. In other words, students probably perceived a stronger online presence of instructors in the second half of the semester as a result of increasing numbers of instructor comments to student posts. In parallel with this positive change, students' perceptions of instructor relatedness and instructor support for help-seeking also significantly increased at the second time point. These results support the claim that instructor's active involvement in online help-seeking environments positively effects students' perceptions regarding instructors' attitudes and may reinforce a positive relationship between instructors and students.

On the other hand, a significant decrease was observed in students' mastery goal orientations, which indeed contradicts the aforementioned finding regarding the positive influence of instructor relatedness on mastery goal orientations. A very plausible reason for this conflicting result is that student participation in EchoLu was graded and students were enforced

to participate by certain due dates, which might have caused students to participate in EchoLu because of their concerns about losing certain grade points. This grade-related aspect of EchoLu might have led to a shift in students' focus from the learning benefits that they could gain by meaningfully participating in EchoLu toward the grade benefits that they could gain by making up questions or comments. These findings suggest that instructors should be cautious about their grading policies when integrating online help-seeking environments in their blended courses. Mandatory student participation in online learning environments may have positive outcomes. For example, dynamic, rich and streamlined content could be achieved with student entries posted on a regular basis, which could support students in a variety ways such as noticing a gap in their own understanding after reading peers' posts (Er et al., 2015). However, this mandatory policy can also backfire in some aspects as noted in this study. Therefore, a good balance should be established.

In summary, instructors' active participation in online help-seeking environments is important for supporting help-seeking. It is also noteworthy that there might be adverse effects of requiring mandatory use of online help-seeking environments and associating students' help-seeking activities with their grades.

Implications

This study suggests that instructors are key players in supporting help-seeking and can influence help-seeking in many ways. There are several implications of this study for properly utilizing instructors' power via online help-seeking systems in the interest of supporting students' help-seeking activities.

The affordances of online help-seeking systems should be improved to support the instructors' capacity in terms of reinforcing and facilitating effective use of help-seeking strategy

among students. First, online help-seeking systems should enable instructors to monitor students' online help-seeking activities dynamically. Since students in online environments can engage in numerous processes and follow different paths depending on their strategies while seeking help (Er et al., 2015), this monitoring capability should offer more than only tracking the number of questions and answers posted. To support effective monitoring, fine-grained digital traces that are generated by students' interaction with online help-seeking systems (e.g., search attempts, time spent on writing a question) should be recorded. Data visualization and reporting features can be implemented to convert the trace data into a meaningful format that instructors can use to monitor student activities day-by-day and identify students who are in need of formative feedback (e.g., encouraging help-seeking and guiding them to use effective help-seeking strategies). Predictive analytics could be used to implement advance features that can automatically identify at-risk students among many others in large-enrollment classrooms and alert instructors. Automatic reminders or messages on behalf of instructors could be also sent to students to promote their participation.

Furthermore, features that can assist instructors to enhance and maintain their relationships with students should be incorporated to online help-seeking tools. For example, as an icebreaker activity at the beginning of the semester, instructors can require students to post an entry to introduce themselves, and then instructor can respond to these entries in a friendly manner to show that they are interested in getting to know about students and want to gain students' friendship. An automatic reply feature (i.e., a system-sent message on behalf of the instructor) or a one-click reply feature (i.e., instructors can choose from template messages created by themselves earlier) can be implemented to enable instructors in large-enrollment classrooms to reach out to every student in an efficient manner. Moreover, virtual gifts and

badges can be implemented in online help-seeking systems to promote instructors' positive interactions with students. Instructors can assign badges or send gifts to students to indicate that they recognize students' efforts and that they support students.

Limitations and Recommendations for Future Research

This study has several limitations. First, the findings of this study relies on quantitative data, which might have captured instructor's influence from a limited perspective. Qualitative data could be obtained through interviews and open-ended survey questions to support and enhance the existing findings. Future research should take advantage of from mixed-methods approaches to more effectively capture the role of instructors with rich data sources. Furthermore, this study examined only instructors' actions in EchoLu and ignored the interactions that took place in the classroom. However, instructors' behaviors and interactions with students during in-class problem solving activities could have potentially influenced students' help-seeking perceptions and intentions. Future research should consider in-class and online interactions together to obtain a complete picture of instructor influence on help-seeking. Moreover, only instructors' activities in EchoLu were considered in this study and there was limited data regarding their activities. Fine-grained digital traces of students and ınstructors (e.g., frequency of logins, length of visits, etc.) could be tracked and examined. Considering the prevalence of information-seeking in online help-seeking (Er et al., 2015), these digital traces can help identify the influence of instructors on students' information-seeking performances.

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CHAPTER 5

CONCLUSION

This dissertation is composed of a series of studies that explore college students' help-seeking behavior in a flipped large-enrollment science classroom. Chapter 2 proposed principles for supporting help-seeking and delineated how these principles informed the design of EchoLu. Students' experiences of using EchoLu for seeking help were examined to identify their help-seeking needs and priorities, and revisions were incorporated to address these needs. The refinements in EchoLu continued for three iterations of research. The results showed that the revisions incorporated between iterations helped improve the capacity of EchoLu in facilitating help-seeking and led to positive changes in students' perceptions. At the end of the chapter, the principles that informed the design of EchoLu were revisited and refined based on the findings of the study. As an emergent principle, it is suggested that information-seeking performances of students should be supported in online help-seeking environments. Also, a pioneering model that illustrates processes involved in online help-seeking was proposed.

While Chapter 2 focused on advancing the theories of help-seeking through iterative research on the design and refinement of EchoLu, Chapter 3 concentrated on examining the role of environmental and personal factors in help-seeking while using the refined version of EchoLu. Examining these factors is important and complementary to the former chapter since no matter how effectively the online technologies facilitate help-seeking, some other factors may still impede help-seeking. Relatedness with peers, instructor support for help-seeking and personal goal orientations were found to be significantly associated with help-seeking. Students'

perceptions of benefits and costs of help-seeking were both determinants and mediators of help-seeking.

Building on the findings of Chapter 3 that suggest a significant influence of instructor support on help-seeking, Chapter 4 further explored the role of instructors who have a great power in controlling many environmental factors (e.g., climate of the classroom, goal structures emphasized in the classroom), and therefore, influencing and shaping students' perceptions and intentions regarding help-seeking. In particular, Chapter 4 examined the effects of students' relatedness with instructors, instructor support for help-seeking, and classroom goal structures on help-seeking. Also, the influence of instructor participation in students' online help-seeking activities was examined. Instructor relatedness and classroom goal orientations were found to be strongly influential in help-seeking. Whereas no significant effects of students' performance goal orientations were found as opposed to the existing literature, mastery goal orientations were highly influential. Additionally, in parallel with the increase in instructor participation in online help-seeking activities, a positive change was observed in several related student perceptions.

Each study in this dissertation explores a different aspect of college students' help-seeking behavior and significantly advances the current knowledge of help-seeking. In the following section, recommendations to improve various capacities of EchoLu with new features are provided and future research possibilities are discussed.

Future Revision Suggestions for EchoLu

Based on the findings presented in the chapters throughout this dissertation, the following eight future revisions in EchoLu are suggested to maximize its capacity in supporting and facilitating help-seeking.

1. *Incorporating more information-seeking features:* The emerging principle presented in the first chapter suggests that online help-seeking environments should embody specific access tools that improve the information-seeking performance of students. There can be many new information-seeking features to be implemented in EchoLu, including, but not limited to, the hashtagging (which can allow students to easily access questions on a specific topic), subscribing to a topic to be notified whenever someone asks a question about it, and creating custom labels that can be attached to questions or answers for personal categorization (e.g., a well-answered label to mark a good answer by a peer for later referral).
2. *Promoting students' exposure to the content in EchoLu:* The improvement in students' access to the questions and answers posted in EchoLu has increased the observability of help-seeking activities and lead to higher student perceptions of EchoLu as a social and supportive learning environment. Accordingly, the increased observability has particularly benefited students who prefer to read others' posts and learn from them. To complement and improve this capacity of EchoLu, new features for promoting students' exposure to the content in EchoLu should be implemented. An email notification feature that can be configured by students could effectively serve this purpose. For example, with such a feature students can choose to receive daily or weekly emails that provides an overview of recent activities in EchoLu or they can choose to receive an immediate email when a question or comment is posted about a topic in which they are interested. Similarly, a mobile notification feature can be implemented.
3. *Enhancing the pseudonyms student profile:* Replacing the anonymous profile feature with a pseudonym profile feature has led to positive student feedback according to the results

presented in the first chapter. By being able to post pseudonymous questions or answers in EchoLu, students who contribute to the discussion were recognized while preserving their own privacy. The pseudonym profile feature can be further improved by enabling students to upload a profile photo that can reflect their pseudonym identity or choose an avatar defined in the system.

4. *Improving the social networking capacity of EchoLu:* As discussed in the second chapter, social networking can play an important role in building and maintaining friendships among students in large-enrollment classrooms and promote help-seeking. Currently, EchoLu has the following features for networking: following, bookmarking, and liking. However, with the exception of liking, these features were rarely used by students. Therefore, in EchoLu, existing features should be enhanced and new features that promote networking among students should be implemented. For example, the system can recommend students who to follow based on their activity history. Furthermore, to enhance the presence of peers, EchoLu can indicate the number of online users at any time, and even report the times and days that users are more active in the system. Private messaging with peers or within groups and class-wide chat can be implemented as well.
5. *Promoting the quality of help-seeking activities:* As emphasized in this dissertation, instrumental help-seeking is highly associated with learning. Therefore, students should be encouraged to seek instrumental help that can meaningfully contribute to their learning instead of using executive help to receive ready-made answers to perform better without learning. In EchoLu, guidelines for asking proper questions can be included in the page where students post their questions. These guidelines can be in the form of a checklist that students can use to review their questions before posting. As another option, the

system can provide a more detailed form for posting questions which can contain several sub-sections such as background work that students may need to complete. In this way, the quality of the question can be ensured to some extent.

6. *Facilitating instructor-student interactions:* In large-enrollment classrooms, it is a challenge for instructors to respond to every student entry and, therefore, achieve a well-timed interaction with every single student. Features that enable instructors to access a large number of students in a time-effective manner should be incorporated into EchoLu. For example, an automatic reply feature (i.e., the system posts an automatic reply to student entries as configured by the instructor) or a one-click reply feature (i.e., instructors can choose from template messages created by themselves earlier) can help instructors to quickly respond to students, leading to higher numbers of interactions. Similarly, virtual gifts and badges can be implemented as well to promote positive interactions between instructors and students. The increased instructor-student interaction is important for supporting help-seeking as discussed in the fourth chapter.
7. *Improving the capacity of instructors in monitoring student activities:* The tracking ability of EchoLu should be improved to record time-stamped, fine-grained trace data that accumulate as students participate in EchoLu. This trace data, when converted into meaningful visualizations and reports, can enable instructors to monitor student activities day-by-day and detect the changes in student behavior over a period of time. For example, some students may become disengaged after performing poorly in exams and may begin to rarely participate in EchoLu. Instructors can detect the disengagement of these students using the monitoring features of EchoLu and provide them with formative feedback. Social networking diagrams can be created as well to help instructors examine

different characteristics of the networking among students (e.g., density, centrality). Various networking diagrams can be created to help instructors identify students who often seek help, students who often provide help, or students who are missing direct interactions but viewing questions.

8. *Incorporating predictive analytics:* The large sets of trace data obtained via (future) tracking features of EchoLu can be used to implement an analytical functionality that can predict at-risk students automatically and inform instructors of these students. Microsoft's Azure Machine Learning service can be used to build the predictive analytics models and program the associated web services. EchoLu, then, can be programmed to consume these web services. For example, a rank ordered list of students who are in trouble or disengaged can be generated automatically for instructors. Instructors can mark the students with whom they contacted and observe if these students' rankings changes in the following days or weeks. Predictive analytics can be also used to predict the questions that can interest students considering their preferences (e.g., tags subscribed) as well as their search and view history in EchoLu. The system can also identify low instructor participation and bring some questions to the attention of instructors that are inadequately answered and possible may lead to confusions. That is, adaptivity can be incorporated into EchoLu to enable personalized help-seeking.

Future Research Directions

Considering the possible new features to be incorporated into EchoLu and the limitations discussed in the studies presented in this dissertation, this section suggests future research directions. First, learning analytics can be used to reveal students' help-seeking behavior in online collaborative learning environments (OCLEs). As described in the second chapter,

students can engage in numerous processes and follow different paths depending on their strategies while seeking help in OCLEs. For example, some students may prefer to search the existing questions before posting any questions, whereas others may prefer to only observe the posted questions to learn from them. Time-stamped, fine-grained digital traces (generated by every single student action) can be used to model various online help-seeking processes, trajectories, and strategies. Therefore, future research should study trace data to identify the processes students undergo, the routes students follow, and the strategies students employ when seeking help. Students' characteristics and perceptions (e.g., goal orientations, self-efficacy, perceived benefits and costs of help-seeking, need for help-seeking, autonomy orientation, etc.) should be measured to complement the interpretations of the trace data. For example, students may passively seek help by e-listening (based on the trace data), and this behavior can be better explained by some relevant learner characteristics. Student grades could also be included to help explain some possible relationships. Shortly, future research should investigate what processes, trajectories, and strategies are involved in online help-seeking, and to what extent they are associated with learner characteristics, grades and perceptions. Moreover, in this dissertation two separate structural models were proposed. These models were tested in a high-enrollment elective course in which students were observed to be competitive and high achievers. To increase the generalizability of these structural models and findings, future research should examine these models in different learning settings such as a lower level class. In this way, these models can be tested to see if they hold up with a different student population and if they are generalizable.

Once the proposed revisions are incorporated into EchoLu, the effectiveness of EchoLu in supporting teaching and learning should be thoroughly examined. Many of the suggested

features (e.g., information-seeking features, social networking features, email notifications, etc.) can directly, yet differently, impact students' help-seeking experiences. By using multiple sources and types of data (e.g., questionnaires about students' perceptions, interviews, trace data, etc.) the influence of EchoLu should be identified and examined using an experimental design approach in which the control group uses a traditional discussion forum for help-seeking, whereas the experiment group uses EchoLu. Furthermore, the suggested features (e.g., data tracking, data visualization, automatic predictions, etc.) can also substantially improve instructors' capacity in supporting and facilitating students' help-seeking activities. Besides improving instructor-student interaction, with new features EchoLu can enable instructors to identify struggling students and support them in a timely fashion. Future research should investigate the effectiveness of EchoLu in empowering instructors to support help-seeking and student learning by considering perspectives of both instructors and students. Additionally, the changes in student activities (tracked by EchoLu) should be examined in relation to the actions of instructors.

APPENDICES

APPENDIX A

DESCRIPTIVE STATISTICS AND FACTOR STRUCTURE

	Time point 1				Time point 2			
Items	Mean	SD	FL	α	Mean	SD	FL	α
MAST1	4.43	.798	.899	.916	4.35	.809	.917	.935
MAST2	4.43	.754	.904		4.27	.830	.910	
MAST3	4.42	.792	.909		4.38	.788	.905	
MAST4	4.21	.871	.732		4.03	.870	.803	
INTHS1	3.87	1.019	.942	.963	3.97	.907	.866	.936
INTHS2	3.84	1.042	.944		3.96	.881	.942	
INTHS3	3.78	1.048	.945		3.81	.948	.899	
BENFS1	4.02	.888	.789	.886	3.98	.863	.804	.918
BENFS2	3.80	.970	.772		3.82	.909	.872	
BENFS3	3.94	.926	.822		3.89	.854	.931	
BENFS4	3.72	.970	.830		3.82	.846	.827	
PAPP1	3.56	1.093	.902	.931	3.45	1.080	.913	.936
PAPP2	3.44	1.120	.902		3.35	1.066	.894	
PAPP3	3.43	1.133	.823		3.22	1.044	.827	
PAPP4	3.31	1.152	.779		3.16	1.075	.784	
PAPP5	3.53	1.091	.866		3.41	1.073	.896	
PAVO1	3.78	1.031	.884	.823	3.62	1.137	.876	.874
PAVO2	3.91	1.031	.899		3.76	1.093	.829	
PAVO3	3.63	1.087	.686		3.60	1.114	.779	
PAVO4	3.73	1.083	.474		3.52	1.089	.705	
EXEC1	2.08	1.039	.622	.665	2.01	.962	.793	.668
EXEC2	2.66	1.124	.320		2.64	1.142	.333	
EXEC3	2.06	1.046	.607		2.09	1.036	.779	
INST1	3.79	.922	.558	.729	3.73	.936	.462	.719
INST2	4.01	.792	.763		3.91	.887	.590	
INST3	3.97	.815	.760		3.86	.885	.639	
COSTS1	2.03	.988	.813	.898	2.00	.950	.791	892

COSTS2	2.19	1.036	.856		2.20	.959	.863	
COSTS3	2.17	1.087	.764		2.15	1.035	.718	
COSTS4	2.15	1.035	.881		2.14	1.040	.872	
ISUP1	3.81	.951	.799	.922	4.02	.768	.803	.934
ISUP2	3.99	.849	.903		4.12	.778	.910	
ISUP3	3.91	.932	.928		4.13	.748	.929	
ISUP4	3.96	.947	.850		4.15	.765	.877	
CPAPP1	4.04	.927	.822	.865	3.95	.937	.857	.897
CPAPP2	4.07	.826	.822		3.91	.938	.824	
CPAPP3	4.26	.835	.838		4.09	.856	.916	
CMAST1	4.28	.780	.595	.877	4.25	.794	.695	.898
CMAST2	3.90	.993	.683		4.03	.822	.748	
CMAST3	4.10	.920	.879		4.23	.792	.868	
CMAST4	4.18	.914	.906		4.15	.801	.884	
CMAST5	4.12	.863	.884		4.18	.784	.891	
CMAST6	3.67	1.068	.472		3.80	.970	.568	
IREL1	4.07	.888	.722	.885	4.27	.778	.735	.929
IREL2	3.93	.879	.692		4.11	.837	.713	
IREL3	3.79	.942	.707		4.02	.859	.705	
CPAVO1	2.56	1.033	.846	.905	2.64	1.083	.846	.913
CPAVO2	2.41	1.012	.895		2.42	1.052	.925	
CPAVO3	3.13	1.188	.601		3.10	1.071	.563	
CPAVO4	2.43	1.100	.887		2.53	1.073	.926	
CPAVO5	2.36	1.061	.871		2.38	1.028	.866	

APPENDIX B

DESCRIPTIVE STATISTICS AND CORRELATION COEFFICIENTS - TIME POINT 1

Variables	ISUP	IREL	CPAVO	CPAPP	CMAST	MAST	PAVO	PAPP	COSTS	BENFS	INT	INST	EXEC
ISUP	1.0	-	-	-	-	-	-	-	-	-	-	-	-
IREL	.769**	1.0	-	-	-	-	-	-	-	-	-	-	-
CPAVO	-.291**	-.359**	1.0	-	-	-	-	-	-	-	-	-	-
CPAPP	.100	.144*	.207**	1.0	-	-	-	-	-	-	-	-	-
CMAST	.188**	.652**	-.242**	.188**	1.0	-	-	-	-	-	-	-	-
MAST	.441**	.424**	-.210**	.085	.499**	1.0	-	-	-	-	-	-	-
PAVO	-.067	-.040	.306**	.308**	-.010	-.034	1.0	-	-	-	-	-	-
PAPP	-.012	.039	.207**	.362**	.049	.105	.240**	1.0	-	-	-	-	-
COSTS	-.286**	-.322**	.443**	-.060	.198**	-.303**	.257**	.198**	1.0	-	-	-	-
BENFS	.377**	.420**	-.215**	.096	.446**	.519**	.122*	.081	.254**	1.0	-	-	-
INT	.445**	.425**	-.315**	.003	.430**	.535**	-.108	.014	-.372**	.577**	1.0	-	-
INST	.402**	.425**	-.095	.123*	.535**	.424**	.083	.106	-.189**	.516**	.396**	1.0	-
EXEC	-.246**	-.278**	.310**	-.014	-.237**	-.368**	.107	.121*	.602**	-.295**	-.253**	-.196**	1.0
Mean	3.917	3.930	2.577	2.577	4.042	4.192	3.513	3.500	2.136	3.870	3.827	3.925	2.264
SD	.829	.814	.920	.920	.729	.684	.794	.916	.907	.810	1.00	.680	.828
Skewness	-.689	-.365	.048	.048	-.886	-1.205	-.359	-.457	.662	-.489	-.625	-.385	.533
Kurtosis	.698	-.381	-.426	-.426	1.314	2.620	-.131	.057	-.100	.487	-.190	.265	.037

** $p < .01$, * $p < .05$

APPENDIX C

DESCRIPTIVE STATISTICS AND CORRELATION COEFFICIENTS - TIME POINT 2

Variables	ISUP	IREL	CPAVO	CPAPP	CMAST	MAST	PAVO	PAPP	COSTS	BENFS	INT	INST	EXEC
ISUP	1.0	-	-	-	-	-	-	-	-	-	-	-	-
IREL	.777**	1.0	-	-	-	-	-	-	-	-	-	-	-
CPAVO	-.255**	-.241**	1.0	-	-	-	-	-	-	-	-	-	-
CPAPP	.123	.155*	.305**	1.0	-	-	-	-	-	-	-	-	-
CMAST	.648**	.730**	-.196**	.232**	1.0	-	-	-	-	-	-	-	-
MAST	.457**	.536**	-.149*	.149	.593**	1.0	-	-	-	-	-	-	-
PAVO	-.003	-.022	.272**	.279**	.065	-.009	1.0	-	-	-	-	-	-
PAPP	-.019	.042	.414**	.435**	.109	.133*	.263**	1.0	-	-	-	-	-
COSTS	-.348**	-.348**	.569**	.048	-.326**	-.253**	.261**	.264**	1.0	-	-	-	-
BENFS	.440**	.468**	-.161*	.154	.553**	.500**	.148*	.068	-.208	1.0	-	-	-
INT	.465**	.531**	-.291**	.011	.550**	.568**	-.033	.014	-.444**	.651**	1.0	-	-
INST	.490**	.446**	-.087	.054	.500**	.535**	.060	.007	-.172**	.575**	.519**	1.0	-
EXEC	-.335**	-.281**	.332**	.032	-.254**	-.319**	.058	.130*	.455**	-.161*	-.293**	-.251**	1.0
Mean	4.104	4.135	2.616	3.982	4.105	4.135	3.385	3.352	2.122	3.877	3.914	3.835	2.246
SD	0.699	0.772	0.914	0.830	0.675	0.732	0.827	0.903	0.866	0.778	0.860	0.723	0.814
Skewness	-.363	-.323	-.248	-.688	-.377	-.852	-.334	-.256	.519	-.417	-.467	-477	.419
Kurtosis	-.614	-1.057	-.158	-.406	-.574	.855	-.207	-.104	-.345	.113	-.279	.579	.244

** $p < .01$, * $p < .05$

APPENDIX D

MPLUS OUTPUT FOR FULL MODEL ANALYSIS AT TIME POINT 1

MODEL FIT INFORMATION

Number of Free Parameters	202
Loglikelihood	
H0 Value	-15173.249
H1 Value	-14041.406
Information Criteria	
Akaike (AIC)	30750.498
Bayesian (BIC)	31475.122
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	30834.663
Chi-Square Test of Model Fit	
Value	1554.092*
Degrees of Freedom	1337
P-Value	0.0000
RMSEA (Root Mean Square Error Of Approximation)	
Estimate	0.025
90 Percent C.I.	0.019 0.030
Probability RMSEA <= .05	1.000
CFI/TLI	
CFI	0.925
TLI	0.920
Chi-Square Test of Model Fit for the Baseline Model	
Value	4319.049
Degrees of Freedom	1431
P-Value	0.0000
SRMR (Standardized Root Mean Square Residual)	
Value	0.081
WRMR (Weighted Root Mean Square Residual)	
Value	1.698

MODEL RESULTS

Two-Tailed

	Estimate	S.E.	Est./S.E.	P-Value
CPAVO ON				
IREL	-0.496	0.123	-4.021	0.000
ISUP	-0.025	0.100	-0.247	0.805
CPAPP ON				
IREL	0.126	0.103	1.225	0.221
ISUP	0.032	0.101	0.318	0.751
CMAST ON				
IREL	0.291	0.064	4.556	0.000
ISUP	0.207	0.063	3.282	0.001
MAST ON				
CMAST	0.781	0.098	7.982	0.000
CPAPP	0.057	0.047	1.203	0.229
PAPP ON				
CPAPP	0.430	0.067	6.431	0.000
CPAVO	0.364	0.052	7.005	0.000
CMAST	0.214	0.110	1.947	0.052
PAVO ON				
CPAPP	0.355	0.062	5.756	0.000
CPAVO	0.216	0.056	3.861	0.000
CMAST	0.133	0.100	1.327	0.185
COSTS ON				
CPAVO	0.347	0.046	7.581	0.000
CPAPP	-0.214	0.053	-4.018	0.000
PAVO	0.155	0.043	3.632	0.000
PAPP	0.120	0.048	2.528	0.011
MAST	-0.290	0.047	-6.174	0.000
BENFS ON				
CMAST	0.447	0.113	3.963	0.000
MAST	0.391	0.070	5.568	0.000
PAPP	-0.011	0.037	-0.296	0.767
PAVO	0.121	0.041	2.922	0.003
INT ON				
BENFS	0.705	0.075	9.426	0.000
COSTS	-0.181	0.047	-3.877	0.000
MAST	0.234	0.073	3.198	0.001
PAPP	0.012	0.038	0.330	0.742
PAVO	-0.179	0.048	-3.731	0.000
INST ON				
BENFS	0.415	0.059	7.015	0.000

MAST	0.093	0.057	1.627	0.104
PAPP	0.015	0.030	0.491	0.623
PAVO	-0.009	0.030	-0.289	0.773
EXEC ON				
COSTS	0.697	0.059	11.767	0.000
MAST	-0.238	0.052	-4.569	0.000
PAPP	0.032	0.040	0.808	0.419
PAVO	-0.066	0.039	-1.682	0.093

APPENDIX E

MPLUS OUTPUT FOR FULL MODEL ANALYSIS AT TIME POINT 2

MODEL FIT INFORMATION

Number of Free Parameters	202
Loglikelihood	
H0 Value	-12880.332
H1 Value	-11757.707
Information Criteria	
Akaike (AIC)	26164.664
Bayesian (BIC)	26871.918
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	26231.593
Chi-Square Test of Model Fit	
Value	1535.649*
Degrees of Freedom	1337
P-Value	0.0001
RMSEA (Root Mean Square Error Of Approximation)	
Estimate	0.025
90 Percent C.I.	0.018 0.030
Probability RMSEA <= .05	1.000
CFI/TLI	
CFI	0.929
TLI	0.924
Chi-Square Test of Model Fit for the Baseline Model	
Value	4245.183
Degrees of Freedom	1431
P-Value	0.0000
SRMR (Standardized Root Mean Square Residual)	
Value	0.086
WRMR (Weighted Root Mean Square Residual)	
Value	1.771

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
CPAVO ON				
IREL	-0.146	0.129	-1.133	0.257
ISUP	-0.323	0.140	-2.298	0.022
CPAPP ON				
IREL	0.221	0.094	2.342	0.019
ISUP	-0.021	0.106	-0.202	0.840
CMAST ON				
IREL	0.494	0.064	7.734	0.000
ISUP	0.170	0.070	2.445	0.014
MAST ON				
CMAST	0.854	0.083	10.341	0.000
CPAPP	0.037	0.030	1.234	0.217
PAPP ON				
CPAPP	0.446	0.063	7.089	0.000
CPAVO	0.338	0.057	5.975	0.000
CMAST	0.129	0.082	1.583	0.113
PAVO ON				
CPAPP	0.259	0.059	4.414	0.000
CPAVO	0.163	0.061	2.680	0.007
CMAST	0.213	0.097	2.192	0.028
COSTS ON				
CPAVO	0.479	0.053	9.115	0.000
CPAPP	-0.116	0.046	-2.509	0.012
PAVO	0.089	0.040	2.251	0.024
PAPP	0.079	0.040	1.964	0.050
MAST	-0.229	0.047	-4.862	0.000
BENFS ON				
CMAST	0.545	0.101	5.417	0.000
MAST	0.198	0.079	2.519	0.012
PAPP	-0.044	0.033	-1.323	0.186
PAVO	0.118	0.035	3.329	0.001
INT ON				
BENFS	0.580	0.064	9.120	0.000
COSTS	-0.292	0.039	-7.419	0.000
MAST	0.274	0.058	4.757	0.000
PAPP	0.018	0.027	0.650	0.516
PAVO	-0.042	0.027	-1.513	0.130
INST ON				

BENFS	0.410	0.063	6.542	0.000
MAST	0.336	0.072	4.653	0.000
PAPP	-0.049	0.032	-1.560	0.119
PAVO	-0.010	0.029	-0.347	0.728
EXEC ON				
COSTS	0.522	0.089	5.841	0.000
MAST	-0.237	0.055	-4.343	0.000
PAPP	0.027	0.042	0.650	0.516
PAVO	-0.123	0.056	-2.190	0.029

APPENDIX F

QUESTIONNAIRES

Achievement Goal Orientations (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
Mastery Goals					
I want to learn as much as possible from this class.	○	○	○	○	○
It is important for me to understand the content of this course as thoroughly as possible.	○	○	○	○	○
I hope to have gained a broader and deeper knowledge when I am done with this class.	○	○	○	○	○
I desire to completely master the material presented in this class.	○	○	○	○	○
Performance Approach Goals					
It is important to me to do better than the other students.	○	○	○	○	○
My goal in this class is to get a better grade than most of the students.	○	○	○	○	○
I will striving to demonstrate my ability relative to others in this class.	○	○	○	○	○
I am motivated by the thought of outperforming my peers.	○	○	○	○	○
It is important to me to do well compared to others in this class.	○	○	○	○	○
I want to do well in this class to show my ability to my family, friends, advisors, or others.	○	○	○	○	○
Performance Avoidance Goals					
I often think to myself, "What if I do badly in this class?'	○	○	○	○	○
I worry about the possibility of getting a bad grade in this class.	○	○	○	○	○
My fear of performing poorly in this class is often what motivates me.	○	○	○	○	○
I just want to avoid doing poorly in this class.	○	○	○	○	○
I'm afraid that if I ask my TA or instructor a “dumb” question, they might not think I'm very smart.	○	○	○	○	○
My goal for this class is to avoid performing poorly.	○	○	○	○	○

Classroom Goal Structures (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
Mastery Goal Structure					
In our class, trying hard is very important.	○	○	○	○	○
In our class, how much you improve is really important.	○	○	○	○	○
In our class, really understanding the material is the main goal.	○	○	○	○	○
In our class, it's important to understand the work, not just memorize it.	○	○	○	○	○
In our class, learning new ideas and concepts is very important.	○	○	○	○	○
In our class, it's OK to make mistakes as long as you are learning.	○	○	○	○	○
Performance Approach Goal Structure					
In our class, getting good grades is the main goal.	○	○	○	○	○
In our class, getting right answers is very important.	○	○	○	○	○
In our class, it's important to get high scores on tests.	○	○	○	○	○
In our class, getting good grades is the main goal.	○	○	○	○	○
Performance Avoidance Goal Structure					
In our class, showing others that you are not bad at class work is really important.	○	○	○	○	○
In our class, it's important that you don't make mistakes in front of everyone.	○	○	○	○	○
In our class, it's important not to do worse than other students.	○	○	○	○	○
In our class, it's very important not to look dumb.	○	○	○	○	○
In our class, one of the main goals is to avoid looking like you can't do the work.	○	○	○	○	○

Help-Seeking Scales (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
The Perceived Benefits of Help-Seeking					
Getting help in this class would make me a better student.	○	○	○	○	○
I think that asking questions in this class helps me learn better.	○	○	○	○	○
Getting help in this class would increase my ability to learn the material.	○	○	○	○	○
Getting help in this class would make me a smarter student.	○	○	○	○	○
I DO NOT think that asking questions in this class helps me learn better (reverse coded).	○	○	○	○	○
The Perceived Costs of Help-Seeking					
People in this class would think less of me if I succeeded only because I got help.	○	○	○	○	○
I would not want anyone to find out that I needed help in this class to succeed academically.	○	○	○	○	○
Getting help in this class would be an admission of my own lack of ability or competence.	○	○	○	○	○
I would feel uneasy about what people in this class would think if they found out I needed help in order to succeed academically.	○	○	○	○	○
Intentions to Seek Help					
If I need help in this class I would ask someone for assistance.	○	○	○	○	○
If I need help understanding the lectures in this class I would ask for help.	○	○	○	○	○
If I need help with the readings in this class I would ask for help.	○	○	○	○	○
Intentions to Seek Executive Help					
Getting help in this class would be a way of avoiding doing some of the work.	○	○	○	○	○
If I were to ask for help in this class it would be to quickly get the answers I needed.	○	○	○	○	○
The purpose of asking somebody for help in this class would be to succeed without having to work as hard.	○	○	○	○	○
Intentions to Seek Instrumental Help					
I would get help in this class to learn to solve problems and find answers by myself.	○	○	○	○	○
If I were to get help in this class it would be to better understand the general ideas or principles.	○	○	○	○	○
Getting help in this class would be a way for me to learn more about basic principles that I could use to solve problems or understand the material.	○	○	○	○	○

Instructor/Teacher Support for Help-Seeking (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
The instructor provides opportunities for us to ask for help.	○	○	○	○	○
The instructor believes that student questions are important.	○	○	○	○	○
The instructor gives us the feeling that it's better to ask for help if we don't understand.	○	○	○	○	○
The instructor encourages us to ask for help any time, even after class (such as in online environment).	○	○	○	○	○

Relatedness with Instructor (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
The instructor is friendly and considerate towards students.	○	○	○	○	○
The instructor helps students who are having trouble with the work.	○	○	○	○	○
The instructor is interested in students' problems.	○	○	○	○	○
The instructor does not consider students' feelings (reverse coded).	○	○	○	○	○

Relatedness with Peers (1 to 5 Scale)

	Strongly Disagree				Strongly Agree
I like the people I interact with in this class.	○	○	○	○	○
The people in the class are generally pretty friendly towards me.	○	○	○	○	○
I pretty much keep to myself and don't have a lot of social interactions.	○	○	○	○	○
I consider the people who I interacted with to be my friends.	○	○	○	○	○
People in the class care about me.	○	○	○	○	○
I feel accepted by others in the class.	○	○	○	○	○
I feel ignored by others.	○	○	○	○	○
The people I interact with do not care me much.	○	○	○	○	○

APPENDIX G

CONSENT FORM

Dear MIBO3500 Student:

Thank you for considering participating in this research study "Use of an educational social networking site (e-SNS) in a large science class and its impact on students". The goal of this study is to find out if the new instruction model that utilizes an educational social networking site has helped you learn best in this class. Your consent to participate in this study will allow me to identify factors that contribute to student learning in MIBO3500. I am especially interested in your help-seeking behavior in the course. All results from this study will be shared with interested participants.

Whether you choose to participate in my study or not will have no effect on your grade in MIBO3500. In fact, whether or not you choose to participate in this study will remain unknown to me until after grades have been submitted to the Registrar. If you choose to participate in the study, you will receive 1 point of extra credit. If you do not choose to participate, you can earn the same credit by completing an assignment that is commensurate in time and effort. The assignment will require writing a short summary for introducing a microbiology science pioneer. Your participation in this study may require an additional time commitment as you may be asked to fill out questionnaires, each of which may take at most 4-5 minutes. I would like your permission to access your exam grades for individual MIBO3500 exams, your overall course grade, UGA major, and overall Grade Point Average. In addition, I would also like to include information collected via questionnaires, as well as comments that you post in the social networking site (e-SNS) in my analysis.

All individually-identifiable information collected from individual participants will remain confidential and only summary data will be reported (all identifying information will be removed from the data set once your responses are matched with achievement information in order to protect your identity). A potential risk of participation is the possibility that stored data (before identifiers are removed) will be accessed by unauthorized individuals. To eliminate that risk I will store all data on a hard drive that is not connected to (and cannot be accessed through) the internet. Internet communications are insecure and there is a limit to the confidentiality that can be guaranteed due to the technology itself. However, once the materials are received by the researcher, standard confidentiality procedures will be employed. Another potential risk is the bias of the instructor with regard to participation in this study. To rule out that possibility, it will not be known to me until after all term course grades have been submitted, which students agreed to participate in this study. For this reason all students will be asked to participate in all class learning activities and assignments, but only the responses of the students who have agreed to participate in this study will be analyzed the following semester.

Participation in this study is entirely voluntary. Your decision about participation will have no bearing on your grades or class standing. You may refuse to participate or stop at any time without penalty or loss of benefits to which you are otherwise entitled. If you wish to stop your participation for any reason or have any questions, you should contact me, Erkan Er (erkaner@uga.edu; 706-254-5900), or Dr. Orey (mikeorey@uga.edu; 706-542-4028). I will be glad to address your concerns. Additional questions or problems regarding your rights as a research participant should be addressed to The Chairperson, Institutional Review Board, University of Georgia, 629 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address: IRB@uga.edu

You have been informed about this study's purpose, procedures, possible benefits and risks. You have been given the opportunity to ask questions before you continue, and you have been told that you can ask other questions at any time. Please print a copy of this consent form for your records, if you so desire.

By entering your student id and by clicking the SUBMIT (or NEXT) button to enter the survey, you are assumed to sign the consent form and to voluntarily participate in this study.

APPENDIX H

Full name of the abbreviations used in Chapter 3

INTSH	: Intention to seek help
BENF	: Perceived benefits of help-seeking
MGO	: Mastery goal orientation
COST	: Perceived costs of help-seeking
REL	: Relatedness (with peers)
ISFHS	: Instructor support for help-seeking
INSTHS	: Intentions to seek instrumental help
EXECHS	: Intentions to seek executive help
PGO	: Performance goal orientation

ADDENDUM TO CHAPTER 5

In the study presented in Chapter 5 of this dissertation, the instructor's role was a collaborator. That is, the instructor provided her input as a collaborator of the research study, and her input was used to support the analysis and findings of the results.