Schlusche et al. *Research and Practice in Technology Enhanced Learning* (2023) 18:17
https://doi.org/10.58459/rptel.2023.18017

Research and Practice in
Technology Enhanced Learning

RESEARCH Free and Open Access

Understanding students' academic help-seeking on digital devices – a qualitative analysis

Christian Schlusche *, Lenka Schnaubert and Daniel Bodemer

*Correspondence:
christian.schlusche@uni-due.de
Institute for Research Methods in Psychology,
University of Duisburg-Essen,
Lotharstr. 65,
D-47057 Duisburg, Germany
Full list of author information is available at the end of the article

Abstract

Undergraduate students are expected to regulate their learning processes and overcome knowledge-related obstacles. Academic help-seeking (HS) is a social strategy to acquire missing information or explanations. As mobile devices are a popular means for communication between students, services on those devices are of interest for computer-mediated academic HS. The goal of the presented study is to determine requirements for the design of digital services that support asking for and receiving help. The article presents students' perspectives on the knowledge-related obstacles that cause them to seek help through computer-mediated communication via mobile devices. Moreover, it presents respondents' perceived inhibitions about asking peers for help. Finally, the perceived technical drawbacks of popular services are outlined. Data acquired from *N* = 59 semi-structured interviews were analyzed using qualitative content analysis. The students reported that they experience knowledge-related obstacles while working on assignments and that they avoid HS when they are worried about social humiliation. They also reported that a messenger service was used most frequently for HS. The results are valuable for designers and practitioners in the field of computer-mediated academic HS.

Keywords: Academic help-seeking, Peer learning, Mobile learning, Higher education

Introduction

Undergraduate students are confronted with a vast amount of complex materials in various subjects, which imposes different requirements on them than those at school: Students are expected to manage their own learning processes responsibly and to make appropriate use of learning strategies to successfully integrate new information and understand concepts, which is known as self-regulated learning (SRL; Foerst et al., 2017; Zimmerman & Martinez-Pons, 1986). During this process, knowledge-related problems that exceed learners' competencies are inevitable. In these cases, learners may consult external sources of help to seek further information or explanations from other students (Nelson-Le Gall,

1985). Research on academic help-seeking (HS) describes and predicts the behavior of students who deal with academic problems by asking a personal source for help (e.g., peer-students; Nelson-Le Gall, 1981). Academic HS is recognized as a functional social learning strategy that is linked to study success, but it demands social competencies and cognitive capabilities (Newman, 2002; Richardson et al., 2012). Nevertheless, the fear of negative consequences (e.g., the contempt of peers or the perceived threat to self-esteem) may lead students to avoid seeking help when it is needed, which can impair learning (Ryan & Pintrich, 1997). In contrast to face-to-face communication, computer-mediated communication (CMC) may reduce perceived social costs. Currently, communication is often mediated by computers in the form of mobile devices. These ubiquitous tools (Vorderer et al., 2016) enable various modes of distance communication with regard to synchronicity (real-time or asynchronous), representational complexity (text messages, photos or videos), and multiplicity (a single addressee or a group of addressees). These features make mobile devices an interesting platform for seeking academic help. However, to our knowledge, little is currently known about how students make voluntary use of popular available services in an academic context. Qayyum (2018) reports that students seek help via phone call, text message or Facebook. Nevertheless, existing services are usually designed to facilitate everyday communication, but often lack features supporting specific tasks (e.g., discussions of a problem or making appointments). The research interest in computer-mediated HS is three-fold: (1) the task or learning situation that induces a knowledge-related problem, (2) learners' inhibiting beliefs regarding HS, and (3) the service's options for encoding and transferring different modalities of information. These questions are useful in gaining a better understanding of students' perspective on HS with mobile devices. This understanding is relevant for practitioners as well as researchers, who prepare supporting services for mobile devices. The resulting overview of popular services and the most frequently used features provides relevant insight into the development of applications supporting HS. We planned semi-structured interviews to gain insight into student's use of communication services for academic HS.

Seeking academic help via computer-mediated services

From the perspective of SRL, learners are responsible for their own learning process (Newman, 1994). Academic HS is a functional social learning strategy for solving knowledge-related problems. Seeking academic help involves a learner (helpee) who lacks information or needs an explanation and approaches a source of help (helper) to receive it (Knapp & Karabenick, 1988; Makara & Karabenick, 2013; Nelson-Le Gall, 1985). The procedure of seeking help has been described as being divided into stages, each of which comprises various decisions. These stages are not necessarily executed sequentially but can include loops and shortcuts (Nelson-Le Gall, 1985). The research questions in this article

correspond with the stages of the HS process (see Table 1). Thus, first the process is presented and followed by the explication of the research questions. Makara and Karabenick (2013) describe the procedure as follows: After (1) *identifying the problem,* learners may realize that it exceeds their cognitive capabilities, they subsequently infer that (2) *help is needed* and thus (3) *decide to seek help* from an as yet undefined source. In the next stage, helpees (4) *establish a goal* about the anticipated type of help sought, which could mean asking for the necessary information to solve the problem on their own or merely asking peers to provide them with a solution. In the next stage, the helpee decides on a (5) *source of help* that may *provide the needed information or solutions* in stage (6). Each stage comprises decisions that may be enriched by certain features of computer-mediated services. For example if one feels inhibited to decide to seek help, computer-mediated communication (CMC) could lower this inhibition (Kitsantas & Chow, 2007). Communicating with a helper via technology on the other hand comes along with the effort to find a proper representation of a problem. In aiming to support students' insights regarding the learning situation, their beliefs about seeking help and their use of communication services are of interest. Data regarding the following research questions should contribute to clarify core requirements for digital services that aim to encourage academic HS (see Table 1).

The first question of interest is, which knowledge-related obstacles make students realize that they have a problem and consecutively decide to seek computer-mediated help (and send a request) (stages 1–2). Second, the literature on HS provides evidence that the perception of threatened self-worth (perceived threat) by being perceived as incompetent is a major reason for HS avoidance (Ryan & Pintrich, 1997). There is evidence that when communication is mediated between students these perceived threats seem to be lowered (Kitsantas & Chow, 2007). In the light of these results, the present study explores the reasons that inhibit students from seeking help from peers in digital social media (e.g.,

Table 1 Makara and Karabenick's (2013) phases of help-seeking and derived research questions

Phases of HS process	Research questions (RQ)
(1 – 2) Identifying the problem & determine help is needed	RQ-1: Which types of knowledge-related obstacles do students try to overcome through computer-mediated academic help-seeking?
(3 – 4) Deciding to seek help & which goal to pursue	RQ-2: Which factors make students feel inhibited asking for help?
(5 – 6) Identifying source of help & soliciting help	RQ-3: (a) Which services are used by students for computer-mediated academic help-seeking? (b) How are messages characterized with regard to representational format and number of addressees?

perceived distance of agents or number of addressees [stages 3–4]). The insights provided may help to design services that lower such inhibitions. Third, gathered data about the most popular communication services and the characteristics of the messages' representation provides insight into digital communication about problems and explanations (stage 6). Evidence of how help is sought digitally may facilitate the identification of relevant features to support students during academic HS. Additionally, future interventions may benefit from reported technical issues with existing services that can be addressed. In conclusion, interlinking concepts and evidence of face-to-face academic HS and CMC may lead to valuable insights to define requirements for digital HS tools. Below, the three central stages of the HS process are described in more detail to derive the research questions (see Table 1).

Identify the problem and determine that help is needed

During the first stage of the process learners recognize a knowledge-related problem that exceeds their knowledge and makes information from an external source necessary (Nelson-Le Gall, 1985). This realization is pivotal to initiate a new HS episode. With the goal to improve computer-mediated HS it is crucial to understand common obstacles to students that result in knowledge-related problems. Moreover, their expectation of what kind of information an answer should provide is relevant for the design of a supporting application. This leads to the first research question, which focuses on what content-related problems students try to solve by seeking computer-mediated academic help (see RQ-1 in Table 1). Additionally, the learners' intent of the subsequent request (e.g., solving a problem or making an appointment) may lead to relevant requirements. Gaining insight into the initial problem and the goals during CMC HS is valuable for the design of supporting applications, especially when planning services or interventions that need to fit well into students' learning situation.

Peers as a source of help

Continuing in the HS process, after realizing that help is needed, helpees have to choose an adequate personal (e.g., peer students) or impersonal (e.g., search engines) source of help (Makara & Karabenick, 2013). Both categories of sources differ firstly with regard to interactivity during problem solving and secondly with regard to their (negative) potential that helpees could try to avoid seeking help from them. Puustinen and Ruet (2009) differentiate sources of help on a continuum of helpers' capability to adapt to helpees' needs. At the least adaptable end they designate *impersonal* (technical) *sources* of help, such as search-engines that supply documents or digital artifacts. They designate *personal sources*, such as human experts, as the most adaptable sources. Those are able to verify their understanding of the problem interactively and are able to adapt their explanations to

the needs of the helpee (audience design; see Clark & Murphy, 1982). Research has shown that students make use of both types of sources (Giblin & Stefaniak, 2021): Non-human, online sources of help are used by students because they are easily accessible and convenient to use. Whereas the utilization of help from a peer comes along with the expectation to provide help in the future (Giblin & Stefaniak, 2021). Nonetheless, HS with a person is a social activity that can evoke discomfort in helpees for mainly two reasons, which may cause them to avoid HS behavior. First, research has found that HS avoidance can be predicted by perceived threat from peers or teachers, which is the social dimension of avoidance (Ryan & Pintrich, 1997). Second, the necessity to seek help from others can threaten helpees' self-esteem resulting in HS avoidance (Ryan & Pintrich, 1997). In both cases, learners are unable to regulate their learning progress and avoid seeking help when they need it. These threats have been researched in face-to-face settings and may be prevalent in CMC as well. For example, Reeves and Sperling (2015) found that perceived threat to seek help from instructors (formal sources) is negatively associated with the intention to seek help via face-to-face communication. Interestingly the results for digital communication channels were not systematically associated with threat. Nevertheless, HS avoidance tendency is a continuum and depends on further variables such as self-efficacy, thus a moderate expression alone does not necessarily lead students to prevent HS (White & Bembenutty, 2013). Expectedly the reasons for avoidance may have a different emphasis in CMC, thus they need to be assessed and characterized.

Peer students are roughly homogenous regarding knowledge and their goals, thus they are a special type of personal source: They might deal with similar knowledge-related obstacles because they are comparable with regard to their prior knowledge and provided learning materials (Webb et al., 2002). Thus, peers are a valuable source of help for students. Peers being more approachable might be one reason, why they are preferred over institutional staff when seeking help (Knapp & Karabenick, 1988). However, on the other hand asking peers for help in their free time might induce a higher perceived threat of feeling embarrassed, compared to asking formal sources who get paid to answer such requests. This leads to the second research question, which is about students' beliefs that prevent them from seeking help from peers (see RQ-2 in Table 1). An increased understanding of the inhibiting factors may be relevant for designers and practitioners to consider students' inhibitions and address them when planning interventions.

Seeking computer-mediated help from peers

Seeking help involves a decision on how to communicate a knowledge-related problem to an agent. A communication service shapes the communication during a HS episode, because it constrains the characteristics of the transferred messages. Among these characteristics are (1) time-dependency (synchronicity), (2) used encoding of information

(representation) and (3) number of addressees of a message (multiplicity). First, when considering synchronicity, peers can decide to communicate via video call, which requires them to be present in front of a mobile device at the same time (synchronously). In addition to that, CMC enables learners to communicate time-independent (asynchronously) and even bridge geographical distances (Walther & Burgoon, 1992). While the possibility of answering with a delay leads to greater flexibility, the loss of dialogue-structuring nonverbal behaviors can make successful understanding more challenging (e.g., deictic gestures, turn-taking; see cues-filtered-out in Walther, 2011). Second, when considering the representation of the problem, CMC requires the encoding of information into the symbol system of the targeted channel. For example, writing text messages on a smartphone instead of calling someone requires the effort of using a screen keyboard instead of verbalizing into a microphone. Hence, when one wants to take advantage of CMC there is likely an increased effort to represent the problem compared to co-present face-to-face communication. Third, when considering multiplicity, information and communication technology facilitates one-to-many communication: one sender is able to communicate with multiple receivers at once (Mesch et al., 2012). Sending a HS request to whole groups instead of arranging a face-to-face meeting with a single individual is expected to decrease the idle time until an answer is provided but comes at a higher cost in terms of formulating a message. In sum, technology enables time- and location independent communication between individuals or groups but requires the encoding of messages, which causes a loss of information compared to face-to-face communication. This makes establishing a correct mutual understanding (grounding) more demanding in CMC compared to face-to-face communication (Clark & Brennan, 1991). Thus, CMC seems to be prone to misunderstandings (Edwards et al., 2017) and this might apply for computer-mediated academic HS as well.

Makara and Karabenick (2013) hypothesized two major goals for helpees seeking information, namely (1) sufficient help to overcome the problem and (2) receiving the necessary help as soon as possible. Additionally, investing the least effort possible into communication (Clark & Brennan, 1991) can be assumed as a further goal when seeking computer-mediated help. From this perspective, spreading questions among groups of helpers (using services that enable high multiplicity) seems to be a promising strategy that is likely to result in timely responses. However, the value of this strategy may decrease with the complexity of the problem that needs to be encoded. It is assumed that the complexity of the problem's description increases the effort to formulate an explanation for a solution. Thus, requests for help that lack a specific addressee, for example within groups, could fail as the members of the group might rein their invested effort to encode explanations to others. Due to the communication overhead in CMC and to prevent a lack of specificity, students may adapt their effort to communicate. For example by arranging

face-to-face appointments digitally and discuss the problem in face-to-face meetings (Giblin & Stefaniak, 2021). Despite the information loss after encoding a question, the promise of timely help with a relatively small investment of time might make it an attractive communication method, especially for problems that are unspecific, needing less complex descriptions (Broadbent & Lodge, 2021).

The students' choice of a communication channel is not only affected by the properties of the service, but also by individuals' and peers' preferences (Fulk et al., 1990). Students commonly use smartphones multiple times a day (Mesch et al., 2012), partially to communicate with peers via mobile services. There is an increasing number of services due to the availability of broadband cellular network technology and the widespread adoption of smartphones (Xu et al., 2011). Various services are available for students to communicate with their peers, although they differ in their purpose (e.g., chatting, learning, or sharing text messages and photos) and the number of addressees a single message can reach (e.g., one-to-one, one-to-many). Mobile instant messenger services are commonly used for personal communication and hence are expected to be used in an academic context as well. They allow users to send messages to individuals or groups of contacts as textual, pictorial, acoustic, or audio-visual representations. Addressees are notified immediately when a message is received. As these services were not designed specifically for HS, identifying potential improvements to such services would be valuable when designing interventions to support HS behavior on smartphones. In conclusion, the third research question aims to reveal three characteristics of computer-mediated HS episodes: first, the mobile services students use, second the representational characteristics of the exchanged messages and third, the number of addressees of new requests (see RQ-3 in Table 1). Knowing about these characteristics is beneficial for the conceptualization of new services that should support academic HS. Above all, the goal of the presented study is to provide evidence-based orientation for researchers and designers who plan or implement computer-mediated academic HS studies or services.

Method

The presented study focuses on the critical stages of the HS process when CMC was utilized: We aim to better understand (1) the problems and situations inducing HS episodes, (2) the inhibiting beliefs of learners and (3) the most reported options to encode and transfer information relevant to the problem. We conducted semi-structured interviews in order to gain insights into students' HS behavior with digital services. The interview explored a situation in which the interviewee reported to utilize computer-mediated HS. Based on the transcribed interviews categories associated with the research questions were acquired (see Table 1). Students preferably early in their academic career were interviewed in the summer term 2019. The sample consists of 59 participants, of which 80% were in

their second semester and further 9% were in their fourth semester at a German university (M = 2.36; SD = 0.89). Overall 90% of the participants were recruited among a study program related to media informatics and psychology and received adequate non-monetary compensation. Of the sample, 76% were female participants with the mean age of 20.96 (SD = 2.12; 18 – 30 years). All participants provided written informed consent before they were interviewed. The interview guideline (see Appendix) was designed to gather information about (1) typical knowledge-related problems when seeking computer-mediated help, (2) factors related to CMC that inhibit students' HS behavior, and (3) the perceived benefits and drawbacks of the service students actually use to seek computer-mediated help. The interview guideline was designed to make the participant reflect on a situation in which computer-mediated help was sought. Hence, the use of a digital service mediating the communication was the context of all interviews. With regard to the research questions (see Table 1) the following questions from the guideline were asked: Guideline question (2.a) *Please describe which "problem" you wanted to solve with the support?* refers to the problem that is going to be solved (compare RQ-1). Then, guideline question (3.c) *Do you find it more comfortable to ask via this channel, compared to other channels?* refers to the inhibitions of asking for help (compare RQ-2). Then, guideline question (3) *Why do you think is {channel} especially appropriate to seek knowledge-related support from peer students?* refers to the features of the used service (compare RQ-3). The guideline was designed to elicit detailed information about a particular situation which the participants remembered. Furthermore, the guideline and the training of the interviewers guided them to ask interviewees to elaborate on particularly relevant aspects. The procedure was as follows: first, participants provided informed consent, then the interview was conducted, the participants filled in a closing demographics questionnaire and finally, participants received their compensation.

The interviewers received interviewer training to familiarize them with the guidelines. They acquired, transcribed, and analyzed the qualitative data. Qualitative content analysis was used by applying either inductive category formation (ICF) or deductive category assignment (DCA; see Mayring, 2014 for an overview, 2015). ICF describes a systematical and reproduceable process to extract categories from qualitative data based on rules to extract categories. For each research question a selection criterion (i.e., a definition of accepted types of statements) and the level of abstraction for accepted statements provide the framework for coding the categories (see Table 2 for an example). After the initial definition, the coding started with one-fourth of the interviews. Subsequently, selection criteria and levels of abstraction were discussed and revised, materials were recoded and a final coding cycle including all the material was executed. For DCA, the categories were defined by the group of coders, as the answers to the related questions could be anticipated (e.g., the representational formats of messages). Finally, categories were assigned to text

Table 2 Exemplary definition for the procedure of inductive category formation (ICF; definitions are shortened)

ICF procedure	Exemplary definition
Question guiding category formation:	Which [knowledge-related] obstacles (…) cause students to seek help from peers?
Selection criterion:	Problem of understanding or lack of information that hinder students attaining their learning goals; emotional-motivational obstacles are not taken into account
Level of abstraction:	Explicit description of obstacles, independent of study program

passages, and the frequencies of each category were counted. Categories were counted at most once per document, as the frequency within an interview was less relevant compared to the ratio of mentions across all interviews.

Results

Overall, $N = 59$ interviews were processed and the percentual fractions of interviews in which a category had been found at least once are reported. The results represent the counting of binary indicators of whether a certain category occurred within an interview. The interview guidelines were designed with the goal of elaborating on a typical HS situation but not describing a broad spectrum of situations. Therefore, differences between frequencies of categories represent differences between most typical situations reported by participants but not systematic differences of usage frequencies.

RQ-1 is answered based on category extraction based on the question: "Which knowledge-related obstacles during the learning process drive students to seek help from other students?" (see Table 3). The answer given by most students was that knowledge-related obstacles occur *while working on an assignment* (45.76%). Furthermore, students were asked about their purpose in requesting help and answered most frequently that they expected to receive *content-related hints* (38.98%) or were interested in mutual *communication to solve the problem* (35.59%; see Table 4).

Table 3 Interviews including the categories (1) knowledge-related obstacles (RQ-1)

Which *knowledge-related obstacles* during the learning process drive students to seek help from other students? [ICF]	
Obstacles while working on an assignment	45.76%
Incomplete information based on the learning material used	38.98%
Insufficient prior knowledge	25.42%
Insecurity about one's own solution	13.56%
Other	11.86%

Table 4 Interviews including the categories (2) helpee's purpose (RQ-1)

Which *purposes* do helpees have when using the service? [ICF]	
Requesting content-related hints (self-formulated information)	38.98%
Communicating…with the goal of solving the problem	35.59%
Making an appointment…with the goal of solving the problem	20.34%
Comparing one's own solution	13.56%
Asking for learning materials	10.17%

Table 5 Interviews including categories of students' perceived inhibitions to seek help (RQ-2)

Which *inhibitions* do students report preventing them from seeking knowledge-related help in social media? [ICF]	
Worry about social humiliation by peer students	32.20%
Asking a question being annoying to others	27.12%
Low degree of familiarity with source	20.34%
Unreliability of answer due to anonymity of the source	15.25%
Worry about a confusing explanation	13.56%
Worry about humiliation by institutional persons	11.86%

Table 6 Interviews including categories (1) used services, (2) representational formats, (3) number of addressees and (4) technical difficulties (RQ-3)

Questions guiding category formation			
(1) Which *services (on technical devices)* are used for the communication of help-seeking? (2) Which features are used to transmit a message in a certain *representation format* within a given service? (3) Who is contacted for help-seeking (specific individual vs. groups)? (4) Which *technical difficulties* with the used service were reported?			
Services to mediate HS episodes (1) [Inductive category formation (ICF)]		**Used representational formats (2) [Deductive category assignment (DCA)]**	
WhatsApp* (mobile instant messenger)	86.44%	Acoustic	71.19%
StudyDrive (document exchange)	25.42%	Textual	69.49%
Moodle (learning management)	22.03%	Visual	52.54%
Bulletin boards (discussion forums)	13.56%	Audio-visual	15.25%
Facebook (social networking site)	11.86%		
Other	10.17%		
Individual or multiple addressees (3) [DCA]		**Technical difficulties (4) [ICF]**	
Single helper	74.58%	Effort of phrasing a problem	32.20%
Group(s) of helpers	71.19%	Delay during communication	22.03%
		Lack of usability	18.64%
		Lack of clarity of depicted contents	16.95%
		Missing selection of addressees	15.25%
		Other	8.47%

* WhatsApp was one of the most commonly used messenger services in Germany.

RQ-2 addresses factors that inhibit students to seek help from peers (see Table 5). The answers that were provided most frequently are the *worry about social humiliation from peer students* (32.20%), the worry about *annoying others with their questions* (27.12%), and the *low degree of familiarity with a source* (20.34%).

RQ-3 focuses on the services students use to seek computer-mediated academic help (see Table 6). Students were asked which services and which representational formats they utilize to communicate knowledge-related problems (see Table 6, middle left). The *WhatsApp messenger service* (86.44%) was the most frequent answer, far surpassing the university's official *Moodle learning management system* (22.03%). Concerning the representational format, students reported most often using *acoustic* (71.19%), *textual* (69.49%), and *visual* representations (52.54%; see Table 6, middle right). The most frequently reported difficulty during use was the *effort to phrase a problem* (32.20%; see Table 6, bottom right). Students reported asking *single helpers* (74.58%) and asking *groups of helpers* (71.19%) with similar frequency (see Table 6, bottom left).

Discussion and conclusion

This article presents an interview study among students ($N = 59$) who were asked about their experience with computer-mediated academic HS behavior. The questions in the semi-structured interview-guidelines targeted three major topics: (1) the circumstances in which content-related problems occur, (2) the reasons for avoiding computer-mediated HS behavior, and (3) the services students use to seek computer-mediated help. The conducted interviews were limited to elaborate on a single HS episode instead of asking for a review of individuals' past episodes. In the following the most frequent categories from the interviews are summarized: Students reported that knowledge-related obstacles occur during the work on assignments (RQ-1). Moreover, incomplete information from learning materials or a lack prior knowledge were reported reasons for obstacles. Episodes were initiated to seek content-related hints in form of self-formulated information from helpers (RQ-1). Next, students reported to be inhibited because they worry about humiliation from peer students, avoid annoying others or missing familiarity with the helper (RQ-2). Popular characteristics of services for computer-mediated HS were gathered to collect data for RQ-3. Students reported using mobile instant messenger for communication during an HS episode. They predominantly reported about sending acoustic or textual messages. Most frequent reported technical difficulties were the effort of phrasing a problem or delay during communication. In the following, the central findings are discussed in detail and presented with suggestions on how to use them to improve computer-mediated academic HS (see Table 7).

Table 7 Summary of the interviews' main findings and first ideas how to approach them

Finding	Approach
RQ-1: Knowledge-related obstacles occur during work on assignments or when lacking prior knowledge	- Regular offering of mock exams - Relating questions to assignments via QR codes
RQ-2: Help-seeking is avoided due to fear of social humiliation	- Asking question with anonymous profiles, but with a university's email address
RQ-2: Lack of information about peers' availability and unknown credibility	- Provision of group awareness information about peers' availability and knowledge (Schlusche et al., 2019)
RQ-3: Mobile instant messenger services were predominantly reported to mediate help-seeking episodes	- Consider the preference for instant messenger services when planning computer-mediated help-seeking support
RQ-3: Textual or acoustic representations are used for describing a problem [probably depicted separately]	- Integrated textual and (annotated) visual descriptions of a problem may facilitate helper's understanding

With regard to RQ-1, the interviews shed light on situations in which students experience problems during learning, which may, in turn, lead to a computer-mediated HS episode (see Table 3). Students reported seeking help digitally after being confronted with knowledge-related obstacles while working on assignments. This kind of task is intended to test knowledge, it induces cognitive processes involving recall and integration of information (Dunlosky et al., 2013). Further reported causes for seeking help included incomplete information on materials and insufficient prior knowledge (see Table 3). In conclusion, there are indicators that knowledge-related problems may arise when necessary information is not accessible. Thus, encouraging students to seek help might be most effective after such situations (e.g., weekly assignments or mock exams). A practical implication of this finding is that access to sources of help is most relevant when students work on assignments and identify gaps in their knowledge. Moreover, new digital services that target to support HS could interlink information about assignments and questions, provide structure by collecting own questions as well as recommend questions from peers about the respective assignments. Moreover, attaching a digital reference of the real-world assignment or artifact (e.g., a QR code) may be useful keeping the problem descriptions associated with these artifacts. Next, students reported that their requests as well as the communication about the problem take place within the digital service. Therefore, future services should enable learners to comfortably communicate their problem/understanding referring to a given task and describing their tentative approach to solve the problem.

With regard to RQ-2, students reported their reasons to avoid seeking computer-mediated help (see Table 5) as either the fear of social humiliation or worry about negative reactions due to missing information about the helper (e.g., annoying helpers that are not available for request, because of lacking this information). First, helpees' concern that helpers may

humiliate them should be taken seriously when planning a HS intervention. Allowing pseudonymous profiles on discussion platforms is one way to counter this concern. When incognito, alleged low competence can hardly be associated with helpees' real-life identity; thus, asking questions might be perceived as less embarrassing. However, anonymity in groups on the other hand can foster undesirable behavior, such as mocking (Spears et al., 2011). This could be avoided by linking the profiles with students' institutional email-addresses, ensuring identifiability in case of misuse. Second, students reported two further inhibitions regarding the lack of peer information, namely: the lacking information about helpers' availability for helping and the unknown credibility of their answers due to their pseudonymity. Similarly, Makara and Karabenick (2013) have hypothesized that the availability and perceived quality (among other factors) of a source may influence the likelihood of selecting it. A way to improve the helpees' situation can be the provision of group awareness information: Group awareness (GA) research in the field of computer-supported collaborative learning focuses on providing GA information to members of groups with the goal to improve groups' coordination in collaborative learning tasks (Janssen & Bodemer, 2013). Research has shown that GA is associated with academic HS behavior (Schlusche et al., 2021). GA tools may visualize such information about the availability and knowledge of all group members to all members within the group. In terms of HS, these tools can be used to provide helpees with information about potential helpers. For example, Schlusche et al. (2019) enriched a list of course participants by visualizing information regarding helpers' availability to provide help in a timely manner, as well as indicating helpers' competence on a certain lecture topic. The provided GA information may eliminate the burden of considering whether a helper is available (and proficient), reducing helpees' worry about annoying others and encouraging them to seek help. However, while the GA information are expected to support the selection of helpers, the results indicate that learners rarely use the service provided by the institution (i.e., Moodle learning management system) to seek help (Schlusche et al., 2019). This leads to the question of which services are most commonly used instead.

With regard to RQ-3, students were asked which services on a smartphone they use during a typical computer-mediated HS episode. Most of them answered that they had chosen the messenger service WhatsApp (WA) to communicate with peers about knowledge-related obstacles (see Table 6). Similarly, Sindermann et al. (2021) provide recent evidence that most people in Germany make use of WA messenger for private communication and similarly, Alamri (2019) found that undergraduate students in Saudi Arabia prefer WA for academic learning-related communication. Similarly, Broadbent and Lodge (2021) provided students with a synchronous live chat at scheduled times to contact course staff. We found that a messenger application is most popular, thus the literature's results and ours are in line insofar that participants value (timely) support via computer-

mediated messaging. Both results are in line with hypothesized expectancy component from Makara and Karabenick (2013) emphasizing prompt responses. Moreover, our finding shows that students make primarily use of messenger services to contact peers and advises future research on computer-mediated academic HS to consider popular messenger services to increase acceptance and usage among students. Furthermore, students reported that they use acoustic, textual, and visual representational formats with similar frequency to seek help. Hence, no clear preference for a specific representation was identified. Instead, it appears that solving questions during CMC involves various representations. Nevertheless, future researchers are advised to quantitatively measure the number of messages considering different classes of representations. These may enable the identification of associations between representational formats and different properties of problems. As WA is the preferred communication service, it is assumed that private and study-related communication are handled within the same service. Future studies should examine in how far this overlap in communication content might have negative consequences, such as the increased effort to separate a high number of educational and private messages.

Based on these findings, implications for the design of services supporting computer-mediated academic HS can be derived regarding the (1) combined depiction of different representations, and the (2) stepwise sequence of creating these representations. First, the combined depiction of various representations of the same problem (e.g., textual and visual) may enable helpers to verify their understanding before replying. Second, enabling the user to create representations in a clear sequence, for example, starting to formulate a textual question and then providing supplemental annotated visual representations, may encourage posing targeted questions. Corresponding support for the gradual active integration of representations could already lead to improved elaboration and social grounding processes in individual and collaborative multimedia learning (Bodemer, 2011; Bodemer et al., 2004). Thus, it may be worthwhile to integrate findings from the research fields of CMC and collaborative multimedia learning when investigating computer-mediated academic HS. Further research is needed to understand how elaborated textual questions can be supplemented through pictorial (or acoustic) representations to support communication during HS effectively.

Our research followed a qualitative approach and revealed students' perspectives on how they use (or avoid) computer-mediated HS. These insights provide useful guidance for developing prototypes of digital services for that purpose. Beyond that, future research studies may follow a quantitative approach by examining relative differences in actual computer-mediated HS behavior. This enables comparisons between the frequency of utilization of various services. Moreover, hypothesized associations between discussed concepts e.g., the *purpose of help requests,* and their *representational format* may be

worthwhile to investigate, as this could lead to the development of new features. Psychological research can contribute perspectives on how HS avoidance can be reduced through specific design of features in the application, such as the representation of helpees or the number of requests that are forwarded to addressees.

As with all research, there were limitations to this study. The interviews were conducted and coded by various interviewers. Although, they all received intensive training and used the same interview-guidelines, it is possible that the interviewees were affected by interviewer effects. Additionally, the interviews were situation-specific and elaborated on participants' perceptions within that situation. Hence, participants' answers are likely to represent computer-mediated situations that were easiest to recall but are not necessarily the most representative of their HS behavior. As the interview focused on a single situation, it did not address multiple HS episodes over a period of time. Therefore, it is less suitable to investigate the relative importance of statements compared to other communication services. To gain a better understanding of the consecutive decisions within a HS episode, future research should examine multiple phases of the HS process. To summarize, this paper provides insights into the *when* and *how* of undergraduates' computer-mediated academic HS among peers, which is of practical importance for app design and for practitioners attempting to support students' social learning strategies.

Appendix

Interview guideline

(This interview guideline was translated from German.)

(1) During studies every now and then one has difficulties with learning materials, and one seeks knowledge-related support from peers. Please describe such a situation you have experienced and how you proceeded then.

(2) (When a face-to-face situation described continue with media-based help-seeking) [Digital media] Do you remember a similar situation, in which you made use of digital media to ask a person for support?

   a. [Problem] Please describe which "problem" you wanted to solve with the support?
   b. [Process] How did you proceed and why?
   c. [Channel/service]
      i. [Communication initiated] How did you establish the contact and why?
      ii. [Problem solving] On which channel did you receive help?
   d. [Addressee] With whom did you made contact and why?

i. Are there reasons why you choose this person and not anybody else?

(3) [Channel/service] Why do you think is {channel} especially appropriate to seek knowledge-related support from peer students?
   a. [Alternatively:] Which properties distinguish this channel to seek knowledge-related support from peer students?
   b. [Features] Which feature of the {channel} do you use to make your request more comprehensible to others?
   c. [Opportunity to deepen: inhibitions] Do you find it more comfortable to ask via this channel, compared to other channels?

(4) [Difficulties with channel] In which situations did the channel you were communicating in restrict you?
   a. [Alternatively:] Please describe situations in which the search for knowledge-related support was extra cumbersome?
   b. [Cumbersome] Which aspects of the usage do you find cumbersome?

(5) [Group awareness information] You probably know a person that provided particularly good support. What characterizes a good helper in your opinion?
   a. [acquire information] How do you acquire information whether a peer student is an appropriate helper?

Abbreviations

HS: Help-seeking; CMC: Computer-mediated communication; SRL: Self-regulated learning; RQ: Research question; ICF: Inductive category formation; DCA: Deductive category assignment; GA: Group awareness; WA: WhatsApp (messenger service).

Acknowledgements

Our sincere thanks go to the students of the research project *Can You Clarify It to Me? – Social Learning Strategies Via Smartphone App* for their dedicated effort and constructive participation. We thank the *Interdisciplinary Centre of Educational Research* of the University Duisburg-Essen for covering the proofreading costs.

Authors' contributions

Christian Schlusche planned and prepared the study, supervised data collection, conducted data analyses and wrote the manuscript. Lenka Schnaubert and Daniel Bodemer supported planning, preparation and analyses of the study as well as the writing and proofreading of the manuscript.

Authors' information

Christian Schlusche worked as a research assistant in the project *Academic Learning and Study Success in the Entry Phase of Science and Technology Study Programs (ALSTER)* at the institute of *Media-based Knowledge Construction* of the University of Duisburg-Essen.

Lenka Schnaubert is a postdoctoral researcher at the *Research Methods in Psychology – Media-based Knowledge Construction* lab at the University of Duisburg-Essen in Germany. Her research includes and connects metacognitive self-regulation, technology-enhanced learning, collaborative learning, group awareness, and awareness tools.

Daniel Bodemer is full professor at the University of Duisburg-Essen in Germany and head of the *Research Methods in Psychology – Media-based Knowledge Construction* lab. His research focus and projects comprise and connect analyzing and guiding processes of technology-enhanced learning, collaboration, and communication in multifaceted formal and informal educational contexts.

Funding

This work was supported by the German Research Foundation under Grant "BO 2511/7-1". The funding source had no involvement in the design of the study, neither on the data analysis nor the writing of the article.

Availability of data and materials
Data will be made available upon request without undue delay.

Declarations

Competing interests
The authors declare that they have no competing interests.

Ethics approval and consent to participate
The study was reviewed and approved by the local ethics committee (approval 1904PFSC2167). Each participant was briefed before participation about the goals of the study. All participants gave informed consent to take part in the study.

Author details
Christian Schlusche,
corresponding author,
ORCiD: 0000-0003-3578-8873,
email: christian.schlusche@uni-due.de

Dr. Lenka Schnaubert,
ORCiD: 0000-0002-6863-8110,
email: lenka.schnaubert@uni-due.de

Prof. Dr. Daniel Bodemer,
ORCiD: 0000-0003-2515-683X,
email: bodemer@uni-due.de

Affiliation for all authors:
Media-based Knowledge Construction, University of Duisburg-Essen, Germany

Institutional address:
University of Duisburg-Essen, Lotharstr. 65, D-47057 Duisburg, Germany

Received: 27 May 2021 Accepted: 14 September 2022
Published: 28 February 2023 (Online First: 16 November 2022)

References

Alamri, M. M. (2019). Undergraduate students' perceptions toward social media usage and academic performance: A study from Saudi Arabia. *International Journal of Emerging Technologies in Learning (IJET)*, *14*(03), 61. https://doi.org/10.3991/ijet.v14i03.9340

Bodemer, D. (2011). Tacit guidance for collaborative multimedia learning. *Computers in Human Behavior*, *27*(3), 1079–1086. https://doi.org/10.1016/j.chb.2010.05.016

Bodemer, D., Ploetzner, R., Feuerlein, I., & Spada, H. (2004). The active integration of information during learning with dynamic and interactive visualisations. *Learning and Instruction*, *14*(3), 325–341. https://doi.org/10.1016/j.learninstruc.2004.06.006

Broadbent, J., & Lodge, J. (2021). Use of live chat in higher education to support self-regulated help seeking behaviours: A comparison of online and blended learner perspectives. *International Journal of Educational Technology in Higher Education*, *18*(1), 17. https://doi.org/10.1186/s41239-021-00253-2

Clark, H. H., & Brennan, S. E. (1991). Grounding in communication. In L. B. Resnick, J. M. Levine & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 127–149). American Psychological Association. https://doi.org/10.1037/10096-006

Clark, H. H., & Murphy, G. L. (1982). Audience design in meaning and reference. In J.-F. Le Ny & W. Kintsch (Eds.), *Advances in psychology* (Vol. 9, pp. 287–299). North-Holland. https://doi.org/10.1016/S0166-4115(09)60059-5

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, *14*(1), 4–58. https://doi.org/10.1177/1529100612453266

Edwards, R., Bybee, B. T., Frost, J. K., Harvey, A. J., & Navarro, M. (2017). That's not what I meant: How misunderstanding is related to channel and perspective-taking. *Journal of Language and Social Psychology*, *36*(2), 188–210. https://doi.org/10.1177/0261927X16662968

Foerst, N. M., Klug, J., Jöstl, G., Spiel, C., & Schober, B. (2017). Knowledge vs. action: Discrepancies in university students' knowledge about and self-reported use of self-regulated learning strategies. *Frontiers in Psychology*, *8*, 1288. https://doi.org/10.3389/fpsyg.2017.01288

Fulk, J., Schmitz, J., & Steinfield, C. (1990). A social influence model of technology use. In J. Fulk & C. Steinfield, *Organizations and communication technology* (pp. 117–140). SAGE Publications, Inc. https://doi.org/10.4135/9781483325385.n6

Giblin, J., & Stefaniak, J. (2021). Examining decision-making processes and heuristics in academic help-seeking and instructional environments. *TechTrends*, *65*(1), 101–110. https://doi.org/10.1007/s11528-020-00556-7

Janssen, J., & Bodemer, D. (2013). Coordinated computer-supported collaborative learning: Awareness and awareness tools. *Educational Psychologist*, *48*(1), 40–55. https://doi.org/10.1080/00461520.2012.749153

Kitsantas, A., & Chow, A. (2007). College students' perceived threat and preference for seeking help in traditional, distributed, and distance learning environments. *Computers & Education*, *48*(3), 383–395. https://doi.org/10.1016/j.compedu.2005.01.008

Knapp, J. R., & Karabenick, S. A. (1988). Incidence of formal and informal academic help-seeking in higher education. *Journal of College Student Development*, *29*(3), 223–227.

Makara, K., & Karabenick, S. A. (2013). Characterizing sources of academic help in the age of expanding educational technology: A new conceptual framework. In *Advances in help-seeking research and applications: The role of emerging technologies* (pp. 37–72). Information Age Publishing.

Mayring, P. (2014). *Qualitative content analysis: Theoretical foundation, basic procedures and software solution*. Klagenfurt. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-395173

Mayring, P. (2015). *Qualitative Inhaltsanalyse. Grundlagen und Techniken* (12th ed.). Beltz.

Mesch, G. S., Talmud, I., & Quan-Haase, A. (2012). Instant messaging social networks: Individual, relational, and cultural characteristics. *Journal of Social and Personal Relationships*, *29*(6), 736–759. https://doi.org/10.1177/0265407512448263

Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review*, *1*(3), 224–246. https://doi.org/10.1016/0273-2297(81)90019-8

Nelson-Le Gall, S. (1985). Help-seeking behavior in learning. *Review of Research in Education*, *12*, 55–90. https://doi.org/10.2307/1167146

Newman, R. (1994). Adaptive help seeking: A strategy of self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications*. L. Erlbaum Associates.

Newman, R. (2002). How self-regulated learners cope with academic difficulty: The role of adaptive help seeking. *Theory Into Practice*, *41*(2), 132–138. https://doi.org/10.1207/s15430421tip4102_10

Puustinen, M., & Rouet, J.-F. (2009). Learning with new technologies: Help seeking and information searching revisited. *Computers & Education*, *53*(4), 1014–1019. https://doi.org/10.1016/j.compedu.2008.07.002

Qayyum, A. (2018). Student help-seeking attitudes and behaviors in a digital era. *International Journal of Educational Technology in Higher Education*, *15*(1), 17. https://doi.org/10.1186/s41239-018-0100-7

Reeves, P. M., & Sperling, R. A. (2015). A comparison of technologically mediated and face-to-face help-seeking sources. *British Journal of Educational Psychology*, *85*(4), 570–584. https://doi.org/10.1111/bjep.12088

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353–387. https://doi.org/10.1037/a0026838

Ryan, A. M., & Pintrich, P. R. (1997). "Should I ask for help?" The role of motivation and attitudes in adolescents' help seeking in math class. *Journal of Educational Psychology*, *89*(2), 329–341. https://doi.org/10.1037/0022-0663.89.2.329

Schlusche, C., Schnaubert, L., & Bodemer, D. (2019). Group awareness information to support academic help-seeking. In M. Chang, H.-J. So, L.-H. Wong, F.-Y. Yu & J.-L. Shih (Eds.), *Proceedings of the 27th International Conference on Computers in Education* (pp. 131–140). Asia-Pacific Society for Computers in Education.

Schlusche, C., Schnaubert, L., & Bodemer, D. (2021). Perceived social resources affect help-seeking and academic outcomes in the initial phase of undergraduate studies. *Frontiers in Education*, *6*, 732587. https://doi.org/10.3389/feduc.2021.732587

Sindermann, C., Lachmann, B., Elhai, J. D., & Montag, C. (2021). Personality associations with WhatsApp usage and usage of alternative messaging applications to protect one's own data. *Journal of Individual Differences*, *42*(4), 167–174. https://doi.org/10.1027/1614-0001/a000343

Spears, R., Lea, M., Postmes, T., & Wolbert, A. (2011). A SIDE look at computer-mediated interaction. In B. Dietz-Uhler, G. Stasser & Z. Birchmeier (Eds.), *Strategic uses of social technology: An interactive perspective of social psychology* (pp. 16–39). Cambridge University Press. https://doi.org/10.1017/CBO9781139042802.002

Vorderer, P., Krömer, N., & Schneider, F. M. (2016). Permanently online – Permanently connected: Explorations into university students' use of social media and mobile smart devices. *Computers in Human Behavior*, *63*, 694–703. https://doi.org/10.1016/j.chb.2016.05.085

Walther, J. B. (2011). Theories of computer-mediated communication and interpersonal relations. In *The SAGE handbook of interpersonal communication* (pp. 443–479). SAGE Publications Ltd.

Walther, J. B., & Burgoon, J. K. (1992). Relational communication in computer-mediated interaction. *Human Communication Research*, *19*(1), 50–88. https://doi.org/10.1111/j.1468-2958.1992.tb00295.x

Webb, N. M., Farivar, S. H., & Mastergeorge, A. M. (2002). Productive helping in cooperative groups. *Theory into Practice*, *41*(1), 13–20. https://doi.org/10.1207/s15430421tip4101_3

White, M. C., & Bembenutty, H. (2013). Not all avoidance help seekers are created equal: Individual differences in adaptive and executive help seeking. *SAGE Open*, *3*(2), 215824401348491. https://doi.org/10.1177/2158244013484916

Xu, Q., Erman, J., Gerber, A., Mao, Z., Pang, J., & Venkataraman, S. (2011). Identifying diverse usage behaviors of smartphone apps. In *Proceedings of the 2011 ACM SIGCOMM Conference on Internet Measurement Conference* (pp. 329–344). Association for Computing Machinery. https://doi.org/10.1145/2068816.2068847

Zimmerman, B. J., & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, *23*(4), 614–628. https://doi.org/10.3102/00028312023004614

Publisher's Note