Nelimarkka, Matti; Hellas, Arto

Social help-seeking strategies in a programming MOOC

Published in:
SIGCSE 2018 - Proceedings of the 49th ACM Technical Symposium on Computer Science Education

DOI:
10.1145/3159450.3159495

Published: 21/02/2018

Document Version
Peer-reviewed accepted author manuscript, also known as Final accepted manuscript or Post-print

Please cite the original version:
Nelimarkka, M., & Hellas, A. (2018). Social help-seeking strategies in a programming MOOC. In *SIGCSE 2018 - Proceedings of the 49th ACM Technical Symposium on Computer Science Education* (Vol. 2018-January, pp. 116-121). ACM. https://doi.org/10.1145/3159450.3159495

Nelimarkka, Matti; Hellas, Arto

Social help-seeking in a programming MOOC

Published in:
Proceedings of SIGCSE '18: The 49th ACM Technical Symposium on Computing Science Education,

Accepted/In press: 01/01/2018

Please cite the original version:
Nelimarkka, M., & Hellas, A. (Accepted/In press). Social help-seeking in a programming MOOC. In Proceedings of SIGCSE '18: The 49th ACM Technical Symposium on Computing Science Education, (pp. 116-121). ACM.

Social Help-seeking Strategies in a Programming MOOC

Matti Nelimarkka
Aalto University and University of Helsinki
Espoo and Helsinki, Finland
matti.nelimarkka@aalto.fi

Arto Hellas
University of Helsinki
Helsinki, Finland
arto.hellas@helsinki.fi

ABSTRACT

Being able to seek help is a crucial part of any learning process. This includes both collaborative models such as asking for help from others as well as independent models such as using course materials and the vast resources provided by the Web. Currently, MOOC research has addressed social help-seeking within the MOOC course, either using MOOC platform tools (forum, chat) or arranging activities using external platforms (Google Hangout, Facebook groups). However, MOOC learning activities take place in a larger *social ecology*, including friends and teachers, general online communities and alumni communities. Using survey data from a programming MOOC, we show a typology of social learning strategies: non-use of social help-seeking, seeking help from friends and seeking help from alumni and teacher communities. We further show that students using social help-seeking strategies orient themselves more with a surface approach but are also less likely to drop the course. We conclude this work by addressing the various design possibilities identified by this work.

CCS CONCEPTS

• **Applied computing** → **Education**; **Collaborative learning**; **Distance learning**; **E-learning**;

ACM Reference Format:
Matti Nelimarkka and Arto Hellas. 2018. Social Help-seeking Strategies in a Programming MOOC. In *Proceedings of SIGCSE '18: The 49th ACM Technical Symposium on Computing Science Education, Baltimore, MD, USA, February 21–24, 2018 (SIGCSE '18)*, 6 pages.
https://doi.org/10.1145/3159450.3159495

1 INTRODUCTION

Research into help-seeking in massive open online courses (MOOCs) has mainly focused on quantifying and assisting the help-seeking process. Researchers have, for example, studied students' forum usage [12, 16], ways to deliver information more efficiently [14, 18] and harnessed participants as peer tutors [5, 12, 20, 27]. Most of the work is focused on activities organized within MOOCs and the platform that is used to facilitate the courses.

In this work, we study help-seeking outside the MOOC course and the platform, focusing on social sources of help-seeking such as friends and teachers. Our study is motivated by the recent acknowledgment that much of MOOC activities take place outside the course [31]. For example, students may create online support communities for different language variants on social networking sites [29], and previous participants of a MOOC may independently volunteer to support participants in new course instances [25].

In a broader sense, our work is based on the constructivist paradigm of learning, which suggests that people actively construct knowledge rather than receive and store it [7, 13]. Instead of focusing on MOOC platforms that are used to deliver content and problems, we focus on the larger *social ecology* that the students are a part of an in which they construct their knowledge. The ideas of social constructivism – that is, knowledge "emerges" from social interaction [21, 28] – were dominantly present in early connectivist MOOCs. The recent developments in MOOC research have brought these ideas also into the MOOCs that are primarily extensions of existing university courses.

More specifically, in this work, we study help-seeking strategies in a programming MOOC. We focus on who the participants seek help from, and what factors contribute to the use of specific help-seeking strategies. In addition, we study whether students' course performance can be explained by the help-seeking strategies. Our research questions in this study are as follows:

RQ1 From whom do MOOC participants seek help and how could the behavior be classified into help-seeking strategies?
RQ2 What learning approaches explain the use of particular help-seeking strategies?
RQ3 Do the help-seeking strategies and learning approaches indicate success?

These questions extend the research focused on interaction emerging on MOOC organizers forums and platforms, which have shown peer interaction improves learning outcomes [4, 5]. However, the questions are not specific to a platform, but rather acknowledge that social interaction takes place outside the MOOC platform as well. At the same time, we highlight the importance of the larger *social capital* in MOOC courses as one factor to consider when compared to traditional course instances.

This article is organized as follows. Next, we summarize the related work on social interaction in MOOCs, discuss the pedagogical background for social learning, and outline the RASI questionnaire that is used to study students' learning strategies. We then present the methodology and the context from which the data was collected from. Then we present the results; first by presenting a typology for students' social help-seeking and then by further examining differences observed in this typology. This is followed by a discussion on our insights for MOOC development and limitations of the study. Finally, conclusions and directions for future work are presented.

SIGCSE '18, February 21–24, 2018, Baltimore, MD, USA

ACM ISBN 978-1-4503-5103-4/18/02…$15.00
https://doi.org/10.1145/3159450.3159495

2 BACKGROUND

2.1 Social interaction and MOOCs

MOOCs typically offer a forum for social interaction. Data from these forums have been in the foci of MOOC research on help-seeking and social interaction. A common observation of these studies has been a skewed participation; some of the participants are super-active while the majority is less engaged [12, 16]. Participation can be altered through changing the forum interface and mechanics; one can, for example, use a reputation system [4]. Similarly, researchers have suggested approaches for structuring the discussions differently, for example by using computer-mediated small group discussions in a free-form [3, 20] or in a goal-oriented manner [5, 22].

Students' learning can increase when such social interventions are used [5, 20], and furthermore, social learning tools can improve the MOOC experience [5, 27]. This said, a common challenge with creating social learning activities is their orchestration [5, 20]: the participants are not present all the time, and developing the critical mass needed to ensure the functionality of social interactions can be challenging.

One recently proposed approach is to not only focus on the participants of the current MOOC, but also on all the previous participants [25]. It is possible to create a community of current and alumni members, where the alumni help those currently enrolled. This highlights an important aspect of the social interaction for MOOCs: the target of help-seeking can be outside of the current class. At the same time, the communication mechanisms that are used in the course should integrate with existing communication practices of the alumni for them to continue participation [25].

Furthermore, others have observed social interaction outside a single course environment is valuable for MOOC students. Kasunic et al. [17] discussed how student-led Facebook groups emerged to support the official, platform provided, course forums. Such groups can also support student retention, as they provide an avenue for social engagement and a "real" community. To illustrate, Zheng et al. [29] have found indications that Facebook groups for a course can be more active than the official forums of the course. This novel strand of research shows that social interaction takes place outside a single course iteration [25] and outside the MOOC provided platforms of interaction [17, 29].

2.2 Social knowledge construction

The trend of emphasizing social aspects of learning are visible throughout the history of learning. Therefore, we briefly review the importance learning scholarship has put on the social knowledge construction in a learning activity.

Dewey once wrote that learning is a necessary incident of dealing with real life situations [6]. As – from the perspective of constructivists – knowledge is constructed through interactions with the environment instead of it being simply received and stored [7, 13], utilizing the existing set of tools and social connections for communication and help-seeking is meaningful.

Vygotsky argued that the internal development processes [of a child] operate only when interacting and co-operating with the environment [26]. In the same way, situated cognition theory suggests that individuals learn through shared activities and language that they engage in [2]; knowledge is constructed within and linked to the activity, context, and culture in which it is learned and used. If the activities are constrained to a specific environment, "*students may come to rely, in important but little noticed ways, on features of the classroom context, in which the task is now embedded, that are wholly absent from and alien to authentic activity*" [2].

Lave and Wenger [21, 28] claim that learning to seek for and to ask for help is a part of the learning process. The learner slowly becomes familiar with the community and its practices. This integration can happen through acknowledging newcomers into the community as *legitimate peripheral participants*, where legitimacy means that the newcomers are recognized by members of the community, and peripherality that the newcomers are not expected to fully contribute to the activities of the community – in online courses, this participation can be initiated through forums or other social channels.

2.3 Approaches to Studying

The students' role as an active participant in the learning process has increased in the in higher education. Due to this, the question both in teaching and learning sciences has focused more on what the students do [1].

To understand students' activities, we explore their study strategies [8–10, 15, 23]. The Approaches to Studying Inventory is a survey that measures three distinct strategies that students apply in their studies [8, 10]:

(1) Students with a deep approach focus on comprehension. Their learning focuses on understanding the topic in fully and internalizing at full.
(2) Students with a surface approach focus on gaining a procedural understanding of the material. Here the learning is seen as a tool for an objective and is focused on the teacher set goals (syllabus) and apply memorization.
(3) Students with a strategic approach aim too high achievement in the learning. Students with this approach aim to organize their studies as efficiently as possible and are motivated by grades.

Overall, studies indicate that students with a deep approach tend to achieve higher learning gains and therefore, the goal in higher education is in part to foster the development of deep approaches for teaching [1]. However, the universities have been recently challenged as students with other approaches to studying participate in the classes, as these approaches may require different ways of teaching students [1]. Catering the versatile student body is a problem in traditional in-class education and has been hardly touched in MOOC environments.

3 DATA AND METHODOLOGY

The data for our study comes from a Finnish 14-week introductory programming MOOC that was organized during Spring 2015. The course material is offered as a blended textbook consisting of theory texts, short quizzes, video tutorials and programming assignments, and the content of the course aligns with typical introductory programming courses for computer science majors.

The course offers an embedded social support channel that is facilitated through an Internet Relay Chat (IRC), which is accessible

	(-1)	1	2	3	4	5
Friends (f2f)	75.3	3.5	9.4	5.9	2.0	3.9
Friends (cmc)	80.3	3.9	6.7	5.9	1.6	1.6
Teacher (f2f)	95.7	3.5	0.4	0.4	0	0
Teacher (cmc)	94.9	3.5	1.6	0	0	0
Unknown (cmc)	93.3	3.9	1.2	0.8	0.4	0.4
MOOC IRC	62.0	4.7	12.9	12.2	3.9	4.3

Table 1: Students response distributions (%) on how beneficial particular social sources were for help. Key: (-1) indicates did not use the source, (1) not at all beneficial, and (5) extremely beneficial.

both directly through the course main page and the learning material, as well as through students' own chat applications. Students are also given guidelines on how to access the chat room using their own tools. The channel has previously been studied by Nelimarkka et al. [25], who observed that participants from past courses stay in the channel and volunteer to help newcomers.

To answer the Research Question 1, *From whom do MOOC participants seek help and how could the behavior be classified into help-seeking strategies?* we surveyed the MOOC participants, asking them to grade on a scale from 1 to 5 how relevant different key social sources have been to problems and challenges related to the course. Key social sources included friends, teachers, the MOOC community and strangers on the Internet. We also provided an opportunity to input free-form text to outline additional sources for help. To extend the analysis, and to determine whether there are sub-populations that have different help-seeking strategies, we conducted a k-means clustering on these social sources and self-reported utility of different channels.

To answer the Research Question 2, *What learning approaches explain the use of particular help-seeking strategies?*, we asked the course participants to answer a basic demographic survey and a 30 item questionnaire based on the Revised Approaches to Studying Inventory (RASI) questionnaire [11]. Using the Kruskal-Wallis χ^2-test, we compare the studying approaches from the RASI questionnaire with the sub-populations that have different help-seeking strategies, which were identified as a part of the RQ1.

Finally, to answer the Research Question 3, *Do the help-seeking strategies and learning approaches indicate success?*, we apply a quantitative approach, where we examine the course trajectory of the students in the different sub-populations.

4 RESULTS

The surveys were sent to students who had completed at least one week in the course ($n = 982$). The survey contained the aforementioned questions on key sources for help, demographic background, and the RASI questionnaire. A total of 263 answers were received, yielding a response rate of 27%, which can be considered acceptable for this study [12, 19]. However, for each question, some responses were discarded due to missing values, and the final analysis was conducted on a subset of 255 users, corresponding to 26% of the whole population and 97% of survey responders.

4.1 Summarizing help-seeking

We asked students to assess how much they benefited from six social sources as they were working on the MOOC assignments: (1) friends through face-to-face (f2f) contact, (2) friends through computer-mediated contact, (3) teachers through face-to-face contact, (4) teachers through computer-mediated contact (CMC), (5) unknown users through the Web and (6) the MOOC supported IRC channel.

	A	B	C	D	E
Friends (f2f)	0.10	−0.77	3.70	0.19	−1.00
Friends (cmc)	2.10	−1.00	1.43	−0.65	−1.00
Teacher (f2f)	−0.40	−0.97	−0.90	−1.00	−1.00
Teacher (cmc)	−0.40	−0.95	−0.90	−1.00	−0.93
From unknown (cmc)	−0.17	−0.95	−0.57	−1.00	−0.90
MOOC IRC	0.83	−1.00	0.20	4.19	2.34
n	30	128	30	26	41
%	11.8	50.2	11.8	10.2	16.0

Table 2: Students clustered based on their help-seeking strategies. The columns indicate the clusters and cell values indicate the mean value of the perceived benefit of each of help sources (rows). The key for the clusters is: (A) CMC Friend, (B) None, (C) Friend, (D) Heavy-MOOC, and (E) MOOC.

We also asked if they sought help from other sources outside the course materials. Students reported e.g. using Google and reading books; a total of 21% of respondents reported the use these non-social forms of help-seeking. Some non-expected social sources were also mentioned, such as family, email and university staff.

As can be seen from Table 1, the majority of the students did not use social help-seeking approaches. The most used venue, the IRC chat room suggested in the MOOC platform, gained attraction from 38% of survey responders. Of them, 88% experienced that they benefited from this help-seeking strategies.

The least used social help-seeking approach related to seeking help from teachers, which was used only by 5% of participants. Friends were used by circa one in four participants, highlighting the aspect that MOOC users extend their help-seeking beyond the MOOC platform. The perceived benefit from this is varied among those who asked their friends to help. Those who received help from friends mostly considered this a little helpful or somewhat helpful (total of 83% of responders), but about 17% felt that they did not receive any support from their friends.

Using the k-means clustering method and the elbow method for determining the optimal number of clusters, we observed that the participants can be summarized using five clusters. We analyzed the descriptive means of each cluster, and classified them as the following learning approaches (see Table 2):

(A) computer-mediated friend-based interaction (CMC-friend)
(B) non-help seekers (none)
(C) friend supported (friend)
(D) heavy MOOC platform benefiters (heavy-MOOC)
(E) MOOC platform benefitters (MOOC)

Approximately one-half of the students did not use social support strategies (51%), and that rest of the students are distributed rather equally among the four different strategies. Overall, we also observe that in each of the clusters, participants considered benefiting from these social help-seeking strategies (i.e. the values are above 2, that is received help "a little").

4.2 Help-seeking and demographics

We then studied participant demographics, including gender, age, level of education, and previous programming experience[1].

We observed that there are gender differences in choosing to use various social help-seeking approaches (Kruskal-Wallis χ^2 = 9.8616, df = 4, p = 0.04283). Overall, men were more likely to not ask for help, while females were, in general, more active as social help-seekers and in using the given support platform. Males, when asking for help, typically used computer-mediated communication.

We observed also a relationship between the age and the social help-seeking approach (Kruskal-Wallis χ^2 = 10.579, df = 4, p = 0.03173). In general, the younger participants belong to those helped by a friend, and older participants use the tools provided by the MOOC platform.

We however did not observe a relationship on the level of education and social help-seeking strategies (Kruskal-Wallis χ^2 = 4.2481, df = 4, p = 0.3735). Thus, education and e.g., social capital gained during higher education did not explain how people seek help.

Similarly, to our surprise, previous programming experience (that is, the subject of the MOOC) was not related to social help-seeking strategies (Kruskal-Wallis χ^2 = 6.7033, df = 4, p = 0.1524). For example, approximately 50% of the most experienced participants who had worked on several group programming projects had sought for help from at least one of the given social help-seeking sources.

4.3 Help-seeking and study approaches

Using the 30 survey items of the Revised Approaches to Studying Inventory (RASI) [11], we studied differences between student clusters and the study approaches. As shown in Table 3, the participants can broadly be described as more deep and strategic learners, and less as surface learners.

We observed that the student clusters that described the help-seeking strategies were not related to deep and strategic approaches. The Kruskal-Wallis χ^2-test demonstrated no relationship, p = 0.769 for deep learning strategy and p = 0.713 for strategic learning approach. However, the surface approach had significant differences between the groups (p = 0.041).

As shown in Table 3, although the differences are modest, the surface approach was highest among the cluster C, the students who relied on their friends for support, and the lowest in the non-help seeking cluster B.

4.4 Help-seeking and course retention

We finally compared the dropout rate of students in each of the different clusters that described students help-seeking strategies. The data included only those students who had completed at least one week of the course. Table 4 shows the proportion of students in different clusters that stayed in the course.

[1]Due to participants not completing both the demographics survey and the RASI survey, the analysis was only conducted with a subpopulation of 102 participants. Their distribution in the cluster groups was even (χ^2= 4.1235, df = 4, p = 0.3896). Gender (male=68%, female=28%, NA=4%), Age (min=18, med=33, max=66), Level of Education (primary/secondary=49%,tertiary=26%,research=25%), Previous programming experience (none=21%,at least some=59%, formal or work experience=20%). Further available from the authors.

	A	B	C	D	E
Deep	37.3	36.8	35.4	36.8	37.8
	(5.8)	(5.7)	(6.4)	(4.9)	(5.5)
Strategic	34.5	33.3	34.4	33.9	35.1
	(6.8)	(5.8)	(5.4)	(6.4)	(6.7)
Surface	26.6	24.3	28.6	26.1	25.5
	(6.3)	(6.0)	(7.0)	(5.2)	(5.9)

Table 3: Mean and standard deviation on the approaches to studying inventory between clusters. A larger value means higher weight on the approach. The key for the clusters is: (A) CMC Friend, (B) None, (C) Friend, (D) Heavy-MOOC, and (E) MOOC. Sub-sample sizes see Table 2.

Weeks	2	4	6	8	10	12	14
A	100%	89%	89%	89%	89%	89%	89%
B	86%	67%	60%	55%	51%	50%	48%
C	85%	78%	68%	62%	59%	52%	52%
D	100%	84%	79%	79%	79%	79%	75%
E	92%	90%	86%	79%	74%	62%	62%

Table 4: Percentage of students in each cluster that were still completing assignments from a given specific course week. The key for the clusters is: (A) CMC Friend, (B) None, (C) Friend, (D) Heavy-MOOC, and (E) MOOC. Sub-sample sizes see Table 2.

Table 4 shows that approximately 50% of those students who did not engage in help-seeking (Cluster B) and those who relied solely on their friends completed (Cluster C) the course. The highest completion rate was among the students who were discussing with friends using computer-mediated communication (Cluster A), and the users who mostly used the tools provided by the MOOC platform fell in between (Clusters D and E).

5 DISCUSSION

Next, we concretize our findings to personas, which can be used to design MOOC courses, followed by further design ideas to improve social help-seeking in MOOC environments.

5.1 Personas

Based on the findings thus far, we idealize five different potential users. These potential users are *personas*, which MOOC system designers and MOOC course teachers can use to help to design their courses. Following standard format of a persona, we give these idealized users a name and provide a short background on them.

Friend over CMC: Ville is around 30 years old. He is keen to understand how programming truly works and is willing to spend time to understand the course exercises. He is connected to some friends who are familiar with programming and who are able to answer his questions in private. He uses Facebook Messenger to stay in touch with his friends but knows them only as they've been bragging about coding in some context in the past. Around 12% of students are like Ville.

None: Matti is around 30 years old. He is keen to understand how programming truly works and is willing to spend time to

understand the course exercises. He, however, either do not have friends who know programming or does not want to ask help from them. Instead, he uses Google, StackOverflow, and other online sources when stuck and re-reads the course material. Around 50% of students are like Matti.

Friend: Maija is around 25 years old. She enrolled in the class to learn to program but considers how to most conveniently pass the course. She has some classmates who are also taking the same MOOC course or she happens to be a good friend with someone programming. She asks help for the hard challenges and receives a lot help from them. Around 12% of students are like Maija.

Heavy-MOOC: Anna is around 30 years old. She enrolled in the class to learn to program and wishes to truly understand how programming works. She has found her way to the MOOC support channel and has received a lot of help from them, and occasionally asks also help from some of her friends when they meet. Around 10% of students are like Anna.

MOOC: Leena around 35 years old. She enrolled in the class to learn to program and wishes to understand how programming works. However, she is careful not to spend too much time on the exercises. There is also a life to live! She has found her way to the MOOC support channel and does get help from there, but it is not super critical. Around 16% of students are like Leena.

5.2 MOOC buddy

Our primary finding is that about one in four students seeks help from their friends and that the majority of them also report receiving a little or more support from them. These participants who sought help from their friends did not consider contacts on the MOOC platform beneficial for working with the course assignments. As any MOOC provider can not ensure that each participant has knowledgeable friends, one may question what is the relevance of this finding. However, we see that this finding justifies proposing an intervention which could benefit MOOC students.

A *MOOC buddy* is a person who will help you with your MOOC exercises. Previous research has indicated that MOOC serves also as a platform for social interaction [30]. Furthermore, previous findings have suggested that alumni are willing to engage in supporting new students in MOOCs without extra compensation [25]. Our data can not answer how critical it was that the help-seeking took place from *a friend*, having a social group (and group pressure for studies) or even that there were constantly same persons who could help the MOOC participants. However, the access to participants' social networks via social network sites (e.g., Facebook) could be used to seek both friends and friends-of-friends who a) have relevant knowledge, b) interest on the subject matter or c) have taken the course previously (and are thus alumni), so that they could help existing MOOC participants in a mentor role.

Based on earlier work on social learning, we believe that it is possible to find such participants. Therefore, we argue that through social network mechanics, MOOC buddy system could be scaled to large MOOCs as well. Furthermore, we may be able to reduce the effect of existing friendships (if not found) by providing the opportunity to find some other volunteers if the MOOC participant does not have anyone with a suitable background in their circles.

5.3 Different learners within a MOOC

Our second finding was related to the differences in participants' study approaches. We observed that, overall, course participants were more deeply and strategically orientated and less surface-oriented in their MOOC studies. We, however, observed that especially groups that sought help from their friends were more surface-orientated than other groups. This is not critical, as in all groups the deep learning approach was higher than the surface approach, and no statistically significant differences were observed.

These differences in study approaches can be seen as an indicator of social help-seekers needing more support in the course and may need to be motivated to approach the course using deep study approach. We suggest that, when possible, the social interaction should be constructed so that it supports building a deeper understanding of the course, and not only the strategies needed to solve the course assignments.

If the MOOC buddy program presented above would be initialized, this could take place when mentors enroll. On MOOC platforms, such as IRC in this course, proposing a guideline or etiquette for participants is easily achieved. However, we highlight that this help-seeking takes place also on tools not connected to the MOOC, but on environments that best facilitate the interaction for each specific group.

Therefore, we propose that students would be introduced to a *wireframe for their social help-seeking*, which would introduce questions students should ask when asking for help to ensure they can engage in a deeper course-wise discussion also. Students could use this when engaged to social-help seeking to ask more detailed questions, connecting the exercise and problem to a wider learning context. Furthermore, students could share this material with those helping them to establish an etiquette. Similar practices already exist for solo-work [24].

5.4 Limitations and future work

Our study has several limitations which we address next. First, the course has a specific population. It is related to programming and as such might attract certain types of participants more than others. Furthermore, the course was organized in Finnish, which means that the participants had somewhat similar cultural backgrounds in relation to education and social interaction.

The two points above are also related to the generalizability of our findings. As we used responses from 255 users, which corresponds to 26% of the initial population, it is possible that the results do not generalize to other contexts. The clusters that we presented in this study are a result of the responses that we received, which means that there is also a possibility of participation bias. Similarly, we must highlight that we studied the *benefit* instead of *frequency* of help-seeking, which can also influence the results.

The course under study has also existed several years. It is thus possible that communities have already emerged around the MOOC, which could mean that some of the help-seeking behaviors have been directed at these communities which we do not know of. In the same vein, we do not have more extensive background details on the participants: we do not know if they have deliberately chosen to act in the way they acted in, or if there were other reasons for their behavior.

Finally, any research is as valid as its measurement instruments are. In this research we have used previously validated measurements, translated to the Finnish language by the research team. The translation was performed by two researchers to check the consistency of the terminology and natural presentation. The questions focused on perceived help sources was developed by the research team.

6 CONCLUSIONS

In this work, we studied social help-seeking in a programming MOOC. Based on analysis of our survey, we found five approaches for social help-seeking. First, we observed that the largest group – approximately one-half of the students – did not engage in social help-seeking. They used the existing resources available (e.g., books, search engines) to solve problems they had with their assignments.

Two of the groups primarily sought support from their friends. These groups differed in the type of communication channel they preferred to use. The first group was mostly connected through computer-mediated means, whereas the other used face-to-face communication, supplemented with some computer-mediation. It is important to observe that the interaction in these two groups took place also *outside* the MOOC platforms. The last two groups used the MOOC provided platform (IRC channel) to seek help, but we observed a difference in how helpful they considered the channel.

We also found that women were more likely to engage in social help-seeking, older participants used the MOOC platform more to seek help, and younger participants used more friends as a source of help. Furthermore, while in general the groups corresponded poorly to the RASI learning styles, users who sought help from their friends were marginally more surface oriented. Finally, we observed differences in the drop-out rate between these clusters, which indicates that the clusters provide information on the ways in which students engage in their learning activities.

Based on our findings, we proposed two practices which could assist social help-seeking and improve its overall quality. Our first proposal was a MOOC buddy system, which would ensure access to "friends" who could help on the MOOC. The second practice we proposed related to helping participants to ask the right questions from persons helping them through scaffolded examples.

REFERENCES

[1] John B Biggs. 2011. *Teaching for quality learning at university: What the student does.* McGraw-Hill Education (UK).

[2] John Seely Brown, Allan Collins, and Paul Duguid. 1989. Situated cognition and the culture of learning. *Educational researcher* 18, 1 (1989), 32–42.

[3] Julia Cambre, Chinmay Kulkarni, Michael S Bernstein, and Scott R Klemmer. 2014. Talkabout: Small-group Discussions in Massive Global Classes. In *Proceedings of the first ACM conference on Learning @ Scale conference 2014 - L@S '14*. 161–162. https://doi.org/10.1145/2556325.2567859

[4] Derrick Coetzee, Armando Fox, Marti A. Hearst, and BjÃűrn Hartmann. 2014. Should your MOOC forum use a reputation system?. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing - CSCW '14*. 1176–1187. https://doi.org/10.1145/2531602.2531657

[5] D Coetzee, Seongtaek Lim, Armando Fox, Bjorn Hartmann, and Marti A. Hearst. 2015. Structuring Interactions for Large-Scale Synchronous Peer Learning. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW '15*. ACM Press, New York, New York, USA, 1139–1152. https://doi.org/10.1145/2675133.2675251

[6] John Dewey. 1967. *The School and the Society: Rev. Ed.* Univ. of Chicago Press.

[7] Rosalind Driver and Beverley Bell. 1986. Students' thinking and the learning of science: A constructivist view. *School science review* 67, 240 (1986), 443–56.

[8] Angus Duff. 1997. A note on the reliability and validity of a 30-item version of Entwistle & Tait's Revised Approaches to Studying Inventory. *British Journal of Educational Psychology* 67, 4 (1997), 529–539.

[9] Angus Duff. 2004. The Revised Approaches to Studying Inventory (RASI) and its use in management education. *Active learning in higher ed.* 5, 1 (2004), 56–72.

[10] Noel Entwistle, Maureen Hanley, and Dai Hounsell. 1979. Identifying distinctive approaches to studying. *Higher education* 8, 4 (1979), 365–380.

[11] Noel J Entwistle and Hilary Tait. 1994. The revised approaches to studying inventory. *Edinburgh: University of Edinburgh, Centre for Research into Learning and Instruction* (1994).

[12] Nabeel Gillani and Rebecca Eynon. 2014. Communication patterns in massively open online courses. *The Internet and Higher Education* 23 (2014), 18–26. https://doi.org/10.1016/j.iheduc.2014.05.004

[13] Tony Greening. 2000. Emerging Constructivist Forces in Computer Science Education: Shaping a New Future? In *Computer science education in the 21st century*. Springer, 47–80.

[14] Philip J Guo, Juho Kim, and Rob Rubin. 2014. How video production affects student engagement: An empirical study of MOOC videos. In *Proceedings of the first ACM conference on Learning@ scale conference*. ACM, 41–50.

[15] Greg Harper and David Kember. 1989. Interpretation of factor analyses from the approaches to studying inventory. *British J. of Educ. Psych.* 59, 1 (1989), 66–74.

[16] Jonathan Huang, Anirban Dasgupta, Arpita Ghosh, Jane Manning, and Marc Sanders. 2014. Superposter behavior in MOOC forums. *Proceedings of the first ACM conference on Learning @ Scale conference - L@S '14* (2014), 117–126. https://doi.org/10.1145/2556325.2566249

[17] A Kasunic, J Hammer, and R Kraut. 2016. A Preliminary Look at MOOC-associated Facebook Groups: Prevalence, Geographic Representation, and Homophily. *Proceedings of the Third ...* (2016), 205–208. https://doi.org/10.1145/2876034.2893415

[18] Juho Kim, Philip J Guo, Daniel T Seaton, Piotr Mitros, Krzysztof Z Gajos, and Robert C Miller. 2014. Understanding in-video dropouts and interaction peaks inonline lecture videos. In *Proceedings of the first ACM conference on Learning@ scale conference*. ACM, 31–40.

[19] Rene F. Kizilcec, Chris Piech, and Emily Schneider. 2013. Deconstructing Disengagement : Analyzing Learner Subpopulations in Massive Open Online Courses. *Lak '13* (2013), 10. https://doi.org/10.1145/2460296.2460330

[20] Chinmay Kulkarni, Julia Cambre, Yasmine Kotturi, Michael S. Bernstein, and Scott R. Klemmer. 2015. Talkabout: Making Distance Matter with Small Groups in Massive Classes. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW '15* (2015), 1116–1128. https://doi.org/10.1145/2675133.2675166

[21] Jean Lave and Etienne Wenger. 1991. *Situated learning: Legitimate peripheral participation.* Cambridge univ. press.

[22] Seongtaek Lim, Derrick Coetzee, Bjoern Hartmann, Armando Fox, and Marti A Hearst. 2014. Initial experiences with small group discussions in MOOCs. In *Proceedings of the first ACM conference on Learning @ Scale conference - L@S '14*. 151–152. https://doi.org/10.1145/2556325.2567854

[23] Karen Mattick, Ian Dennis, and John Bligh. 2004. Approaches to learning and studying in medical students: validation of a revised inventory and its relation to student characteristics and performance. *Medical Education* 38, 5 (2004), 535–543.

[24] Robert McCartney, Anna Eckerdal, Jan Erik Mostrom, Kate Sanders, and Carol Zander. 2007. Successful students' strategies for getting unstuck. In *ACM SIGCSE Bulletin*, Vol. 39. ACM, 156–160.

[25] Matti Nelimarkka and Arto Vihavainen. 2015. Alumni & Tenured Participants in MOOCs. In *Proceedings of the Second (2015) ACM Conference on Learning @ Scale - L@S '15*. 85–93. https://doi.org/10.1145/2724660.2724671

[26] Lev Semenovich Vygotsky. 1978. *Mind in society: The development of higher psychological processes.* Harvard university press.

[27] Joe Warren, Scott Rixner, John Greiner, and Stephen Wong. 2014. Facilitating human interaction in an online programming course. *Proceedings of the 45th ACM technical symposium on Computer science education - SIGCSE '14* (2014), 665–670. https://doi.org/10.1145/2538862.2538893

[28] Etienne Wenger. 1999. *Communities of practice: Learning, meaning, and identity.* Cambridge university press.

[29] Saijing Zheng, Kyungsik Han, Mary Beth Rosson, and John M Carroll. 2016. The Role of Social Media in MOOCs: How to Use Social Media to Enhance Student Retention. *Proceedings of the Third ACM Conference on Learning @ Scale* (2016), 419–428. https://doi.org/10.1145/2876034.2876047

[30] Saijing Zheng, Mary Beth Rosson, Patrick C Shih, and John M Carroll. 2015. Understanding Student Motivation, Behaviors and Perceptions in MOOCs. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW '15*. ACM Press, New York, New York, USA, 1882–1895. https://doi.org/10.1145/2675133.2675217

[31] Saijing Zheng, Pamela Wisniewski, Mary Beth Rosson, and John M Carroll. 2016. Ask the Instructors: Motivations and Challenges of Teaching Massive Open Online Courses. *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (2016), 206–221. https://doi.org/10.1145/2818048.2820082