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A Case Study on Learning Difficulties and Corresponding Supports for Learning in cMOOCs

Une étude de cas sur les difficultés d'apprentissage et le soutien correspondant pour l'apprentissage dans les cMOOC

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Abstract

cMOOCs, which are based on connectivist learning theory, bring challenges for learners as well as opportunities for self-inquiry. Previous studies have shown that learners in cMOOCs may have difficulties learning, but these studies do not provide any in-depth, empirical explorations of student difficulties or support strategies. This paper presents a case study on student difficulties and support requirements at the beginning of a cMOOC. Content analysis of messages posted by learners and instructors in four main online course learning spaces including Moodle, blogs, Facebook and Twitter was conducted. Three questions are explored in this paper: (1) What kinds of difficulties do learners encounter at the beginning of a cMOOC?; (2) Which of these difficulties are typical for most learners?; and (3) How are these difficulties responded to and supported in the cMOOC environment? Based on the research results of this study, we provide some reflections on learning support for cMOOCs and a discussion of the research itself in the last part of the paper.

Resume

Les cMOOC, qui s'appuient sur une théorie pédagogique connectiviste, soulèvent des défis pour les apprenants ainsi que des occasions de questionnement de soi. Des études préalables ont démontré que les apprenants des cMOOC peuvent connaître des difficultés d'apprentissage, mais ces études n'offrent pas d'exploration empirique en profondeur des difficultés des élèves ni des stratégies de soutien. Cet article présente une étude de cas sur les difficultés des élèves et les besoins de soutien au début d'un cMOOC. On a procédé à l'analyse

du contenu des messages publiés par les apprenants et les instructeurs dans les quatre principaux espaces en ligne pour l'apprentissage, c'est-à-dire Moodle, les blogues, Facebook et Twitter. Cet article explore trois questions : (1) Quels types de difficultés rencontrent les apprenants au début d'un cMOOC?; (2) Parmi ces difficultés, lesquelles sont typiques pour la plupart des apprenants?; et (3) Comment réagit-on à ces difficultés et comment y remédie-t-on dans l'environnement du cMOOC? En nous appuyant sur les résultats de recherche de cette étude, nous offrons quelques réflexions sur le soutien pédagogique pour les cMOOC et une discussion sur la recherche elle-même dans la dernière partie de l'article.

Introduction

In recent years, there has been a significant increase in MOOCs all over the world. MOOCs evolved from Open Education Resources (OER) and have shifted people's attention from open education resource to open learning. In 2008, the first MOOC, known as a cMOOC and titled "Connectivism and Connective Knowledge," was provided by George Siemens and Stephen Downes (Yuan & Powell, 2013). This new kind of asynchronous online learning is "based on the explicit principles of connectivism (autonomy, diversity, openness, and interactivity) and on the activities of aggregation, remixing, repurposing and feeding forward the resources and learning" (Rodriguez, 2012, p.1). Two years later, a Stanford professor, Sebastian Thrun, offered another well-known MOOC called "artificial-intelligence." This MOOC is built on behaviorist pedagogy (Bates, 2012), and is regarded as xMOOCs. Since then, MOOCs based on behaviorist pedagogy have attracted increasing attention and developed rapidly because of their simple learning model and the many well-known colleges that are course providers.

With the increasing uptake and interest in MOOCs, there has been increasing criticism as well. Most questions focus on course quality and high dropout rates, which place MOOCs into an awkward position since they are intended to engage people in open learning activities rather than only provide them with learning resources. As Daniel (2012) points out, elite universities who are actively involved in delivering MOOCs may not be talented in teaching, especially teaching online, which causes suspicion as to whether these universities follow procedures of effective online teaching and learning. According to Jordan (2013) who collated completion rates for 24 MOOCs (as of March 11th, 2013), the majority of MOOCs had completion rates of less than 10%. It is argued that one of main factors affecting course quality and completion rates is the lack of interaction between instructors and learners in MOOCs, especially in xMOOCs (Chen, 2014). Low levels of interpersonal interaction may result in an absence of real-time feedback, which would inevitably impact a learner's understanding of course content and give rise to negative feelings about online learning overall.

Distance learners usually encounter various kinds of difficulties including cognitive, metacognitive, organizational, affective, and technological difficulties (O'Rourke, 2003). Any one of these difficulties may affect learning and even lead to dropouts if learners do not receive support in a timely manner. Previous studies on the dropout rates of distance learners have shown that peak dropout periods occur at the beginning of a student's distance learning experience. (Simpson, 2002). When the student embarks on the distance learning journey, there are often too many challenges, which inhibit the learners from successfully adapting to their new

learning environment. When learners cannot access support, they may feel frustrated and are more likely to give up their learning. Simpson pointed out that almost 30% of learners gave up their learning at the British Open University after submitting their first assignment (Simpson, 2002). Therefore, it is very important to understand learner difficulties and to provide them with corresponding supports.

Compared with xMOOCs, it appears that cMOOCs place more emphasis on interpersonal interaction, which is regarded as an essential activity of connective learning and a way to build connections through *nodes*. Therefore, it can be suggested that cMOOCs were more supportive since learners are supported in developing their social network, functioning as a learning support, to create their own personal learning network. However, the literature suggests that most learners in cMOOCs are not yet ready for connective learning, and that they encounter many difficulties in way-finding and sense-making because of their lack of necessary knowledge and skills. When reflecting on his cMOOCs, Viswanathan (2012) summarized some of the challenges learners faced, including having nothing for sharing, poor networking, lack of time to participate in online discussions, and unsuitable course content. Kop (2011) pointed out in his review of various literature, that low self-efficacy and technology application problems obstruct learner's learning in a cMOOCs. She also conducted a survey of learners participating in two cMOOCs (PLENK2010 and CCK11) and found that some learners gave up course study mainly because they felt overwhelmed by the large amount of information in the course and were uncomfortable with the distributed course content.(Kop, Fournier, & Mark, 2011). Mackness, Mak, and Williams (2010) implemented an online survey and personal email interviews to investigate learners' experiences in a cMOOC (CCK08). They summarized the learning difficulties encountered by learners in CCK08 as: too much information in the course; poor networking; lack of expertise knowledge; and the learner's preference for connecting with people who have similar thinking, which led to the formation of isolated small groups. They argued that all above factors obstructed connections and interaction.

Summing up the above, information overload, getting lost in the information, technology application difficulty, network connection problem, lack of prerequisite knowledge, learning conditions, and unsuitable course content are all suggested in the literature as learners' difficulties while learning in cMOOCs. However, there is still little known about the learning difficulties met by learners in cMOOCs, especially students in the early stages of learning. Discussions of student learning difficulties in cMOOCs in the literature are fragmented, and learning difficulties have not always been the core question in previous studies. Previous relevant studies have been mainly based on one-time surveys, such as online surveys and email interviews, and used convenience sampling to collect data. There is a lack of analysis of the messages posted by learners in the course platforms and relevant social network spaces, and important information about learning difficulties may be hidden in those large amounts of messages.

The goal of this research is to synthesize student learning difficulties at the beginning of learning in a cMOOC by: systematically analyzing relevant messages posted by learners in the learning management system and main social network spaces of a case course; and to depict how these difficulties are responded to and supported by analyzing the replies of related messages. This paper hopes to aid cMOOCs instructors and providers in better understanding learner

difficulties and experiences in the early stages of studying in cMOOCs. It will offer insights that will allow course designers and facilitators to be aware of the issues learners are facing.

Methods

This paper selected a typical cMOOC course as case study, and used content analysis to code and analyze the messages posted by learners and instructors in the main online learning spaces, including Moodle, Facebook, Twitter and blogs.

Research Questions

1. What types of difficulties do learners encounter in the early stages of learning in cMOOCs? What changes take place with regard to learning difficulties as the course advances?
2. Among the different types of learner difficulties, which ones are the main types of difficulties for learners in the early stages of learning in cMOOCs? What are the typical problems in the main types of difficulties?
3. What is the status quo of support for addressing these expressed difficulties in cMOOCs?

Introduction of the Case Course

This study selected a cMOOC course "Change: Education, Learning and Technology" (referred to as Change MOOC) as a case study. It was considered to be a successful and typical cMOOC (Rodriguez, 2013) and had large amounts of messages posted by participants. It generated a high frequency of interactions between the participants (for example, the number of blog posts published by participants was 15,888 posts in 36 weeks). The course was facilitated by connectivism advocates experts. The topics of the course were how to be a reader and a listener, how to be understanding, and how to use the content generated by others to create one's own understanding. The course started on September 12, 2011 and ended on May 20, 2012, for a total of 36 weeks. It consisted of 33 themes. The first week was a guiding week with formal learning topics beginning in the second week. Moodle, blogs, Facebook, Twitter, and other social media were integrated into the course. There were two kinds of teachers in the course, both of whom were important learning facilitators and supporters in this case: One was the course facilitator and the other was the weekly topic expert. The course facilitator was responsible for publishing the online content, including the pre-designed structure, weekly schedules, course event notifications, learning guidance, and curriculum resources, as well as sending the course "Daily Newsletter" (Figure 1) to inform learners of the content updates. There was also a weekly topic expert for each theme that introduced his or her own core research and posted theme resources. Both course facilitators and topic experts could initiate discussion and participate in the interaction in the learning spaces. Learners were fully autonomous in this case. They could share their personal views or learning stories by publishing to their blog or Twitter. They could comment on other classmate's blogs or Twitter posts to make contact with other learners. They could also initiate discussions on a topic, or participate in a prior discussion in the learning space.

Figure 1. Screenshot of the "Daily Newsletter."

Data Collection and Analysis

Messages posted in the first six weeks of the course were selected as data sources for analysis. There were four reasons for selecting these weeks. First, the learner population was the largest in this early period of the course. These data on student difficulties would reflect the needs of the largest group of learners. Second, the early period of the course study was the most concentrated period for student difficulties. The difficulties reflected by learners when they adapted themselves to the new curriculum and learning environment were more comprehensive and universal. These data can provide the basis for us to understand why many learners quit the course later on. Third, the learning mode and learning environment of the course were basically the same from the second week. Learners would not confront new problems about adapting to the new course or the environment, so the difficulties in the early period of the course are meant

to represent the learning difficulties in the entire course to some extent. Finally, an analysis of the messages published in the four platforms showed that the first six weeks were the most active in the course.

The main steps of data collection and analysis were as follows:

Step 1. To collect data related to students' difficulties from the posts they published or replied to in the four learning spaces, and to code the data for the first time.
In this study, we defined learning difficulties as various problems that hinder learning encountered by learners during their process of learning, including but not limited to, lack of relevant abilities, poor learning environment, lack of peers, and negative emotions. We identified data from message content by analyzing the semantics in each message according to the following criteria:

1. The learners clearly illustrated the difficulties, such as "can't get into the page," "can't find the address," or "don't know how to filter the information."
2. The learners expressed their negative emotions in the course, such as feeling the information is "too overwhelming," "very hectic," or "consuming a lot of time every day."
3. The learners called for a resource or help, such as "I need a simple-to-use navigation guide," or "I wish someone would share her learning experience with me."
4. The learners expressed complaints or suggestions of curriculum design, such as "daily newsletter can't help me keep up with the conversation," or "I think I should use xx tool instead of **tool."
5. The learners agreed with other learners on the description of difficulties.
6. The learners liked, needed, or forwarded the content about how to study in cMOOC which was published by course facilitators or other learners.

We designed a table for recording data and coding data for the first time. The table consisted of the following categories: publisher, data, timing, platform, original text, and encoding, as well as the same data for each respondent. In order to obtain comprehensive data about the learning difficulties, we also followed two rules during the process of data collection. First, if a piece of a message mentioned several difficulties, each difficulty would be coded separately. Second, if the subsequent replies described how to solve the problem, the entire process should be coded, such as what was the difficulty, who offered help, involved solutions, learners' response to the offer, and so on.

Step 2. To code the data collected from Step 1 for the second and third time, and define the types and subtypes of learning difficulties.

In this step, data from the initial coding were first coded according to the cMOOC learning difficulties from the literature summary (as shown in Table 1). For the learning difficulties that could not be placed into the classification from the literature review, we first created secondary coding on the theme for the difficulties involved, and then analyzed the relationship between the secondary coding, attempting to classify them and extract the name of a concept as a third coding. For example, one primary coding is: "I delayed chang11 learning

because of meeting." Attending the meeting was the learner's job. This difficulty was a typical problem that occurred when work time and learning time was conflicting, which resulted in the secondary coding as "learning time," and the tertiary coding as "learning conditions." Through secondary and tertiary coding, we were able to define all of the types of learning difficulties and subtypes in the cMOOC.

Table 1

Learning Difficulties of cMOOCs Proposed in the Literature

Difficulties' Types	Specific Difficulties
Personal Knowledge Reserves	The knowledge in related fields was reserved not enough
Learning Conditions	Network quality was not high
	Not enough time to learn
	The skills of using English in reading, expressing and communicating were poor
Information Filtering	Information overload
Technology	Technology could not effectively support learning
Confidence	Learners' self-efficacy was poor
Design of Course Content	The course content was not suitable for all work situations of learners

Step 3. To count the number of difficulties in every difficulty type and corresponding subtype for each week of the first six weeks, and to explore what changes will take place with regard to learning difficulties as the course advances.

Step 4. To define the main difficulty types and typical problems according to the following standards:

1. If the number of difficulties in this type is greater than the average number of difficulties per type, this type will be defined as a main type of difficulty.
2. If the number of difficulties in this subtype is greater than the average number of difficulties per subtype in the corresponding type, this subtype will be defined as a typical problem of the corresponding type.

Step 5. To analyze the replies to posted difficulties by assessing the number of replies, and who replied, in order to reveal the status quo of support to the learning difficulties in the course.

Step 6. To analyze the content of replies to typical problems, and extract the possible strategies that were used to support the proposed solutions for the typical problems.

Reliability and Validity of Research

In the data collection stage, two associate professors were invited to demonstrate the data collection criteria and encoding rules to ensure comprehensive and accurate data collection. We also invited two research assistants (W and Z) to help with data acquisition and coding. W was responsible for the collection and primary coding of data on Facebook and Twitter. Z was responsible for the collection and primary coding of data on the course platform and blogs. We reviewed separately the collection and primary coding of W and Z, and performed the secondary and tertiary coding. Disagreements were settled through negotiation.

Results

Research Question 1

> What types of difficulties do learners encounter in the early stages of learning in cMOOCs? What changes take place with regard to learning difficulties as the course advances?

In the first six weeks of the course, 191 pieces of difficulty data from the course were collected. 153 pieces were expressed directly by learners through original content. Thirty eight pieces were expressed indirectly through forwarding others' original difficulties or expressing agreement to the difficulties put forwarded by others. The number of difficulties in each week is shown in Figure 2.

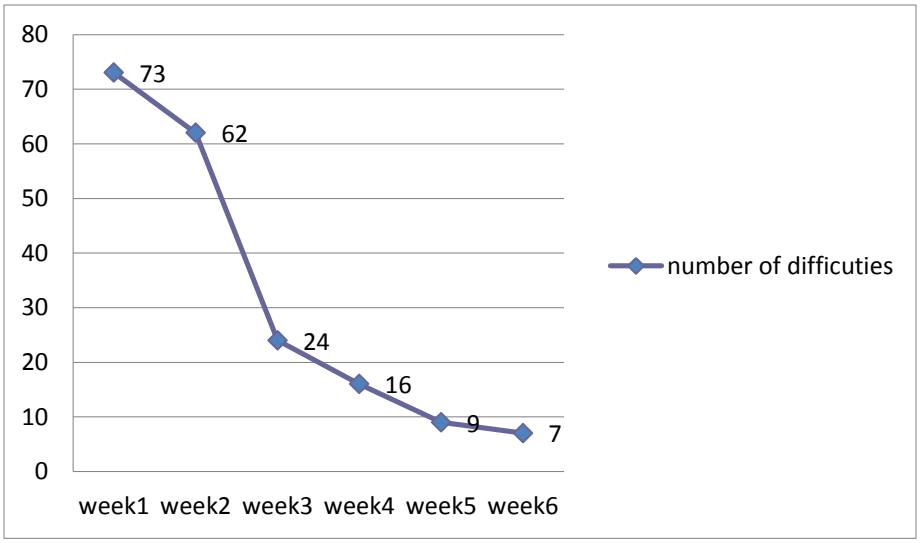

Figure 2. Number of difficulties in the first six weeks of the course.

According to Figure 2, learners showed intense difficulties in the first two weeks of the course; 70% of all difficulties came up in these two weeks. This may suggest that the learners usually have more difficulties in the early learning stages of a new course, due to not being able to adapt to a new learning environment. The number of learning difficulties was significantly reduced from the third week on. This may suggest that learners started to adapt to the new

environment of the course from the third week. After secondary and tertiary coding, we defined the 8 types and 38 subtypes of learning difficulties expressed by learners during their learning process in the first six weeks, as shown in the Table 2.

Table 2

Types and Subtypes of Learners' Difficulties Defined in this Case Study

Difficulties Types and Subtypes	Examples
Learning Methods	
Steps of Course Learning	Forward the facilitator's blog of "nine steps of course participation"
Information Discovery and Information Filtering	I will be interested in how we cope with the volume of #Change11 material that will permeate into our in boxes, blogs.
Formation of the Cognitive Map	I can't find a way to list blog on #change11 site: it's new - www.muise-media-musings.com
Establishment of the Contact	Lost track of who to follow
Learning Concept	My first instinct (as the "good" traditional student that I was) is to try to digest all the information that this MOOC is producing.
Methods of Starting Course Learning	I don't know how to start my learning
Building Personal Learning Space	I am thinking about starting a new blog for my #change11 stuff - should I just use my existing space http://j.mp/c6dzOP ?
Creation of Artefact	I have not added my blog feed to the course because I have not ordered enough ideas to write something about it. Maybe I will, maybe not.
Basic Technical Problems	
Availability of Tools	Awful experience with fuzemeeting. took me about 30 minutes to get the audio work only to find out the meeting was cancelled.
Resource Links	Is it just me or are the links to discussions/blogs/ etc. on the MOOC page not working?
Display of Web Page	I just got a blank screen. Not sure if it were my browser, OS, bandwidth, or what
Login of Course	@Downes where are you? i came to another net and i can't join a channel in bit.
Reception of Materials	I have not yet received any of the newsletters via email, despite setting (and re-setting) my subscription option to

	do so.
Stability of Tools	Audio problems that they're working on. Cuts out all the time.
Display of Original Content	I created lots of lovely content for the #change11 MOOC, but it's not appearing in the system
Resource Search	I can't figure the #change11 synchronous meeting with #mweller. The meetings page says there is nothing on.
Application of Course Platforms (Tools)	
Operation of Course Platforms	I've found what I think are the discussions, but I wonder, how do you start a new thread?
Operation of Other Course Tools	How does Skype work?
Content Transition Between Different Platforms	I have a blog somewhere, now where did I put it?
Learning Conditions	
Time of Learning	Hosting the HERDSA research symposium today http://www.herdsa.org.nz - bit of a disconnect between this and #change11
Language Barriers	It looks easy! ..... but I never go to a Web session, I never watch the videos!
	The translations of texts in PDF are harder!
Access to Network	Do you teach in a school that forbids FB and hides behind a firewall for Twitter?
Negative Emotions and Feelings	
Control of Course Learning	I think about how many times I log onto YouTube to find one thing and end up checking out eight others, spending way too much time than I had initially planned, and logging out without ever having done what I initially set out to do.
Adaptability of Course Learning	I like idea of it but not likin' the whole levels and XP points idea.
Group Learning	Collect people, but how? 100 participants from inside nice to listen not help much - or should help the network, but maybe I'm still too one-dimensional?
No Attention	All of this is leading me to feel like my "voice" is being silenced.
	Deep down, I guess I'm disappointed.
Learning Motivation	Had difficulty making time to get engaged in the MOOC this week. Maybe because the 'real' MOOC will only

	start next week?
Opinions of Course Platform (Tools)	
Function of Tools	Also, as you point it doesn't provide a way to sort or prioritise relevant content. A bit of a melange.
Applicability of Tools	If you joined us, you're aware that Big Blue Button (the synchronous tool we were planning to use in #change11) doesn't like many participants in the room at once. I think it took us about 8 minutes to crash the system.
Usability of tools	I find MOOC communications confusng, frustrating; tempted to bag it
Security of Tools	Facebook's blatant desire to make all information public and its settings changes without permission are becoming very tiresome, and perhaps now edging into dangerous.
Feature of Tools	Twitter can become annoying and distract you from the speaker's message if the tweets come too thick and fast.
Effectiveness of Tools	It's funny, TweetDeck doesn't really appeal to me – it's just too much information that I don't care for. For some reason I feel that it runs counter to twitters "simplicity". The other thing that I find interesting is that people feel constrained by 140 characters, but the 140 character limit was in order to accommodate SMS (which is how twitter got its start). I haz no prob xpresing myself in 140 chars
Design of Web Page	Too many clicks: Perhaps I am spoiled from CCK11, but CCK11 was much more organized in terms of content. The Course Outline page for CCK11 gives you links to each weekly module, and each module in turn has recommended readings, viewings, and activities. So, to get from MOOC homepage, to content it's two clicks. In contrast, Change is three clicks to get to the guest host's blog/webpage/CMS, and then it depends how deeply the content is buried.
Learning Preferences	
Preference for Tools	I don't like to participate in facebook or twitter. I prefer my Google+ account. Is there any solution for participation?
Preference for Learning Style	I actually prefer reading the posts
Others	
Problem Solving	Is there a way to download the mp3 recordings for #change11 for offline listening?
Login of Course	I forgot my MOOC password yesterday and today as

well

We wondered, were these difficulties evenly distributed in the weeks of the course? As the course progressed, what changes in the learning difficulties would take place? In order to find the answers to these two questions, we counted all the types of difficulties in the first six weeks. The results of this tally are shown in Figure 3.

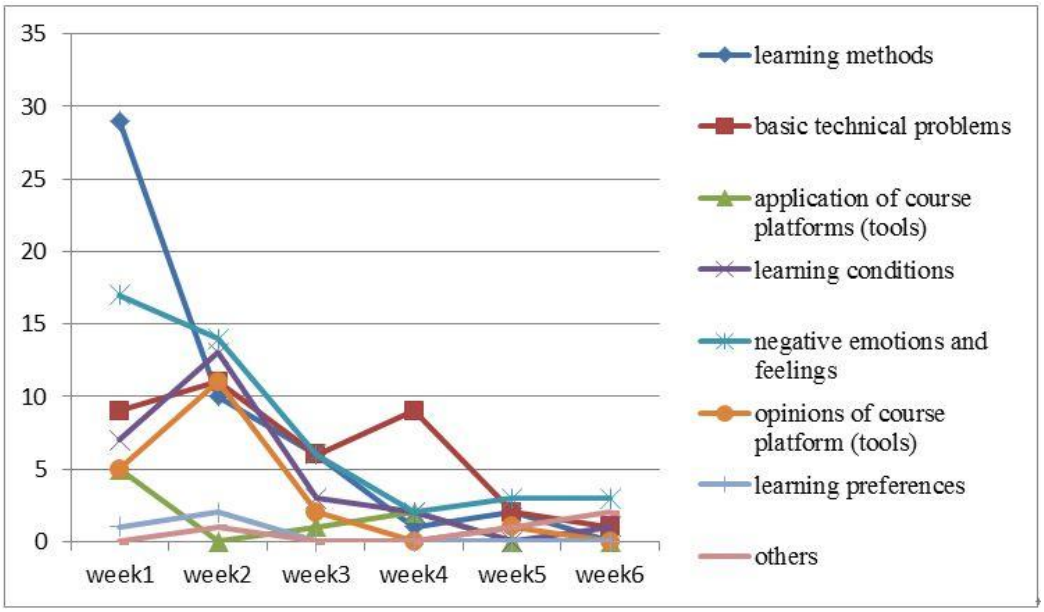

Figure 3. Distribution of eight types of difficulties in the first six weeks of the course.

Seven types of difficulties were shown in the first week, with learning methods and negative emotions and feelings as the prominent difficulty types. When we moved to the second week, all of the types of learning difficulties were reduced; however, the numbers of difficulties in negative emotions and feelings, learning conditions, opinions of platform, basic technical problem, and learning methods were significantly larger than the remaining three types of difficulties. In the third week, in addition to the opinion of platform (tools), another six types of learning difficulties were reduced significantly, compared to the first two weeks. As is shown in Figure 3, the numbers of difficulties in negative emotions and feelings, basic technical problems, and learning method still remained at more than five in the third week. Moving into the fourth week, only difficulties in basic technical problem were still prominent, with almost 10. In weeks five and six, there were no more than three of any of the different types of difficulties, and the total number of difficulties in the two weeks was nine and seven. The above results may suggest that learners, especially ones who are accustomed to traditional modes of learning, need a period of adaptation when they participate in a cMOOC. Learners who are new to cMOOCs would encounter diverse types of difficulties. As the course progresses, these learning difficulties will decrease correspondingly as learners gradually adapt to the learning environment and learning mode of the course. Results also showed that not every type of learning difficulty appeared in every week. For example, opinions about platform were not mentioned by learners in weeks four and six.

Research Question 2

> Among the different types of learner difficulties, which ones are the main types of difficulties for learners in the early stages of learning in cMOOCs? What are the typical problems in the main types of difficulties?

In order to define the main types of difficulties, we calculated the proportion of each type of difficulty, which is shown in Figure 4. According to the criteria we set for defining the main difficulty type, the number of main types of difficulties should be greater than or equal to 12.5% of the total number of difficulties. It was found that the main difficulties that were encountered by learners in the first six weeks were learning methods (25%), negative emotions and feelings (23%), basic technical issues (20%), and learning conditions (14%). The accumulated proportion of the four main types of difficulties was 82% of all the difficulties of the total. Among these four difficulty types, learning methods, and negative emotions and feelings were more prominent problems for learners during the early stages of learning in the cMOOC. It's worth noting that difficulties about learning methods were the largest proportion of learning difficulties expressed by learners in the first six weeks, accounting for 60% of the difficulties posted in the entire six weeks and 40% in the first week. The second major difficulty type was negative emotions and feelings, which was very prominent in the first two weeks according to the learning difficulties maps, and was always in the top two for the first six weeks of the course.

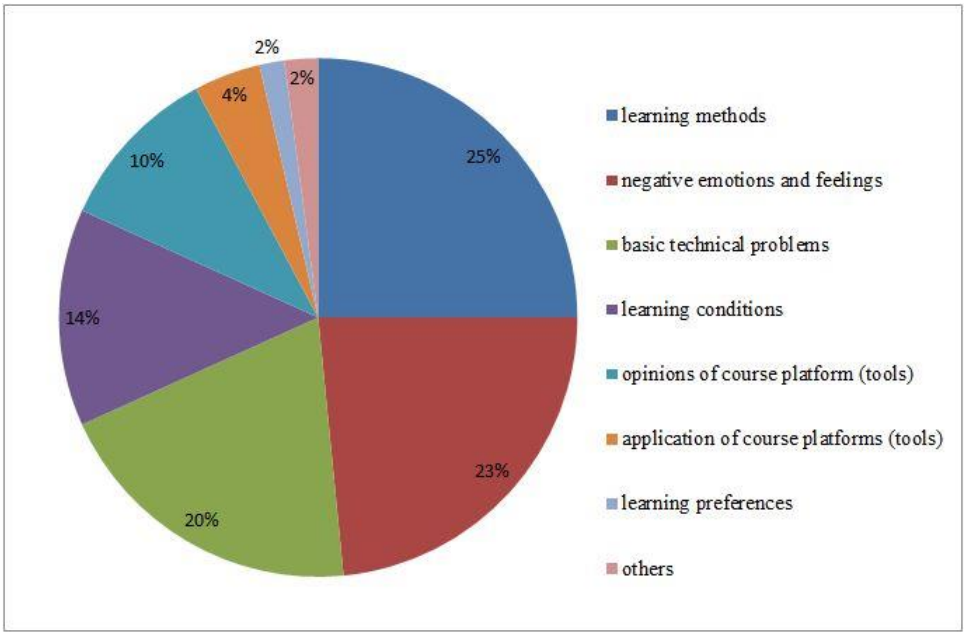

Figure 4. Proportion of difficulties in eight difficulty types in the first 6 weeks of the class.

What were the typical problems that were included in the main types of difficulties? To answer this question, we counted the number of difficulty subtypes involved in each of the main difficulty types. These results are shown in Figures 5 through 8.

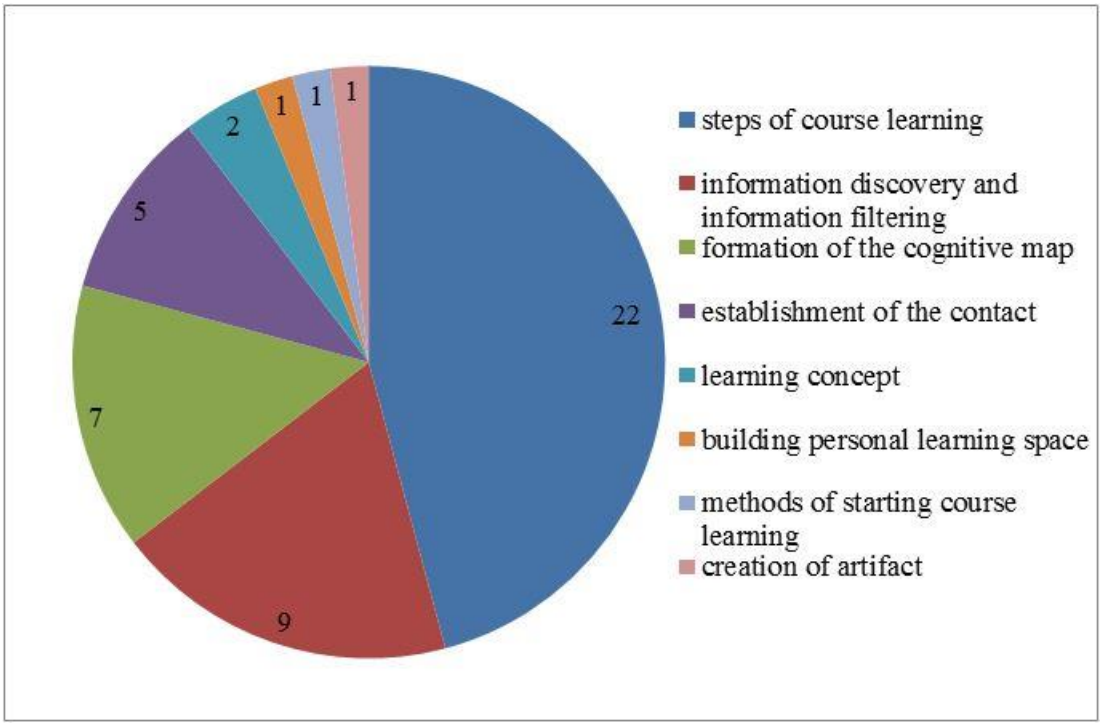

Figure 5. Number of difficulties in the learning methods subtype.

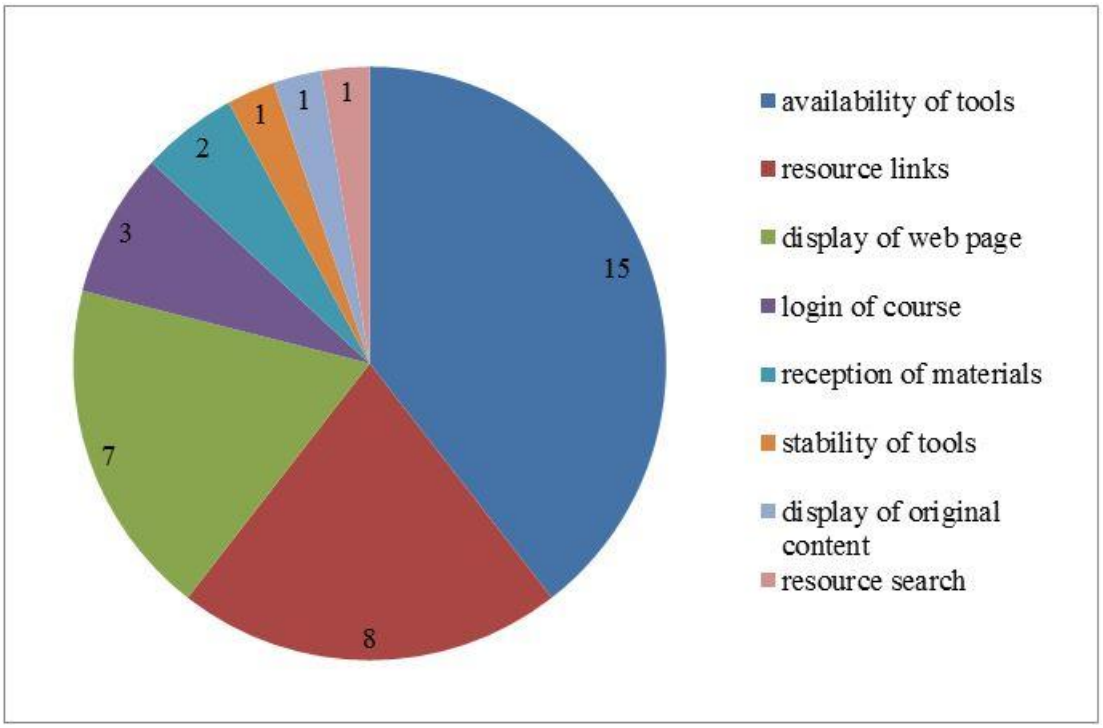

Figure 6. Number of difficulties in the basic technical problems subtype.

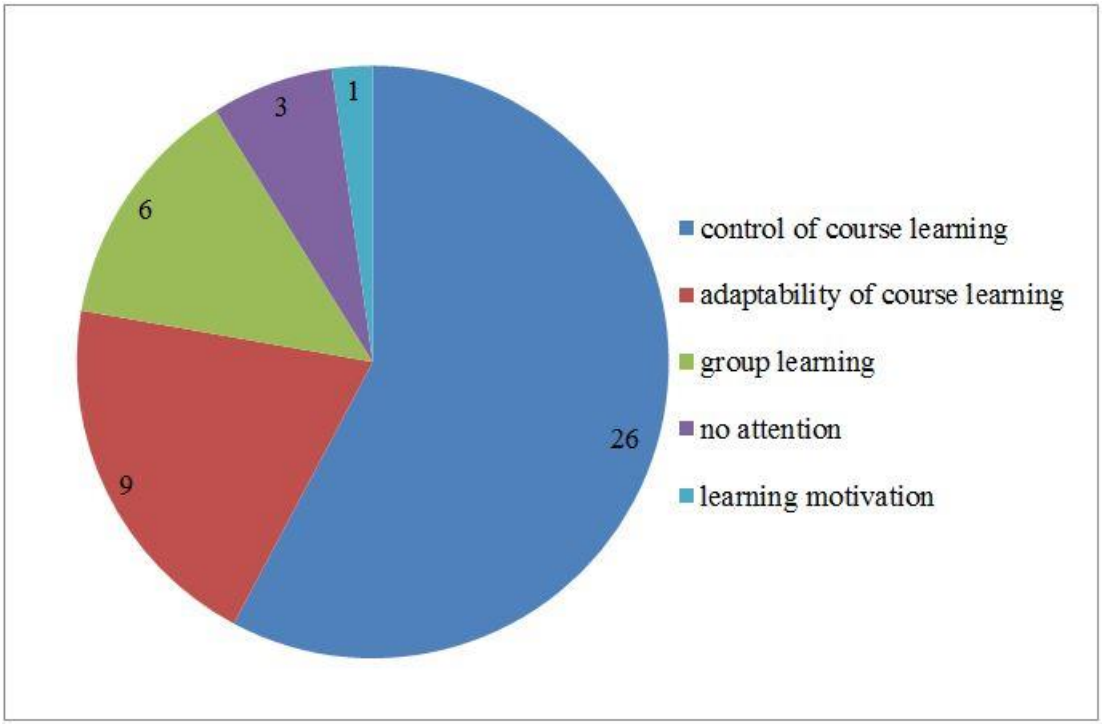

Figure 7. Number of difficulties in the negative emotions and feelings subtype.

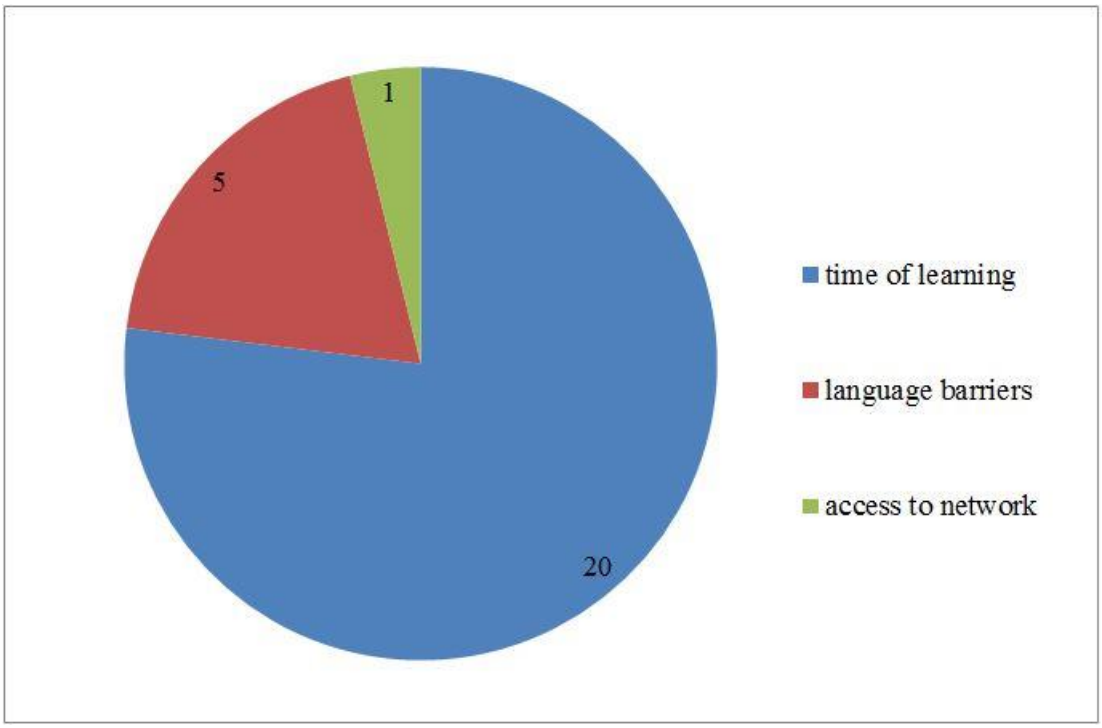

Figure 8. Number of difficulties in the learning conditions subtype.

According to the standard we set for identifying typical problems for each difficulty type, we identified the typical problems of the four main types of difficulties, as shown in Table 3.

Table 3

Typical Problems in the Main Types of Difficulties

Main Types of Difficulties	Typical Problems
Learning Methods	Steps of course learning
	Information discovery and information filtering
	Formation of the cognitive map
Negative Emotions and Feelings	Control of course learning
	Adaptability of course learning
Basic Technical Problems	Availability of tools
	Resource links
	Display of web page
Learning Conditions	Time of learning

According to Table 3, confusion about steps of course learning, lack of ability to discover information and filter information, and lack of ability to build a cognitive map for efficient wayfinding were identified as typical problems in terms of learning methods. Thus the data from the current study supports the previous research results that indicate that cMOOC learners do have difficulties in learning methods, especially in information discovery, information filtering, and formation of the cognitive map. They are not yet fully equipped with the necessary abilities and skills for connectivist learning and face difficulties adapting to this type of learning pattern where they have to find useful knowledge and make sense of it themselves in the sea of information. Typical negative emotions and feelings expressed by participants of cMOOCs in this case study were associated with study control and course adaptation, which for the most part, could be caused by learning method problems. As for basic technology problems, availability of tools, resource links, and display of web page were identified as the typical problems. In terms of learning conditions, learning time was identified as the typical problem, and the tension between working and learning was a main reason for difficulties with learning time.

Research Question 3

What is the status quo of support for addressing these expressed difficulties in cMOOCs? In order to find the answer to question 3, we must do some further analysis on the relevant data and replies to the difficulty posts in the first six weeks of the Change MOOC. Excluding forwarding and recognizing difficulties, the number of original difficulties directly expressed by learners in the course was 153 in all. By analyzing these relevant messages, we found that only 35 of them had been replied to, accounting for 26% of the total difficulties. That means that nearly 3/4 of the difficulties did not receive a reply. The response rates of the eight difficulty types are shown in Figure 9.

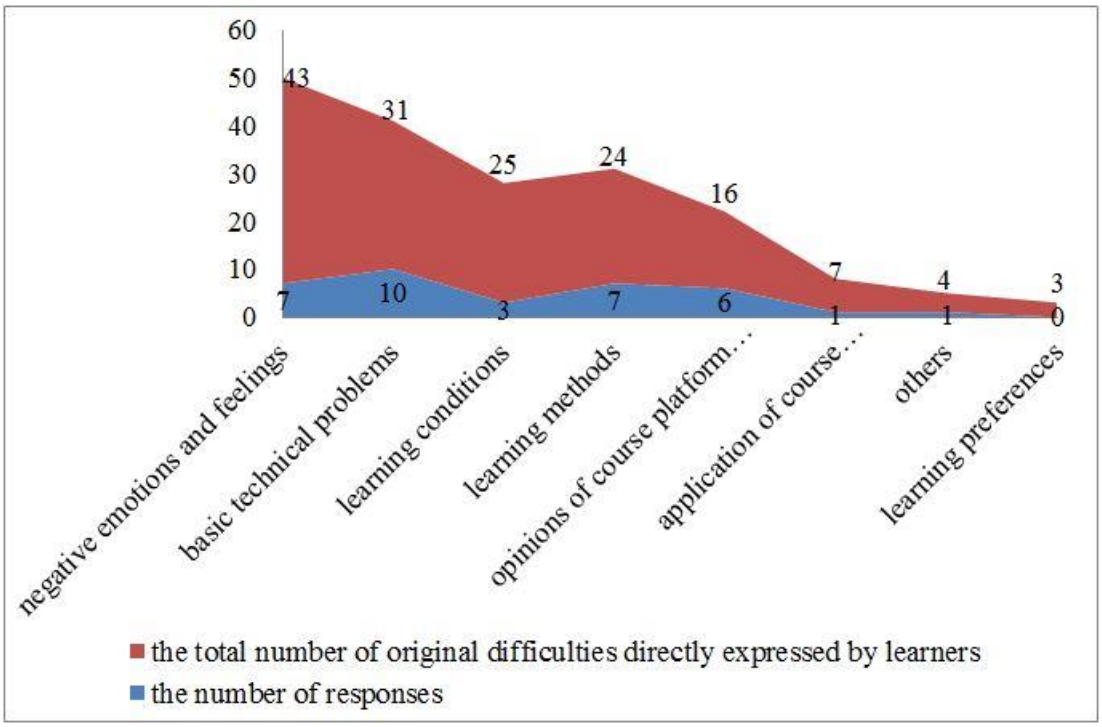

Figure 9. Response rates of directly expressed difficulties in the eight difficulty types.

According to Figure 9, all eight types of original difficulties had no more than 10 replies. For instance, there were 43 messages about negative feelings, and only seven of them got a reply, which means that five out of every six difficulties did not receive a reply. We acknowledge that learners' feelings about learning influence learning outcomes and completion rates, but the feedback rate for learners' expressions of negative feelings in this course was not satisfactory, which would no doubt influence learning outcomes and completion rates.

How fast did learners get a response after they posted about a difficulty? By analyzing the interval between post time and response time of each difficulty that received a reply, we found that 81.6% of responses were given within one day, and 93.9% of responses were given within two days. Only three replies were given three days later. It is commonly claimed that it is better to respond to difficulties within 24 hours, and up to no more than 48 hours in most distance education contexts. Results indicate that responses to difficulties expressed in the course platforms were usually in a timely manner, in spite of having fewer replies.

By analyzing the role of the people who posted the replies, it was found that weekly topic experts, course facilitators, technicians, study companions, and posters themselves were involved in giving responses to the difficulty posts. We divided the above five roles into three types: The poster themselves, study companions, and course teachers, which included course facilitators, topic experts, and technician. The number of replies given by each role is shown in Figure 10.

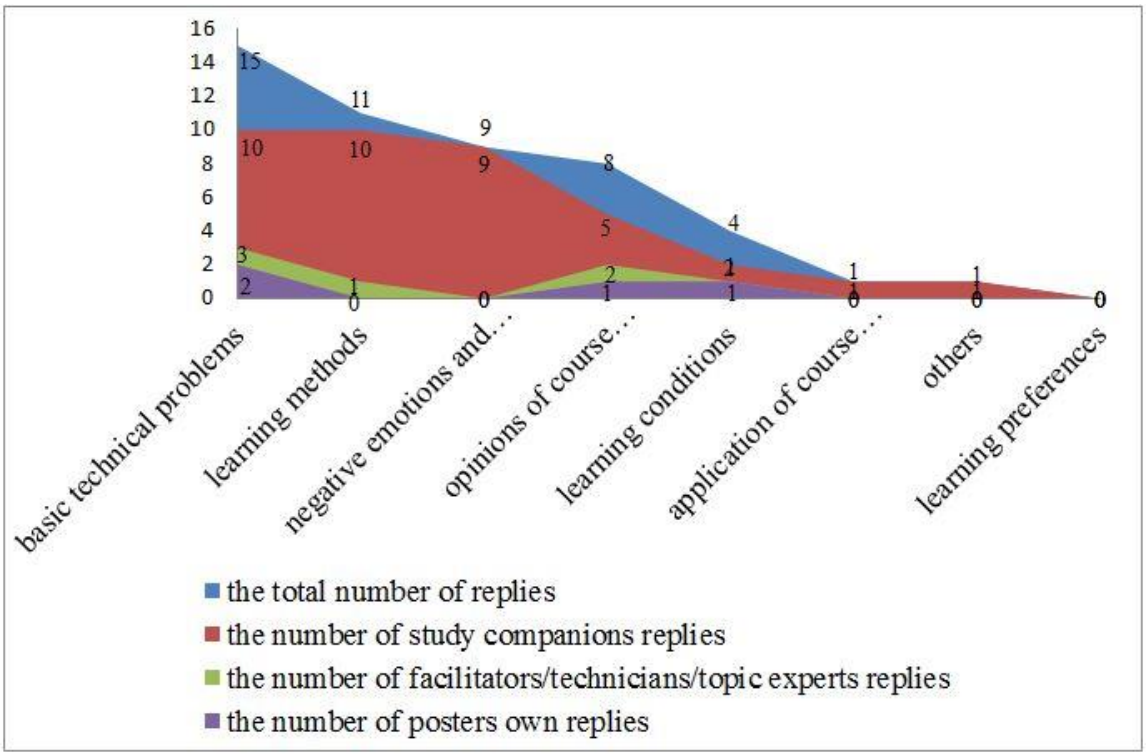

Figure 10. Number of replies by each role in the course.

As shown in Figure 10, compared with other roles, study companions gave the most responses. From Figure 10 we can also see that study companions gave the most responses in each difficulty type, especially in the first to third rank learning difficulties, which accounted for 66.7%, 90.9% and 100% of total replies, respectively.

Do “most responses” mean “most supports”? The answer is probably no. By analyzing the content of the responses, it was found that only 61.2% of all replies were helpful in solving the problems. We calculated the number of supportive replies by the three types of roles. The results are shown in Figure 11, which shows that study companions clearly provided the most supports to difficulties expressed by learners in the course.

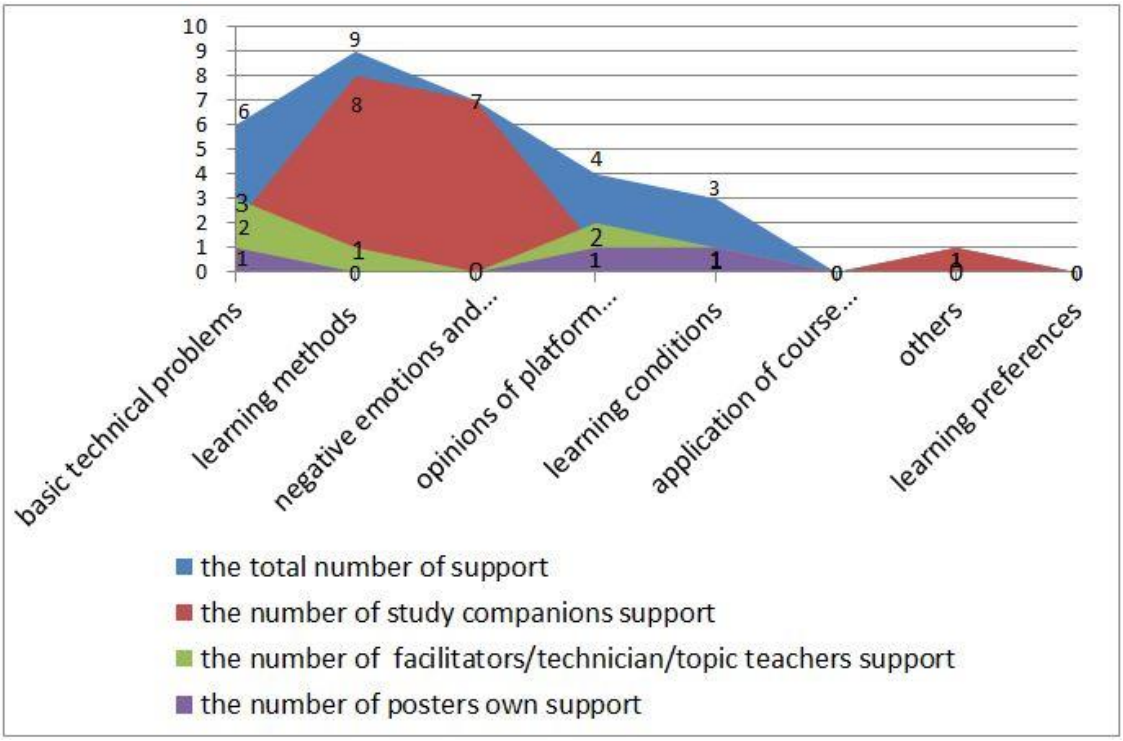

Figure 11. Number of supportive replies by each role in the course.

Through analyzing and coding the content of the replies to typical learning difficulties defined in this study, we also extracted useful support strategies for solving typical problems for four main difficulty types, as shown in Table 4.

Table 4

Support Strategies Used In the Case Course for Typical Problems

Types Of Difficulties	Typical Problems	Strategy Name	By Who	When
Learning Methods	steps of course learning	Introducing learning steps	facilitator	at the beginning of the course
		sharing learning design on the basis of learning step	study companion	the first week
	information discovery and information filtering	sharing own learning goal	study companion	the first week
		publishing daily newsletter	facilitator	every day
		creating course label	facilitator	before the course start

Types Of Difficulties	Typical Problems	Strategy Name	By Who	When
		creating topic label		at any time
		creating topic group	learner	at any time
	formation of the cognitive map	publishing course introduction	facilitator	before the course start
		introducing course modules and course tools	facilitator	at the beginning of the course
		publishing every weeks' content introduction	facilitator	the first day of each week
		creating a separate weekly page	facilitator	before each week start
Negative Emotions and Feelings	control of course learning	referring to strategies of information discovery and information filtering [a]		
	the adaptability of course learning	instructing correct learning concept	facilitator	at the beginning of the course
		explaining learning methods in cMOOCs	facilitator	at the beginning of the course
		sharing personal learning stories and learning experiences	study companion	at any time
Basic Technical Problems	availability of tools	creating question label	facilitator	at the beginning of the course
	resource links			
	display of web page			
Learning Conditions	time of learning	recording and sharing online activities	facilitator	at any online time
		share personal notes or summaries	study companion	every week

[a] Considering typical problem about control of course is usually caused by a lack of skills in discovering and filtering information, the strategies of this difficulty subtype were suggested to refer to ones of information discovery and information filtering

Discussion

Influences of Connectivist Learning Difficulties on the Course Quality and Completion Rates

Wayfinding and sense-making are the two key activities of productive connectivist learning (Siemens & Downes, 2013). As such, wayfinding and sense-making are activities that individuals engage in as a means of building information coherence in complicated distributed online learning environments (Siemens, 2011). According to Siemens, wayfinding represents an individual's capability of building networks, whereas sense-making represents the capability of forming coherent views of information. However, both this study and previous studies have revealed that learners need help in wayfinding and sense-making, especially at the beginning of a course. In this course, learners who had just started their learning also expressed difficulties with these two elements. Relevant difficulties involved forming a cognitive map, finding important nodes, connecting with important nodes, and finding and filtering information. Despite a significant decrease in the expression of these types of difficulties after the fourth week, this does not suggest that these difficulties no longer existed for learners. A possible explanation may be that similar difficulties did not get the expected response and support, resulting in learners choosing to not express similar difficulties or deciding to quit the course.

Among the above difficulties, problems with finding and filtering information were the most prominent in the early period of the course. In the first six weeks of the course, the number of learners expressing this difficulty ranked second among all subtypes of learning methods, and it is a learner's most typical difficulty with learning methods. In addition, 50% of the negative emotions and feelings that learners expressed in this course involved an overabundance of information. These findings suggest that finding and filtering information is a common problem that learners encounter in connective learning environments. This conclusion has also been confirmed by other studies (Kop, 2011; Mackness, Mak, & Williams, 2010). Indeed, in a cMOOC, information is dispersed in different platforms and spaces. This increased the degree of information finding and filtering that was required of learners, and as there were 1000 participants in the course at the same time, learners' sharing and interaction not only made information more abundant, but also made the learning environment more complex. Particularly in the beginning of the course, learners did not adjust to receiving and processing high volumes of information. If learners continued to try and read or understand all content, based on their previous learning experience, they would not likely be successful in the course. In view of this, it is suggested that providing learning topics, materials, and feedback is not enough to guarantee teaching quality and completion rates of cMOOCs. Course instructors also need to design effective scaffoldings to support learners with wayfinding and sense-making, particularly in the beginning of the course.

Who is Responsible for Supporting Connectivist Learning?

Learning support is the key to quality distance education. However, so far, learner support has been regarded as a weakness of MOOCs, whose openness and large-scale present a tremendous challenge to providing learner support. The huge number of learners in MOOCs causes problems for the interaction between instructors and learners. It is suggested in literatures that instructors of MOOCs always has difficulty in interacting with, and providing supports to,

each learner due to a large number of learners (Chen, 2014; Clow, 2013). cMOOCs seems to provide an effective way for solving this problem by allowing learning companions to share the learning support work. The aim of this particular model of MOOCs was to explore new ways of teaching and learning relevant to and afforded by a social and network enhanced digital age (Zhijun, Li, & Anderson, 2013). This study has shown that the learning companion is very effective in providing learner support. In this course, 83.7% (41/49) of difficulties directly expressed by learners got responses from learning companions, and nearly 50% of these replies (20/41) helped to solve learners' difficulties. In further investigating the support from study companions by analyzing the content of relevant replies, we found that the support from study companions was involved in the elimination of negative emotions, providing learning methods, solving basic technical problems, removing learning condition obstacles and assisting with platform difficulties. Study companions in this course played a major supporting role in providing learning methods and eliminating negative emotions. With regards to connectivism, supports from learning companions are very important for constructing connection, finding and filtering information, and forming a cognitive map (Siemens, 2011). However, it is unrealistic to completely rely on companions to solve all the problems in the course, which has been confirmed in this case study. In this course, three-quarters of the learning difficulties received no reply. It is clear that at the beginning of the course learners have not adapted to the role of a supporter, and they are struggling to adapt to the new course and cope with overwhelming information.

Then what role do topic experts, facilitators, and technical support staff play in cMOOCs? In this course, replies to difficulties from these people made up only 16.3% of all replies. Of these replies, 87.5% helped learners to solve their problems. They tended to reply to basic technical issues and platform issues, and generally did not respond to difficulties with learning methods, negative emotions and feelings, and learning conditions, which were learners' main difficulties. As we argued above, in the beginning of the course, when learners are still not used to the new learning environment and their learning network has not yet formed, it is not realistic to give study companions the majority of the responsibility of giving support. Therefore, at the beginning of the course, subject experts, facilitators, and technical support staff should shoulder the responsibility of providing support. Apart from supporting learning course content and using course platforms and tools, they should also provide supports on learning methods and emotions. These supports may be more important in the early stage of the course because they not only support learners in adapting to new learning modes and environments more quickly, but can also support learners in building a social learning network that will provide the basis for their further learning in the course.

Reflection on the Research Method

Collecting data about learners' experiences and learning process in MOOCs has always been a challenge in the study of MOOCs. Many case studies about MOOCs are limited due to the difficulty of acquiring data. In most MOOC case studies, online surveys are used to collect data from participants (Mackness, Mak, & Williams, 2010; Kop, Fournier & Mark, 2011). When analyzing student learning processes, researchers generally collect and analyze data provided by learning management system and always leave out the potentially useful data posted on Twitter, blogs, and other social media spaces of course learners (Liyanagunawardena, Adam, &Williams, 2012). Actually, communications between learners in these social media spaces may provide

useful supports to learning since learners usually prefer their commonly used communication methods to contact and discuss with peers, share opinions, and ask for help if they are not required to use communication tools in the learning management system.

In this study, we analyzed the text of messages from the course learning platform, blogs, Facebook posts, and Twitter posts by learners and teachers, in order to find out about the learners' difficulties and requirements and how these difficulties and requirements were responded to at the beginning of a course. Although this method may leave out some useful data about learning difficulties, such as the difficulties of learners who did not express themselves in the course platforms, potential difficulties that had not yet been expressed, and difficulties that were expressed in other platforms by learners, it allowed us to collect more data about the learning difficulties expressed in the course platforms by learners, including the post time, response time, and the detailed information in the replies to these difficulty posts. All of these things help us to better understand learners' experiences during the beginning of the course. It is critical for distance education course teachers and facilitators to be concerned with and analyze learning difficulties and requirements expressed by learners, since these difficulties have an impact on learners' learning process and feelings about the course.

However, like in previous studies, we had to make a compromise due to the large volumes of data generated by the massive number of students engaged in the case study MOOC. For instance, taking into consideration that messages generated in the preliminary stage of the course would contain more types of learning difficulties and represent the demands of a larger numbers of learners, we collected all of the related messages that were generated during the first six weeks of the course for analysis. This study also had some limitations in data collection and data analysis. For example, it failed to inquire about learners' expectations for support when they posted their difficulties, failed to trace their attitudes and feelings to the responses they received, and failed to survey the silent learners' needs and difficulties, in order to supplement or verify the research outcomes. It was found in this study that most student expressions of difficulties leveled off after the fourth week of the course. Does this status last throughout the rest of the course? Will there be another difficulty expression peak after the fourth week? What supports did these learners demand for by posting these difficulty posts? Did the responses to their difficulty posts change their learning behaviours? More qualitative and quantitative research is needed to answer these questions.

Conclusion

Providing effective learner support based on learning experience and demand, is an important foundation in dealing with high dropout rates and offering quality open learning opportunities in cMOOCs. Distance education practice tells us that learners' difficulties and experiences at the beginning of a course has an important impact on their later learning behaviors, and even influences their completion of the course. However, few previous studies have carried out a systematic, deep analysis of learners' learning difficulties in MOOCs using both qualitative and quantitative methods, in spite of high dropout rates in MOOCs. Relevant studies in literature are likely unable to reveal learners' difficulties and experiences in MOOCs, especially at the beginning of the course. Therefore, this study looked a well-known cMOOC as a case study, in order to uncover and analyze learner difficulties and demand for support, as expressed through posts and interactive texts on the course LMS and main interactive network

spaces. It was found in this case study that learners' difficulties in first few weeks could be divided into eight categories, such as learning method, negative emotion and feeling, learning condition, technical problem, and so on. Among these categories, learning method, negative emotion and feeling, basic technical problem, and learning condition were the main difficulties, but the learners' main difficulties changed as the course progressed. This study also defined learners' typical problems and analyzed the replies meant to address these difficulties. This study has shown that most participants that join in cMOOCs are not equipped with the relevant basic abilities and skills required for connectivist learning. This is especially true at the beginning of a cMOOC. Furthermore, topic experts and facilitators were found to provide few responses and little support in providing solutions for difficulties in learning method and relevant negative emotions. Additionally, although study companions were the main source of support for learners expressing difficulties in the case study course, the data showed that the expected support network that learners form in cMOOCs had not yet been formed at the beginning of the course. To sum up, we argue that the lack of response and support for learning difficulties at the beginning of cMOOCs will influence course quality, which is one explanation as to why some learners quit the course as it progresses. In the future, it is necessary to examine more cMOOCs to verify and improve the related conclusions of this study by adding questionnaires and interviews in order to investigate some of the in-depth reasons for learning difficulties, their influence on learners, and to explore effective support strategies.

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