

Understanding social learning behaviours of xMOOC completers

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INTRODUCTION

This paper is about the experiences with the first two MOOCs developed and executed at the Delft University of Technology (TUD) on the edX platform. The courses Solar Energy (ET3034TU) and Introduction to Water Treatment (CTB3365) have a long tradition at the TUD as regular campus courses with a good reputation worldwide. The focus of Solar Energy was on the discovery of solar energy power and the design of a complete photovoltaic system. This was done by introducing the students to the technology for the conversion of solar energy into electricity, heat and solar fuels with a main focus on electricity generation. The focus of the Water Treatment course was to learn about urban water services, including basic drinking water and wastewater treatment technologies. These two treatment chains were described as well as the physical, chemical and biological processes involved. The emphasis was on water quality and the functionality of each unit process within the treatment chain. In relation to their “MOOC”-characteristics, similarly to many other xMOOCs, these two DelftX courses had low completion rates, “knowledge-acquisition” approach to learning design, and relatively low forum activity.

PROBLEM STATEMENT AND FOCUS

Our initial MOOC evaluation sought to deliver basic quantitative information about the number of participants, dropouts and completers and the progression of these numbers and achievements during the course. Additionally, since the brick-and-mortar concepts of participation and drop-outs are challenged by the very nature of MOOCs [1], we were interested in combining conventional demographic data with qualitative observations to better understand the behaviour of the students. Of particular interest for us became the role of collaborative behaviour, as could be seen through course forums or social media like Facebook.

MOOCs unite diverse learners of various cultures, various motivations, various education levels, and age levels e.g. [2], [3]. It maybe that some MOOC learners have greater needs collaborating and receiving peer-support while learning, while others may experience no such needs. Thus, in the initial stages of our research we opted not to cover all that constitutes collaboration, but to first focus predominantly on learner demographics that would clarify some of the peculiarities of social learning

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and collaboration in MOOCs: the multiculturalism of the learning environment and the diversity of its student population in relation to participation and completion.

This paper is about our research on identifying learner needs and situational factors relevant for collaboration. We took such step prior to investigating collaborative interactions of who talks to whom and why. In our research, we focused on the group of students who finished the course with passing grades, with the specific interest on their social learning behaviours. All the students in the sample already were motivated enough to make it until the end of the course, and still, there are significant differences in their posting behaviour. Our endeavour was to understand why this is so.

1 RELATED LITERATURE

1.1 Culture in MOOCs

When analysing differences and preferences of learners towards information sharing, engaging with other learners, forum participation and collaboration, we decided to consider a demographic that has been addressed but scarcely covered in MOOC research, i.e. the cultures from which the students come from.

Cultural values shape learning behaviours and experience, and research on cultural differences and their effects on learners and learning environments shows that pedagogical methods and structure may not be equally effective [4], [5]. Culture has shown to have influence on how students learn in MOOCs. MOOC learning patterns analysed in relation to whether students come from OECD countries, as opposed to non-OECD countries, focusing on teacher-to-student ratio, show that those from countries with lower student-teacher ratios are more comprehensive and non-linear when navigating through the course [6].

The discussion of culturally-appropriate online pedagogies includes understanding which learners behaviours are culturally determined [7]. The cultural differences in relation to learning can be found in three dimensions, which represent learner perspectives on social relationships, epistemological beliefs and temporal perspectives (*ibid.*). In a recent study of a multicultural online course (not a MOOC), Stepanyan et al investigated how cultural differences and participant roles (as students and facilitators) affect the communication patterns, and show that participants sharing the same culture tend to interact among themselves [8]. Published research and practice cases on xMOOC, have accounts of students' geographical location. Such information is certainly relevant for marketing purposes, but does not necessarily reflect needs of forum facilitators in understanding who are their active students.

1.2 Social Learning and Completion

Social interaction in MOOCs is shown having positive influence on the learning experience [9]–[11]. Some even suggest assigning students who are in reasonable proximity to in-person groups for peer-to-peer learner support and collaboration [12], which resonates with the creation of so-called Coursera Hubs. Despite this, xMOOC forums are notorious for low participation [13], and the scale and design of xMOOC often results into "massive crowds of strangers", while super-posting behaviour is commonly observed among selected few [14]. Learner specific descriptors, e.g. the time when the learner joined the course [15], or learning goals, are important in understanding his/her preference to engaging in social learning and potentially closer collaboration. Yang et al suggest that those learners who join forums earlier are likely to persist in the course, as opposed to their counterparts who joined later, and the factors related to student behaviour and social positioning, e.g. authority, are predictive of (non) dropout [15].

Thus, personal dispositions may reflect learners' needs and influence their choices to participate in a forum and engage with other students. Understanding these various preferences through learners' behaviours is critical to enhance the experience that is limited by the platform affordances. Such rationale framed our exploration towards seeing whether a cultural belonging of a student had an influence on his or her forum participation needs.

1.3 Forums in MOOCs

Descriptive statistics of MOOC forums suggest that forum participation roughly ranges from 3%-20% [13], and that generally those who complete MOOCs try posting on the forums. The general problem

with MOOC forums is shown to be a silent majority and the presence of superposters, who may be intimidating with their active behaviour or expertise. Huang et al. [14] correlates prolific contribution behaviour of the selected few with the general activity and health of the forum, and shows that, at least in the analysed courses, superposting behaviour, is positively correlated with more forum vitality, and does not cause the silence of the rest. Huang et al also address demographics of superposters - native English speakers are more vocal participants on Coursera forum and that superposters are older than the average forum user – but still referring to superposting as an inherent personality trait, as active posters show consistent behaviour (and performance) across courses. Top 5% of posters obtain generally better grades, they respond speedier and receive more upvotes. In relation to expertise, Papadopoulos et al (2014) find that community teaching assistants (CTAs) - who may sometimes show superposting behaviour - do not only provide forum coverage, as far as quantity and time zones are concerned, but also act as brokers between staff and student posts [16].

When it comes to active posting, our research question was: How can we culturally characterize vocal forum participants who produce 50% of the content on the forum, and how does that compare to the collaborative needs of the entire group of completers?

1.4 Social Media and Spontaneous Groups in MOOCs

Blogs, Twitter, Facebook and similar play an important role in the distributed discussions of cMOOCs, whose organizers quickly found them to be effective tools for supporting scale when it comes to course discussions [17]. However, very few xMOOC researchers addressed the role of social media in the so-called spontaneous study groups. Alario-Hoyos, C. et al. (2013) surveyed MiriadaX participants in relation to the use of social media, and found that learners generally agree on their importance, and Facebook is often named as the second choice after the course forum [18]. The learners surveyed in the study were mainly from Spain and Latin America (e.g. Colombia, Peru, Mexico). It is also noteworthy that the Facebook groups in the courses analysed were actually facilitated by the MOOC teachers, and the most active user posted 12 messages. Data that we have collected from one of the Facebook groups shows more diverse and active community than the one described by Alario-Hoyos et al., with the group leader posting almost 200 messages, and not being related to any of the course organizers or official CTAs. However, the initial study by Alario-Hoyos et al is of interest due to the demographics of their learners - as their cultural belonging is quite similar to the observations we have made within the Facebook group data we have collected, and quite different to the xMOOC forum data we have analysed.

Our research question with regards to collected participation in a Facebook group was, what are the differences between students of the same course who are more active in a Facebook study group as compared to the students who are more active edX forum?

2 DATA COLLECTION

The courses on Water Treatment and Solar Energy ran for ten weeks in the fall of 2013 and were monitored and evaluated with the purpose to gather as much information and data as possible. Conducting pre- and post-course surveys offered the opportunity to collect qualitative information on issues like expectation, motivation and collaboration, and correlate the outcome with other data. Additionally to data collected on the edX platform, we were monitoring one spontaneous Facebook study group.

For the purpose of this paper, we created sub-sets of learners who completed the course within a passing grade, which omits students who did not persevere in completing, as well as those who did not get the grade satisfactory enough. This delimitation of students is neither to say that there was no learning that took place among the students we did not include, nor to suggest that this group is more representative or important. It is to be understood as the strategy in distinguishing between performance levels of the students. Moreover, observations about such a group can be transferable to facilitating collaborative activities in other online formal courses, where successful performance is equivalent to completion.

The “tendency to collaborate” or collaborative behaviours in this paper is reduced to the simple counts of the posts on the forum, which again is not to say that the number of forum posts defines meaningful collaboration. It also does not to diminish the role of students who just read posts. The strict

boundaries we imposed serve as a starting point to further analysis, which is out of the scope of this paper. A summary of relevant collected data can be found in the *Table 1* below.

Table 1. Summary of relevant data

	SolarX	WaterX	Facebook Group (WaterX)
Passed	5%, (n=2912)	1,9%, (n=545)	28% (n=21)
Average Grade	83%	71,94%	76%
Most frequent grade	99%	61%	NA: People with grade over 80% made up 12% of the group
Available Data on the Completers Group	74% (n=2165)	76% (n=415)	82% (n=60)
Total # of posts produced by all completers	14219	4819	686
Max # of posts per person	681	239	176
% of completers who made "0" posts	47%	22%	4%
% of completers who made "50" posts or more	1,03%	2,38%	2%

3 DATA ANALYSIS

3.1 Forum Participation and Performance

Regression analysis between the two variables suggests that there is a positive relationship between forum activity and performance, but the nature of this relationship is not clear-cut. A lot of people do not participate in the forums, but receive passing grades and perform well on the course overall. Our preliminary exploration of the relationship between forum participation and performance within completing groups of xMOOC learners shows that forum participation and performance in the course are related in different ways, depending on which subset of completing learners we are investigating. There seems to be an important threshold area in between the two groups of participating and non-participating students, within which average increase in grade is high, when the amount of posts is low, and the other way around.

3.2 Culture and Forum Participation

To understand whether culture plays any role in forum participation, we have created a variable for culture clusters accounting for nationality, place of residence and formal education of a MOOC learner. We have analysed whether belonging to a culture is linked to students' preference to work alone on a course, or together with another student. Finally, we have addressed whether the actual student behaviour (posts on the forum) shows the same disposition as in students cultural preference. Analysis shows that there are cultural tendencies to work alone or together on a course, but there is no such distinction when it comes to posting behaviour. However, it is also shown that MOOC forums and spontaneous study groups differ in relation to the cultural dominance of who speaks most. Cultural groups show different presence in the voices of discussions, depending on the affordances of the platform through which they are communicating, as well as the strategy chosen by a facilitator.

Creating a Culture Cluster

Countries of origin were grouped into cultural clusters to describe the learners in broad cultural terms. Cultural clustering provides an analytical framework that relates to understanding learners expectations towards the role of the teacher (i.e. their relationship with power), their expectations towards peer-to-peer interaction, and other factors related to course satisfaction, experience of the learning process and community development.

This was done in accordance with GLOBE Extension Study [19], in which clustering is statistically derived and accounts for such factors as (1) racial/ethnic distribution; (2) religious distribution; (3) geographic proximity of the countries; (4) major language distribution; and (5) colonial heritage. Such clusters are distinguished: Africa, Latin Europe, Latin America, East Europe (includes some South European countries), Germanic, Nordic (includes the Baltic countries), South East Asia, Confucian Asia, Middle East, Anglo (i.e. mostly English-speaking countries).

After converting the information about learners places of residency, top 5 cultural groups that completed both courses were as followed: South East Asia, Latin Europe, Latin America, East Europe and Anglo, as can be seen in *Fig. 1*.

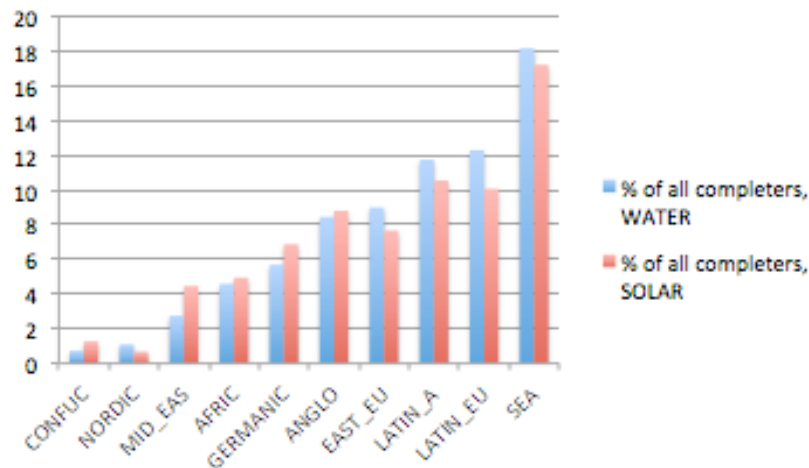


Fig. 1. Distribution of culture of completing students

When it comes to cultural representation of the Facebook study group for Water Treatment, the largest groups are similarly (in the order of size): South East Asia, Latin America, Latin Europe and Eastern Europe. African and Middle Eastern group follow, and Anglo, Germanic, Nordic and Confucian group are not represented on Facebook study group at all.

We also used a Mixed Culture Cluster to account for the students who may have been significantly influenced by cultures other than his/her own. In pre-course questionnaire, the students were asked about their nationality, country of residence, and where they received their education. If all the three countries belonged to the same cluster, then the learner was assigned that cultural cluster. If the answers to these three questions belonged to different culture clusters, then the learner was assigned Mixed culture cluster, with the assumption, that it is not up to us to decide which one is more prominent. The majority of students within Mixed Culture Cluster were born various places and either lived or studied in Anglo or Germanic culture. The third prevalent group in the Mixed cluster was Latin Americans who either lived or studied in Latin European countries.

Culture and Collaborative Preference

To understand whether there is a tendency for a culturally determined preference for engaging with others while learning in the MOOC, we analysed how belonging to a culture may be linked to students' preference to work alone on a course, or together with another student.

The answers of the pre-course questionnaire as to whether individual learners preferred to work on this course alone, or together with another student, were combined with culture clusters. As reflected in the *Table 2*, although the entire students body preferences are split 50:50, there seems to be a tendency among cultures to prefer working alone or together, which implies that culture does play a role in how learners engage with one another.

There are striking differences when it comes to certain cultural groups, such as African, Middle Eastern or South East Asian who show stronger preference towards working with another student. Similarly, cultures like Anglo, Germanic and Eastern European show a tendency to the preference of working alone. Mixed group shows the ratio that reflects the general tendency, i.e. 50:50. Unfortunately, the Nordic group in both courses is too small to draw any conclusions (<20 people), and Latin American group shows difference in between two courses.

Table 2. Preferences for working alone or together

Accumulated Culture Cluster	Preference to work alone, %		Preference to work together, %	
	WaterX	SolarX	WaterX	SolarX
AFRIC	38%	25%	57%	75%
ANGLO	54%	62%	41%	38%
CONFUC	50%	58%	50%	42%
EAST_EU	59%	64%	41%	36%
GERMANIC	76%	68%	24%	32%
LATIN_A	22%	43%	70%	57%
LATIN_EU	53%	55%	47%	45%
MID_EAS	40%	39%	60%	60%
NORDIC	0%	86%	100%	14%
SEA	40%	42%	58%	58%
Mixed	53%	55%	47%	45%
Total	47%	51%	50%	49%

Cultural Dominance across MOOC Discussions

To see whether the same strong cultural preference for engaging with other learners is reflected in the actions of the participants on the edX forums and Facebook study group, we analysed the cultural backgrounds of the completing learners who have produced 50% of all the posts within each course respectively and are to be found on an active side of the “inactive-active forum participant” continuum.

Although learners’ culture may indicate different preferences when it comes to engaging with another person in a learning experience, our analysis shows that it does not mean that the forums are dominated by the cultures that prefer working together.

Table 3. Cultural dominance of the forums

Accumulated Cluster	WaterX Forum Active Completers, %	SolarX, Forum Active Completers, %	WaterX Forum Active Completers, N	SolarX, Forum Active Completers, N	Facebook Group Forum Active Completers, N
AFRIC	5,4%	2,1%	2	1	1
ANGLO	16%	14,8%	6	7	0
CONFUC	0%	0%	0	0	0
EAST_EU	8%	6%	3	3	0
GERMANIC	0%	4,2%	0	2	0
LATIN_A	19%	19%	7	9	1
LATIN_EU	13,5%	2,1%	5	1	1
MID_EAS	0%	10,6%	0	5	1
NORDIC	2,8%	2,1%	1	1	0
SEA	13,5%	25,5%	5	12	1
Mixed Culture	22%	4,2%	8	2	0
Proportion of the vocal group in relation to the entire course completers	6% of the entire completers group	1,7% of the entire completers group	37	47	28%; n=6

The cultural dominance of the forums within two MOOCs and the Facebook group are different (*Table 3*):

- In general, SolarX forum is dominated by cultures that prefer working together, but there is also strong presence of cultures that tend to prefer to work solo. In the Solar Energy xMOOC, the dominant groups are closely correspondent with the overall course cultural representation: SEA is largest, with Latin America and Anglo being of a significant size as well. Middle Eastern group in SolarX is overrepresented, and Latin Europe is under-represented.
- In general, the forum in WaterX is dominated by cultures that tend to have preference towards working alone. The dominant groups are not as closely correspondent with overall course cultural representation: Mixed culture being the largest group (out of which roughly speaking half lives in Anglo or Germanic culture, and one quarter studied in Anglo or Germanic culture); after Mixed, Latin American group is the largest group, followed by Anglo and Latin Europe. In that regard the South East Asian group is significantly under-represented. We observe a large difference from SolarX – Middle Eastern group in Water is literally non-vocal, and Latin European students are more vocal.
- In the Facebook Water treatment group, which should be viewed as supplementary to edX Water forum, there is no group member associated with Anglo culture, and the strongest voices of the group are equal, and exclusively belong to cultures with natural preference for working together. Such description of cultural composition is the opposite of what the forum for the same class looks.
- Finally, across two MOOC forums - we can see that the voices of Anglo group and Latin American group are consistent in strengths and presence. This is natural if the size of the Latin American group in the entire cohort of completers is considered, but the Anglo group is over-represented.

4 DISCUSSION

We observed in the analysis that learners belonging to different cultures tend to report preferences for working alone or working together. Such tendencies do not show when it comes to understanding the actual behaviour of learners.

- In the SolarX forum, we see that the forum is dominated by learners who come from cultures with preferences to working together, but with strong presence of cultures that report preference for studying alone. In SolarX, 47% of completing learners made “0” posts.
- In WaterX forum, it is the other way around: forum dominated by learners who come from cultures with preferences for working alone. In WaterX, 22% of completing learners made “0” posts. Additionally, here we see an spontaneous study group emerging on Facebook run by the learners who culturally report preference for working together, and the group composition is opposite of the course forum.

To explain the differences in posting behaviour among cultures we need to address the differences in the forum management between the two courses. In SolarX the teacher would personally review the posts, and the team actively encouraged participation, including selection and appointment of community teaching assistants from the student body. CTAs are among top forum users in this forum. Water Treatment forum had a “laissez-faire” strategy towards forum participation, where the teachers and facilitators monitored the forum but engaged only when strictly necessary and provided most feedback through group videos.

It could be said that high activity of the Middle Eastern group and higher activity of the South East Asian group was seen because of the higher teacher’s presence and the reward for competitive and ambitious behaviour. On the other hand, it could also be speculated that Middle Eastern students in the course simply belonged to natural superposters, as described by Huang et al. [14] Further research is needed to show whether the role of the teacher and higher group status as reward in forum participation is motivational for students from higher power distance culture. Such research is important because South East Asian cultural group is the largest among completers, and despite the fact that it is easy to “hide” in edX forums, these cultural groups report preference for working together with other students. Does this mean that MOOC instructors do not create sufficient opportunities for them to learn with others?

To continue within the same line, we turn to the discussion of observations of Facebook activity. The most vocal students in the group come from the Water treatment class, where forum did not serve

them right, as they chose to go to Facebook to collaboratively learn. Additional analysis on the activity within this study group is out of the scope of this paper, but we can say the activity was collaborative in nature, and community-oriented. The group leaders belonged to cultures that report preference for working together, and show natural superposting behaviours, which they did not show on edX forum. In other words, the students who branched off the edX forum had the potential to be edX forum community leaders, which was not realized by the course organizers. The question is whether these learners did not work collaboratively on edX forum because they felt it was dominated by cultural groups they did not identify with, or, which is more likely, that the edX platform, as opposite to Facebook, did not have appropriate affordances for these students to collaborate and work together, and the course facilitators did not use the forum strategy suitable for engaging these students in discussions.

That leads to the last question that arises from our analysis: If the edX platform does not provide appropriate affordance for learning with others, why is there high presence of Anglo and Germanic cultures on the forums? Both these cultures report preference for learning alone, but tend to use the forums in xMOOCs actively. The answer to this question may be that edX forums are a space for expert consultations, like those short Q&A sessions that instructors tend to have at the end of a large-scale lecture. Build similarly to expert forums, edX forums may be suitable for collective knowledge creation through information sharing, but lacking opportunities for collaborative problem solving.

Another possible explanation could be drawn from the research on organizational learning and knowledge sharing in multicultural organizations [20], which pinpoints to various cultural preferences towards social media. In cultures like Anglo, individuals tend to perceive information independent of its context (low-context cultures), and are more likely to accept such information. Members of high-context cultures look for contextual cues [21]. Such distinction may explain why cultures with preference to work alone find it easy to operate within a forum, which is not rich in features, and allows for short, up-to-the point information exchanges.

5 CONCLUSIONS

Our exploratory work suggests that MOOC researchers should consider learners demographics not as analysis material, but as intermediary characteristics that help MOOC designers and teachers on the way to understand learners needs. It is learners' needs, and not the demographics, that should be evaluated against the opportunities created by MOOC teachers, and MOOC delivery media. Our research suggest that social interaction with other learners is beneficial for student performance, but that forum strategies and platform affordances create unequal opportunities for participation, as MOOC learners are diverse and their needs differ, in the same way as their backgrounds. We see it necessary to test the hypothesis about the differences in participation and engagement with others of cultures known to be on different sides of the spectrum when it comes to in-group and out-group, collectivism, and relation to power and hierarchy. Our research also suggests that it is necessary to understand how cultural differences show in micro-contexts, i.e. specific interactions. Finally, further research needs to be done to connect learners' needs with their learning patterns and behaviours on the technical media, but also accounting for the teaching context.

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