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Do MOOC students come back for more? Recurring Students in the GdP MOOC

François Bouchet[1,2], Rémi Bachelet[3]

[1] Sorbonne Universités, UPMC Univ Paris 06, UMR 7606, LIP6, F-75005, Paris, France
[2] CNRS, UMR 7606, LIP6, F-75005, Paris, France
[3] École Centrale de Lille, BP 48, F-59651 Villeneuve d'Ascq Cedex, France
francois.bouchet@lip6.fr, remi.bachelet@ec-lille.fr

Abstract: Today, most students enrolling in a MOOC already have attended to another MOOC before. We study here a subcategory of these students, who register to the same MOOC several times, which we call Recurring Students (RS). Using data collected during three 5-week sessions of the GdP MOOC (N > 14,000 on average per session), we show there is a significant and increasing proportion (over 10%) of RS. While their re-enrollment seems influenced by changes in course content, they succeed in the same proportions or less than new students (NS). A more granular analysis, separating RS who had previously completed a track (Recurring Successful Students - RSS) from those who hadn't (Recurring Unsuccessful Students - RUS), reveals that RUS complete the new session in the same proportion as NS, whereas RSS fail more. As a conclusion, we propose recommendations to address these students, which could be valuable for other multiple-session MOOCs.

Keywords: Massive open online courses, MOOC, recurring student, returning student.

Introduction

As MOOCs are becoming a part of the educational landscape, more and more students who register are already familiar with them, a situation affecting the way they behave and interact with the platform. Whereas some MOOCs are very similar from one session to another, some others are significantly improving over time with addition of new features and content. They may also offer more content than can be assimilated during the time provided for a single session, or provide a satisfying social experience. This phenomenon raises a question: are those changes significant enough to attract the same students over once more? Do they prefer to move on once they have completed the MOOC or do they sometimes come back for a more advanced track?

In this paper, we investigate the question of the existence of this specific kind of MOOC attendants, who would not only be familiar with MOOCs in general, but with the very MOOC they are attending to in particular. We will refer to those hypothetical students as "recurring students", not to confuse them with "returning students", a term often used to qualify students who get back to studying at a later age after having worked as professionals for some years (Fomin, 2013; Leppel, 1984). To assess the importance of the phenomenon, we use data collected during 3 sessions of a same MOOC on the same platform across 2 years to answer to our first research question: do recurring students actually exist, and if so, how frequent are they? Then, we analyze how those recurring students might differ from the ones who attend to the MOOC for the first time, in order to characterize their differences by drawing conclusions on how their MOOC experience should be adapted to cater best to their specific needs. Thus, we investigate:

1. How to identify recurring students: is asking students whether they are recurring students a reliable way to identify them as such or should we rely on other indicators such as email addresses or unique IDs?
2. Their behavior relatively to the (optional) initial questionnaire MOOC participants typically are presented with before the session starts: do recurring students answer in the same proportion as new students despite the fact they might have already answered to such a questionnaire during their first session and do they spend as long to fill it in when they choose to do so?
3. The differences between new students and recurring ones in terms of performance on the MOOC: are recurring students the ones who had failed to complete the MOOC at first and who want a second chance at obtaining the certificate it delivers? Are they, on the contrary, the students who had performed well and who want to go further by trying to obtain a more advanced certificate or by simply checking what new content has been added between the two sessions? And in either case, how does the fact of being a recurring student impact their performance in the second session of the MOOC they are attending: is it improving or degrading?

The novelty of this study is making it very exploratory and no theoretically based a priori hypotheses could be formulated on the nature of the results expected. Recurring students, and more generally the problematic of comparing the evolution of students across different MOOCs is, as far as the authors are aware, a new

problematic that hasn't yet been studied by the MOOC community, according to the proceedings on the most popular conferences on this topic (EMOOCs, Learning At Scale…) and extensive reviews of the domain (Liyanagunawardena, Adams, & Williams, 2013). This is not particularly surprising considering there are not many MOOCs that have collected data across numerous sessions, and even less that have done enough changes (between two sessions) to have reasons to expect former students returning to attend a new session. The closest related works could be the ones studying the question of student retention (Adamopoulos, 2013; Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014), which aim at keeping students involved in a given MOOC, even if in our case, we are considering it across different sessions of a same MOOC.

Context

Data used in this paper comes from three different sessions of the GdP MOOC (GdP meaning "Gestion de Projet", the acronym for "project management" in French). Its first session (GdP1) took place in Spring 2013. It was the first xMOOC to be organized in France, relying on a previous Open Course Ware (OCW) website (Bachelet, 2012a) and experience of running a distance learning course (8 editions, 400 laureates from 2010 to 2012 (Bachelet, 2012b)). This first session, hosted on the open source MOOC platform Canvas Network, was set up with almost no financial resources using a personal home studio and run by an open team of volunteers, but was nonetheless supported by l'Ecole Centrale de Lille (a French Graduate Engineering school), with a platform run by Instructure, a US company. Enrollment opened 2 months before the start of the MOOC, which began mid-March 2013 and lasted 5 weeks. Two individual tracks were offered: Basic and Advanced, and two corresponding certificates were delivered to participants who met the requirements specified for each track. A "Team project" track was also proposed after the individual tracks, which run 14 projects and was instrumental in recruiting volunteers supporting the next editions of the MOOC (since the team track is of a different nature, we will not describe it in details in this paper). Due to a change in the MOOC platform hosting between this session and the following ones, data from GdP1 (which has been previously analyzed in details in (Cisel & Bachelet, 2014)) was not used in this paper. While the basic track requires 20-25 hours of work, the Advanced track requires to both complete the Basic track and to submit one essay per week while taking part in the peer assessment of 4 other papers (for a total of 40-45 hours of work).

GdP2 (Fall 2013) had a functional analysis course added to the curriculum. From this session on, the Canvas platform was hosted by the French startup UNow, which provided engineering and technical support. Basic and advanced tracks started mid-September 2013. This session was 5 weeks long, with one additional week dedicated to the final exam. A one week add-in SPOC session on Project Evaluation was organized after the end of the MOOC in November for employees of the Francophone University Association (AUF), and the Team project track started mid-October with project proposals, and ended mid-December with final presentation and report. In addition to the previously mentioned free tracks, it became for the first time possible to be awarded European University Credits (ECTS) by Centrale Lille, by taking either a webcam (ProctorU) or an in-presence table exam (AUF campuses in two developing countries). All non-foreign Centrale Lille first year engineering students (approximately 200 of the 1011 students of this track) were enrolled in the advanced track, as required by their curriculum (Bachelet, 2013).

GdP3 (Spring 2014) followed the same principles and had the same core content, but the number of courses was doubled: the MOOC started with a common-core syllabus and then an elective course system offered seven possible specializations. Students could choose one or several specializations, but had to pass at least one in order to obtain the basic certificate (Bachelet, 2014).

GdP4 (Fall 2014) included 1,500 students enrolled through their university, a new mind mapping module available during the Pre-MOOC (the preparation phase before the MOOC officially starts), and a new version of the core course was shot for better video quality. In the advanced track, self-evaluation was implemented in addition to peer evaluation, and the quality of peer grades given by each student was assessed and subject to grade bonuses (Bachelet & Carton, 2014).

Table 1 provides a summary of the key numbers associated to each session of the MOOC, and the success rates were calculated as follows:

- Entry rate: ratio of the number of students submitting at least one short quiz divided by the total enrollment in the MOOC.
- Basic track success rate: ratio of the number of students submitting at least one short quiz divided by the number of students awarded with basic track "pass" (*i.e.* an average of 70% of maximum points and 60% success in the final exam)
- Advanced track success rate: ratio of the number of students submitting at least one assignment divided by advanced track "pass" (*i.e.* basic track "pass" plus an average of 70% of maximum points).

Table 1. Summary of the main differences between the 4 sessions of the GdP MOOC

	GdP1 (data not used)	GdP2	GdP3	GdP4
Date	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Duration	4 weeks + 1 week for final exam	5 weeks + 1 week for final exam	5 weeks including 1 elective course + 1 week for final exam	6 weeks including 2 elective course + 1 week of exams
Platform	Canvas Network	Canvas by UNow	Canvas by UNow	Canvas by UNow
Content	4 weeks core course	5 weeks core course	4 weeks core course + 1 elective course	4 weeks core course + 2 elective courses
Tracks available	basic, advanced, team	basic, advanced, team	basic, advanced, team	basic, advanced, team
Attendance: • enrolled • entry rate	 3493 66%	 10848 53%	 11827 50%	 19171 42%
Track success: • basic • advanced	 57% 78%	 61% 78%	 38% 67%	 41% 73%

Detecting recurring students

Methodology

The first issue that had to be solved was to find a reliable method to identify recurring students. We considered two complementary approaches: questionnaires and session IDs.

In the three sessions of the GdP MOOC considered here, before the beginning of the actual MOOC, the students had been asked to fill a questionnaire to know them better. This optional questionnaire includes items regarding demographic information (age, gender, country, professional status, highest diploma obtained, etc.) as well as regarding their previous experience with MOOCs in general, and in sessions 3 and 4, also about their potential previous experience with the GdP MOOC itself. To provide an incentive to answer to this questionnaire, students who decided to reply were granted 2 to 6 additional points (depending on the number of questions they replied to), which represents less than 2% of the minimal number of points required to complete the basic track of the MOOC.

Moreover, on the UNow platform, a student normally has to register only once to be given a unique ID. This ID remains identical for any MOOC they attend to on the platform, including if they attend to a new session of the same MOOC.

In order to compare the two approaches, based on answers to the optional initial questionnaire and student IDs, we considered data coming from the GdP3 (data from the GdP2 could not be used here because not only the question regarding a previous participation to the GdP hadn't been asked, but also because the student IDs differed when the GdP was transferred to the UNow platform). In the GdP3, as students could reply only to some questions and not others, the participation to the initial questionnaire has to be considered on a per item basis.

Results

Using student IDs only on data from GdP2 and GdP3, we found that out of the 12158 in the GdP3, 1020 (8.39%) had participated to the GdP2 and therefore fitted our definition for recurring students. Using the initial questionnaire data, we found that 4927 students (40.5%) replied to the question regarding their experience on MOOCs, with 1924 (39.1%) declaring they had already participated to a MOOC before. Among those, 662 (34.4%) declared they had participated to the GdP MOOC before (either the first or second session), 311 (47.0%) of those declaring more specifically to have participated to the GdP2 (*i.e.* 93.7% of the students who answered the questionnaire declared they did not take part in the GdP2).

When comparing the declaration of those students with what could be determined with the student IDs, 46 (14.8%) of the students who declared to have participated in the GdP2 before had an ID indicating the contrary. Conversely, we found that 36 (0.7%) of the 4927 students who had declared not to have participated in the GdP2 (either by saying they didn't participate in any MOOC before, or by explicitly declaring that they had not participated in the GdP2) had actually had some activity on that session of the MOOC.

Discussion

The first clear result is that either way we try to identify them, Recurring Students (RS) exist and represent a significant proportion of the students registered to a MOOC, even if they are by far outnumbered by New Students (NS). The proportions of discrepancies, although fairly low overall, could seem intriguing at first, but several elements can explain it. First, we found that almost half (47.2%) of the students who had declared not to have participated in the GdP2 declared to have participated to the GdP1: it could indicate they simply misidentify the session of the GdP they attended to. Second, using the participants' names, we have found that several of the participants who had declared to have participated in the GdP2 but whose IDs weren't found were indeed in the database. It indicates that they registered with a new account (either by choice or because they had forgotten their previous ID/password). For the remaining ones, it is unclear whether they registered with a different name or email address, whether they were on the GdP1 instead or whether they simply lied for an undetermined reason. Overall, despite those small issues, using student IDs appears to be a reliable way of identifying RS. In particular, it appears in some cases more reliable than relying on a questionnaire, because students make mistakes and only half of them replied to this particular question. The results obtained when applying that same methodology to data from the 3 sessions is summarized in Table 2.

Table 2 reveals that the proportion of RS increased in GdP4 compared to GdP3. Interestingly, the number can be broken down into 2332 GdP4 students who were registered to the GdP3, 585 students who were registered to the GdP2, with an overlap of 321 students who attended to the 3 sessions considered here, suggesting the potential existence of some "serial recurring students", although more sessions should be considered in order to confirm this hypothesis.

Categorizing recurring students based on their previous success

We make the hypothesis that RS are not a homogeneous group but that they could be distinguished according to at least one dimension: their success in the first session of the MOOC they have attended to. Indeed, we can assume that the motivation of a recurring student who had previously completed the MOOC (*i.e.* a R*ecurring Successful Student* – RSS) might be to focus on newly added content of the MOOC or elements they hadn't covered the first time (*e.g.* completing the advanced track after having completed the basic one). On the contrary, a recurring student who hadn't previously completed the MOOC (*i.e.* a *Recurring Unsuccessful Student* – RUS) might be more interested in simply re-reading content they had not understood well, or retrying to pass quizzes what they failed at first.

To distinguish RSS from RUS, we need an operational definition of "success". Here we considered a student had successfully completed the MOOC if they had obtained at least the basic certificate (regardless of whether it was the free or monitored version). Using this definition, we determined that 38.0% of the RS in the GdP3 were RSS, a proportion that dropped to 23.9% in the GdP4. Table 2 provides the numbers of RS and RUS in GdP3 and GdP4. For the GdP4, a recurring student who had completed the GdP2 (resp. GdP3) but failed the GdP3 (resp. GdP2) appears counted both as a RSS and as a RUS (132 students are in this case). To avoid this issue, in the remainder of this paper we consider RS in GdP4 as being only the students who had attended to the GdP3.

Table 2. Recurring students in the sessions 2 to 4 of the GdP MOOC using students IDs

Session	Total number of students	New Students (NS)	Recurring Students (RS)	Recurring Successful Students (RSS)	Recurring Unsuccessful Students (RUS)
GdP2	10841	N/A	N/A	N/A	N/A
GdP3	12158	11138 (91.6%)	1020 (8.4%)	388 (38.0% of RS)	632 (62% of RS)
GdP4	19103	16507 (86.4%)	2596* (13.6%) [585 from GdP2 2332 from GdP3 321 overlap]	653* (23.9% of RS) [230 from GdP2, 436 from GdP3, 13 overlap]	2075* (76.1% of RS) [355 from GdP2, 1896 from GdP3, 176 overlap]

Recurring students' behavior relatively to the initial questionnaire

Although proving the existence of RS is interesting per se, *e.g.* as an indicator of the MOOC quality, it is interesting to understand how the behavior of RS is specific. In this section, we analyze the differences between RS and NS in terms of answers provided to the initial questionnaire.

Methodology

We analyzed the differences in the replies to the optional initial research questionnaire for GdP3 and GdP4 according to 3 parameters:

- the propensity to answer to the questionnaire, which is a boolean value indicating whether or not the student replied to the questionnaire,
- the number of questions answered in the questionnaire (GdP3 only, as in GdP4 one was forced to answer all items for the questionnaire to be counted as completed),
- the time in seconds spent answering the questionnaire.

For the propensity to answer to the questionnaire, for the GdP3 data, we dichotomized the data by considering that a student had replied to the questionnaire if they had at least answered one question (as opposed to those who didn't take part at all). In both cases, we performed a Pearson's Chi-square test to evaluate whether answering the questionnaire was dependent on being a RS or a NS, and whether it was dependent on being a RSS or a RUS.

For the number of questions answered in the questionnaire, we considered performing a t-test but the nature of the distribution prevented us from doing so, therefore only descriptive statistics could be provided (*cf.* Figure 1).

Finally, for the time in seconds, we started by removing outliers with a modified z-score which absolute value was superior to 3.5, as recommended by (Iglewicz & Hoaglin, 1993). Despite a slightly positive skewness in all distributions post-outliers removal (*cf.* Figure 2), we performed a t-test to compare distributions (NS vs. RS, and NS vs. RSS vs. RUS)

Results

Propensity to taking part in the questionnaire

Table 3 summarizes the results obtained for each comparison for both GdP considered. We can highlight that although there was a very strong dependency between the fact of being a RS and answering less to the questionnaire in the GdP4 ($p=9.83*10^{-17} < 0.001$), the proportion of students who had answered to at least one question was exactly the same for NS and RS in the GdP3 ($p=0.999$), and the difference was barely stronger when considering students who had replied to the whole questionnaire ($p=0.633 > 0.05$). It is particularly interesting since the proportion of answers among the NS in both GdP is fairly similar.

A second result is the fact that in both sessions, RUS have been answering statistically significantly more to the initial questionnaire than RSS ($p = 0.005 < 0.01$ for the GdP3, $p = 0.0004 < 0.001$ for the GdP4).

Table 3. Proportions of answers to the initial questionnaires by new, recurring, recurring successful, and recurring unsuccessful students in GdP3 and GdP4

Answer to the questionnaire	GdP3				GdP4			
	NS	RS	RSS	RUS	NS	RS	RSS	RUS
Answered (%)	44.2	44.2	38.7	47.6	44.7	35.0	27.8	36.7
Not answered (%)	55.8	55.8	61.3	52.4	55.3	65.0	72.2	63.3

Number of questions answered in the questionnaire

Overall, no obvious differences appear between the distributions of the number of questions answered for NS, RS, RSS and RUS (*cf.* Figure 1), except for the aforementioned result according to which RUS answer more to the questionnaire than RSS.

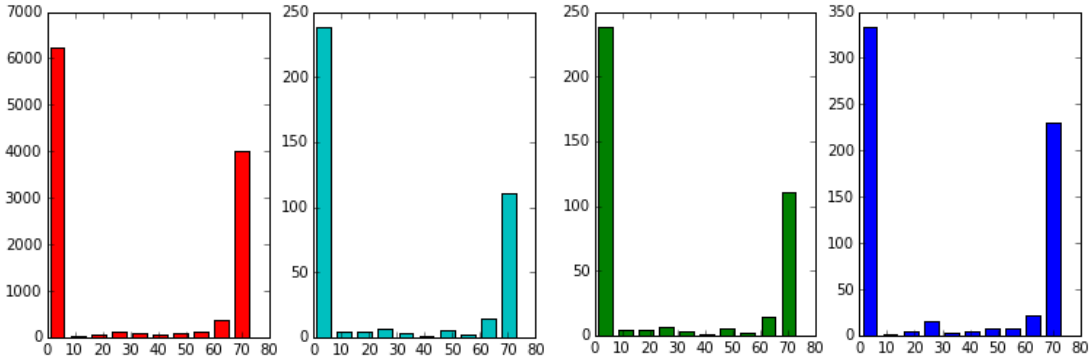


Figure 1. Number of questions answered by (from left to right) new, recurring, recurring successful, and recurring unsuccessful students in the GdP3

Time spent answering the questionnaire

In the NS/RS analysis, we found no significant differences between the 463 RS who spent on average 931 seconds on the initial questionnaire and the 4861 NS who spent on average 938 seconds ($p=0.786$). When splitting RS into RSS and RUS, we found that RSS spent on average 880 seconds on the initial questionnaire whereas RUS spent 857 seconds on it. The difference between RSS and RUS wasn't statistically significant ($p=0.686$) but RUS answered statistically significantly faster than NS ($p=0.044 < 0.05$). The temporal distributions for both comparisons are shown on Figure 2.

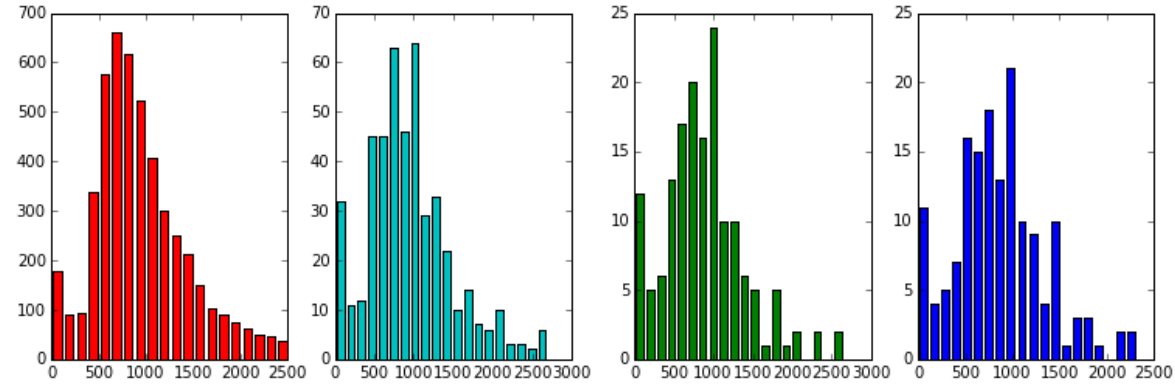


Figure 2. Time in seconds spent to answer the initial questionnaire by (from left to right) new, recurring, recurring successful, and recurring unsuccessful students in the GdP3

Recurring students' performance

Methodology

For this analysis, first we considered the total number of points obtained by students in the GdP3, for both the basic and advanced tracks. When a student had taken both a monitored and unmonitored test, we considered the maximum number of points they obtained. We also excluded students who scored less than 5 points overall, which includes students who haven't answered to any quiz and the ones who only replied to the initial questionnaire (which completion provided students with a couple of bonus points). The nature of the distributions (*cf.* Figure 3) prevented us from performing a t-test to compare them.

We also considered the Boolean value representing the fact of having completed or not the current session, and performed a Pearson's Chi-square test to check the validity of two null hypotheses: (1) being a recurring student and completing the current session are independent of each other, (2) having completed the previous session and completing the current session are independent of each other.

Results

For the basic track, RSS obtained less points (M=156.8, SD=145.9) than RUS (M=181.5, SD=143.0) and RS globally obtained less points (M=174.1, SD=144.1) than NS (M=205.5, SD=145.4). In the advanced track though, RSS obtained more points (M=219.1, SD=223.2) than RUS (M=204.7, SD=182.1), but RS (M=209.1, SD=195.4) still globally obtained less points than NS (M=233.3, SD=190.1). The corresponding distributions are shown on Figure 3.

Regarding the independence of completing the current session on being a recurring student, as shown in Table 4, we found that for both sessions 2-3 and 3-4, being a recurring student was strongly correlated with having lower chances to complete the current session ($p=8.18*10^{-9}$ and $p=4.28*10^{-26}$ respectively). On the contrary, regarding the independence of completing the current session on having completed the previous one, we found a dependency for sessions 2-3 where RUS had statistically more chance to complete the current session than RSS ($p=0.024 < 0.05$), but no dependency for sessions 3-4 where RUS and RSS had similar chances to complete session 4 ($p=0.785$).

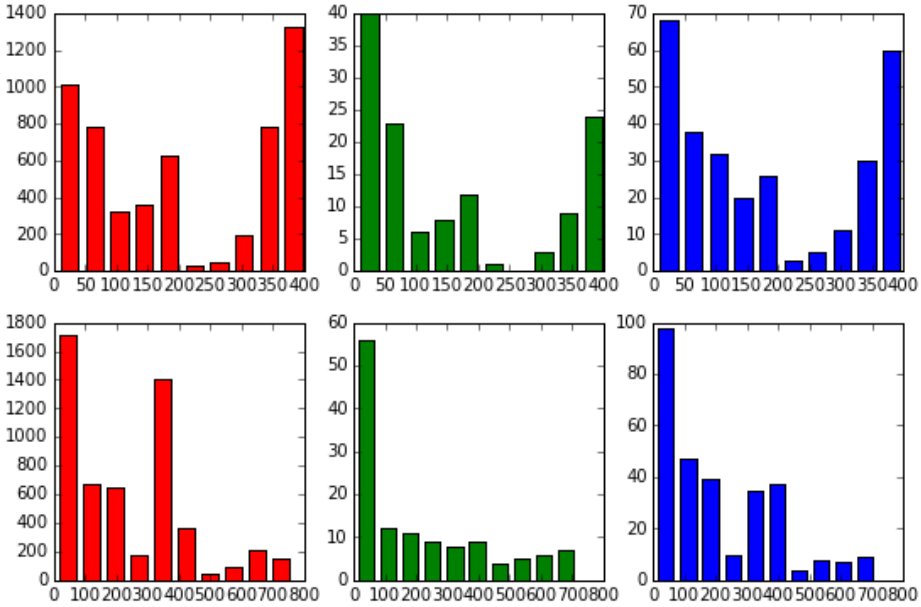


Figure 3. Number of points obtained in the basic (top) and advanced (bottom) tracks by (from left to right) new, recurring successful, and recurring unsuccessful students in the GdP3

Table 4. Proportions of new and recurring students who completed GdP3 and GdP4

Completion of the session	GdP3				GdP4			
	NS	RS	RSS	RUS	NS	RS	RSS	RUS
Completed (%)	18.3	11.1	8.2	12.8	18.3	9.5	9.2	9.6
Did not complete (%)	81.7	88.9	91.8	87.2	81.7	90.5	90.8	90.4

Discussion

Overall, we see that the analysis of recurring students is improved by splitting them into two categories: those who had previously completed the MOOC (by at least obtaining a basic certificate) and those who did not. The fact that recurring unsuccessful students answer more the initial questionnaire than successful ones but that they answer faster could be an indication that they are more interested in obtaining the few bonus points granted to students who fill in this questionnaire. This is therefore a clear hint that they came back in order to obtain a certificate they failed to obtain the first time. However, the fact that they overall complete the MOOC less than the new students shows that despite the fact it is their second attempt and therefore the second time they are getting exposed to the majority of the content, they still struggle to understand the learning material and could therefore benefit from an individualized support, from peers or from the pedagogical team.

Concerning the recurring successful students, the fact they complete less the MOOC (even the advanced track) than the new students, combined to the observation that they answer less to the initial questionnaire, suggest that they come back for the new or advanced content exclusively, but that they are not motivated enough by the perspective of obtaining the advanced certificate to bother completing again the basic content. Indeed, with the way the MOOC is currently organized, it is not possible for a student to complete the advanced track without having completed the basic one first. It could therefore be beneficial for those students to be identified as recurring students and to be granted with bonus points.

Regarding the significant differences in the proportions of answers to the initial questionnaire in GdP3 and GdP4, we believe it can be explained by the way the questionnaire was integrated within the MOOC. Although the content of the questionnaire did not change much between both sessions, its presentation (as a separate questionnaire in LimeSurvey for the GdP2 vs. as an integrated questionnaire to the platform for the GdP3 and GdP4) could explain that recurring students didn't recognize it, and were therefore more willing to fill it in. We therefore believe that lower proportions of answers, as it was the case in GdP4, is more likely to happen again in future sessions. For this aspect as well, detecting recurring students as such would be beneficial, as we could consider to simply ask them to update their previous replies instead of having them filling the whole questionnaire in once more.

Conclusion and future works

In this paper, we have revealed the existence of a specific type of MOOC attendants, the recurring students. We have shown that those students need to be split between those who had previously completed the MOOC and those who hadn't, and that they displayed different behaviors in the way they answer to the initial questionnaire (less overall) and on how likely they are to complete the MOOC (less likely for both categories of students, but for different reasons). Another interesting aspect is the fact that the phenomenon seems to be growing, as we found more recurring students in our 4th session than in our 3rd, although this trend would need to be confirmed in upcoming sessions. Recurring students exist and are here to stay, and as such we can only recommend to other MOOC designers to work on detecting them and trying to support them (for the unsuccessful students) or to take into account their previous experience in the MOOC (for the successful ones).

We analyzed how students who have been attending to two sessions (M then N) behave in session N, using some elements of information stemming from M such as whether they had completed M or not. In a future study, we plan to investigate how students who returned in N behaved while taking their first session M, in order to determine predictive factors indicating that a student might become a recurring student. This information could be valuable to target them preferentially when advertising a new session, and possibly to focus more on them as they might become prominent community members, for instance by helping other students about to drop-out once those are detected (Bani, 2014). We also plan to detect those students in upcoming sessions in order to ask them additional questions on their motivation for re-enrolling, to have a better understanding on who they are and to be able to subcategorize them better.

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