

Students' Achievement of Personalized Learning Objectives in MOOCs

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ABSTRACT

Massive Open Online Courses (MOOCs) provide the opportunity to offer free and open education at scale. Thousands of students with different social and cultural backgrounds from all over the world can enroll for a course. This diverse audience comes with varying motivations and intentions from their personal or professional life. However, course instructors cannot offer individual support and guidance at this scale and therefore usually provide a one-size-fits-all approach. Students have to follow weekly-structured courses and their success is measured with the achievement of a certificate at the end. To better address the varying learning needs, technical support for goal-oriented and self-regulated learning is desired but very limited to date. Both learning strategies are proven to be key factors for students' achievement in large-scale online learning environments. Therefore, this paper presents a continuative study of personalized learning objectives in MOOCs to encourage goal-oriented and self-regulated learning. Based on the previously well-perceived acceptance and usefulness of the concept of personalized learning objectives, this study examines which learners select an objective and how successful they complete objectives. Concerning the learners' socio-demographic and geographical background, we could not identify any practical significant difference between students with selected learning objectives and the total course population. However, we have identified promising objective achievement rates, and we have observed a practical significant improvement of the certification rates comparing the total course population and students who selected an objective that included a graded certificate. This has also demonstrated a method for calculating more reasonable completion rates in MOOCs.

CCS Concepts

• **Applied computing** → **Interactive learning environments;**
E-learning;

Author Keywords

MOOCs; Learning Objectives; Self-Regulated Learning.

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INTRODUCTION

In contrast to analog learning environments like traditional schools or universities, Massive Open Online Courses (MOOCs) offer free and open education for thousands of students with different social, cultural, and geographical backgrounds, as long as an Internet connection is available. To provide a learning experience at this scale, individual guidance and needs are often neglected. The same content is offered to all students in weekly-based, structured, and self-guided courses [12]. From a provider's point of view, the achievement of a certificate usually defines a successful learning outcome. However, the diverse learning community comes with many different motivations and intentions [1]. Therefore, the current one-size-fits-all approach needs to be reconsidered and studies have shown that a certificate is only one of many different desired learning outcomes [8, 24].

In learning environments with little support and guidance like MOOCs, goal-oriented and self-regulated learning have been recognized as a valuable skill set because of their positive influence on students' achievement [2, 6]. Allowing learners to follow personal objectives aims to better address the varying learning needs, enables them to follow different learning paths, and connects the definition of success with the learners' motivations and intentions. Nevertheless, technical support for goal-oriented and self-regulated learning in MOOCs is very limited to date [10, 8].

This work builds upon previous studies about the theoretical concept of personalized learning objectives in MOOCs [18], and the technical implementation and integration as well as the perceived acceptance and usefulness by learners [19]. Based on a multivariate A/B test, the latter study showed that "nudging learners with an objective modal while offering multiple possibilities to set an objective has been identified as the best-suited approach to engage learners". Between 49.4% and 58.7% of the learners selected an objective, which demonstrated their general interest in personalized learning objectives. The study also presented that "the interests and intentions for a course vary significantly and learners do not solely focus on course completion but also prefer individual learning paths". Additionally, a survey was conducted which revealed that 69% of the learners consider the selection of an objective as useful and 63% stating that it helps them to achieve their personal goals. The overall positive results motivated us to further investigate which learners select an objective and how successful they complete objectives.

In order to gain a better understanding of these aspects, we examine the following research questions in this paper:

Research Question 1 How do students with selected learning objectives differ from the total course population?

Research Question 2 How successfully do students achieve their learning objectives?

To answer these questions, first, the pedagogical rationale of self-regulated learning and learning objectives is introduced in Section 2, as well as related work. Afterward, Section 3 explains the study design and the captured data that was used for the analysis – before Section 4 presents and discusses the results. At last, Section 5 concludes the paper.

PEDAGOGICAL RATIONALE AND FOUNDATIONS

In this paper, we continue our efforts to better support self-regulated learning (SRL) in MOOCs. In doing so, we strive for a maximum degree of automation so that it works at scale and ideally without additional effort for course instructors. This section briefly explains SRL in general, the specific metacognitive strategies we want to support, and the definition of personalized learning objectives to achieve a common understanding of these terms and emphasize their benefits for learners. We also discuss related work. This content is a condensed and enhanced version of the same sections in [19] since it continues this research and builds upon the same groundwork.

Self-Regulated Learning

The ability of learners to actively and autonomously take control of their learning process is known as SRL in educational and cognitive psychology [17, 25]. It has been recognized as a positive influential factor for students' achievement in regular online learning [2] as well as in MOOCs [6, 10]. The most prominent models of SRL are defined by Pintrich [17] and Zimmerman [25]. According to them, learning is a proactive and constructive process. Learners can participate by setting goals, monitor their progress, and adjust their learning behavior and actions, which means that they apply self-corrective behavior. These activities are skills that can be trained through experience and practice.

Pintrich defines four phases of SRL: (1) forethought, planning, and activation; (2) monitoring; (3) control; and (4) reaction and reflection. For each phase, four different dimensions can be regulated: the cognition (e.g., through activation of prior knowledge and setting goals), motivation and affect (e.g., by building self-efficacy), behavior (e.g., by applying resource management strategies), and the context of learning, i.e., the learning environment. Likewise, Zimmerman describes SRL as a cycle of three phases each encompassing different sub-processes: (1) forethought phase, including task analysis and self-motivation beliefs; (2) performance phase, including self-control and self-observation; and (3) self-reflection phase, including self-judgment and self-reaction. This shows that SRL is relevant for the preparation, during the actual learning, and in the aftermath of it. Learners should participate in all three phases to be able to successfully regulate their learning. To implement these models in practice, different strategies are proposed which can be applied by students. In the context of

MOOCs, the metacognitive strategies goal setting, strategic planning, and self-evaluation are of particular relevance [6, 10]. To set a goal the learner needs to agree on a specific outcome and the required effort to achieve it [25, 21]. This can be used to provide guidance through the learning process and to measure progress [17]. To achieve a certain goal, strategic planning is necessary to formulate proper tasks and their implementation procedures like the order and timing of activities [25, 17]. To self-evaluate the success of learning activities and their performance – with respect to the defined learning goal – students need to monitor their learning progress and outcomes [17, 21, 6]. This allows them to make informed decisions to improve and adjust their learning behavior.

Learning Objectives

The terms learning goals and learning objectives are often used interchangeably as both describe the intended outcome of a learning process. According to [22] and [17] a learning goal is a broad statement of what a learner will be able to do at a certain time. It provides an overview describing a rather wide range of knowledge and skills a student will acquire and is therefore usually not explicitly measurable. For example, it can refer to the outcome of a single course but also of taking several courses as a thematically consecutive series to acquire certain competences. In contrast, learning objectives have a narrow focus, describing specific and discrete units of knowledge and skills being acquired. These objectives are the results of short-time activities that can be achieved by following a certain number of steps. Consequently, they are specific enough to be observable and measurable. In pedagogy, learning objectives are typically classified and created using models like Bloom's (Revised) Taxonomy [9]. Another well-known approach to define objectives is the *SMART* acronym [3] — objectives should be specific, measurable, achievable, relevant, and time-bound. A learning goal thus can comprise multiple learning objectives.

Proper assessment methods need to be in place to be able to measure and verify the attainment of objectives. Only if the outcome is measurable, a quantified decision about the level of success can be made and provided as feedback to the learner, which is desired to enable self-regulation. MOOC courses typically group the content by specific topics and address different smaller thematic units. In contrast to the predominant orientation towards the completion of the course, individual objectives can be understood as completing certain parts of the course material by offering a form of optional personalized pathways. Therefore, we define the completion of these thematic units as the basis for learning objectives since they represent the smallest unit of imparted knowledge within a course. This view is compatible with the Extension MOOC (xMOOC) concept and reflects the needs of lifelong learners, who are primarily interested in gaining specific knowledge [14]. The verification of the acquired knowledge is possible through the provided exercises. Furthermore, personalization is achieved by offering different didactically appropriate objectives per course, created by the teaching team and course instructors, from which the learner can select one if desired and follow it individually.

Three types of objectives were implemented and integrated into the HPI MOOC platform: (1) receiving a graded certificate, called Record of Achievement, for course completion; (2) receiving an un-graded certificate, called Confirmation of Participation, for consuming a specific proportion of the learning material; and (3) different thematic units can be derived and offered as learning objectives based on selected knowledge acquisition and knowledge examination items. All conditions of the definition of learning objectives are fulfilled for all 3 types, which is why we use this term in the scope of this work. However, the definition of learning goals also applies to type 1 and 2, as the definitions of objectives and goals are not mutually exclusive. In addition, the teaching team determines the granularity and number of learning items that belong to a type 3 objective.

Related Work

SRL has been widely studied in formal classroom settings and also in traditional online learning. Over the last years, it has increasingly gained attention in the context of learning in MOOCs. A common focus in literature is on identifying how learners apply SRL strategies and which strategies are most effective concerning the learner's behavior and learning outcomes as this forms the basis for proper (technology-based) support of these strategies [10, 6]. This support is crucial since learners differ in their ability and motivation to regulate their learning [15, 13]. Different authors proposed design guidelines and patterns to facilitate SRL in MOOCs [16, 11]. Usually, goal setting has been realized based on pre-course surveys. For example, Wilkowski, Deutsch and Russell [23] used a survey to enable learners to set the initial goal and a post-course survey in combination with clickstream analysis to evaluate goal attainment. Also utilizing questionnaires, Henderikx, Kreijns and Kalz [5] analyzed goal achievement based on the intention-behavior gap. All of these studies show that a certain number of learners achieves their (initial) learning objectives while there is also a specific portion of learners which exceed or underachieve their objective. The actual achievement rates depend on the specific courses in terms of their design and difficulty as well as the required effort to complete the individual objectives. Since the current capabilities in terms of goal-setting are not sufficient to actively support learners, platforms should offer the possibility to set an objective within the platform itself so that learners can self-evaluate their progress towards the achievement of their objective [18].

RESEARCH METHODOLOGY

The following section introduces the study design including the technical prototype, the evaluated courses, the captured data, and the process of how the data was analyzed.

Study Design

Building on the results of the preceding studies, the existing prototype was polished and adapted for the current experiment. Three features for learners were technically implemented and thus directly integrated into the HPI MOOC platform: the learning objective selection, guidance, and evaluation.

Objective Selection

Selecting an objective is always optional to not restrict the open nature of learning in MOOCs and upset users who want to stick to the traditional learning path they are used to. Therefore, personal learning objectives were introduced as an extension and optional feature. Based on the previously examined user interface alternatives in [19], an objective selection modal¹ is shown when the user accesses the learning content for the first time (Figure 1). This modal can be dismissed without selecting an objective and it will never appear automatically again to avoid learner frustration. If the user later decides to select an objective the modal can be opened again from an infobox displayed at the top of each learning item page or from the progress page. Here, the currently selected objective is displayed and can be changed at any time. The infobox disappears if an objective was selected or if it was dismissed by the user. Previous evaluations showed that it makes sense to explicitly encourage learners to select an objective instead of relying on its discovery by learners. Additionally, offering objective selection at different places was recommended [19].

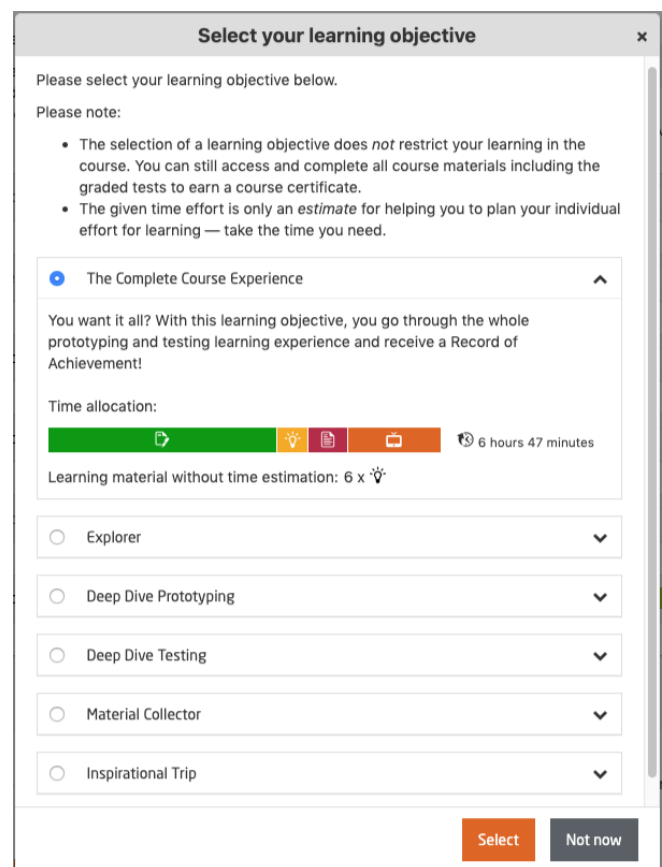


Figure 1: Objective Selection Modal

The selection modal was chosen as an interface to avoid a complete context switch from the learning process for the user and to reuse it at different pages. The modal provides information on how the learning process is affected when an

¹A graphical overlay window also called dialog or pop-up.

objective was selected. Every objective provides a short title and expandable details by clicking on it to make an informed decision. Next to a more comprehensive description of the objective also the estimated time effort accumulated for each learning item type and the whole objective is displayed. This should also enable learners to better compare the different objectives. Currently, only one objective can be selected per course. After selecting an objective, a short confirmation is shown with additional explanations on how the user will be guided through the learning items of the chosen objective.

Objective Guidance

Personalized learning objectives provide the opportunity to open up the traditional course structure in MOOCs. To quickly identify the content which is part of a selected objective, we implemented blue triangles as highlights in the course navigation, as shown in Figure 2. Also, a tooltip is provided when hovering the navigation items. This enables learners to see where to start with their objective and which content they should focus on. Since the learning items of an objective can be placed in multiple weeks of a course, the left-hand section navigation is decorated with the same blue triangles. As shown, the regular course structure is still maintained and the implemented approach of guidance does not restrict the user from accessing the other content. This also enables learners to do more than initially intended and exceed their original objective.

Objective Evaluation

Next to selecting and working on a learning objective, a user needs to constantly evaluate the progress and achievement. Therefore, we adapted the platform’s progress page (Figure 3) based on the work in [20] — this study presents a deeper analysis of how the learner dashboard and progress can support students in applying self-regulated learning. At the top of the progress page, the overall course progress summary is complemented by the overall learning objective progress summary. It shows the required and achieved points as well as the visited items to complete an objective. This progress is depicted

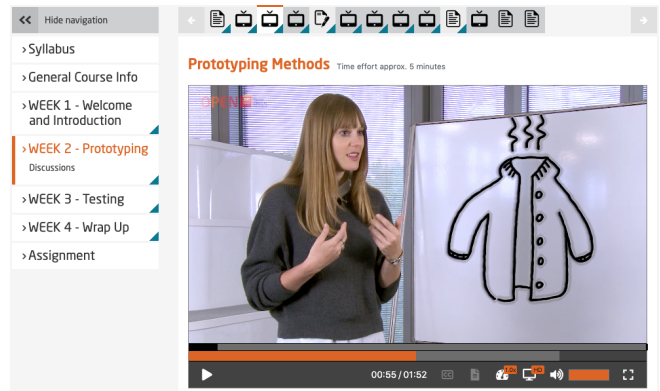


Figure 2: Objective Guidance

using circular progress bars and thus visually distinguished from the more detailed section progresses below. Each section progress can be expanded and the objective material can be highlighted with a checkbox above. By activating this checkbox, the learning items which are part of the selected objective are grouped separately next to the regular material. This allows learners to follow their objective but also to discover the other course material. Each learning item is visualized as rectangle and colored if visited or partially filled if not all points were achieved. This visualization was introduced to distinguish between different states of visited and completed content. All in all, this page should help to raise awareness and allow learners to monitor their progress. Below that part, the currently selected objective is displayed and can be changed.

Sample Courses

We examined two courses of openHPI – our institute’s platform instance with courses based on the HPI curriculum. The first course, Human-Centered Design: Building and Testing Prototypes² (abbreviated *prototype2019*), covered different

²<https://open.hpi.de/courses/prototype2019>

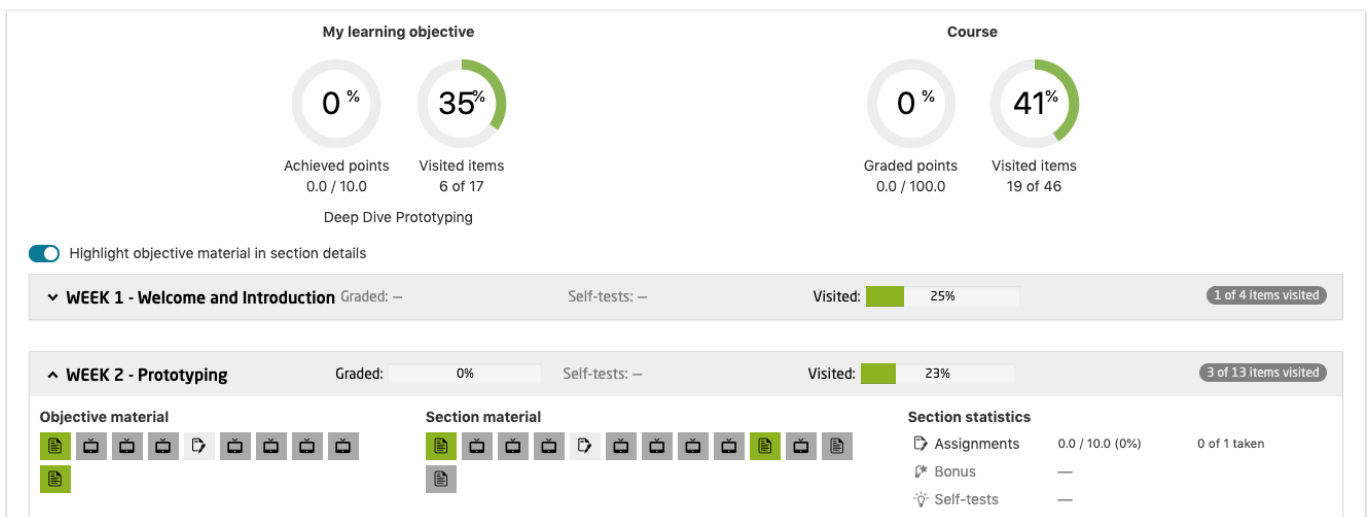


Figure 3: Objective and Course Progress

Table 1: Enrollments and Certificates of the Sample Courses

Course	Enrollments			Shows	Records of	Confirmations of
	At Start	At Middle	At End	At Middle	Achievement	Participation
<i>prototype2019</i>	3,029	3,356	3,533	1,568 (46.72%)	250 (15.94%)	626 (39.92%)
<i>international-teams2019</i>	2,327	2,778	2,991	1,074 (35.91%)	212 (19.74%)	370 (34.45%)

task-based approaches to turn an idea into a simple prototype, set up a testing scenario, and collect feedback. The course was held in English, was running from August 28, 2019, until October 10, 2019, and started with 3,029 enrollments. It was structured into four weeks and graded with three exercises (40% of all points) and one peer assessment (60% of all points). A Record of Achievement was gained by about 16% of all shows-at-middle³ by earning more than 50% of all graded points. A Confirmation of Participation was achieved by about 40% of all shows-at-middle by completing at least 50% of the course material. More detailed numbers can be seen in Table 1. The following objectives for the course were created by the teaching team:

1. *Complete Course Experience*. This objective comprised all course material including the graded exercises and the peer assessment to gain a Record of Achievement.
2. *Explore*. This objective comprised all introductory material about design thinking, prototyping, and testing. Following the objective sufficed to receive a Confirmation of Participation.
3. *Deep Dive Prototyping*. This objective focused only on content about prototyping.
4. *Deep Dive Testing*. This objective focused only on content about testing.
5. *Material Collector*. This objective highlighted the material items for users who were mainly interested in collecting resources and templates.
6. *Inspirational Trip*. Learners who did not know whether the course is interesting for them or not could choose this objective to take a look at the course.

The second course, Introduction to Successful Remote Teamwork⁴ (abbreviated *international-teams2019*), presented benefits and risks of driving a virtual team culture and how guided remote work leads to success, as well as intercultural competences as a key factor of interaction and communication. It was held in English, was running from October 2, 2019, until October 30, 2019, and started with 2,327 enrollments. The course was structured into four weeks and graded with a final exam (55% of all points) and one team peer assessment (45% of all points). A Record of Achievement was gained by about 20% of all shows-at-middle by earning more than 40% of all graded points. A Confirmation of Participation was achieved by about 34% of all shows-at-middle by completing at least 50% of the course material. All numbers are listed in Table 1 as well. The teaching team defined the following objectives:

³Users who visited at least one learning item by course middle.

⁴<https://open.hpi.de/courses/international-teams2019>

1. *Passive Participation with Certificate*. This objective comprised all course material including the final exam to gain a Record of Achievement if the learner got most of the exam right.
2. *Active Participation with Certificate*. This objective comprised all course material including the final exam to gain a Record of Achievement if the learner got most of the exam right. Additionally, the learner was encouraged to contribute to discussions or at least follow them.
3. *Deep Dive Virtual Teamwork with Certificate*. This objective comprised all course material including the participation in discussions, the final exam, and the team peer assessment to gain a Record of Achievement.
4. *Peek In and Explore*. This objective left it up to the learner to look at the material and to receive a Confirmation of Participation.

Data and Analysis

To investigate the presented research questions, the platform's data of the two sample courses was analyzed after the courses had ended and the final results and certificates had been released. Therefore, course reports were used to export information from the platform about each enrollment's socio-demographic profile data and metrics about the learning behavior and course completion. They were enriched with data about the selected objectives and their achievement. All exported data was pseudonymized and analyzed with external tools afterward. The enrollments were filtered by users who visited at least one learning item by the middle of the course. This is the specified date that marks the latest possible entry date for the course when it is still possible to gain a Record of Achievement. We refer to this user group as *shows-at-middle*. Users who never showed up for the course or never had the chance to achieve a graded certificate are excluded from the study. Gaining a certificate is the traditional way to measure course success and also the most demanding learning objective in both courses. Therefore, only users who have had a realistic chance to do so are of interest for the study and form the total population in this scope. Since the users could choose an objective voluntarily, this was not a controlled experiment with a control group but an authentic and real-world learning experience. Thus, we compared users with a selected learning objective with the total course population.

RESULTS AND DISCUSSION

In this section, we present and discuss the study results. To investigate both research questions, it is split up into an analysis of the learners' socio-demographic and geographical background and an analysis of the achievement rates of learning objectives.

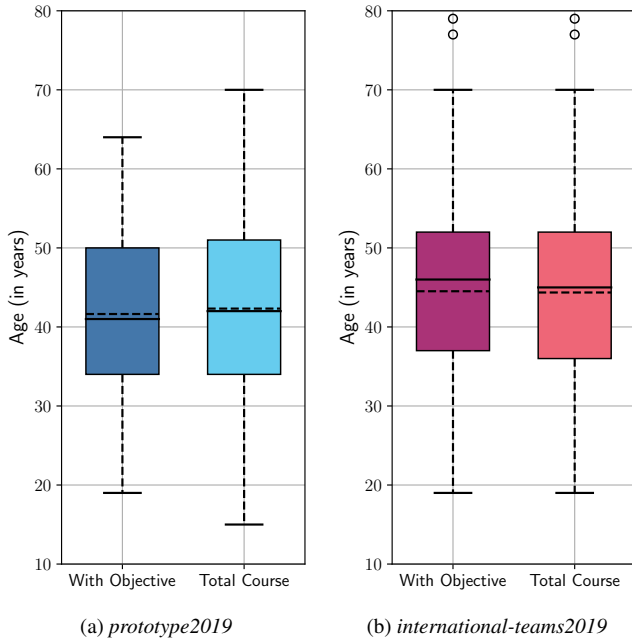


Figure 4: Age Distribution

Socio-Demographic and Geographical Background

The students’ socio-demographic data is based on their platform profile. They can provide this information voluntarily. Therefore, this data is not available for each student and missing entries were excluded. For the *prototype2019* course about 33% have provided this data and for the *international-teams2019* course about 44%. In Figure 4 the age distribution is displayed for both course populations and the students who selected a learning objective. It can be seen that there is no practical significant difference of the learners’ age. The mean age of users in the *prototype2019* course is 42.32 with a median of 42 years and the mean age of users with an objective in this course is 41.64 with a median of 41 years. The mean age of users in the *international-teams2019* course is 44.36 with a median of 45 years and the mean age of users with an objective in this course is 44.52 with a median of 45 years.

Table 2 displays the gender distribution in both courses. It can be seen that roughly one quarter in both populations is female and the rest is male. This also applies for the cohorts of users who selected an objective. Again, we could not identify a practical significant difference in this characteristic.

Figure 5 shows that more than 80% of users attended university and the majority of them gained a Master’s degree. The

Table 2: Gender Distribution

Course	With Objective		Total	
	Female	Male	Female	Male
<i>prototype2019</i>	27%	73%	29%	71%
<i>international-teams2019</i>	26%	74%	25%	75%

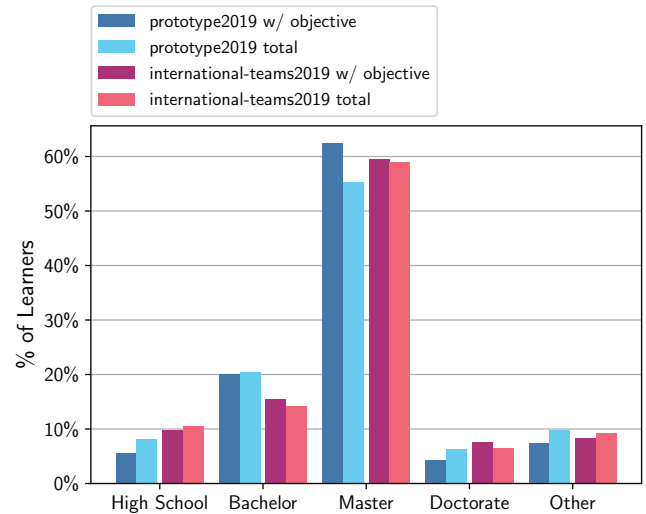


Figure 5: Highest Degree

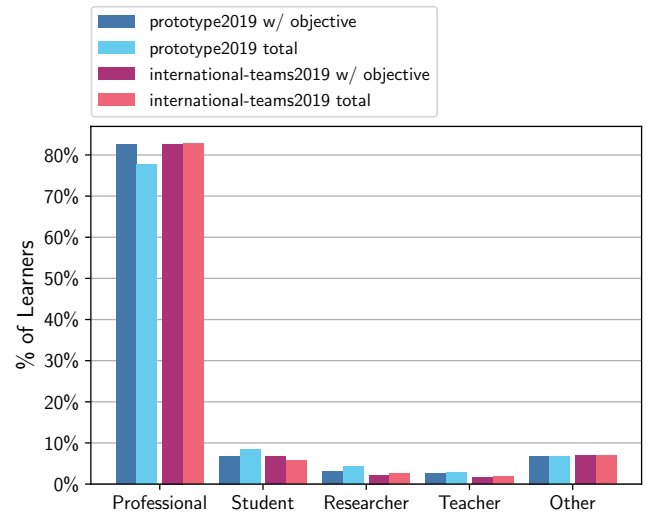


Figure 6: Career Status

results highlight that also the educational background of users does not differ significantly between the two courses and users with an objective. As the last socio-demographic characteristic, we examined the career status (Figure 6). Again, we had very similar results with no practical significant differences. Around 80% of the learners were professionals and the remaining were students, researchers, teachers, and others.

We also examined the geographical background of each user (Figure 7). Therefore, the learner’s IP address was mapped to a location for each action and the country with the highest frequency was picked. With this automated process, the information is available for all learners and no self-reported data was needed. It should be noted that this variable reflects the country where most of the learning activities took place but not the nationality of a user (although there is probably a strong correlation). Even though both courses were offered in

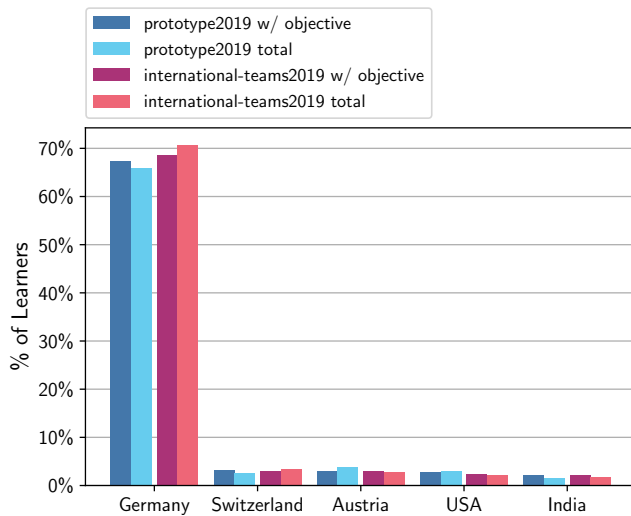


Figure 7: Geographical Location

English, most users accessed them from Germany (up to 70%). This is mainly because the platform originates from Germany and is best known there. Users are further distributed among other German-speaking countries, such as Switzerland and Austria, and then more populous nations such as the USA, India, and other countries. However, here too the distributions between the courses and users with an objective are very similar and there are no practical significant differences.

In summary, the examined learners are on average well-educated, working men in their mid-40s which is very typical for MOOCs and diversity is still a large issue [4, 7]. Concerning research question 1, we could not identify any practical difference between students with selected learning objectives and the total course population regarding their age, gender, degree, career status, or geographical location. Of course, this statement is limited to our case study and a larger sample is needed to check its general validity.

Achievement of Learning Objectives

The total objective selection rates for both sample courses are presented in Table 3. The big difference between 28.57% and 63.87% of users who selected a learning objective is probably due to the fact that objectives are defined individually for each course by different teaching teams. Therefore, they differ in their complexity and in the way they are formulated. Furthermore, the diverse course contents may appeal to users from different industries and backgrounds. Unfortunately, this information is not included in the socio-demographic profile

Table 3: Total Selected Objectives

Course	Shows At Middle	With Objective	Quota
<i>prototype2019</i>	1,568	448	28.57%
<i>international-teams2019</i>	1,074	686	63.87%

data. Compared with the objective selection rates from the two courses of the previous study (49.4% and 58.7%) [19], it can be stated that a notable portion of learners sets a personal learning objective and it confirms the acceptance of the concept. However, the objective selection rates can differ largely between courses. The number of changes of learning objectives by users are negligibly small as shown in [19].

Table 4 and Table 5 display in detail the selected objectives of each course, as well as their achievement and exceeding rates. We also defined a criterion for each objective by which it could be measured whether a goal was exceeded. Objectives that already included the Record of Achievement (RoA) could not be exceeded. Objectives that included the Confirmation of Participation (CoP; some Topic objectives included that in the textual description) could be exceeded by gaining a Record of Achievement. All other Topic objectives, which only included a minor subset of learning items, could be exceeded by achieving a Confirmation of Participation. It can be seen that in both courses the most frequently selected learning objectives included a Record of Achievement, which indicates that a large amount of users is still interested in completing the course with a graded certificate. This is reasonable considering that the courses were also primarily designed with this intention. However, this is not the case for a notable amount of learners who were not interested in gaining a Record of Achievement (28.12% and 16.33%). This is also supported by the numbers from the previous study (34.3% and 44.1%), which confirms our assumption that learners enroll for courses with varying outcome intentions. For the *prototype2019* course, the two objectives Deep Dive Testing and Material Collector were almost never selected. This is surprising since at least the other Deep Dive objective was chosen more frequently. The reasoning for these outliers needs to be further investigated with qualitative user feedback.

In this study, learners for the first time had the opportunity to evaluate the achievement of their learning objective on the new progress page (Figure 3). This is made possible by the automatic calculation of the objective progress within the platform, which also allows us to evaluate the achievement rates. From our perspective, with the experience of many years of operating a MOOC platform, these figures ranging from 18.18% up to 46.97% can be considered a success. Also, between 6.06% and 18.18% of the learners even exceeded their objectives, which indicates an increase in motivation during the course. So far, however, there are no comparable figures as this approach of success in a MOOC is new. Only the certification rates for objectives that included a Record of Achievement could be compared with the traditional approach (Table 6) since gaining a graded certificate is the commonly assumed course outcome to date. For the *prototype2019* course, we see an increased certification rate of 12.63% from 15.94% of gained Records of Achievement for the total course population to 28.57% of users who selected objectives that included this certificate. For the *international-teams2019* course, we see an increased certification rate of 11.62% from 19.74% of gained Records of Achievement for the total course population to 31.36% of users who selected objectives that included this certificate. We consider both rates as a practical significant

Table 4: Selected Objectives with Achievement and Exceeding Rates (*prototype2019*)

Objective	Type	Selected	Quota	Achieved	Exceeded	Criterion
Complete Course Experience	RoA	322	71.88%	28.57%	-	-
Explore	CoP	66	14.73%	46.97%	6.06%	RoA
Deep Dive Prototyping	Topic	31	6.92%	19.35%	9.68%	RoA
Deep Dive Testing	Topic	4	0.89%	0.00%	0.00%	RoA
Material Collector	Topic	3	0.67%	0.00%	0.00%	CoP
Inspirational Trip	Topic	22	4.91%	18.18%	18.18%	CoP

Table 5: Selected Objectives with Achievement and Exceeding Rates (*international-teams2019*)

Objective	Type	Selected	Quota	Achieved	Exceeded	Criterion
Passive Participation	RoA	249	36.30%	23.29%	-	-
Active Participation	RoA	174	25.36%	33.91%	-	-
Deep Dive Virtual Teamwork	RoA	151	22.01%	41.72%	-	-
Peek In and Explore	CoP	112	16.33%	23.21%	8.93%	RoA

Table 6: Traditional vs. Selected Objective Certification Rates

Course	Shows At Middle	Traditional RoAs		Selected RoA Objective	Objective RoAs	
		<i>N</i>	Quota		<i>N</i>	Quota
<i>prototype2019</i>	1,568	250	15.94%	322	92	28.57%
<i>international-teams2019</i>	1,074	212	19.74%	574	180	31.36%

improvement. However, these rates relate to different total quantities and therefore do not reflect an absolute increase in the number of gained certificates. Nevertheless, they demonstrate that this objective achievement-based method is more reasonable for calculating completion rates in MOOCs than the traditional approach.

All in all, we have observed varying objective selection rates, probably due to different formulations by different teaching teams and target groups. Most users tend to select objectives that include a graded certificate, but also a considerable number of learners selected objectives with less effort, covering only parts of a course. Regarding research question 2, about one-fifth to half of the learners achieve their learning objectives and a notable amount of them even exceed them. We were also able to compare the certification rates of the total course population with the users who selected an objective which leads to a graded certificate and we have observed a practical significant improvement. Again, a larger sample is needed to verify our results. Additionally, more qualitative feedback can help to better understand the learners' experience and satisfaction with our approach of personalized learning objectives.

CONCLUSION

In this paper, we presented a continuative study of personalized learning objectives in MOOCs to better support goal-oriented and self-regulated learning. These are crucial skills for students' achievement and success in online learning environments with little support and guidance like MOOCs. After examining the students' acceptance and usefulness of

the concept [19], the overall positive results led us to further investigate which learners select an objective and how successful they complete objectives. Regarding the learners' socio-demographic and geographical background, i.e., their age, gender, degree, career status, or geographical location, we could not identify any practical significant difference between students with selected learning objectives and the total course population. However, we have identified promising objective achievement rates. Additionally, we have observed a practical significant improvement of the certification rates comparing the total course population and students who selected an objective that included a graded certificate. In the future, we would like to verify our results with more courses and include qualitative data.

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