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Factors influencing the pursuit of personal learning goals in MOOCs

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ABSTRACT

MOOCs are promising opportunities for lifelong learning, but as promising as these learning opportunities seem, many learners do not succeed in pursuing their personal learning goals. Barriers to learning are the main reason for not finishing the intended (parts of the) MOOCs. This study addressed the question whether the factors age, gender, educational level, and online learning experience affect barriers faced while learning in MOOCs. The results show that it is challenging to combine work and family life with lifelong (online) learning activities, especially for learners in their early adulthood and mid-life. However, more experience with online learning positively affects individuals' ability to cope with these challenges. Also, learners with a lower educational level may experience a lack of knowledge or difficulties with the course content. These findings may serve as input to inform potentially vulnerable learners about these issues and support them in successfully achieving their personal learning goals.

The possibility of learning online adds flexibility to opportunities for lifelong learning. Massive open online courses (MOOCs) are particularly suitable for this purpose, as they are accessible to everyone and cover an ever-expanding range of topics and interests (Greene, Oswald, & Pomerantz, 2015; Missopoulos, Argyropoulou, & Tzavara, 2018). But as promising as these learning opportunities seem, many learners do not succeed in pursuing their personal learning goals (Henderikx, Kreijns, & Kalz, 2017a) and do not finish the sections of a MOOC they indented to complete. These learners are considered unsuccessful learners or dropouts and generally determine the overall assessment of course success.

As student achievement is often used as an evaluation measurement for online course success or even quality (Lim, Morris, & Yoon, 2006), research has investigated which factors predict course outcomes. Scholars have studied whether factors such as learner characteristics, learning skills, and learning experience influence academic achievement (Hattie, 2008). Yet, while progressing through a course, learners may

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experience barriers that hinder, or even prevent, them from reaching their personal learning goals. These goals do not necessarily equal achievement in the traditional sense of finishing the course, but may comprise any individual goal a learner may have, for example, finishing the first three modules, following the whole course without taking the tests, or getting a certificate (Henderikx et al., 2017a). Research on barriers to MOOC learning illustrates that most learners face barriers to a greater or lesser extent (Henderikx, Kreijns, & Kalz, 2018; Khalil & Ebner, 2014), and that some of them are easier to overcome or are less interruptive to the learning process than others (Henderikx, Kreijns, & Kalz, 2017b). Besides the fact that these barriers may affect personal achievement, they may also affect the students' general learning experience or satisfaction, as well as the perceived difficulty of achieving personal goals and may, therefore, influence future decisions about participation in MOOCs. In this study, we thus focused on barriers to MOOC-based learning as an outcome variable. More specifically, we focused on age, gender, educational level, and previous online learning experience and their predictive power for the encounter of (specific) barriers (Figure 1). Consequently, the research question posed in the current study was: Do learner characteristics (age, gender, educational level, and prior online learning experience) affect the experience of (specific) barriers in MOOCs?

As no prior research can be found that investigates possible determinants that predict barriers when learning in MOOCs or, more generally, barriers to online learning, the aim of this study was to further untangle the online learning process by exploring whether certain variables do indeed affect the experience of barriers while learning in MOOCs. First, a short overview of the literature on barriers to MOOC-learning is given, as well as our hypotheses, which introduce barriers to learning as an independent variable opposed to academic achievement. Next, we introduce variables extracted from the literature as potential determinants, such as age, gender, educational level, and prior online learning experience in combination with academic achievement. This is followed by an overview of the methodology and the results. Lastly, the results are discussed, as well as limitations and avenues for future research.
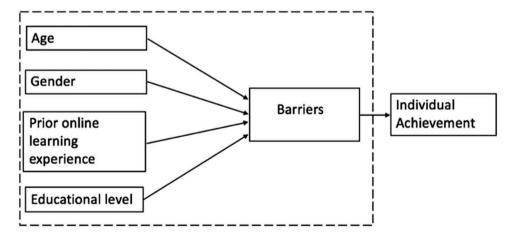

Figure 1. Research model illustrating the focus of the study.

Barriers to MOOC-learning

Online learning with MOOCs is not without challenges (Missopoulos et al., 2018). Learners do not always succeed in pursuing their personal learning goals due to various reasons, which we summarise under the construct of barriers. Barriers can be defined as obstacles that prevent or hinder learners from reaching their personal learning goals and can be either MOOC-related or non-MOOC-related (Henderikx et al., 2017b, 2018). We conducted a non-exhaustive literature search, inspired by PRISMA (Moher, Liberati, Tetzlaff, & Altman, 2009), on barriers to online learning, which identified many obstacles, including lack of reading, typing, and writing skills (Muilenburg & Berge, 2005), technical problems with the computer (Song, Singleton, Hill, & Koh, 2004), feelings of isolation (Khalil & Ebner, 2014), and family issues (Park & Choi, 2009). The barriers mentioned most often in the literature were lack of interaction (Khalil & Ebner, 2013; McAuley, Stewart, Siemens, & Cormier, 2010; Schrire & Levy, 2012), lack of time (Aragon & Johnson, 2008; Belanger & Thornton, 2013; Khalil & Ebner, 2014; Onah, Sinclair, & Boyatt, 2014), and insufficient academic background (Belanger & Thornton, 2013; Mackness, Mak, & Williams, 2010; Park & Choi, 2009). Other barriers experienced by students are family and workplace issues and lack of support from family and friends or the workplace (Park & Choi, 2009). In addition, insufficient technology background (Khalil & Ebner, 2014), computer and/or Internet issues (Aragon & Johnson, 2008; Song et al., 2004) and lack of instructor presence (Aragon & Johnson, 2008; Onah et al., 2014) are also often reported as obstacles to online learning. Furthermore, a recent empirical study on barriers to learning in MOOCs by Henderikx et al. (2018) found that own responsibility for learning, lack of time, bad course content, lack of motivation, low quality of instruction and/or materials, and family issues were most often considered as barriers in this type of course. In the current study, we focused on the number of barriers learners faced while learning in MOOCs in general, as well as on several specific barriers.

Empirical research on predictors of academic achievement in online learning contexts

Age

The relationship between various learner characteristics and online course outcomes has often been studied. A study by Breslow et al. (2013) on gaining insight into predictors of student achievement in edX's first MOOC found no significant relationship between age and student success. Greene et al. (2015) investigated which factors were likely predictors of student achievement and retention in MOOCs. Similar to the findings in the study by Breslow et al. (2013), age proved not to be a significant predictor of student success. In addition, Park and Choi (2009), who studied factors influencing online learning success, also found that age was not significantly predictive of achievement. These findings all indicate that age is not related to online student achievement or satisfaction.

However, because we did not look at achievement but concentrated on barriers that hinder or prevent personal achievement, we expected that age does make a difference with regards to certain barriers—especially barriers that belong to

a specific age range. Life stages theory identifies various stages in which individuals can generally be categorised. These stages are late adolescence (16–20 years), early adulthood (20–35 years), mid-life (36–50 years), and mature adulthood (50–80 years) (Armstrong, 2007; Stoffelsen & Diehl, 2007). The theory argues that at each stage in life, different demands are made on individuals regarding education, work, family, and personal development, which makes certain age groups more prone to facing barriers then other age groups. Even though it is true that individuals of the same chronological age do not necessarily find themselves in the same life stage (Kooij, De Lange, Jansen, Kanfer, & Dikkers, 2011), it is most likely that individuals aged 20–35 and 36–50 years (those in the adulthood and mid-life stages) will experience the highest demands regarding career development and starting and running a family (Armstrong, 2007; Stoffelsen & Diehl, 2007). Therefore, we hypothesised that MOOC-learners in these age categories are most likely to face a greater number of barriers in general and are also most likely to experience barriers specifically related to work and family, such as family issues and workplace issues.

Hypothesis 1a   Learners in the age categories of 20–35 and 36–50 years face a greater number of barriers while learning in MOOCs than learners in other age categories.

Hypothesis 1b   Learners in the age categories of 20–35 and 36–50 years experience barriers related to work and family more often than learners in other age categories.

Gender

Research on gender as a predictor of online course success showed similar results as research on age as a predictor. The aforementioned studies by Breslow et al. (2013), Greene et al. (2015), and Park and Choi (2009) established that there is no significant difference between male and female learners with regards to study success. Furthermore, Marks, Sibley, and Arbaugh's (2005) empirical evaluation of potential predictors of effective online learning found no relationship between gender and perceived effectiveness of learning. These findings indicate that gender is not a predictor of online course success.

Nevertheless, our aim was to investigate a possible relationship between gender and barriers to MOOC-learning, as opposed to individual achievement. Generally, women spend more time doing household work and daily childcare than men, despite an increase in these women's paid working hours (Bittman, England, Sayer, Folbre, & Matheson, 2003; Sayer, 2005; Yavorsky, Kamp Dush, & Schoppe-Sullivan, 2015). For this reason, we hypothesised that gender is related to experiencing barriers. More specifically, we expected that female MOOC-learners experience a greater number of barriers than male MOOC-learners. Also, we expected that female MOOC-learners face barriers related to work-life balance dimensions such as family issues, workplace issues, and lack of time more often.

Hypothesis 2a   Female learners experience a greater number of barriers while learning in MOOCs than men.

Hypothesis 2b Female learners face barriers related to work and family more often than men.

Educational level

A further characteristic frequently studied in relation to course outcome is educational level. Yukselturk and Bulut (2007) empirically evaluated predictors of student success in an online course and found no relationship between prior education and student success. Further studies by Wang, Shannon, and Ross (2013) and Park and Choi (2009) that examined the relationship between student characteristics and online course success did not find educational levels to be a significant predictor of course outcomes. Likewise, the study about predictors of achievement in MOOCs by Greene et al. (2015) and the study on the relationship between educational level and student success in a MOOC by Goldberg et al. (2015) established once again that level of education was not predictive of student achievement. However, a contradictory result was found by Breslow et al. (2013), whose findings showed a "marginal relationship between highest degree earned and achievement" (p. 20).

The previously discussed research, for the most part, found no significant relationship between educational level and course outcome. However, insufficient academic background is one of the barriers most often experienced by learners (Belanger & Thornton, 2013; Mackness et al., 2010; Park & Choi, 2009). Academic background knowledge is generally acquired at educational institutions, and we can expect that higher educational levels indicate more academic knowledge. Therefore, we hypothesised that learners with a higher educational level are less likely to experience the barrier insufficient academic knowledge. In addition, we expected that learners with lower educational levels are more likely to experience the barrier course content too hard.

Hypothesis 3a Learners who have a higher educational level experience the barrier insufficient academic knowledge less often than learners who have a medium or low educational level.

Hypothesis 3b Learners who have a lower educational level experience the barrier course content too hard more often than learners who have a medium or high educational level.

Prior online learning experience

Lastly, various studies on the relationship between prior online learning experience and student performance showed uniform results. Marks et al. (2005) and Yukselturk and Bulut (2007) found no statistical significance for prior online learning experience as a predictor of student achievement in an online learning environment. In addition, Greene et al. (2015), who studied predictors of achievement in the MOOC-learning context, determined that prior online learning experience was not predictive of study success in MOOCs. However, Wang et al. (2013) examined which student characteristics and skills were significantly related to course outcomes in online learning. Their findings indicated that previous online learning experience was positively and significantly

Table 1. Overview of hypotheses.

	Predictor for	
Variable	Number of barriers	Specific barrier(s)
Age	Yes	Yes
Gender	Yes	Yes
Educational level	-	Yes
Previous online learning experience	-	Yes

related to learning strategies, which meant that students with more online learning experience used more effective learning strategies. Furthermore, the use of learning strategies was also positively and significantly related to time management. Time management, in turn, was found to be a crucial element of successful online learning (Morris, Finnegan, & Wu, 2005; Song et al., 2004).

Thus, taking these findings into account, we reasoned that learners with more previous MOOC-learning experience are more skilled at managing their time. We therefore expected that prior online learning experience is negatively related to experiencing the barrier lack of time.

Hypothesis 4   Learners who have more prior online learning experience are less likely to face the barrier lack of time.

Overview of this study

The focus of this study was to explore several determinants and their relationship to experiencing barriers while learning in MOOCs. These determinants were derived from research on predictors of academic achievement in online learning contexts and were then related to barriers. The literature overview generally revealed no significant predictive relationship between the variables age, gender, educational level, and previous online learning experience, and academic achievement. However, our aim was not to investigate the relationship between these variables and achievement as is traditionally the case, but to study a possible relation to the experience of (specific) barriers while learning in MOOCs. This is the first study to explore these determinants in relation to experiencing barriers that impede learning. As we consider MOOC-learning to be a valuable addition to the learning and development possibilities for individuals, we wanted to expand and deepen the current knowledge base by establishing the extent to which certain variables impact achievement in MOOCs. Our specific hypotheses regarding the predictive power of these determinants are outlined in Table 1.

Method

Participants

Participants were individuals who took part in 18 MOOCs offered by the National Institute for Educational Technology and Teacher Education, a centre in the Spanish Ministry of Education. Participants were mainly teachers and educational professionals (see Castaño-Muñoz, Kalz, Kreijns, & Punie, 2018 for full details of the participants).

Sample 1, post-course survey data

Hypotheses 1, 2, and 3 were tested using only data from a post-course survey that was completed by 1349 participants (858 women, 491 men, M_{age} = 42.8, age range: 18–82 years). A majority (83.4%) were of Spanish nationality. Participants from other European countries comprised 3% of the sample, while the remaining 13.6% of participants were from countries outside Europe. Most participants (73.1%) were employed for wages (mainly teachers) and 5.2% were self-employed. In addition, 7.5% of the participants were unemployed, of which 3.3% were not currently looking for work, 3.6% were students, 1% were retired, and the remaining 9.6% of participants indicated that they were homemakers or other.

Sample 2, matched pre- and post-course survey data

Data about past MOOC experience was only collected in the pre-course survey. Thus, to test Hypothesis 4, pre- and post-course survey data was matched, resulting in a total of 596 participants (405 women, 191 men, M_{age} = 42,8, age range: 20–72 years). These participants showed a similar distribution regarding nationality and employment as the post-course data. The majority of the participants of the matched data were of Spanish nationality (81%). A further 6.1% of participants were from other European countries, and the remaining 12.9% represented participants from non-European countries. The majority (70.8%) of the participants were employed for wages, while 5.4% were self-employed. A further 4.4% were currently looking for work, and 3.4% were not looking for work. Of the remaining participants, 4.5% were students, 1.2% were retired, and 10.3% indicated that they were homemakers or other.

Materials and procedure

Within the framework of the MOOCKnowledge project (https://ec.europa.eu/jrc/en/moocknowledge), two surveys (pre- and post-course) were constructed, including several general questions on gender, age, educational background, employment status, and online learning experience (Kalz et al., 2015). To ascertain their online learning experience, participants were asked in the pre-course survey to indicate how many MOOCs they had taken in the past. The post-course survey contained a list of 19 barriers and the option to indicate that no barriers were encountered. The respondents were asked to indicate which barriers (if any) they had experienced during their MOOC-learning. They had the option to indicate multiple barriers.

These barriers were derived from a non-exhaustive literature review on barriers to online learning in general and in MOOCs specifically, including articles from 2004 until 2018. Examples of the barriers listed include lack of decent feedback, family issues, lack of motivation, and technical problems with the computer. All the individuals registered in a MOOC received an invitation in the first week to participate in the pre-course survey. At the end of the last week of the MOOCs, all registered MOOC-takers received an invitation to participate in the post-course survey. Participation was voluntary and informed consent was collected from the participants.

Data analysis

First of all, some variables were recoded into groups. Age was recoded into three groups—20–35 years, 36–50 years, and 50+ years—to fit the life stages theory (Armstrong, 2007; Stoffelsen & Diehl, 2007). After matching the pre-course and post-course surveys, there were no learners in the age group 16–19 years, representing the late adolescence life stage. Educational level was recoded into the groups non-academic (low), bachelor's (medium), and master's+ (high).

Furthermore, we performed descriptive statistics and, depending on the type of data (nominal, ordinal, continuous, and number of groups) and the hypothesis, we performed Kruskal-Wallis tests, chi-square tests of independence and a binary logistic regression to test the various hypotheses. As the data were predominantly nominal and ordinal, not normally distributed and included some small samples, non-parametric tests were conducted to test the hypotheses. The assumptions of random samples and independent observations were met. Furthermore, as we were performing multiple tests using the same data, we also included (where applicable) the Bonferroni corrected significance level (Rice, 1989) to prevent unnecessary Type I errors. Since there are no distinct rules concerning the employment of the Bonferroni correction (Cabin & Mitchell, 2000), and to prevent discussion about the interpretability of the analysis, we report both the corrected and uncorrected Bonferroni significance level.

Results

Descriptive statistics

An overview of the descriptive statistics can be found in Table 2. The average number of barriers experienced by MOOC-learners was 1.75. Lack of time, family issues, and workplace issues were experienced more often in comparison to insufficient academic knowledge and course content being too hard. Furthermore, the majority of the MOOC-learners were women between the ages of 26 and 50 years old. The educational level was, in most cases, medium to high, which represented bachelor's degree to doctorate-level education. Lastly, the average number of MOOCs taken in the past, which represented the prior online learning experience, was 3.00.

The first two hypotheses concerned the independent variable age. We hypothesised that learners aged 20–35 and 35–50 experienced a greater number of barriers in general (Hypothesis 1a) and were also more likely to face barriers specifically related to work and family (H1b).

To test Hypothesis 1a, a Kruskal–Wallis test was conducted. This test did not reveal a statistically significant difference in the number of barriers experienced across the three different age groups, χ^2 (2, n = 1349) = 3.442, p = .179. However, the mean ranks in Table 3 show that learners in early adulthood (20–35 years) faced most barriers, followed by learners in their mid-life stage (36–50 years).

Hypothesis 1b was tested by using two chi-square tests of independence (Bonferroni corrected significance level p < .025, uncorrected significance level p < .05). The first test indicated that there was a significant relationship between age groups and the experience of the barrier family issues (see Table 4), χ^2(2, n = 1349) = 18.071, p = .000. As can be seen in Table 4, learners in their mid-life stage (35–50 years) struggle most often with

Table 2. Descriptive statistics of the variables.

Variable	n	M	SD
Number of barriers		1.75	1.507
Barrier—Workplace issues	516		
Barrier—Family issues	386		
Barrier—Lack of time	593		
Barrier—Insufficient academic knowledge	45		
Barrier—Course content too hard	43		
Age			
20–35 years	295	29.61	4.103
36–50 years	751	43.1	4.125
51+ years	303	54.96	4.078
Gender			
Male	491		
Female	858		
Educational level			
Low	217		
Medium	635		
High	497		
Prior online learning experience (no. of past MOOCs)		3.00	5.248

Note. Learners were able to indicate multiple barriers.

Table 3. Difference in the number of barriers experienced per age group.

Age groups	n	Mean rank
20–35 years	295	694.74
36–50 years	751	681.05
51+ years	303	640.79

Table 4. Percentage of learners who did or did not experience the barrier family issues per age group.

Age group	Family issues—No (n = 963)	Family issues—Yes (n = 386)	Total
20–35 years	75.3%	24.7%	n = 295
36–50 years	66.8%	33.2%	n = 751
51+ years	78.9%	21.1%	n = 303

family issues. The second test showed no significant relationship between age groups and the barrier workplace issues (see Table 5), χ^2(2, n = 1349) = .789, p = .674. Despite the fact that the result is not significant, it is interesting that again learners in their mid-life (35–50 years) most often indicated that they were hindered by workplace issues.

The next two hypotheses, regarding gender, indicated that female learners face more barriers in general than men (Hypothesis 2a), and that female learners more often come across barriers related to work-life balance than men (Hypothesis 2b). A Kruskal–Wallis test was conducted to test Hypothesis 2a, which revealed no statistically significant difference in number of barriers experienced across gender, X^2(1, n = 1349) = 1.814, p = .178. However, the mean ranks in Table 6 show that women do indeed experience more barriers than men.

To test Hypothesis 2b, three chi-square tests of independence were conducted (Bonferroni corrected significance level p < .025, uncorrected significance level p < .05). The tests regarding family and workplace issues were not found significant. The results for gender and the encounter of the barrier family issues (see Table 7) were

Table 5. Percentage of learners who did or did not experience the barrier workplace issues per age group.

Age group	Workplace issues—No (n = 833)	Workplace issues—Yes (n = 516)	Total
20–35 years	62.7%	37.3%	n = 295
36–50 years	60.7%	39.3%	n = 751
51+ years	61.7%	38.3%	n = 303

Table 6. Difference between males and females in the number of barriers experienced.

Gender	N	Mean rank
Male	491	656.58
Female	858	685.54

Table 7. Percentage of male and female learners who did or did not experience the barrier family issues.

Gender	Family issues—No (n = 963)	Family issues—Yes (n = 386)	Total
Male	69.7%	30.3%	n = 491
Female	72.4%	27.6%	n = 858

$\chi^2(1, n = 1349) = 1.134, p = .287$ and the result for gender and the barrier workplace issues were $\chi^2(1, n = 1349) = 2.014, p = .156$ (see Table 8). In contrast to the direction we were expecting—that women face barriers related to work and family more often than men—the results in Tables 7 and 8 actually indicate the opposite. In both cases, men indicated encountering family and workplace issues more often.

The last chi-square test of independence indicated that there was indeed a significant relationship between gender and experiencing the barrier lack of time (see Table 9), $\chi^2(1, n = 1349) = 5.115, p = .024$. As shown in Table 9, women indicated that they encountered the barrier lack of time more often than men did.

The next hypotheses predicted that, respectively, learners with a higher educational level experienced the barrier insufficient academic knowledge less frequently (Hypothesis 3a),

Table 8. Percentage of male and female learners who did or did not experience the barrier workplace issues.

Gender	Workplace issues—No (n = 833)	Workplace issues—Yes (n = 516)	Total
Male	59.3%	40.7%	n = 491
Female	63.2%	36.8%	n = 858

Table 9. The percentage of male and female who did or did not experience the barrier lack of time.

Gender	Lack of time—No (n = 756)	Lack of time—Yes (n = 593)	Total
Male	60.1%	39.9%	n = 491
Female	53.7%	46.3%	n = 858

and that learners with a lower educational level more often indicated that they found the course content too hard (Hypothesis 3b). Again, the chi-square test of independence was used to test both hypotheses. The first test indicated that there was no significant relationship between the educational level groups and experiencing the barrier insufficient academic knowledge, χ^2(2, n = 1349) = 4.550, p = .103. However, Table 10 shows that with an increase in educational level, the encounter of this specific barrier decreases.

The second analysis, which tested the relationship between educational level and experiencing the barrier course content too hard, did reveal a significant relationship, χ^2 (2, n = 1349) = 7.133, p = .028. As can be seen in Table 11, with an increase in educational level, encounters with this specific barrier decrease.

The last hypothesis predicted that learners with more online learning experience were less likely to face the barrier lack of time (Hypothesis 4). To test this hypothesis, a binary logistic regression was performed. The model was found statistically significant χ^2(1, n = 596) = 6.581, p = .0.16 (see Table 12) and showed that for every additional MOOC taken, a learner was 4.4% less likely to face the barrier lack of time.

Discussion

The purpose of this study was to further untangle the online learning process in MOOCs by exploring whether the variables age, gender, educational level, and prior online learning experience affect the experience of (specific) barriers. Based on the literature review, multiple hypotheses were formulated. Our analyses showed that these hypotheses were partially confirmed. Figure 2 and Table 13 give an overview of the results.

Table 10. The percentage of learners who did or did not experience the barrier insufficient academic knowledge per educational level.

Educational level	Insufficient academic knowledge—No (n = 1304)	Insufficient academic knowledge—Yes (n = 45)	Total
Low	94.5%	5.5%	n = 217
Medium	96.7%	3.3%	n = 635
High	97.6%	2.4%	n = 497

Table 11. The percentage of learners who did or did not experience the barrier course content too hard per educational level.

Educational level	Course content too hard—No (n = 1306)	Course content too hard—Yes (n = 43)	Total
Low	94%	6%	n = 217
Medium	97%	3%	n = 635
High	97.8%	2.2%	n = 497

Table 12. Logistic regression result for determining the relationship between prior online learning experience and the experience of the barrier lack of time.

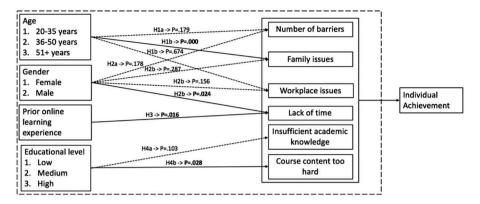| Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Prior online learning experience	−.044	.018	5.797	1	.016*	.956

Figure 2. Overview of analyses results. All tested relationships are depicted in this model. Non-significant relationships are represented by dotted lines and significant relationships are represented by solid lines.

Table 13. Overview of hypotheses testing results.

Predictor for	Variables			
	Age	Gender	Educational level	Previous online learning experience
Number of barriers	Not supported	Not supported	-	-
Specific barrier	Partially supported	Partially supported	Partially supported	Supported

Age

Our study hypothesised that, based on life stages theory (Armstrong, 2007; Stoffelsen & Diehl, 2007), learners in their early adulthood (20–35 years) and mid-life (36–50) stage experienced the most barriers and they also faced barriers related to work and family more often. The analysis indicated that learners in the age groups of 20–35 and 36–50 years did indeed experience more barriers than the 50+ group; however, the result did not confirm a significant difference between age groups. The association between facing the barrier workplace issues and learners in the age groups of 20–35 and 36–50 years was also found not significant. Yet, learners in the age groups of 20–35 and 36–50 years did most often face the barrier family issues. This association was found significant, also after Bonferroni correction, with learners in their mid-life stage (36–50 years) being the largest group to indicate that they were hindered by family issues. These results are predominantly consistent with the life stages theory (Armstrong, 2007; Stoffelsen & Diehl, 2007), which suggests that different demands are made on individuals in different life stages and seems to confirm that running a family can put extra strain on learners in early adulthood (20–35 years) and mid-life stage (36–50 years) who combine work and family with learning (in MOOCs).

Gender

Based on research stating that women generally spend more time taking care of the children and doing housework than men do (Bittman et al., 2003; Sayer, 2005; Yavorsky

et al., 2015), we hypothesised that women experience more barriers in general and also face barriers regarding work-life balance more often. Similar to the result we found for age, the analysis did display the hypothesised direction—women did experience more barriers than men—but this association was not significant. Further, both workplace and family issues showed no significant association with gender. One interesting aspect of these findings is that men indicated more often than women that they experienced family or workplace issues. This is the opposite of what we expected based on the literature. A possible explanation for this could be that even though women still spend more time on doing housework-related activities and childcare than men do, men increasingly take responsibility for these care tasks as well and might have more difficulties combining work and care tasks than women do. Lastly, as was hypothesised, women faced the barrier lack of time more often than men did. This difference was also found to be significant after Bonferroni correction.

Educational level

We hypothesised that learners with a higher educational level would experience the barrier insufficient academic knowledge least frequently, and that learners with a lower educational level would most often experience the barrier course content too hard. The results showed that learners with a low educational level, compared to learners with a high educational level, indicated twice as often that they experienced the barrier insufficient academic knowledge; however, this association was not significant. As hypothesised, we did find a significant association between educational level and the experience of the barrier course content too hard. Learners with a low educational level indicated more often that they were hindered by this barrier.

Prior online learning experience

Lastly, we hypothesised that more prior online learning experience would be negatively related to the likelihood of facing the barrier lack of time. Our reasoning was that learners with more prior online learning experience use more effective learning strategies (Morris et al., 2005; Song et al., 2004). Learners who use more effective learning strategies were found more skilled in time management; thus, if learners are more skilled in time management, they are expected to be less likely to encounter the barrier lack of time. The analysis confirmed this hypothesis, and the significant result indicated that for every additional MOOC taken, a learner is 4.4% less likely to face the barrier lack of time.

Limitations and future research

Some limitations to this study need to be acknowledged. The participants were Spanish-speaking learners who work in education, educational management or support positions. As this is a very specific population, the findings need to be interpreted with caution. Further research should establish whether these results also hold for differently composed populations. Furthermore, we analysed data of 18 MOOCs in aggregate. Thus, we had no knowledge of whether learners experienced more or other barriers in certain MOOCs due to design issues or specific topics. It might be, for instance, that learners

who participated in a MOOC which they experienced as learning intensive indicated more often that they faced the barrier lack of time. We also did not know whether the populations in the various MOOCs are comparable. It is possible, for example, that certain MOOCs are more interesting for females than males, or more suitable for more advanced (and thus likely older) educators than for beginners. To provide a more accurate overview of barriers to online learning in MOOCs and their potential predictors, future research should aim to take these issues into account by performing analyses on a MOOC-specific level.

Conclusion

How can these results help to support, advise, and prepare potential MOOC-learners embarking on new learning journeys? Some main issues MOOC-learners struggle with are once again confirmed here. It is challenging to combine work and family life with lifelong (online) learning activities, especially for certain age groups. However, more experience with online learning has a positive effect on coping with these challenges. Also, learners with a lower educational level more often experience a lack of knowledge or experience difficulties with the course content than learners who are more academically educated. Interestingly, these findings deviate from the presented literature overview, which generally revealed no predictive relationship between the variables age, gender, educational level, and previous online learning experience and academic achievement. This might indicate that, although learners come across barriers that hinder them in reaching their personal learning goals, this does not necessarily mean that these barriers prevent them from reaching these goals.

Gollwitzer and Sheeran (2006) have pointed to the different phases of the intention-realisation process. Although barriers are pervasive for lifelong learners, the way these barriers are tackled depends on the individual and environmental characteristics of each learner. Although some learners will be able to cope with barriers easily, others will struggle and stop learning due to the same barriers. The perceived difficulty of overcoming these barriers may influence the learning experience and satisfaction and consequently affect future decisions to participate in MOOCs. Studies should be designed to investigate the whole research model as depicted in Figure 1, thus including the possible relationship between (specific) barriers and academic achievement, as this would close the circle of the intention-behaviour cycle (Henderikx et al., 2017a) and provide useful knowledge about the extent to which (certain) barriers are or are not related to the achievement of personal goals.

For MOOC-designers, the source of the barrier has important implications. Barriers can be related to the MOOC-design (e.g. lack of interaction with the instructor, lack of decent feedback or low quality of course material) or related to the individual (Henderikx et al., 2018). The investigated barriers in this study—family issues, work issues, lack of time, insufficient academic knowledge, and course content too hard—are typically barriers which are related to the individual, and thus hard to address by changing the design of a MOOC. However, even though these issues are not addressable by mere redesign of a MOOC, MOOC-educators should be aware that barriers experienced by learners do have the potential to hinder the learning process and possibly influence individual achievement and learning experience. Despite the fact that MOOC-designers and providers are only able

to deal directly with course-related barriers, they are in the best position to inform potentially vulnerable learners about these issues. They could make learners aware of certain challenges that go with the territory of learning online and provide effective supportive tools where possible. For instance, they could start a MOOC with a short risk assessment survey. Learners could be asked several questions that refer to their personal (learning) circumstances. Based on the answers, an overview of personalised awareness messages and supporting tools could be suggested to the learner, which could subsequently increase the chance of personal learning success. In this way, learners could embark on new learning adventures well informed and anticipate possible barriers they might face along the way.

Note

The views expressed in this article are purely those of the authors and should not be regarded as the official position of the European Commission.

Data availability statement

The data that support the findings of this study are available from the MOOCKnowledge project (https://ec.europa.eu/jrc/en/moocknowledge) of the Joint Research Centre. Data can be made available on request from the Joint Research Centre.

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