Exploring MOOC Learners' Behavioural Patterns Considering Age, Gender and Number of Course Enrolments: Insights for Improving Educational Opportunities

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RESEARCH ARTICLE

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ABSTRACT

Massive Open Online Courses (MOOCs) now offer a variety of options for everyone to obtain a high-quality education. The purpose of this study is to better understand the behaviours of MOOC learners and provide some insights for taking actions that benefit larger learner groups. Accordingly, 2,288,559 learners' behaviours on 174 MITx courses were analysed. The results show that MOOCs are more attractive to the elderly, male, and highly educated groups of learners. Learners' performance improves as they register for more courses and improve their skills and experiences on MOOCs. The findings suggest that, in the long run, learners' adaptation to MOOCs will significantly improve the potential benefits of the MOOCs. Hence, MOOCs should continue by better understanding their learners and providing alternative instructional designs by considering different learner groups. MOOC providers' decision-makers may take these findings into account when making operational decisions.

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INTRODUCTION

Lifelong learning is critical for society's members' continuous development and improved level of education. Open universities and Massive Open Online Courses (MOOCs) provide numerous opportunities for society in this regard. However, earlier research reported some concerns about the purposes and functions of open universities, highlighting the risks to lifelong learning (Jauhiainen et al., 2007). Top universities are offering MOOCs to anyone in the world to provide them with a high-quality education. This is a very big opportunity for people to continue their education according to their interests. Additionally, MOOCs provide some advantages for the traditional educational environment by supporting and enriching current education programs (Ebner et al., 2020; Y. Li et al., 2015; Sandeen, 2013). For instance, an earlier study shows that in unexpected situations such as the COVID-19 pandemic period, hybrid learning models established through MOOCs support continuity of education and training (Okoye et al., 2021).

However, MOOCs face some challenges as well. One of the critical challenges is the low completion rates of these courses, where only 10% of the registered learners complete them (Ho et al., 2015; Jordan, 2014), and even in some cases, completion rates are less than 6% (Cagiltay et al., 2020; Despujol et al., 2017; Pardos et al., 2013; Cagiltay et al., 2023). An earlier study reported time management as one of the possible causes of dropout ratios (Shcherbinin et al., 2019). However, in the literature, there are not many studies conducted to better understand the correlation between the number of courses that a learner registers for and the course completion and certification ratios.

Another challenge in MOOCs is addressing the inequalities in education. For instance, in a systematic review study conducted on student equity in MOOCs by reviewing articles published between 2014 and 2018, it was concluded that, even in technical disciplines, where gender inequality is a well-known fact, none of the MOOCs have targeted women yet (Lambert, 2020). In this regard, age is another factor that needs to be addressed. However, an earlier study reviewing 10 MOOCs reported that even for elderly people participating in MOOCs, there is very limited research on their engagement (Liyanagunawardena, T. R., & Williams, 2016). In a study analysing 633 articles published between 2016 and 2018, it is suggested to focus more on the social justice and widening participation aspects of MOOCs (Bozkurt, 2021). Besides, as a result of a systematic review study including MOOC research between 2009 and 2019, it is reported that, majority of these studies were conducted on data collected through survey and interviews (Zhu et al., 2020) indicating very limited results on analysing MOOC learner behaviours from the MOOC databases.

To this end, in order to contribute to the literature from this perspective, in this study, learners enrolled in MITx courses are evaluated based on the number of courses they register for as well as their course activities. The findings of this study are expected to shed some light on how learners register for and successfully complete a MOOC. The research questions of this study are as follows:

RQ1. Are there any significant differences in course activities due to the density of enrolled courses?

RQ2. Are there any significant differences in course activities by gender?

RQ3. Are there any significant differences in course activities by age?

RQ4. Are there any significant differences in course activities based on educational level?

METHOD

The current study used a quantitative descriptive research approach to thoroughly explain the circumstance or case (Creswell, 2004). Furthermore, no variables are controlled or changed in this research design; instead, they are observed or measured. This study was conducted by analyzing 174 courses that were offered by MITx between 2012 and 2016. There are 4,360,705 registrations for these courses by 2,288,559 learners. The dataset for this study was prepared by taking the average of course activities for each learner. On average, each learner has registered for 1.91 courses.

THE EVALUATED COURSE ACTIVITIES

The course activities for the learners are conducted based on MITx database field values named "viewed", "explored", "completed" and "certified". In this concern, "viewed" has a true or false value, where it is set as "true" if the learner registers for the course and views the course content at least once, and "false" otherwise. "explored" is set to "true" when the learner completes half of the course and "false" otherwise. "completed" is assigned the value "true" when the learner completes the course and "false" otherwise. "certified" is set to "true" when the learner completes the course and gets the related certificate from the system.

DATA ANALYSIS

Munzel-Bruner analysis, which is a non-parametric alternative to MANOVA, was performed on the course activities (viewed, explored, completed and certified) with respect to gender, the density of courses enrolled, age, and level of education demographics. Munzel-Bruner analysis was chosen since the multivariate normality and homogeneity of error covariance matrices were violated in our dataset (Field, 2017; Green & Salkind, 2017; Wilcox, 2017). As follow-up analysis for the significant results, Mann-Whitney U tests for two-category demographics (gender) and Kruskal-Wallis H tests for more than two categories' demographics (density of total courses enrolled, age, and level of education) were applied. Since there were several comparisons, Bonferonni corrections were lastly taken into account. In order to offset this increase, the Bonferroni correction tests each individual hypothesis at a significance level of , where is the number of hypotheses and is the desired overall alpha level (Miller, 1981).

To categorize the total number of courses in which students individually enrolled, a two-step cluster analysis was performed. Three categories emerged: low, medium, and high numbers of courses (see Table 1 for frequency distributions). Accordingly, the number of courses for which an individual MOOC learner is registered to is classified into three groups.

CATEGORIES	n	%	MEAN	SD	MIN	MAX
High	40233	1.8	16.79	10.15	10	160
Medium	182215	8.0	5.37	1.51	4	9
Low	2066111	90.3	1.31	.59	1	3
Total	2288559	100.0	1.91	2.74	1	160

Table 1 The descriptive statistics for the density of courses enrolled.

In that concern, the "low" group represents MOOC learners who register for 1–3 courses. The low group averaged 1.31 (SD = .59), and the cut-off was three or fewer courses. Similarly, the "Medium" group represents the learners who have registered for 4–9 MOOC courses. The medium group had an average value of 5.37 (SD = 1.51), and the threshold was between four and nine courses. Finally, the "High" group represents MOOC learners who have registered for ten or more courses. The group with the highest number of enrolled courses had an average of 16.79 courses (SD = 10.15). The threshold value was found for the high group at ten or more courses. The variance of the high group was higher than that of the other two groups, and this indicated that the high group students enrolled in a great diversity of courses compared to the other two groups. The Silhouette measure of cohesion and separation was found to be 0.80, and the ratio between the highest frequency and the lowest frequency groups was 51.35. The data is analysed by considering this grouping.

RESULTS

The results of the study are given below in order to answer each research question.

UNDERSTANDING THE INFLUENCE OF THE DENSITY OF ENROLLED COURSES ON LEARNERS' COURSE ACTIVITIES (RQ1)

The descriptive statistics of course activities (viewed, explored, completed and certified) by the density of total courses enrolled are illustrated in Table 2.

Table 2 The descriptive statistics of course activities by the density of courses enrolled.

# OF COURSES ENROLLED	VIEWED		EXPLORED		COMPLETED		CERTIFIED	
	M	SD	M	SD	M	SD	M	SD
Low	1.21	.48	1.10	.34	1.08	.31	1.07	.29
Medium	3.48	1.71	1.68	1.01	1.45	.84	1.42	.79
High	10.22	7.44	3.34	3.40	2.28	2.11	2.20	1.95

The Munzel and Bruner's method for MANOVA findings generated a significant main effect of course density on the course activities, $F (2.98, 6865677) = 1061886$, $p < .0001$. Considering the average course "viewed" activity of each learner, it has been found that those who have registered a higher number of courses have also on average viewed significantly higher number of courses than those who have registered a medium number of courses ($H = 178807.614$, $Z = 92.372$, $p < .001$) or a low number of courses ($H = 782839.874$, $Z = 442.191$, $p < .001$). Moreover, the group of learners who have registered for a medium number of courses has viewed on average a significantly higher number of courses than that of the ones who have registered for a low number of courses ($H = 604032.260$, $Z = 677.720$, $p < .001$). For the course explore activity, the learners who have registered for a higher number of courses had on average significantly higher numbers of explore than those who have registered for a low number of courses ($H = 101258.211$, $Z = 239.742$, $p < .001$) and a medium number of courses ($H = 50329.182$, $Z = 108.494$, $p < .001$). The difference between the medium and low groups decreased here, but it was still significant ($H = 50929.029$, $Z = 184.446$, $p < .001$). In both course completion and certification activities, the learners who have registered for a higher number of courses on average had significantly higher course completion and certification activities than that of both learner groups who have registered for a low number of courses (completions: $H = 28534.558$, $Z = 130.636$, $p < .001$ and certifications: $H = 27164.914$, $Z = 128.367$, $p < .001$) and a medium number of courses (completions: $H = 14507.081$, $Z = 60.074$, $p < .001$ and certifications: $H = 14085.714$, $Z = 60.228$, $p < .001$).

UNDERSTANDING THE INFLUENCE OF LEARNERS' GENDER ON THEIR COURSE ACTIVITIES (RQ2)

The descriptive statistics of course activities (viewed, explored, completed and certified) based on gender are illustrated in Table 3.

Table 3 The descriptive statistics of course activities by gender.

GENDER	VIEWED		EXPLORED		COMPLETED		CERTIFIED	
	M	SD	M	SD	M	SD	M	SD
Male	1.74	2.16	1.46	1.33	1.31	.94	1.30	.88
Female	1.46	1.44	1.26	.84	1.17	.59	1.16	.56

The Munzel and Bruner's method for MANOVA findings generated a significant main effect of gender on the course activities, $F (1.78, 4045048) = 388804$, $p < .0001$. As per Mann-Whitney U follow-up test ($U = 158039957667.0$, $Z = -73.317$, $p < .001$), for "viewed" activity, males' average views ($M = 1.74$, $SD = 2.16$) were significantly higher than females ($M = 1.46$, $SD = 1.44$) indicating that males viewed the courses more than females. The same situations were also observed in course explores and males average ($M = 1.46$, $SD = 1.33$) was significantly higher than females' ($M = 1.26$, $SD = .84$), $U = 6322185319.500$, $Z = -40.043$, $p < .001$. This meant that males explored more courses than females. For both completions and certifications, the average scores remained significantly in favour of males: $U = 957634632{,}500$, $Z = -23{,}787$, $p < .001$, and $U = 896414828{,}500$, $Z = -23{,}764$, $p < .001$, respectively.

UNDERSTANDING THE INFLUENCE OF LEARNERS' AGE ON THEIR COURSE ACTIVITIES (RQ3)

The descriptive statistics of course activities (viewed, explored, completed and certified) by age are illustrated in Table 4. The age groups of the learners are arranged in four groups as less than 16 (16<), between 16 and 30 (16–30) including both values, between 31 and 45 (31–45) including both values, and higher than 45.

Table 4 The descriptive statistics of course activities by age.

AGE	VIEWED		EXPLORED		COMPLETED		CERTIFIED	
	M	SD	M	SD	M	SD	M	SD
16<	1.58	1.95	1.36	1.18	1.26	.88	1.24	.81
16–30	1.65	1.93	1.36	1.10	1.23	.77	1.22	.72
31–45	1.69	2.13	1.45	1.34	1.32	.93	1.31	.89
45>	1.76	2.37	1.55	1.54	1.40	1.12	1.37	1.04

The Munzel and Bruner's method for MANOVA findings generated a significant main effect of age on the course activities, $F (3.69, 7761912) = 418094.6$, $p < .0001$. Table 5 illustrates the pairwise comparison of age groups. As seen from Table 5, while the learners are getting older, their number of course "viewed" activities is also getting significantly higher. Learners under the age of 16 have a significantly lower number of views (see Table 4, M = 1.58) than those between the ages of 16 and 30 (see Table 4, M = 1.65). A similar pattern can be seen for the other learner groups. In course explores, averages were the same for age groups less than 16-year-old and 16–30-year-old learners (see Table 4, M = 1.36). Moreover, there was a significant increasing trend of averages across ages. In course completions and certifications, the same significant increasing trend were also observed.

Table 5 Pairwise comparison of course activities by ages.
*p < .05, **p < .01.

COURSE ACTIVITIES		AGE GROUP PAIRS					
		16< VS 16–30	16< VS 31–45	16< VS 45>	16–30 VS 31–45	16–30 VS 45>	31–45 VS 45>
Viewed	H	–22,260,224	–26,220,692	–30,961,087	–3,960,468	–8,700,863	–4,740,395
	SE	2,156,264	2,196,699	2,281,074	611,553	867,068	963,234
	Z	–10,324**	–11,936**	–13,573**	–6,476**	–10,035**	–4,921**
Explored	H	–1,007,328	–4,972,560	–8,771,905	–3,965,232	–7,764,577	–3,799,345
	SE	999,133	1,010,030	1,027,736	243,672	308,963	342,567
	Z	–1,008	–4,923**	–8,535**	–16,273**	–25,131**	–11,091**
Completed	H	87,380	–2,004,254	–3,359,579	–1,916,874	–3,272,199	–1,355,326
	SE	608,938	135,547	173,072	613,800	623,162	189,468
	Z	,143	–14,786**	–19,411**	–3,123*	–5,251**	–7,153**
Certified	H	240,220	–1,919,198	–2,995,078	–1,678,978	–2,754,859	–1,075,880
	SE	596,742	132,072	168,918	601,495	610,644	185,007
	Z	,403	–14,531**	–17,731**	–2,791*	–4,511**	–5,815**

UNDERSTANDING THE INFLUENCE OF LEVEL OF EDUCATION ON LEARNERS' COURSE ACTIVITIES (RQ4)

The descriptive statistics of course activities (viewed, explored, completed and certified) by level of education are illustrated in Table 6.

The Munzel and Bruner's method for MANOVA findings generated a significant main effect of age on the course activities, $F (5.74, 13788936) = 186288.5$, $p < .0001$. Table 7 illustrates the pairwise comparison of education levels on viewed and explored course activities. Elementary school learners have on average viewed significantly lower number of courses (see Table 6, M = 1.54),

than those of the learners having junior high school (M = 1.69), high school (M = 1.68), bachelor's (M = 1.64), master's (M = 1.71), and Ph.D. (M = 1.72) degrees. They were not significantly different from the associate degree learners. Junior high school students had fewer views (M = 1.69) than master's (M = 1.71) and Ph.D. (M = 1.72) degree holders, but their views were higher than those with an associate degree (M = 1.50). Their views did not differ significantly from those of the learners with high school and bachelor's degrees. Learners with high school education levels had significantly lower average views compared to those with master's and Ph.D. degrees. However, their average number of views on the courses that they have taken is higher than that of the learners with associate and bachelor's degrees. Those with an associate degree had significantly fewer average views than those with a bachelor's, master's, or Ph.D. Learners with a bachelor's degree also had a significantly lower average number of views on the courses they had registered for when compared to those with a master's or a Ph.D. Finally, no significant difference has been found between the average number of views among the learners with master's and Ph.D. degrees.

Table 6 The descriptive statistics of course activities by level of education.

LEVELS OF EDUCATION	VIEWED		EXPLORED		COMPLETED		CERTIFIED	
	M	SD	M	SD	M	SD	M	SD
Elementary (El)	1.54	1.65	1.37	1.04	1.20	.57	1.18	.53
Junior high school (Jhs)	1.69	2.15	1.35	1.49	1.27	1.48	1.26	1.21
High school (Hs)	1.68	1.99	1.36	1.10	1.22	.75	1.21	.72
Associate degree (A)	1.50	1.68	1.33	.98	1.21	.63	1.20	.62
Bachelor's degree (B)	1.64	1.97	1.40	1.21	1.27	.83	1.26	.80
Master's degree (M)	1.71	2.02	1.44	1.23	1.31	.86	1.29	.81
Ph.D. (P)	1.72	2.09	1.51	1.51	1.38	1.14	1.34	1.02

Table 7 Pairwise comparison of viewed and explored course activities by levels of education.

Note: El: Elementary, Jhs: Junior high school, Hs: High school, A: Associate degree,

B: Bachelor's degree, M: Master's degree, P: Ph.D.

*p < .05, **p < .01.

EDUCATION LEVEL PAIRS		VIEWED			EXPLORED		
		H	SE	Z	H	SE	Z
El	Jhs	−29477.962	4110.139	−7.172**	−1718.284	1875.912	−.916
	Hs	−32435.452	3861.320	−8.400**	−3788.884	658.447	−5.754**
	A	985.247	4055.524	.243	−113.951	914.626	−.125
	B	27744.222	3849.608	7.207**	−1544.498	676.822	−2.282
	M	−43243.064	3858.256	−11.208**	−8114.637	789.092	−10.284**
	P	−43197.276	4052.938	−10.658**	−6334.838	660.006	−9.598**
Jhs	Hs	2957.491	1587.624	1.863	2070.600	1774.398	1.167
	A	30463.209	2014.456	15.122**	−1832.235	1884.536	−.972
	B	1733.740	1558.923	1.112	−173.785	1781.298	−.098
	M	−13765.102	1580.159	−8.711**	−6396.353	1826.910	−3.501**
	P	−13719.314	2009.245	−6.828**	−4616.554	1774.977	−2.601
Hs	A	33420.700	1440.340	23.203**	−3902.835	682.628	−5.717**
	B	4691.230	668.421	7.018**	−2244.385	295.852	−7.586**
	M	−10807.612	716.553	−15.083**	−4325.753	502.103	−8.615**
	P	−10761.824	1433.043	−7.510**	−2545.954	255.046	−9.982**
A	B	−28729.469	1408.641	−20.395**	1658.450	700.368	2.368
	M	−44228.311	1432.107	−30.883**	−8228.588	809.379	−10.167**
	P	−44182.523	1895.018	−23.315**	−6448.789	684.132	−9.426**
B	M	−15498.842	650.490	−23.826**	−6570.138	525.968	−12.492**
	P	−15453.054	1401.178	−11.029**	−4790.340	299.305	−16.005**
M	P	−45.788	1424.767	−.032	1779.799	504.145	3.530**

In the case of the average number of "explored" course activities (see Table 8), learners with an elementary school level of education had significantly lower average scores than those with high school, master's, and Ph.D. degrees. Their average number of "explored" scores was not significantly different from that of the learners having junior high school, associate, and bachelor's degrees. Learners with a junior high school education had significantly fewer explorations on average than those with a master's degree. Their average number of explorations, on the other hand, did not produce a significant difference when compared to learners with other levels of education. Learners having a high school level of education had a significantly lower average number of "explored" compared to the learners having an associate, bachelor's, master's, or Ph.D. level of education. Learners with an associate degree had a significantly lower average number of explorations than those with a master's or a Ph.D. On the other hand, their average number of "explored" was not significantly different from that of the learners with bachelor's degrees. Learners with a bachelor's degree completed significantly fewer explorations than those with master's and doctoral degrees. Finally, master's degree holders had a significantly lower average number of explorations than Ph.D. holders.

Table 8 Pairwise comparison of completed and certified course activities by levels of education.

Note: El: Elementary, Jhs: Junior high school, Hs: High school, A: Associate degree.

B: Bachelor's degree, M: Master's degree, P: Ph.D.

*p < .05, **p < .01.

EDUCATION LEVEL PAIRS		COMPLETED			CERTIFIED		
		H	SE	Z	H	SE	Z
El	Jhs	−252.993	573.408	−.441	−357.930	561.103	−.638
	Hs	−1189.808	442.004	−2.692	−1058.827	433.907	−2.440**
	A	−39.317	451.810	−.087	−4.107	443.187	−.009
	B	−117.250	1149.712	−.102	−115.856	1119.453	−.103
	M	−2951.618	506.916	−5.823**	−2323.201	497.176	−4.673**
	P	−2279.822	441.486	−5.164**	−2032.771	433.432	−4.690**
Jhs	Hs	936.816	392.229	2.388	700.897	381.935	1.835
	A	292.309	403.247	.725	362.037	392.445	.923
	B	135.743	1131.509	.120	242.074	1100.352	.220
	M	−2698.626	464.156	−5.814**	−1965.271	452.530	−4.343**
	P	−2026.829	391.646	−5.175**	−1674.841	381.395	−4.391**
Hs	A	−1229.125	170.820	−7.195**	−1062.933	165.689	−6.415**
	B	−1072.559	1070.927	−1.002	−942.971	1041.256	−.906
	M	−1761.810	286.377	−6.152**	−1264.374	279.683	−4.521**
	P	−1090.014	141.271	−7.716**	−973.944	137.482	−7.084**
A	B	156.567	1075.011	.146	119.962	1045.157	.115
	M	−2990.935	301.291	−9.927**	−2327.307	293.873	−7.919**
	P	−2319.139	169.476	−13.684**	−2036.877	164.439	−12.387**
B	M	−2834.369	1099.309	−2.578	−2207.345	1069.169	−2.065
	P	−2162.572	1070.713	−2.020	−1916.915	1041.058	−1.841
M	P	671.797	285.577	2.352	290.430	278.944	1.041

In average number of completions on the courses that the learners have registered for, the elementary school and junior high school education levels of learners had significantly lower scores than those of the learners having master's and Ph.D. degrees. Learners with only a high school diploma had a significantly lower average number of completions than those with an associate, master's, or Ph.D. Learners with an associate degree had a significantly lower average number of completions than those with master's and Ph.D. degrees. There were no significant differences between bachelor's, master's, and Ph.D. learners.

In the average number of certifications, learners with an elementary school level of education had significantly lower scores than those with a high school, master's, or Ph.D. level of education.

Learners having a junior high school level of education had a significantly lower average number of certifications than those having a master's or Ph.D. level of education. Learners with a high school diploma had a significantly lower average number of certifications than those with an associate, master's, or doctoral degree. Learners with an associate degree had a significantly lower average number of certifications than those with master's and Ph.D. degrees. There were no significant differences between bachelor's, master's, and Ph.D. learners.

DISCUSSIONS

The findings of this study provide several insights about MOOC users that can be used to improve the new design of MOOCs such as cMOOCs, xMOOCs, hMOOCs, and ahMOOCs proposed by previous studies (García-Peñalvo et al., 2018). These results can be summarized under some learner demographics such as gender, age, and education levels as well as their MOOC experiences by considering the number of courses each learner registers for.

GENDER

First, the results indicate that MOOCs are male-dominated settings. In this regard, an earlier study found that male learners made fewer positive comments about the MOOCs that they had registered for than female learners (Bayeck, 2016; Shapiro et al., 2017). Another study conducted among popular MOOC providers also reports this gender gap for all studied MOOC providers, indicating around 63% male participation, even in some MOOC providers with 79% male participation (Ruipérez-Valiente et al., 2020). Besides, our results also show that on the MITx platform, male learners had significantly higher course activities (e.g., viewed, explored, completed and certified) than female learners. These findings are indicative of female learners' dissatisfaction with MOOCs. Accordingly, some strategies can be developed to attract female learners to MOOCs. For instance, earlier studies show that women's participation increases in group studies in MOOCs (Bayeck, 2016). However, an earlier study also reported some different behaviors of women from different countries during the pandemic across the world (Yu & Deng, 2022). Hence, this situation should be further analyzed by considering the country's effect on women's behaviors in MOOCs.

AGE

Previous research has found that the elderly participate in MOOCs, but there has been very little research on their engagement with the courses (Liyanagunawardena & Williams, 2016). By providing some evidence to this end, our results show that while the learners are getting older, their number of course view activities is also getting significantly higher. A recent study (Deng et al., 2020) reports the age and gender of the MOOC participants. Another review study (Liyanagunawardena & Williams, 2016) found very few studies evaluating the engagement of elderly people in MOOCs in the literature. However, some limited evidence in the literature indicates the effect of gender and age on MOOC learners' course behaviours. For instance, even though they reported a weak correlation between learners' age levels through a survey study (47 participants from Coursera and Open2study), researchers have reported some evidence showing that elderly learners' course completion ratios are higher than those of the younger ones (Huang & Hew, 2017). In another study, researchers reported that gender and age of participants were factors for predicting both goal setting and environmental structuring usage in a survey study conducted with 4503 learners from 17 Coursera courses (K. Li, 2019). Studies also report the positive impact of MOOC learners' age on their enrolment ratios (older learners showing higher enrolment ratios) (Castaño-Muñoz et al., 2017) and their course completion ratios (older learners showing higher course completion ratios) (Morris et al., 2015). In that regard, this study confirms previous studies by analysing the ages and genders of a very large group of MITx learners and their course behaviours.

EDUCATION LEVEL

Considering the education levels of the learners, our results indicate that, in general, while the education levels of the learners are getting higher, their viewed, explored, completed, and certified activities are getting higher. This result indicates that the learners' educational level is an important factor in their course performance. As people with a higher level of education have

improved their skills through an effective learning process, this could be a reason for their higher performance. Additionally, they may have better directed their learning process by choosing an appropriate MOOC for their future career plans and expectations or personal developmental purposes. Besides, the MITx courses may have been designed to fit higher education learners' expectations. Earlier studies also reported that the majority of the learners from Europe and North America have higher levels of education, such as a doctorate or master's degree (Chuang, 2017), and this situation is similar for all MOOC providers (Ruipérez-Valiente et al., 2020). For both possible reasons, the MOOCs can be reorganized to address the lower-level education groups' requirements as well as to attract them to taking MOOCs. Such approaches, in turn, will possibly improve the MOOCs' potential benefits for them. For instance, the course length can be further analysed under this consideration, and instead of 10- to 14-week courses, some shorter courses or course modules can be organized for the lower education level groups.

NUMBER OF COURSE REGISTRATIONS

Another important finding from the results of this study indicates that the learners who have registered for a higher number of courses have also on average performed a significantly higher number of course activities (e.g., viewed, explored, completed, and certified) than those who have registered for a medium or low number of courses. Moreover, the group of learners who have registered for a medium number of courses has viewed, on average, a significantly higher number of courses than that of the ones who have registered for a low number of courses. Studies report that MOOC instructors facilitate learners' self-management skills (the enactment of learning goals, time management, management of resources and support, and navigation (Zhu, 2021). These improved skills probably influence the activities of the learners in the MOOC.

In general, the results of this study show that the MITx MOOCs mainly attract an elderly, male, and higher-education group of learners, which may indicate that this group has a higher competence need and needs satisfaction from the MITx courses. Hence, currently, MOOCs are very limited in addressing the problem of educational inequalities in society. People who have already reached a higher level of education are the ones getting the most benefits from the MITx MOOCs. Earlier studies also reported the effect of experience on continuous intention to use (Kim & Song, 2021) and MOOC usage intention (Fianu et al., 2020) on actual MOOC usage. This study draws the community's attention to how to attract different user groups to the MOOC by emphasizing the learners' age, gender, and educational level. The findings also show that as learners' experiences with MOOCs improve, so do their learning skills and performance on the MOOCs. Additionally, this also shows their intention to continuously use the MOOCs. This study provides important evidence indicating that, in the long term, the possible benefits of the MOOCs would be improved as the learners adapted their learning skills to the MOOC environments. For instance, as there is no interaction between instructors and learners, MOOC learners need to improve their self-regulation skills for their time management and their organization of the activities required by the course content (Milligan & Littlejohn, 2014). Additionally, in order to encourage the lower level of participation in the MOOCs, the courses can be revised by implementing different pedagogical approaches, or some MOOC-specific pedagogical approaches can also be developed to better address this problem.

CONCLUSION

In summary, this study found that the MITx MOOCs primarily target an elderly, male, and higher-level education group of learners. This indicates that, currently, MOOCs are not effectively addressing the problem of educational inequalities in society, as people who already have a higher level of education are the ones who are benefiting the most from the MOOCs. The study highlights the need to attract different user groups to MOOCs by focusing on learners' age, gender, and educational level. Additionally, the study found that as learners' experience with MOOCs increases, their learning skills and performance on the MOOCs also improve, increasing their intention to continue using MOOCs in the future. The study suggests that for the MOOCs to be more accessible and inclusive to different user groups, the courses can be revised by implementing different pedagogical approaches or by developing MOOC-specific pedagogical approaches.

DATA ACCESSIBILITY STATEMENT

The data that support the findings of this study are available from MITx but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

ETHICS AND CONSENT

The data set used for this study is prepared considering the ethical procedures and all data is anonymously used. There are no ethical considerations for this study.

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COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

Nergiz Ercil Cagiltay: Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.; Sacip Toker: Formal Analysis, Writing – review & editing.; Kursat Cagiltay: Conceptualization, Data curation, Writing – review & editing.

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