

MOOCs Adoption Pattern during Pre and Prevailing Pandemic Periods in Indian Context – A Comparative Study

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Abstract

Covid-19 has impacted education globally. However, it paved the opportunity for online education practice. Massive Open Online Courses (MOOCs) became an effective mode of online education. This study attempted to quantify MOOCs comparative impact in terms of adoption across varying parameters like geographical distribution and gender. The study was conducted on 2 MOOCs-one conducted before covid-19 and the other during the covid-19 period. It is found that learners' participation rose to 81.5 per cent during covid-19 as compared to 74.6 per cent during pre-covid. MOOCs were adopted by more learners from remote regions of the country during covid-19. There was a statistically significant association between region influence on learners and learners' participation during the pre-covid and covid-19 periods with respect to the study variables. It is also observed that female participation has risen by 122 per cent during covid-19 as compared to their participation during pre-covid. The learner participation has significantly increased in all activities like assignments submission, learning resource access and participation in the quiz. The study suggested that MOOCs can help the education system as an effective model for reaching unreached people during this pandemic situation and also help increase inequitable gender participation.

Keywords: MOOC adoption pattern, massive open online courses, disruptive technology, online education, participation and engagement pattern, educational technology

Introduction

Education has taken a significant makeover with disruptive technologies like Massive Open Online Courses (MOOCs) in recent times all over the world. This is further accentuated by the unforeseen catastrophe like covid-19 which has forced everyone to stay home and explore the possibilities of learning online.

The impact of the covid-19 pandemic

was recorded across the world which caused major interruptions in students' learning disruptions in the academic programmes, suspension of examinations, cancellation of internal & international conferences and created gaps in the teaching-learning process (Jacob et al., 2020). The United Nations Educational, Scientific and Cultural Organization (UNESCO) is continuously tracing the influence of the pandemic on education. Around 87 per cent of

the world's students are affected by the closure of educational institutions due to covid-19. In this regard, UNESCO has announced the launch of a global education alliance to support countries in expanding the best distance learning solutions and reaching children and youth (UNESCO, 2020). The pandemic situation challenged the education system across the world and forced educators to shift to an online mode of teaching overnight.

A positive effect of covid-19 was also reported by adopting online learning strategies which progresses learning efficiency and performance (Gonzalez et al. 2020). Universities that serve formal education transferred their face-to-face education to distance education and started to reinforce it during the covid-19 period (Vezne, 2020). MOOCs help educational institutions to make educational resources more accessible and affordable. All over the world, institutions are offering MOOCs to improve their distance education provisions (Joo, So & Kim, 2018; Gameel, 2017).

The outbreak of covid-19 influenced the digital revolution in higher education through online lectures and interaction in virtual environments, digital open books, teleconferencing and online examination (Strielkowski, 2020; Kumar, 2020). Due to covid-19 crisis, teachers and students started using online learning platforms such as Zoom, Google Hangouts, Google Meets, Google classrooms, Telegram, LinkedIn learning, Learning Management System (LMS), SoloLearn, Udemy, Facebook, YouTube and many more to widen their academic exposure (Mishra et al., 2020). The combined mode of MOOC micro-video was applied to the online training of nursing interns during the covid-19 pandemic period, and this achieved good results (Shenoy et al., 2020; Zhou et al., 2020).

Zayapragassarazan (2020) put forward a theory that the identification of appropriate digital platforms will help learners to involve themselves in an online teaching-learning environment. MOOCs are accepted as significant progress in higher education and millions of students are enriching their existing skill (Gupta & Gupta, 2020). Alhazzani (2020) found a significant impact of MOOC on student academic performance, learning skills and improvement in communication between students and faculty. Xiao and Ran (2020), investigated the effect of online teaching on student autonomous learning with MOOC during the covid-19 pandemic and the result showed that the outcome of MOOC proves fruitful during this period. Also, MOOC is an active attempt to use information communication technologies to improve students' autonomous learning abilities. In India, University Grand Commission (UGC) has asked universities and colleges to consider the SWAYAM MOOCs as credit courses (Manash Pratim Gohain, 2020).

Thus, it can be seen that covid-19 has strongly influenced the education sector through the use of technology. It is very much essential to assess the extent of influence on education with its status in the pre-covid backdrop. A study was conducted to compare the adoption pattern of online courses during pre and covid-19 regimes with the following specific objectives.

1. To study the participation and engagement through MOOCs during the pre-covid and covid-19 regimes.
2. To identify the parameters influencing MOOCs adoption pattern during the pre-covid and covid-19 periods.

Method

The study was conducted considering two benchmark courses viz. MOOC on Teaching Excellence and Designing e-learning Content, each of which was offered during pre and covid-19 periods. Data was analysed using standard data interpretation procedures which are described below.

Course Selection for the Study

The dataset used in the study was obtained from Moodle LMS e-learning platform. Institute provides various MOOCs through Moodle LMS platform. Two different MOOC courses were considered namely "Teaching Excellence" was conducted during November 1-30, 2019 (Pre-covid MOOC) and "Designing E-learning Content" was conducted during July 1-30, 2020 (Covid MOOC). The courses were divided into four weeks and mainly consisted of video lectures, reading materials, powerpoint presentation, discussion forums/doubt clarification from faculty assignments and quizzes. Two topics were presented per week. Each topic consisted of one video lecture, reading materials, PowerPoint presentations and a discussion forum/doubt clarification from faculty. A successful completion certificate was awarded to the learners who viewed the course contents and participated in the assignment submission, discussions and quiz participation with more than a 40 per cent score.

Data Collection and Analysis

Data was collected from Moodle LMS portal which has pre-defined functionalities of capturing learners' login activities, participation in a discussion forum, assignment submissions, quiz participation and certification for the course. Data for analysis of learners' motivation to participate in MOOC was taken from the

learners' feedback submitted through a google form. The number of learners registered during the pre-covid and covid-19 periods was 1,329 and 2,773 respectively. While collecting the data, the dataset includes some rows (basic information) with empty values, which were removed in the study as part of the data cleaning process. After the data cleaning process, the number of learners considered for this study during the pre-covid and covid-19 periods was 992 and 2,259, respectively.

Descriptive statistics were carried out to understand the region and gender-wise distribution of the learners. Simple frequency distribution was calculated to assess the learners' registration, learners' logs during the course period, learners' participation pattern, assignment submission, quiz participation and certification. The Chi-Square test was carried out using statistical software R to determine the association between various parameters of the study with respect to the geographical area. Analysis was also carried out on identifying the motivating factors for the participants to take part in MOOC during both the pre-covid and covid-19 periods.

Chi-Square test (χ^2)

where, O is the observed frequency and E is the expected frequency

Findings and Discussion

The present study was carried out for the overall assessment of the adoption pattern of learners during the pre-covid and covid-19 period with respect to the following parameters.

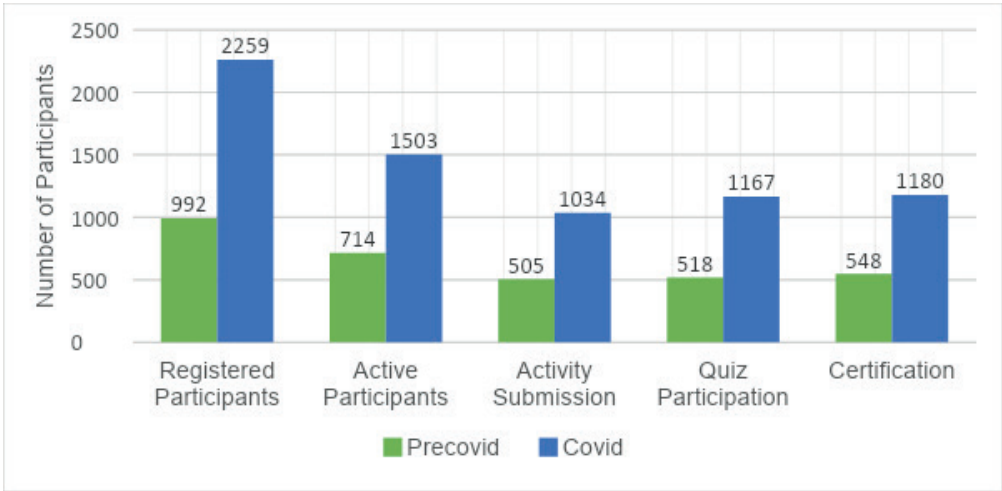
Analysis of Learners' Participation in MOOCs during Pre-covid and Covid-19 Period

Course registration patterns, active participation, assignment submission pattern, participation in quizzes and

learner certification were analysed during both periods of MOOCs. Figure-1 shows learners' overall participation in various activities during pre-covid and covid-19 periods. A total of 2,259 learners registered in the covid-19 period, which was 127 per cent higher

than the 992 learners registered in the pre-covid period. This clearly shows that the learners have evinced more interest during the pandemic period to participate in online programmes like MOOCs to utilise their time at home more effectively.

Figure-1: Learners' Participation Pattern of MOOC during the Pre-covid and Covid-19 Periods



The number of active learners during the pre-covid was found to be 714 as compared to 1503 during covid-19 periods, thereby indicating an increase of 111 per cent. A similar trend was observed for course completion, with 1,180 learners completing successfully during the covid-19 period as against 548 during the pre-covid period. This indicates 115 per cent increase in course completion. There was a significant increase in the number (more than 100 per cent increase) of learners' participation in all activities during the covid-19 period. It further indicates that because of the covid-19 (lockdown) situation, the learner might have got more time to participate in all activities to complete the course successfully. The pandemic seems to have compelled

the learners to attend online courses for their capacity development as they could not attend conventional training programmes.

Analysis of Learners' Engagement in Courses

Milligan et al., (2013) stated that understanding the learners' engagement is critical to the success of any online education, with the requirements that the learner should self-motivate and self-direct their learning. They identified confidence, prior experience, and motivation as the key factors of learners' engagement in MOOCs. An attempt was made in this study to quantify the engagement pattern of the learners in both MOOCs.

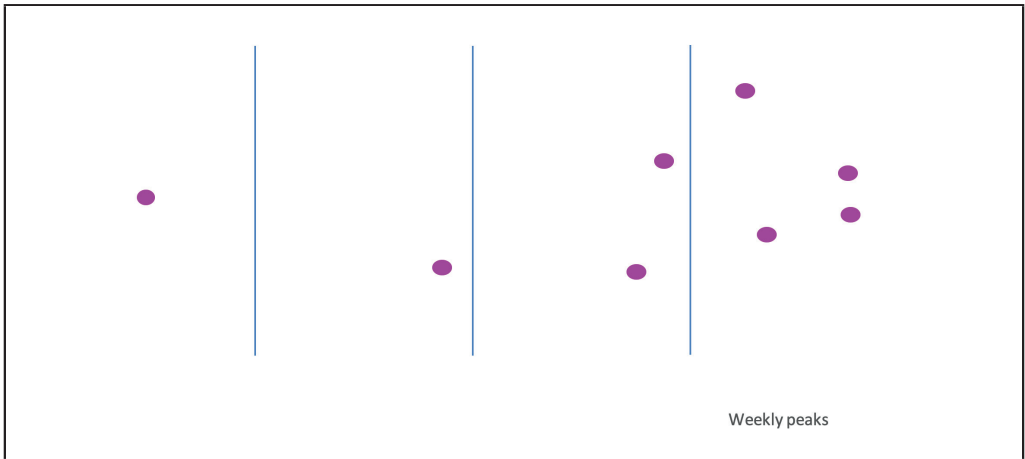
Table-1: Week-wise Analysis of Learners' Engagement (through number of hits) in MOOCs during Pre-covid and Covid-19 Period

Week	Number of hits during Pre-covid	Number of hits during covid-19	Change (%)
1	16,392	51,360	213
2	21,558	31,534	46
3	29,807	71,387	140
4	50,877	91,020	79
Total	118,634	245,301	107

Learners' engagement in the course was analysed through the week-wise course login details i.e. viewing the course content, discussion forum participation, interaction with faculty, assignment and quiz submission etc. As shown in Table 1, the learners' participation was growing exponentially from week 1 to week 4 during both MOOCs except for the second week of the covid-19 period

as this week contained fewer activities compared to the previous MOOC. Learners' participation was highest in the final week of the 4 weeks because of more activities like completion of viewing course content, assignment submission and quiz participation. It was also observed that the covid-19 period had 107 per cent more participation compared to the pre-covid period.

Figure - 2: Day-wise Analysis of Learners Interaction in MOOCs during Pre-covid and Covid-19 Period



As shown in Figure-2, during the covid-19 period, there were more hits than the pre-covid period for 28 days out of 30 days. Average hits per day during the pre-covid and covid-19 periods was 3,954 and 8,176, respectively. The maximum number of hits in a day was 11,059 and 20,531 during the pre-covid and covid-19 periods respectively. It

is observed from Figure-2, there was a peak in the 2nd, 3rd, 4th week of the pre-covid period and 3rd, 4th week of the covid-19 period which captures learners' engagement in activities like assignments, doubt clarification or discussions which were planned towards the end of the week.

Region-wise Learners' Engagement in MOOCs during Pre-covid and Covid-19 period

India is a vast country with varying landscapes of cultural and sociological factors. Hence, the study also considered identifying the demographic regions of the country which responded well to adopting online learning during the covid-19 period, with the benchmark of similar study for the pre-covid period.

Region-wise Course Registration Pattern

As seen in Table-2, the participants' registration had increased in all six regions of the country during the covid-19 period. In particular, the remote areas like the Northeast region recorded the highest increase of 383 per cent. It shows that MOOC is an effective model for reaching the unreached (difficult areas) people during this pandemic situation. It was followed by the South region which showed an increase in registration by 155 per cent during covid-19. This was followed by North, Central, East and West regions.

Table-2: Region-wise Participants' Registration Pattern in MOOCs during Pre-covid and Covid-19 Period

S.No.	Region	Pre-covid (Numbers)	Covid-19 (Numbers)	Change (%)
1	Central	42	81	93
2	East	77	148	92
3	North	151	371	146
4	Northeast	12	58	383
5	South	396	1011	155
6	West	314	590	88
Total		992	2259	128

Region-wise Pattern of Active Participants

MOOC is known for high drop rates thereby resulting in low active participation in the course. This study focused on the "activity pattern" of those active participants across the different regions of the country. Learners who participated at least in any one of the activities or viewing content were highlighted in Table-3. The South

region had the highest number of active learners among other regions and less number of active learners from the Northeast region in both courses. Even though the Northeast region had less number of active learners, it showed the highest increase in percentage (425 per cent) during the covid-19 period. It indicates that Northeast learners have more proactively participated during the pandemic situation.

Table-3: Region-wise Active Participants in MOOCs during Pre-Covid and Covid-19 period

S.No.	Region	Pre-Covid (Numbers)	Covid (Numbers)	Change (%)
1	Central	29	51	76
2	East	53	95	79
3	Northeast	8	42	425

4	North	104	229	120
5	South	282	725	157
6	West	238	361	52
Total		714	1503	111

Region-wise Assignment Submission Pattern

Learners were expected to submit the assignment for successful course completion. Results revealed that assignment submission of participants increased in all six regions during the covid-19 period compared to the pre-covid period. The Northeast region had less number of assignment submissions.

But, there was the highest percentage of increase that was asserting much improvement compared to pre-covid period. The West region had the least percentage of increase in the submission of assignments compared to other regions. The highest number of South region learners has submitted their assignments which was the second highest increase in percentage compared to the pre-covid period.

Table-4: Region-wise Assignment Submission Pattern of Participants during Pre-covid and Covid-19 Period

S.No.	Region	Pre-covid (Numbers)	Covid (Numbers)	Change (%)
1	Central	16	30	88
2	East	31	78	152
3	North	77	181	135
4	Northeast	5	33	560
5	South	188	566	201
6	West	201	279	39
Total		505	1034	105

Region-wise Participation Pattern in Quiz

Quiz is an important aspect of online learning as it gauges how much a learner learned from the course. It also helps to assess knowledge and understanding of the course content (Kalantzis & Cope, 2012). Table-5 indicates a total of 125 per cent increase in quiz participation during the covid-19 period and also

indicated that all regions have recorded more than 100 per cent increase in quiz participation during the covid-19 period except for the Central and West regions. The Northeast region had the highest increase in percentage of quiz participation whereas the West region recorded the least increase in percentage of learners' participation in the quiz.

Table-5: Region-wise Learners' Participation Pattern in Quiz during Pre-covid and Covid-19 Period

S. No.	Region	Pre-covid (Numbers)	Covid (Numbers)	Change (%)
1	Central	14	28	100
2	East	36	65	81

3	North	75	163	117
4	Northeast	6	26	333
5	South	187	514	175
6	West	187	238	27
Total		518	1167	125

Region-wise Learners' Certification

Course completion certificates were awarded to the learners who fulfilled the assignment submission, discussions and quiz participation with more than 40 per cent score. In the South region, the highest number of learners were awarded completion certificates during the covid-19 period. But in the pre-

covid period, the South region had the second highest certified learners. In the Northeast region, 4 times more learners were awarded certificates during the covid-19 period compared to the pre-covid period. More than double the number of learners got certificates compared to the pre-covid period in all regions except the East and West region.

Table- 6: Region-wise Learners' Certification in MOOCs during the Pre-covid and Covid-19 period

S. No.	Region	Pre-covid (Numbers)	Covid (Numbers)	Change (%)	Pre-covid Completion Rate (%)	Covid Completion Rate (%)
1	Central	18	32	78	3.3	2.7
2	East	37	78	111	6.8	6.6
3	North	78	183	135	14.2	15.5
4	North East	7	33	371	1.3	2.8
5	South	201	573	185	36.7	48.6
6	West	207	281	36	37.8	23.8
Total		548	1180	115		

Association between Region influence on Learners and Learners' Participation

A Chi-square test was carried out to check whether there is any association between regional influence on learners and learners' participation during the pre-covid and the covid-19 periods with respect to registration, discussion, assignment submission, quiz participation and certification.

Null hypothesis (H0): There is no significant association between any region influence and learners'

participation during the pre-covid and the covid-19 periods in terms of registration, discussion, assignment, quiz and certification.

Alternative hypothesis (H1): There is a significant association between regional influence and learners' participation during the pre-covid and the covid-19 periods in terms of registration, discussion, assignment, quiz and certification.

Data pertaining to during pre-covid and covid-19 period performance is given in Table 6. The statistical analysis showed

that P-value and chi-square values are 0.001 & 20.06 for learners' registration in the MOOCs, respectively. For active participants in MOOC, the P-value and chi-square value is 0.001 & 31.32 respectively. P-value and Chi-square value is 0.001 & 39.52 respectively for learners' assignment submission in the MOOC platform. In the case of quiz participation, the P-value and chi-square value is 0.001 & 46.13, respectively. For the MOOC certification

P-value and chi square value is 0.001 & 42.18, respectively. Since, the P-value is less than 0.01 level of significance for all variables, it can be concluded that there was a significant association between regional influence on learners and learners' participation with respect to registration, active participants, assignment, quiz and certification during the pre-covid and the covid-19 periods.

Table-7: Association Analysis of Regional Influence on Learners and Learners' Participation

S. No.	Variables	Chi-square value	P-value
1	Registration	20.06	<0.001**
2	Active Participants	31.32	<0.001**
3	Assignment	39.52	<0.001**
4	Quiz	46.13	<0.001**
5	Certification	42.18	<0.001**

** Significant at 1% level

Gender-wise Learners' Participation in MOOC during Pre-covid and Covid-19 period

The study also explored the gender influence on learner participation during both the periods.

Gender-wise Course Registration Pattern

The registration pattern of learners is given in Table-8 which described that total 627 male participants registered in the pre-covid period whereas 1,364 (118 per cent increase) registered in the covid-19 period. Female participants registered in the pre-covid and the covid-19 period were 365 and 895, respectively. Male participants registered more than females in both courses during the pre-covid and covid-19 periods. This is in agreement with the findings of Wu and Chen (2017), who reported registrations of 59.1 per cent of male learners as compared to

40.9 per cent of female learners for MOOCs. Another study by Kaveri et al., (2016) who reported that 72 per cent of learners were males, also corroborates this fact. However, it was observed that the female learners had the highest increase in percentage (145 per cent) as compared to males (118 per cent). It shows that female learners actively registered during the covid-19 period more than male learners.

Gender-wise Pattern of Active Participants

Results (Table 8) indicated an overall 111 per cent increase in participation in the course like, viewing the course content, participating in the discussion forums, assignment submission and taking final quizzes during the covid-19 period. Out of these, more percentage (122 per cent) of female learners actively participated in the covid-19 period compared to male learners.

Gender-wise Assignment Submission Pattern

Table 8 shows that male and female participants have equally submitted the assignments as a part of course completion. Coincidentally both genders registered a 105 per cent increase in assignment submission during covid-19 period.

Gender-wise Learners' Participation Pattern in Quiz

Table 8 indicates that nearly more than double of the learners of both genders were involved in attempting quiz during the covid-19. Out of this 132 per cent and 122 per cent increase in female and male learners for attempting quiz during covid-19 respectively.

Gender-wise Learners' Certification

More number of male learners got the certificate in the covid-19 period but the increased percentage is less compared to females. It shows that during the covid-19 period more percentage of female learners participated to get the certificate. It may be interesting to note that Healy (2017), had observed that female performance in online programmes was low probably because of differences in internet access, language and other psychological barriers. However, the covid-19 seems to have maintained a similar trend in accessing online courses for both genders because of equal opportunities to access the resources because of stay-home learning.

Table- 8: Gender-wise Participation in MOOCs during Pre-covid and Covid-19 period

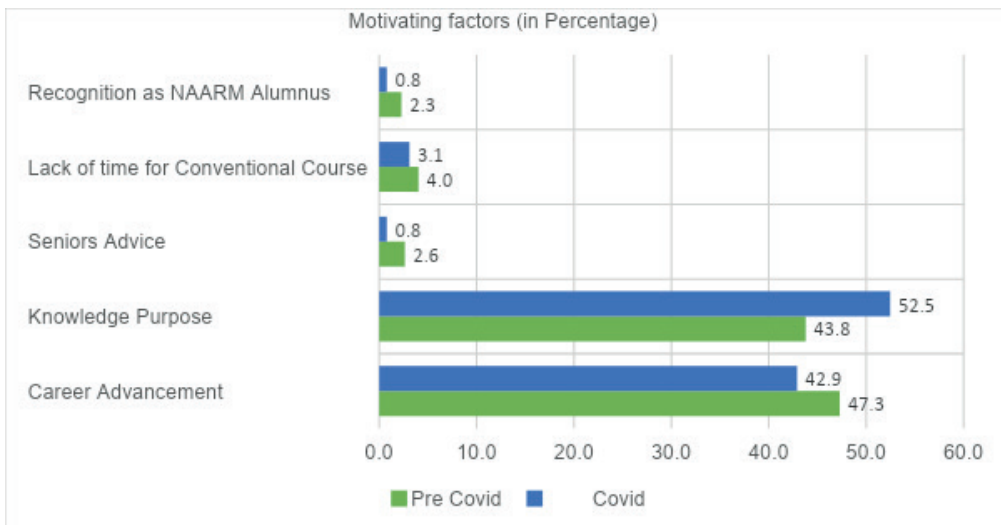
Categories	Gender	Pre-covid (Numbers)	Covid-19 (Numbers)	Change (%)
Registration in MOOC	Male	627	1364	118
	Female	365	895	145
	Total	992	2259	128
Active Participants in MOOCs	Male	447	911	104
	Female	267	592	122
	Total	714	1503	111
Assignment Submission Pattern	Male	309	633	105
	Female	196	401	105
	Total	505	1034	105
Quiz Participation Pattern	Male	319	707	122
	Female	199	460	132
	Total	518	1167	125
Learners' Certification	Male	338	715	112
	Female	210	465	121
	Total	548	1180	115

Motivating Factors to Learners' Participation in MOOCs during Pre-Covid and Covid-19 Period

Data for this analysis was taken from the learners' feedback submitted through a google form. Figure-3 illustrates the different factors that motivated learners to enroll in the course during the pre-covid and covid-19 period. Results revealed that in courses, knowledge purpose and career advancement were the important motivating factors. Knowledge purpose (52.5 per cent) and career advancement (47.3 per cent) was the greatest influencing factor during the covid-19 and pre-covid periods, respectively.

The second-highest motivating factor was career advancement (42.9 per cent) and knowledge purpose (43.8 per cent) during the covid-19 and pre-covid periods, respectively. It shows that personal development was an important influence for learners to enroll in MOOCs. Seniors' advice, lack of time for conventional courses and recognition as NAARM alumni were the least (less than 5 per cent) stimulating factors for learners during these two MOOCs. This finding is in agreement with that of Alario-Hoyos et al., (2017) who indicated intrinsic goal orientation and self-efficacy as the strong factors for enhancing learning and performance in a MOOC.

Figure-3: Motivating factors for Learners' Participation



Conclusions

The study has emphatically established the fact that learners have actively moved towards online education in the form of MOOCs during the covid-19 period. The study on the geographic and gender distribution of learners has reinforced the fact that MOOCs can be an effective mode of learning to reach remote and unreached areas and also

to encourage participation among both genders equally. The study has far-reaching relevance and impact for a country like India where there is a humongous magnitude of learners to be provided with the education, coupled with challenges like the covid-19 scenario. The practice of MOOC can thus be institutionalised among all educational organisations for effective and inclusive education.

Implications and Recommendations

The findings reveal a positive shift towards adopting MOOCs, in the wake

of covid-19. This augurs well in line with the National Education Policy (NEP) 2020 which highlights the role of technology in online education.

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