

Hybrid Learning and Teaching in Mathematics Courses Due to COVID-19

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Received: 27 November, 2020 / Accepted: 21 May, 2022 / Published online: 31 August, 2022

Abstract.: The educational strategies have changed in Pakistan due to COVID-19. This epidemic covers almost 204 countries and territories all over the world and on 11th March 2020, WHO declared this outbreak as a pandemic. Pakistan has become one of the two hundred and four countries over the world has stopped their educational activities and closed their institutions for unspecified duration. As we know that spring semester was started in the month of January in Pakistani universities, and had covered almost half path of its journey. In this situation, HEC (Higher Education Commission) announced that universities must convert educational activities in hybrid teaching mode and start online teaching. We made a case study on the Learning Management System (LMS), Campus management System, and WhatsApp etc. Apply these tools on private sector engineering university where two hundred and fifty students enrolled in different mathematics courses. The outcome of this study shows that quick switching to the online education system was little bit difficult but successful. Though in the beginning, there were some problems for teachers and students both but overall the experience was good. Government of Pakistan will reopen the education institute in the month of September and in these days we are quite close to resume educational activities as per the regular practice. The aim of this study is to support to continue the hybrid teaching mode at tertiary level in the regular teaching practice specifically of Mathematics courses. In hybrid teaching mode, the ratio of face to face teaching is seventy percent and online tools and teaching strategies used thirty percent. This method of teaching and learning keep students connected with their teachers. Lastly, we suggest that there is still a room for

betterment in LMS. The result of this study shows that students' performance in mathematics class and exam has been improved by using different application, software and gadgets. E-learning teaching and learning method will be beneficial strategy.

AMS (MOS) Subject Classification Codes: 00A06; 00A35

Key Words: E-Learning, Hybrid Teaching, Tertiary level, Technological Tool.

1. INTRODUCTION

In Pakistan, universities have conventional education systems where the pupils have to come in university campus and attend the classes every day as per their timetable. Unfortunately, educational strategies have changed in Pakistan due to COVID-19. When COVID-19 spread all over the world and first case was reported in Pakistan in late February then Pakistani government was taken decision and closed all educational institutions from 1st March, 2020 till 15 March, 2020. However, the condition of all over the world day by day went worst and the highest single-day death toll rate daily increased in the month of March. Then different countries including Pakistan announced lockdown with no time limit. In the other side spring semester had covered almost half path of its journey in Pakistani Universities. So, HEC announced that universities must prepare online classes strategies and start online on earliest basis. The classrooms of Pakistani universities are equipped with new and old teaching tools like white board, projectors or audio-visual display equipment, blackboard, marker, and chalk etc. However, the requirement of online classes is total change. The tools which are essential for online class are internet, communication applications, PC/Laptop and software. From the last decade, the use of technology increase day by day in the field of education as well. There can be many types of online learning systems introduced like Knowledge base, online support, asynchronous training, synchronous training and hybrid training. Lectures and notes are published on the website in knowledge base online learning. Students follow general instruction with no any online support. In modified version of knowledge base is online support available for some topics through web forum and other communication tools. In Asynchronous training, student get content regularly and communicate with teacher through email or other communication tools. Students can communicate with the teacher and other group members in a real time this type known as synchronous training. Hybrid teaching is a merged method of online and in-person interaction. In this hard period, most of the Pakistani universities select Hybrid teaching method. The first phase had covered before COVID-19. While in second phase, universities deciding platform for live student-teacher interaction and uploading of video lectures then universities got the support from large companies such as Microsoft, Google, Zoom, and Slack. These companies have offered many free features of their product. In further, U.S., China, Japan and Italy these are the countries where Zoom has increase the video call time as per their request. From the 1st July, 2020 Google has offered its enterprise video conferencing features with around 250 people at a time and G suite education customers can use recording option. Microsoft is the big name in computing world they offered anyone its premium version of teams for free six months and extended existing user

limit.[9].The objective of this study is to improve mathematical skills by using different and latest technological tools.

2. RELATED LITERATURE

The study of related literature reveals that the main cause to close the educational institutions is children. They are sensitive and affected early, they can become the source. [1]. Another researcher group provides the approach is that “in the cause that sufficient precautions are not taken, or precautions are reduced then pandemic may show a very fast change in the negative direction”, then the cure is social distancing has to be applied.[2]. The infectivity due to contact with the infected person is the most significant alternative of the spread of Corona virus.[6]. [7] state that the online teaching is currently raising due to COVID-19. It is convenient in terms of effort, time and location [8], and its most suitable alternative of physical environment where we can train and evaluate students skills [3]. For implementation of e-learning method, there are two types of resources are required. Number one is digital for instance educational videos, teaching platforms, video conferences, podcasts, social and social networks. Whilst in technological aspect we need desktop PC, tablet, Smartphone etc. In mathematics courses, e-learning strategies play more effective role than other courses. For instance student attained class and listen a lecture but due to some reason they cannot catch any important point at that stage recorded lectures were helpful and student can replay the recorded lecture and understand that can easily. In online mode LMS, Zoom, Google meet are still rooms for students’ betterment.

3. OBJECTIVES OF THE STUDY

The aim of this study is to support to continue the hybrid teaching mode at tertiary level in the regular teaching practice specifically of Mathematics courses. In hybrid teaching mode, the ratio of face to face teaching is 70 percent and online tools and teaching strategies used 30 percent. This method of teaching and learning keeps students connected with their teachers and modern world of technology.

4. RESEARCH METHODOLOGY

4.1. Subject. In this study, the population was the students of private engineering university. 250 students were selected as a sample and these students enrolled in different mathematics courses. Convenience sampling (Leiner, D. J. (2014)) had been used to choose Karachi, Pakistan based sample [3]. While the WhatsApp groups also be created in each mathematic course for students convenience.

4.2. Online learning and teaching tools.

4.2.1. Learning Management System (LMS). This is a basic tool for online education system. LMS has manage all course content and students’ attendance. Teacher upload their recorded lecture, quizzes, assignments, reference books, notes and other videos related to the topic. Furthermore, midterm exam and final exam also be conduct on LMS.

4.2.2. Campus Management System (CMS). CMS manage teacher and students administrative activities and teaching activities. Like students enrolled course, results, attendance.

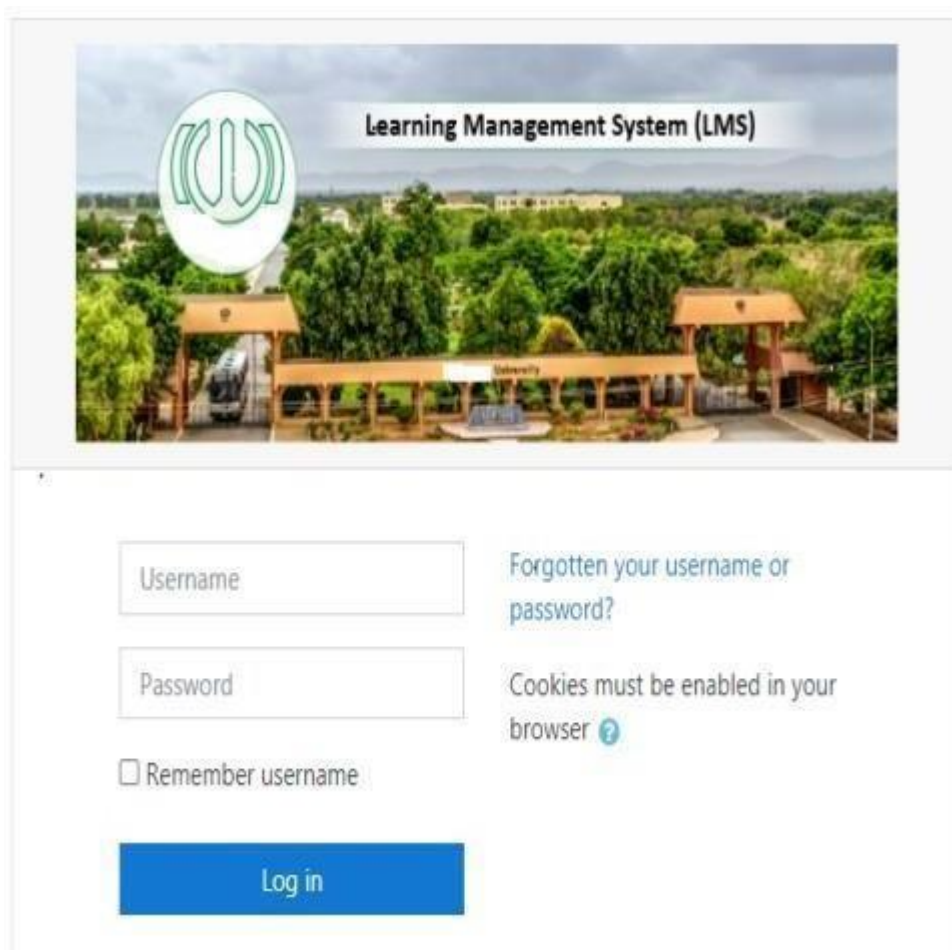


FIGURE 1. (Learning Management System (LMS))

4.2.3. *WhatsApp Group*. Through WhatsApp teacher and students communicate easily. Nowadays everyone has smart phone and cellular campiness offer cheap packages especially for students or some mobiles campiness provide free whatsapp. In further, via this application teacher can share different notes, books PDF, some informative video etc.

4.2.4. *ZOOM Meeting*. Zoom meeting application provide online classroom. You can easy conduct your class with large number of students group. Zoom also provide whiteboard sharing option which is helpful in mathematics class. On the other side students also share their screen after teacher permission and teacher can shares Power point slides, books PDF, and word documents. Teacher can record their session for LMS uploading and students can access it on LMS if they want to learn or miss something during online zoom class.

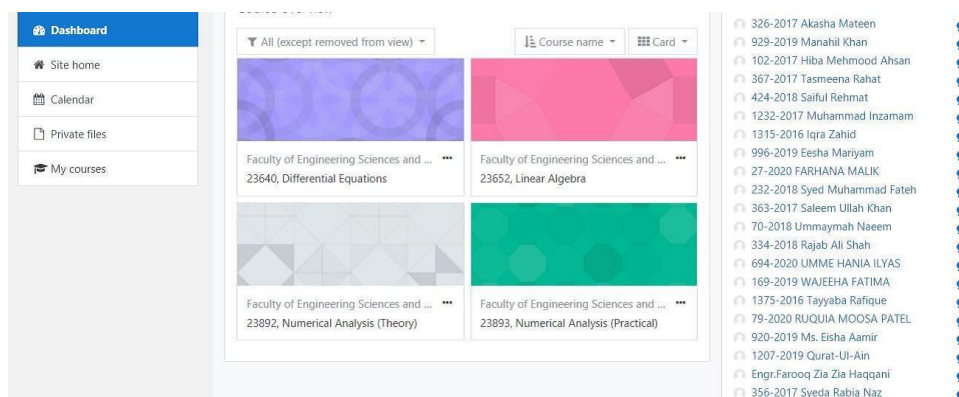


FIGURE 2. (Learning Management System with courses and enrolled students names)

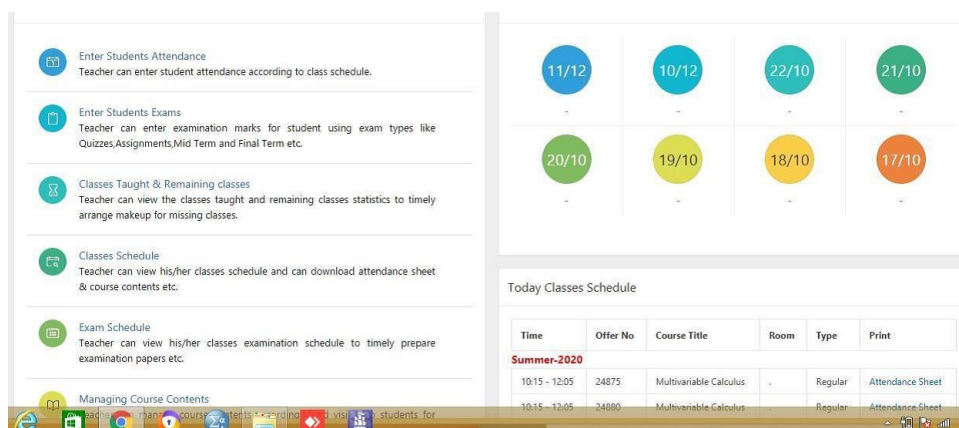


FIGURE 3. (Campus Management System(CMS))

4.2.5. *S.O.S. Mathematics*. S. O. S. Mathematics is free resource for math review material of Calculus, Algebra, Numerical Analysis, Differential Equation, Complex Variable and some other mathematics branches. This site is helpful for school, collage and undergraduate students. Browse more than 2,500 mathematics pages filled with easy understanding explanations. This site gives a platform for your mathematics needs.

5. RESULTS PARADIGMS

In spring 2020, due to COVID-19 hybrid teaching method was implemented and results are better than conventional method of teaching in mathematics courses. Following are the paradigms of results.

Exam Summary				
Dist	Total	Dist	GPA	Res
77	100	B+	3.33	Pass
82	100	A	3.66	Pass
80	100	A	3.66	Pass
82	100	A	3.66	Pass
82	100	A	3.66	Pass
72	100	B	3.00	Pass
76	100	B+	3.33	Pass
88	100	A	4.00	Pass
75	100	B+	3.33	Pass
76	100	B+	3.33	Pass
73	100	B	3.00	Pass
76	100	B+	3.33	Pass
77	100	B+	3.33	Pass
77	100	B+	3.33	Pass
78	100	B+	3.33	Pass
78	100	B+	3.40	Pass
78	100	B+	3.40	Pass
77	100	B+	3.33	Pass

FIGURE 4. (Result table of Differential Equation Sp-2020)

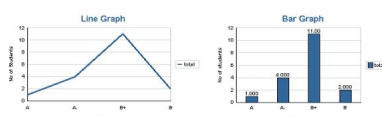


FIGURE 5. (Result Graph of Differential Equation)

Exam Summary				
Dist	Total	Dist	GPA	Res
80	100	A	3.66	Pass
86	100	A	4.00	Pass
	100		0.00	Fail
85	100	A	4.00	Pass
87	100	A	4.00	Pass
90	100	A	4.00	Pass
90	100	A	4.00	Pass
71	100	B	3.00	Pass
85	100	A	4.00	Pass
86	100	A	4.00	Pass
86	100	A	4.00	Pass

FIGURE 6. ((Result table of Linear Algebra Sp-2020)

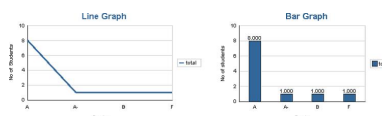


FIGURE 7. ((ResultGraph of Linear Algebra Sp-2020)

5.1. **Differential Equation Course result-Spring 2020.** [Total students: 18 Grade A= 1 ; Grade A-= 4 ; Grade B+= 11 ; Grade B = 2]

5.2. **Linear Algebra Course result-Spring 2020.** [Total students: 10 Grade A= 8 ; Grade A-= 1 ; Grade B= 1 ; Grade F = 1]

5.3. **In spring 2019 semester the conventional teaching method was implemented.** [Differential Equation Course result-Spring 2019]Total students: 16

Exam Summary				
Obt	Total	Grd	GPA	Res
53	100	D	1.00	Pass
51	100	D	1.00	Pass
50	100	D	1.00	Pass
50	100	D	1.00	Pass
75	100	B+	3.33	Pass
16	100	F	0.00	Fail
14	100	F	0.00	Fail
50	100	D	1.00	Pass
3	100	F	0.00	Fail
73	100	B	3.00	Pass
71	100	B	3.00	Pass
92	100	A	4.00	Pass
71	100	B	3.00	Pass
29	100	F	0.00	Fail
90	100	A	4.00	Pass
52	100	D	1.00	Pass

FIGURE 8. ((Result table of Differential Equation Sp-2019)

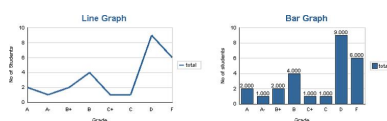


FIGURE 9. ((Result Graph of Differential Equation Sp-2019)

Grade A= 2 ; Grade A-= 1 ; Grade B+= 2 ; Grade B = 4 ; Grade C+= 1 ; Grade C = 1 ;
Grade D = 9 ; Grade F = 6

6. CONCLUSION AND RECOMMENDATIONS

In this paper we discussed how to carry on teaching and learning during bad time of COVID-19 with the help of different technology tools. At initial stage of online classes many difficulties were faced students and teachers both. But they were used to after few days practice. Online tools save students time and developed awareness about different educational software's. Whilst the different function of technologies and the fast infusion of gadgets in classrooms make the online classes experience interesting and exciting and students was worked independently which is the big advantage. This research reveals that students' performance in mathematics courses has been improved by using different applications, software and gadgets. The exam result of students shows that if we implement hybrid system in our routine education life it will be highly beneficial for both teachers and students. In addition parents are also being aware of their children performance. Apart from the above, teachers should have up dated knowledge and skills of their subject as well as have latest technology tools which they can use in their teaching. Results of different studies conclude that the e-learning environments can be used successfully in higher education system if institutions having proper technical tools and support. To Sum up, pandemic 2020 give a lesson to prepare a new rules and regulations, platforms for future cases, where the whole world will be prepare than the today

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