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RESEARCH ARTICLE

THE EFFECTS OF ONLINE LEARNING ON LONG-TERM EDUCATION AFTER COVID-19

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ABSTRACT

As the world is technologically evolving, speedy solutions show up at any time. Starting from 2019 onwards, a new member of corona viruses has appeared which is COVID-19. The world witnessed a dramatic spread of this virus that it has become a pandemic. The educational system was about to fall apart without the appearance of what is called online learning. In previous times, most educators relied on traditional learning; some did on blended learning, and a few on distance learning. All educators and institutions around the world cooperated to fix the issue of shutting down schools due to COVID-19 deadly cases. It happens that online learning has gained its popularity so quickly as being the most appropriate solution at the current time of COVID-19. However, no field is flawless. It is 2020's world challenge in education that must be closely reviewed for further reference.

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INTRODUCTION

Our world is experiencing extreme changes in technology. Due toCOVID-19pandemic in 2020,online learning is gaining popularity."COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. COVID-19 is now a pandemic affecting many countries globally" (World Health Organisation, 2020). According to UNESCO's statistics on 29th April 2020 (UNESCO, 2020), there are 1,292,378,969 affected learners, 73.8% of total enrolled learners and 186 country-wide closures as shown in figure 1. To ensure the safety of learners and educators, facilities of online learning must be available for everyone to establish social distance. Traditional, blended and online learning are going to be defined with their pros and cons to examine their effectiveness as ifin COVID-19 pandemic. Traditional learning has shown its limitations: All educators and students should be physically present to complete the educational process. Blended learning has its neutral role by combining the ability to be physically present but for limited meeting times and the ability to establish communication between tutors and students and between educators themselves. Will online learning be the best solution of our world crisis? Online learning happens to be the dominant mode; consequently, an overlook on how online learning can be achieved is given through the methods used such as specialised programmes, and these programmes adaptability among different institutions. From this point, programmers can improve the applications that contribute in the capability of online learning. To assess students, there are four methods of grading demonstrated and discussed in their terms of strengths, weaknesses, requirements and considerations. In previous times, medicine and engineering were excluded from distance learning due to the absence of professional training. However, in COVID-19 pandemic, they need to enrol in online learning to keep the education system running with no delays. How can we develop old ways to fit into our technological world? Are we going to end up relying on online learning fully in such fields? Or are we going to stick to some traditional methods? Or a hybrid of education methods is needed?

Literature Review: Before COVID-19, most of schools relied on traditional learning whereas other organisations used blended learning and a few ones were working on distance learning. Researches show that traditional and blended learning have better consequences than distance learning. In table 1, a comparison between them is demonstrated based on empirical researches by different authors, showing what their advantages and disadvantages are followed up by a discussion about the effectiveness of each method. In traditional learning, both the tutor and the student are in the same physical place. They are continuously being tracked by their tutors. Students are given enough motivation to be continue their studying (Tseng, 2020).

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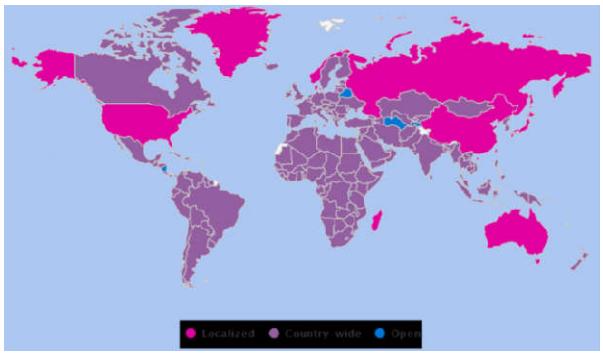

Figure 1. Global monitoring of school closurescaused by COVID-19.

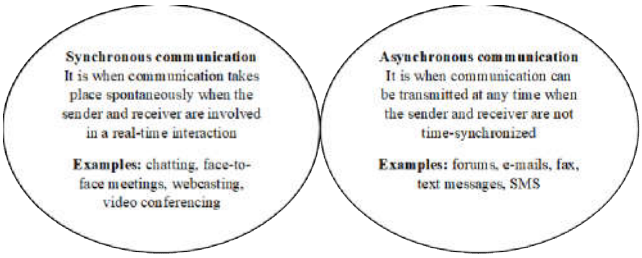

Figure 2. Synchronous and asynchronous communication

The tutor is the leading source of knowledge to his students without less scientific resources available. Students are barely involved in the questioning what they are being taught as their tutors' instructions are unchallengeable unless they are asked to. Thus, the students may be either active or non-active thinkers so they lack essential skills (Khalaf BKh, 2008). However, students have more chance to be reminded of their assignments and tasks on campus in addition to get instructions on time with no delays. They are well-motivated to pursue their education and are morally developing and socialising (KhalafBKh, 2018; Tseng, 2016). Blended learning offers students flexibility. It gives opportunity for online assessments, synchronous and asynchronous communicating as well as face-to-face meetings and proctored final examination. It is a hybrid of traditional and distance learning. In blended learning, there are two environments of learning: an environment where the student and tutor are present; and an environment physically divided between the tutor and the students in which they intercommunicate using technological communication and provide their students with content of their lessons using different multimedia. Time-management is vital as both students and tutors are given specific timing to achieve certain tasks (Rivera, 2016; Tseng, 2016; Wong, 2016).

As for distance learning, it has offered students to complete their studies from their remote areas. It has negative sides. As assumed, students are not fully satisfied with distance learning as they may experience ambiguity in their material when delivered. Instructions given may be unclear and need to be clarified with feedbacks. However, distance learning can be modified by computer-based communication (CMC) to produce what is called 'Online Learning'. Distance learning lacked what online learning has in terms of technologies as it is assumed that these technologies do not differ from traditional learning that much. Online learning facilities were limited and barely available. However, this was not forever in the world of continuous technological development. In England, students are provided with laptops and internet routers (BBC, 2020). Braika et al. in their earlier research demonstrated how the learning outcome of students using online learning was better than those who attend regular classes (Baika, 2009). Online learning has enhanced education. Thus, in COVID-19 pandemic, online learning comes out as a life saver.

Online courses have engaged students in active learning that fits their modern lifestyle. No distance is important as long as the educators and learning are connected together. Students' learning outcomes are enhanced and lectures can be re-viewed and revised by students at any time. Thus, a significant increase in learning outcome is noticeable (Rivera, 2016).Online learning is more accessible in higher education. Most of university students already have access to modern technology. Universities and colleges in Scotland have set new measures for online learning to deal with the pandemic (BBC News, 2020b). As for K-12, in Churston Ferrers Grammar school in south Devon, England, students are provided with PCs and are working within a forum with their teachers since the school was shut due to a corona virus case (BBC News, 2020c). J. Benila Pearl's and N. Arunfred's study has shown that students following online modules concentrate better than those using traditional methods as online media encourages them to better performance (Pearl, 2019). It is technology that widened students' scope on education. In online learning, content is created and then shared among groups to be accessed by any device connected to the internet. Students can be anywhere getting their education in the desired way.

METHODS

Systems of Online Education Methods: Earlier generations in distance learning tended to call televised-broadcasts and video conferencing using Skype. However, online learning can be supported by modern applications providing asynchronous means of communication (e.g. e-mail, threaded discussion boards, and newsgroups) and synchronous means of communication (e.g. chat sessions and webcasting) establishing real-time and face-to-face lectures, conferences and meetings that satisfy online learning needs (Baika, 2009). In figure 2, synchronous and asynchronous communications are defined with relevant examples. To achieve communication there must be a medium, which is this case, specified software. In the following table, there are four popular programmes and platforms used for communicating. An approximate statistic is done to see how many institutions employ them worldwide in their education.

Software employed in online learning varies from an institute to another. Some use Moodle; moodle's Learning Management System (LMS) allows educators to provide online material and assessment as well as communication between tutors and students. Moodle is also usable on mobiles to a wider range of users. There is a web-conferencing system called Big Blue Button designated by several universities that is sufficient for online learning. It is designed for online learning as it supports sharing audio, video, slides, chat, and screen in real-time. Students can, on the other way, share their thoughts through chatrooms held while lectures and tutorials are going live. Zoom helps educators to provide their learners with secure video communication services for hybrid classrooms, office hours and administrative meetings (Zoom, 2020). CISCO Webex enables employees to work from their different locations and to safely connect to their network and teammates. Based on the previous statistics, it happens that CISCO Webex has more popularity. However, this does not mean that the others are not a good fit in online learning.

Those applications are used via several types of hardware e.g. personal computers (laptops) and handheld computers (Tablets). Internet connections are becoming enhanced to fulfill the needs of the e-world. This happened gradually for a number of years. Its accessibility is being spread as well as the speeds and increasing from 2G reaching 5G nowadays.

Programmers Opportunity in Online Education Development: Many of computer programmes are becoming adaptable in smart phones. For example, Microsoft office did not just stick to be only usable on PCs, it has become available as an application in smart phones! Consequently, in the light of online learning, many applications are evolving to fit different devices to facilitate the needs of educators. There are a number of available applications that support online learning including: Google classroom; edX; seesaw; and remind. In table 3, the features of these four applications that can be employed in online learning are shown. This is the golden age of programmers to focus on creating applications to enhance online learning successfully and effectively. There are a variety of devices that are showing up so programmes and applications should also fit them. By spotting highlight on relying on applications to set up online learning, will these applications with their online facilities and features replace tutors? Actually, it is expected that teachers' jobs may be taken over by machines (9).Machines are already taking over many manual works; can robots work as teachers as well?

Online Learning Assessment: "Cancelling exams was something no education secretary would ever want to do, but it was vital in these "extraordinary times"" said Gavin Williamson, England's Education Secretary (BBC News, 2020d).Studies show that online quizzes can provide students with better display quality such us online illustrations and media (Baika, 2009). They are allowed to do their exams using their PCs in their homes. It is difficult to monitor their progress during the exam given time; thus, multiple choices have been offered. A student can submit essays as a given open-book or open-note exam. In the UK, students are given estimated grades by their teachers based on their coursework (BBC News, 2020d). Other institutions can develop traditional exams' methods to fit online learning. For example, they may choose specified exam software to monitor whether students are visiting other websites or simply virtual proctors as in traditional education where students sit in an examination hall and proctored by tutors. Nonetheless, in the twenty-first century, technology and creativity levels are at their utmost evolution. There are numerous ways to cheat and plagiarise to do in-home examination. In the following figure, four methods of grading are reviewed based on researches done empirically in addition to my personal conclusions.

The first method is *Pass/fail grading*. According to Ming Ma (Ma, 2004), it refers to distinguishing acceptable and failing work. By using this method, students are less anxious and pressured about their passing their semesters. They can confidently register and pass more credit hours in a short period of time; although some may fear failing as there is no midway to be assessed with (Ma, 2004; Melrose, 2017). Despite the fact that students can focus on the learning objective because they worry less about their grades, as Ming Ma (2004) has mentioned in her research, a study examined by Gregory A. Harris (Ma, 2004) has shown that although students are comfortable with passing or failing procedure, this method also has its limitations.

When students get their transcripts showing their exact grades, they know what their missing points are to reconsider them later on. As a result, students get higher grades when they were clearly clarified and register less credit hours to score higher GPAs. Nonetheless, educators can adapt this method only for the first semester; so that, freshmen can have insight of their studying and be encouraged to deepen their knowledge in their specialisations. In my opinion, this method may reduce students' capabilities of precise studying and may lead to going backwards in their educational acquisition forgetting their techniques in hard-work-studying they gained in their earlier education. Moreover, advanced students are understated and their unique abilities are underestimated. Indeed, in Sherri Melrose's research, it is agreed that students' interest in learning may be diminished and their quality of thinking will be reduced as they only focus to pass and excellent students will no longer be recognised which is unfair to them (Melrose, 2017).

If this method has been adopted, students can face difficulties in getting accepted in graduate schools as their learning achievements are not clear as well as in job sectors (Ma, 2004). In addition, in the circumstances where students are having in-home assignments or online examinations, it is easy to succeed simply by cheating or getting help from others. One solution to avoid this issue, *High-standard grading* method can be adopted in combination with *Pass/fail grading* method. Grades act as a 'symbolic representation' of students' achievement (Melrose, 2017). The second method is *Criterion-referenced grading*. In the research conducted by Ming Ma (Ma, 2004), by having set up criteria, students' achievement is absolutely indicated. It pushes them to show harder work to satisfy the criteria given as well as they can cooperate in their studying. *Criterion-referenced grading* encourages teachers as well to improve their teaching effectiveness. As any other method, there are limitations. Advanced students can lose interest in learning as there are assessed based on a fixed criterion that does not challenge their intellectuality. They lose motivation and move backwards in their education. In addition, when the syllabus is presumably difficult, the final grades unfairly represent students' learning achievement. Tutors should, as a result, set up clear criteria for students and prepare them well to achieve their desired learning outcomes. Advanced students can register in higher standards courses in which they receive the education that suits their intellectual abilities. Some institutions avoid this method because, surprisingly, it is possible that a large number of students score the same grade and a few score any other grades. For instance, out of a group of 10 students, it is possible that 5 students get an A while the others get C or F. Again, combining *High-standard grading* with *Criterion-referenced grading* method becomes a point of consideration.

As students are given in-home examination and/or assignments, they may easily cheat and get the same grade as discussed earlier. To avoid this issue, *High-standard grading* in combination with either *Pass/fail grading* or *Criterion-referenced grading* method can be considered. David N. Figlio and Maurice E. Lucas conducted an empirical study showing that setting high-standard grading techniques appears to be adaptable (Figlio, 2000). Low performers may struggle but, with providing both motivation from their tutors and support from their parents, they can overcome anxiety and deal with higher standards in learning to end up with the best learning results.

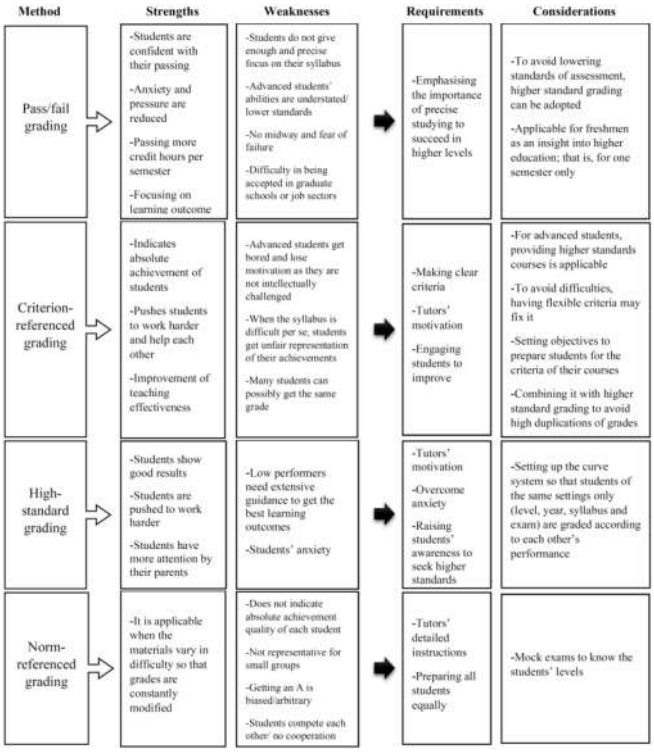

Figure 3. Online learning assessment methods.

High performers proved that they can deal with higher standards as they are work harder. Fara Elikai and Peter W. Schuhmann also showed that strict grades made students motivated to advance their duties (Elikai, 2010). To make it fair for all learners, the curve system ensures that students' results of the same settings are compared to each other. Students who are set up for the same syllabus, same exam, and same timings will not be graded as any other settings. Accordingly, the curve system will set grades depending on the students' outcomes in the same settings (Figlio, 2000).

This brings us to consider *Norm-referenced grading* method. Students get their grades based on their peers' achievement so that a limited number of students get top grades whereas the majority gets mid grades although a number of students can possibly fail (Melrose, 2017). This method depends on a statistical system called the 'curve' which depends on the academic achievement of students as a whole. When students face abnormal syllabus difficulty, this may affect their performance as they are newly exposed to such material. The curve can help them get the grade they deserve based on the overall achievement of students to avoid getting low grades because of the lack of experience in abnormal difficulties. However, according to D. Royce Sadler, there is an imbalance of power between learners that may affect the overall grade of the group (Sadler, 2009). Although this abnormal material may affect the majority of students, a number of students can ace it and get higher scores and affect the curve dramatically. Here comes the role of tutors, they should set clear instructions for their students to be all equally prepared. One way to examine students' level is by setting mock exams to know their academic progress and their level of acquisition. Based on mock exams results, there should be flexibility in the curve system so that all students get fair grades. Considering that technology nowadays is super advanced that students can make use of to cheat or plagiarise, programmers can work harder to improve plagiarism detectors. Institutions can set high standards while assessing their students, either these institutions choose to follow *Pass/fail grading*; *Criterion-referenced grading*; or *Norm-referenced grading* method. Tutors should motivate students to study harder and raise their awareness about the importance of effective education. This is a challenge for both students and tutors. It is a challenge for students as they are facing advanced education that examines their intellectuality alongside their acquisition of information; it examines their adaptability of modified learning that pushes them to production and development. It is a challenge for tutors as they will seek new methods of teaching, seek new syllabuses, and seek new material that corresponds the development of the twenty-first century.

Making New Methods In Practical Subjects As Medicine And Engineering: A number of studies has reviewed online learning effectiveness in fields like clinical subjects and engineering. In the following table, a comparison between traditional learning and online learning effectiveness in those fields are demonstrated in two study cases. Some fields of study such as medicine and engineering require real-time lectures and practical sessions to achieve the satisfactory results needed from the students. Nevertheless, online learning is fixing this need by media and online lectures and seminars. By this, they are provided with a wider access to information throughout search engines and wider tools for their research worldwide. Developers are doing their best to transfer online material in the best possible way. It is said that the students of twenty-first century are going to hitting the ground running with all the facilities they have (Dromey et al., 2019). A study conducted by Jennifer Hall Rivera has demonstrated that the students' learning outcomes and scores significantly increased in online learning; which thereby proves the effectiveness of this learning method to bring out 'authentic learning experience' as traditional classrooms do (Rivera, 2016). In virtual laboratories offered for online learning, students can re-attempt their failed experiments; thereby, their overall comprehension is improved. By online learning, students can access their laboratory sessions remotely with less expenses of providing equipment in traditional laboratories (Rivera, 2020). However, will online learning provide demanded professional training? Professional training is considered a vital part of practical subjects, especially medicine. According to Rivera, students' cognition of understanding their material is increased in traditional laboratory classrooms (Rivera, 2020). Students, then, become more capable of using laboratory equipment and more capable of solving scientific problems with laboratory settings. How things are going to work then during pandemics as COVID-19? One solution can be allowing students with given and authentic permission from their institution to do their professional training in their local hospitals or laboratories. It is agreed, as Rivera has mentioned, that blended learning is a viable option in this case (Rivera, 2020).

RESULTS AND DISCUSSION

As the number of school-closure is very high due to COVID-19 in 2020, education has to be continued one way or another. Traditional education has its obstacles to be considered; students and educators had to follow social distancing to avoid getting the virus. A number of empirical studies have shown that traditional education may give students opportunities to pursue their education on campus with real time lectures but providing students with wider access to information is limited. Students follow up their tutors' instructions lacking observation that is followed up by drawing their own conclusions.

Table 1. A comparison between traditional learning, blended learning and online learning

Study author (year)	Traditional learning		Blended learning		Online learning	
	+	-	+	-	+	-
Rivera (2016)	-Students' cognition and comprehension is enhanced -Good learning setting is available		-Mixing online with in-class assessment makes students outcomes better		-Higher learning outcomes -Authentic learning experience -Re-attempting failures to fix weaknesses	
Tseng and Walsh (2016)	-Higher learning motivation, outcomes, skills and achievement		-Delivers meaningful learning experiences -Learning materials and resources delivered via different multimedia formats -Predicted to be the new normal	-Motivation must be present to engage students in learning -Time management skill is vital	-Substantial and practical course delivery -Instructions is capable with learning styles -Engage in active learning	-Developing social skills is absent
Wong and Ng (2016)			-Hybrid of traditional and online learning so both advantages are present			
Khalaf (2018)	-Students are morally developing	-Students are not given enough space to express their thoughts				
Pearl and Arunfred (2019)		-Less concentration skills			-Better concentration skills and brainstorming abilities as sensory experience is provided due to using digital methods	

Table 2. Number of educational sites employing online learning programmes mentioned

Moodle LMS	BigBlueButton	Zoom	CISCO Webex
Approximately 153843 sites are currently active, registered from 239 countries (21)	Over 2000 members (7)	Over 700 Universities and Colleges (31)	Thousands of academies in more than 180 countries and engages more than 1.3 million students each year (8)

Table 3. Online learning applications

application	Features available
Google classroom	• includes email, documents, and storage • saves teachers' time • keeps classes organized • improves communication with students • affordable, secure and protected • access at any time on the web or via the Android and iOS Classroom mobile apps
edX	• support for offline access to content • secured and anti-spam • supports Learning Management System (LMS) • supports online courses, online campuses, and online degree programs • available for desktop, iOS and Android versions
Seesaw	• supports students' progress assessments • records number of notes on students privately • provides data on parents' engagement • has centralized setup and management • available on iOS, Android, Chromebooks, Computers with Chrome/Firefox, Kindle Fire, and Apple TV
Remind	• sends messages in real-time • translates messages into more than 90 languages • protects the safety and security of users and their personal information • available on iOS and the Android

Table 4: Two study cases of traditional and online learning effectiveness in medicine and engineering

Study author (year)	Field of study	Traditional learning effectiveness	Online learning effectiveness
Wong and Ng (29)	Electronic engineering	Teacher-centred means of education	Information can be replayed as many as needed and accessed by any computer Computer-based-assessment (CBA) encouraged student-tutor interaction Autocorrection programmes facilitated information acquisition Provided clear visual media and illustrations Improved academic performance
Ashouri et al (8)	Nursing	Traditional learning must be present as well to provide laboratory clinical skills Preferred over e-methods	Comprehensiveness is maximised Controlling learning process It works as a complementary role
		A combination was the best	

Distance education offered this issue to provide students with wider range of information wherever they are located; however, tutor-student communication is not enough to deliver their instructions and the subject fully and effectively. Computer-based-communication alongside the innovative means of synchronous and asynchronous communication has provided a path between educators and students to easily keep in touch. From this point, blended and online education has showed up. Blended education supported educators with more flexibility in learning. An environment where both student and tutor are present and a technological environment where they student and tutor can communicate from several locations at any time-zone. Online education is fully being in the technological environment. Facilities of online education are being provided to learners from different organisations so that all learners can receive their education during the pandemic of COVID-19. Active learning; electronically face-to-face meetings; and reviewing lessons not one time but many times are all present in online learning.

Online education is supported by numerous platforms and programmes to establish synchronous and asynchronous communication between educators and students. They are developed and modified to be accessible from different types of devices as well as internet access is widely spreading; thereby, it becomes possible for learners to continue their education successfully. Assessing students is possible in online learning by giving students online quizzes or essay-based assignments. There are several methods of grading students that institutions can adopt according to their policies. Medicine and engineering studies have a debate in accepting to follow distance education. Researches show that even though online education is providing students with online accessibility to a wide range of resources, students still need to be present on campus for professional training. Nevertheless, this is an issue that must get to a solution in the world pf COVID-19 pandemic. All students from all majors have the right to get their desired education. In this world of developing technology, solutions can possibly come up easily.

Expectations: As demonstrated above, online learning may be a way to overcome crisis, although some educators prefer traditional ways. Being compared with traditional and blended learning, some fields may still need to refer back to traditional methods to satisfy specific needs as medicine students who need extreme professional training as they are going to deal with fatal cases and people's lives, or engineers who build entire infrastructures. However, things are never going to be stable; our world is experiencing extreme changes in all fields. Online learning can be modified to fit our everyday lifestyles in different locations. It is expected to impact three major roles.

Role of Teachers And Educators: In the next years, it is estimated that educators will continue using technology in learning as the current circumstances in 2020. That is, for what it has from respectable benefits for educators and students. They will be got used to the ease facilities that online learning has provided. Educators can easily communicate from their homes using the internet and social media per se. Teachers can set their meetings online with much more flexibility than sticking to physical places and times. Due to the rapid revolution in technology, can robots replace teachers? It is possible to record lectures and make these robots present them to students for example.

Assessing students can be through computer programmes that automatically mark their examinations based on certain criteria. However, robots may fail in assessing students' behavioural attitudes or assessing the intellectual human being abilities.

Role of Programmers: It is a golden age for programmers to stand on their own. The educational sector will rely on technology more than before the pandemic of COVID-19. Communication among educators and students will be mainly through social media or special platforms that satisfy educational needs. Programmers can modify software and applications to monitor students' progress at their homes. Students can attend their lectures from different locations according to their circumstances. If a student could not make it to campus, he still has an opportunity to attend his lectures and never miss any.

Role of Campuses: How about attending at schools? Will it be cancelled forever? As educators and students get use to online learning, campuses will be empty and barely busy. When the educational system is passed through online systems, what is the point of spending so much money on buildings maintenance or paying rent if the institution was running by renting an area for example? As a result, why would students pay so much money to register in a university like Harvard to simply attend lectures on Zoom?.

How About Students?: Socialising is so important to build the character of students. By the absence of school attendance, the moral side of students should be recovered. Behaviourism was a key concern in traditional learning. Attention is given for skills of the learners and their experience. Students may lose some vital life skills when they are only working behind screens. These skills may include:

- Time management
- Social skills
- Real life communication
- Family ties
- Physical flexibility

It is educators turn to focus as much as possible to raise awareness among students and make new educational protocols; for example, having less credit hours per day or giving students less assignments to keep a balance between their education and their personal lives. This is also applicable for teachers themselves. They are managing both their home needs and their jobs as teachers.

Conclusion

This paper critically reviews 2020's world experience in online learning during COVID-19 pandemic. It has compared traditional learning, blended learning and online learning all together so that the urge to follow online learning during the pandemic is stated clearly. Nonetheless, online learning needs a number of facilities to have it successfully achieved. There must be communication between educators, educators and students, and students. Synchronous and asynchronous communication absolutely needs a medium to be delivered. Smart phones and personal computers are capable of having so many applications and programmes that satisfy online learning that all institutions can benefit from. Assessing students online from a distance happens to be away from the difficulty that

some institutions may assume. They can adopt *Pass/fail grading* method; *Criterion-referenced grading* method; *High-standard grading* method; or *Norm-referenced grading* method. Each method is discussed in detail so that they are compared clearly. Institutions may choose one based on their personal policies. It is left for practical subjects like medicine and engineering to choose whether to pursue online learning or pursue blending learning to cover professional training.

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