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Online-Learning: A Solution for Teaching and Learning in Higher Education during the Covid-19 Pandemic

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Abstract
This paper describes two teaching and learning approaches that were adopted and compared across five different faculties (i.e., Health Sciences; Natural Sciences; Educational Sciences; Humanities, Social Sciences and Law; lastly Commerce and Administration) over a two-year period (2019 and 2020). Students are subjected to assessments that comprise of essays, practicals, presentations, and written tests. Students were taught using the traditional method (face-to-face learning) in 2019, whereas in 2020 students were taught and assessed using e-learning methods on Blackboard. The Mann-Whitney U test showed that students performed significantly different in 2019 compared to 2020, with greater performance in 2020 than 2019. As a result, there is sufficient data to conclude that online learning is more successful compared to face-to-face learning.
Keywords: Traditional method, e-learning, teaching, Higher Education, Students.
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1. Introduction

Education has a critical role in a nation's development and growth. Despite this, the outbreak of COVID-19 (SARS-COV-2), challenged the education system across the world and it forced higher education institutions to shift from face-to-face to E-learning strategies (Akhter, Jaued, Shah, and Javaid, 2021; and Aboagye, Yawson, and Appiah, 2020; Dhawan, 2020; Mahyoob, 2020) in order to save the 2020 academic year, while protecting students, staff members, and communities from the COVID-19 pandemic (Akhter et al., 2021). However, Mahyoob (2020) opines that, most schools, colleges, and universities are not familiar to e-learning, as a result staff members do not know what e-learning involves.

On March 5, 2020, South Africa reported its first coronavirus case. Dr. Nkosazana Dlamini-Zuma, the Minister of Cooperate Governance and Traditional Affairs, declared a national state of disaster ten days later, (15 March 2020), in the government gazette. Following that, the President of the Republic of South Africa declared a 21-day national lockdown, which was supposed to run from March 26 to April 16, 2020. Closure of schools and universities was meant to restrict the spread of the virus, as it is believed that social and physical separation is the only way that could reduce the spread of the virus by breaking transmission (WHO, 2020; Akhter, 2021). Education has a critical role in a country's development and growth. Because of the national lockdown, colleges and universities had to close, and the only way to impart curriculum was through e-learning. Many institutions of higher learning, particularly historically disadvantaged ones (HDIs), were caught off guard by such a circumstance. This meant that academics and students had to be equipped with technologies for online teaching and learning such as provisioning of laptops and data to both students and lecturers.

1.1 Learning Management System (LMS)

According to Munoz and Duzer (2005), Blackboard is a Microsoft Learning Management System (LMS) software suite, which is used in universities for teaching and learning. When universities committed to online teaching and learning, the Blackboard learning system is the best software program. Blackboard is intuitive and straightforward to use, it consists of valuable tools such as education, correspondence, and evaluation (Beatty & Ulasewicz, n.d). According to Aboagye et al., (2020), the unexpected shutdown of institutes of higher learning forced these institutions to rely on online learning to keep students active during the epidemic.

1.2 Definition of E-Learning

According to Saleem and Rasheed (2014) e-learning is an interaction that allows the use of Information and Communication Technology (ICT) to enhance and facilitate teaching and learning. Akhter et al., (2021) on the hand defined e-learning as teaching and learning that takes place in or outside of classroom through computers and internet. E-learning provides information through different channels including books, and CDs amongst others. Saleem and Rashed (2014) further content that, e-learning is computer-based learning that allows student-centered and collaborative learning.

E-learning, according to Allen (2003), is the systematic, intentional use of electronic systems like computers to aid in the learning process. In its web-published lexicon, the American Society for Training and

Development (ASTD), a worldwide association for workplace learning and performance experts, provides the following description of e-learning (Allen (2003). The list of example technologies and applications covered exemplifies the term's all-inclusive nature:

Web-based learning, computer-based learning, virtual classrooms, and digital collaboration are all examples of e-learning applications and procedures. Content delivery via the internet, intranet (LAN/WAN), audio- and videotape, satellite transmission, interactive TV, and CD-ROM are all examples (American Society for Training and Development, 2001 as cited by Allen, 2003). Some argue, however, that only internet-delivered learning apps should be included, arguing that the critical role the internet plays in particular applications necessitate a distinction (Allen, 2003). Others point out that there are numerous great interment delivery learning apps that do not use any capabilities that are not already available in CD-ROM training. Many programs rely solely on the internet for distribution. They do not encourage students to communicate with one another or with instructors, they do not give them access to changing databases, and they do not require them to search websites. This does not necessarily make them good or bad; they simply do not make use of unique internet capabilities and hence might be given through other means (Allen, 2003).

According to Tirziu and Vrabie (2015), teaching and learning, in an online environment, differs significantly from teaching and learning in a traditional classroom setting, posing new challenges for both module facilitators and students participating in the online environment. As a result, the aim of the study was to determine if how online learning affected the performance of students

2. Literature review

Face-to-face courses are those in which 80 % of the content is offered only in a typical face-to-face environment, whereas online courses are those in which 80 % of the content is facilitated online without face-to-face meetings (Alsaaty, Carter, Abrahams, & Alshameri, 2016).

2.2 Key e-learning issues

According to Tirziu and Vrabie (2015), as institutions embrace e-learning, a few difficulties invariably. Such difficulties include:

- Institutions need to provide adequate and reliable technical infrastructure to enhance e-learning exercises.
- Facilitators and students should have specialized abilities to utilize e-learning tools.
- Facilitators should re-design their courses to fuse e-learning viably into their instructional method.

2.3 Types of E-learning

Wan et al., (2008) as referred to in Tirziu and Vrabie (2015) categorize e-learning into:

2.3.1 Online distance learning:

The facilitator conducts sessions online rather than via email or phone in this sort of e-learning. Online distance learning usually does not necessitate any face-to-face contacts between students and the facilitator in the classroom or via video during the course.

2.3.2 Traditional course supplemented with technology

The facilitator leads all sessions in the classroom in this type of e-learning, but technology is used in part or all of the classes (utilizing Microsoft PowerPoint, web-based activities, online tests amongst others).

2.3.3 Hybrid courses

The instructor combines elements of traditional and online distance learning courses to replace some classroom sessions with virtual sessions.

3. Models of E-learning

Dhull and Sakshi (2017), on the other hand, divide e-learning into two categories: partially online courses and totally online courses. They argue that a partially online course combines existing resource materials that are available on paper or in non-print form, such as printed versions or softcopy reading materials, with some elements of online learning, whereas a fully online course entails most of the learning and teaching activities taking place online (Dhull & Sakshi, 2017). They also claim that e-learning has two models which comprise the wraparound model and the integrated model, as seen in Figure 1.

3.1 Wrap around model

This online-learning strategy is based on study materials that may include online study guides, exercises, and discussions "wrapped" around already published resources such as textbooks or CD-ROMs, among other things (Dhull & Sakshi, 2017).

3.2 The integrated model:

This concept is the more like a complete online course. Most of these courses are delivered by a complete learning management system (LMS). They include chances for computer conferencing, small-group-based, collaborative online learning activities, and online assessment of learning outcomes, as well as the availability of much of the subject information in electronic format (Dhull & Sakshi, 2017).

According to Faleh (2011), there are three distinct models for using e-learning in education. These are the following:

3.3 Models for using e-learning in education

Adjunct is when e-learning acts as a supplement to regular classroom instruction, allowing students to have more independence.

While blended learning is when traditional learning and e-learning are combined in the classroom. Online learning is e-learning that does not require participation in a classroom or traditional learning setting, and where the e-learning is complete such that the students' independence is maximized. Individual and collaborative learning are differentiated further in the online paradigm, with collaborative learning being further segmented into synchronous and asynchronous learning.

3.4 Types of E-Learning

E-learning consist of three types which are:

3.4.1 Text Driven

Text, images, audio, and test questions are included in the content. Text-based e-learning is an excellent example of compliance concerns.

3.4.2 Interactive

An interactive e-learning course is quite similar to a text-based one, with the exception that interactive components have been given extra thought to increase learning. In addition, there is a larger usage of visuals in general (graphics, charts, and diagrams), all of which are likely to be interactive.

3.4.3 Simulation

E-learning that is based on simulation is extremely interactive and heavily reliant on graphics, video, audio, and gasification. Importantly, tailored simulations, which may or may not incorporate 3D components, are frequently used to aid in learning acquisition. A course that frequently incorporates a high degree of involvement and simulations is new software training.

3.5 The impact of e-learning

Chitra and Raj (2018) highlighted the following to be the impacts of e-learning:

a) It has brought about the feeling of self-responsibility amongst students where they have to account to themselves when they decide to study or not.
b) It enables students not only to rely on textbook information but to expand their knowledge by researching using the World Wide Web.
c) Teachers benefit from this by allowing them to acquire various computer skills as well as students and this has enabled them to encourage students to apply their knowledge and skills. It always helps in the communication with their students.
d) It increases the students' ability to study on their own and their critical thinking skills.

3.6 Advantages of using e-learning

According to Soni (2020), e-learning serves students' needs and requirements at their own pace while also proving to be beneficial for a variety of reasons. It is, for example, available whenever the students want it to be (Saleem & Rasheed, 2014; Akhter et al., 2021). E-learning also allows for the exchange of educational materials in a variety of formats, such as slideshows, audios, recordings, PDF files, word documents, and e-mails.

Nguyen (2015) discovered that E-learning had benefits such as increased learning in the form of marks, student engagement with class material, improved impression of learning, and a reduction in dropout or failure. Furthermore, according to Saleem and Rasheed (2014), e-learning has a significant impact on students' academic performance positively and saves time; for example, by using e-learning, one might divide responsibilities and lessen workload.

Galy, Downey, and Johnson, (2011) showed that online students' performance was significantly worse in the midterm than their face-to-face counterparts, but the results of the final assessments show no statistically significant differences, and qualitative comparisons of ambiguity, cognitive effort, and excitement in the two types of course delivery showed no statistically significant differences either.

According to Dhull and Sakshi (2017), online learning systems allow students to identify and process their learning style, context, goal, current knowledge, and individual talents. Online learning gives the individual the

ability to plan and direct his or her own education. It arouses, creates certainty and confidence, and overcomes barriers that students experience; it customizes the learning experience, augments access, and improves the learning experience, while also assisting in the improvement of ICT abilities. Dhull and Sakshi (2017) further claim that online learning encourages research, because when students generate high-quality work, they are eager to get it published. Online learning students can also develop specific skills in the use of information and communication technology. These skills will be useful to them in their professional lives and in all future endeavors, and they may be desirable elements of their education Dhull & Sakshi, 2017).

3.7 Challenges of E-Learning

Online learning sometimes is linked to poor teaching and learning outcomes. This is probable because online teachers may not take lesson preparation as seriously as they might in a face-to-face session, and this lack of commitment leads to poor online learning quality (Dhull & Sakshi, 2017). Online learning, according to Dhawan (2020), can impedes contact between students and educators, given that the direct communication and the human touch get lost. Furthermore, students differ regarding their ability and level of certainty. Some students may be uncomfortable with online learning, which can lead to dissatisfaction and disorganization (Dhawan, 2020), while the opposite may be true for others.

Al-adwan and Smedley (2012) argued that not all students possess the requisite skills to participate and succeed in e-learning. To use e-learning effectively, both teachers and students must possess particular skills. Students will face a variety of challenges when participating in e-learning. For example, they require data bundles to connect and the ability to access web information effectively (Al-adwan & Smedley, 2012; Dhawan, 2020). Some students may need additional assistance in gaining knowledge and confidence in the use of technology (Al-adwan & Smedley, 2012; Dhawan, 2020).

Hardware, software, and internet access are all pre-requisites for online teaching and learning. Without any of these, online learning is impossible (Dhull and Sakshi, 2017). In addition, Paschal and Mkulu (2020) believe that e-learning is hampered by ineffective online instructions, inadequate internet connectivity, which prevents the provision of online education, and a lack of teaching and learning resources, among other things. One aspect that hinders online learning in institutions of higher learning is facilitators' lack of competencies and provision of online programs, such as English as a form of assistance (Paschal & Mkulu 2020; Soni, 2020).

Soni (2020) also believes that an online course necessitates a detailed exercise regimen. The arduous task of creating a lesson plan online is one of the challenges of e-learning. The largest issue of E-learning is the lack of sufficient support from technical teams, as well as the overload in LMS. E-learning major challenge is its incapacity to teach and learn practical and clinical work (Mukhtar, Javed, Arooj, & Sethi, 2020). Students learning online are also presented with problems, such a lack of proper demeanour, appropriate materials, classroom involvement, learning incompetence, self-control, and an inadequate home environment (Soni, 2020).

The most inevitable feeling associated with online learning is dissatisfaction. Most students are dissatisfied with some aspect of online learning (Dhull & Sakshi, 2017). Most of the frustration is related to technology; for example, students find it difficult to login in, and links that do not work sometimes. The absence of clear directions for getting to the necessary learning platforms can cause frustration in students.

If students are not able to handle their computer anxiety properly, online learning might cause complications. Furthermore, the internet use has been linked to an increase in depression Dhull and Sakshi (2017). Online learning is linked to concerns of behavior and impulse control, such as over-contribution in online interactions and repetitive web surfing or database searches (Dhull & Sakshi, 2017). Allen (2003) explains what makes a good e-learning as indicated in table 1.

3.8 Ways to motivate e-learning

Allen (2003) presented methods for making e-learning experiences more attractive and engaging, such as building on expected results, which entails assisting learners in seeing how their participation in the e-learning would result in outcomes that they care about. Second, putting the learner in danger; this theory asserts that when students have something to lose, they will pay attention. Third, choose the correct topic; the reasoning here is that if the content is worthless or students already know it, the learning experience will be unpleasant. Fourth, create an engaging environment; here, novelty, tension, fascinating graphics, humor, sound, music, and animation all work to entice learners. Fifth, have pupils do multistep projects; the point of departure here is that having people attempt actual (or "authentic") things one step at a time is a good way to replicate one step at a time. Sixth, give intrinsic feedback; the premise is that seeing the beneficial outcomes of successful performance is better feedback than being told, "yes, that was good." Lastly delay judgment; if students must wait for confirmation, they will most likely revaluate for themselves as the tension rises—basically reviewing and practicing.

As a result, it is critical to get started in the right direction straight away. The allure of these methods is that they are so dependable and extensively applicable. Their presence or absence corresponds well with an e-

learning application's likely effectiveness, at least in terms of providing inspiring and engaging experiences. Thankfully, these features are not as tough to create as some of the less successful interactions. These are techniques to extremely effective e-learning that are realistic and practical (Allen, 2003)

4. Materials and Methods

The study looked at how well students performed in their face-to-face learning in (2019) as opposed to how well they performed in their e-learning in (2020) in a historically disadvantaged institution. Fifteen modules, three form the five faculties (i.e., Faculty of Natural Sciences, Faculty of Health Sciences, Faculty of Education, Faculty of Commerce and Administration and Faculty of Humanities, Social Sciences and Law) of Mthatha campus.

In 2019, these modules were facilitated using contact lessons whereas in 2020, these were online via Blackboard and Microsoft Teams. Blackboard collaborative ultra-function and Microsoft Teams were used to administer course materials, make announcements, assign assignments, and conduct live sessions. Martin (2008) discovered that the Blackboard's worth could be ascribed to its ability to administrate courses, materials, assignments, and grade books at any time and from any location. Both face-to-face and online learning were facilitated by the same facilitators. In 2019, 1 589 students were registered for the fifteen selected modules, whereas 1 023 students were registered in 2020. To compute the semester marks/dual performance, the students were given essays, practicals, oral test and written tests. These semester marks were used to compare online-learning students' performance to those of traditional/face-to-face learning students. In contrast to examinations and written tests, the semester mark is the most important evaluation indication because it includes all other types of assessments. All the assessments were moderated by specialists in the subject of study for both online and traditional learning.

5. Statistical analyses

Analyses combined data from the fifteen modules and the Statistical Package for Social Sciences (SPSS Version 25) was used. Both the Kolmogorov-Smirnov and Shapiro-Wilk tests revealed that the dataset was not normally distributed ($p< 0.05$), necessitating the use of a non-parametric test (the Mann Whitney U Test). A non-parametric statistic known as the Mann-Whitney U test was used to compare students' semester marks that were generated through online learning in 2020 versus face-to-face learning in 2019. The Mann-Whinteny U-test was used to show if scale or ordinal dependent variables have any significant differences ($p < 0.05$).

6. Ethical considerations

The research followed ethical standards for research and were conducted without human and animal contact.

7. Findings

The independent samples Mann-Whitney U test outcomes showed that year category 2020 (N = 1 023) rejected a larger mean rank (1 587.40) than year 2019 (N = 1 589) with a mean rank of (1 125.66) as portrayed in Figure 4.

As per the universities examination policy, a student cannot sit for an examination at the end of a module/course unless he or she has received a semester or year mark of at least 40 %. (Walter Sisulu University, 2020). Considering this, it is reasonable to conclude that students taught using traditional method/contact session struggled to qualify to write in 2019. For example, in 2019, 73 (4.59 %) students did not qualify to write the final year examinations, whereas in 2020, 10 (0.97 %) students only did not qualify to write the final examinations. Furthermore, it can be concluded that e-learning boost the students' performance. This is shown by the total number of students who qualified with distinction whereas there were 46 (2.89 %) in 2019 students, as opposed to 88 (8.6 %) of students in 2020.

The highest semester mark achieved in 2019 was 91 %, while the highest semester mark achieved in 2020 was 99 %. The Mann-Whitney U test showed that there is statistically significant differences ($U=1100132.500$, $P < 0, 05$) in the semester marks from 2019 versus from 2020.

8. Discussion

Unlike examination marks, the semester mark remains the most important evaluation indicator because it includes all other performance indicators such as practical's, assignments, and tests. To see how effective alternative forms of course delivery is, this study compared 2019 semester grades of students who were taught using the traditional/face-to-face approach to those who were taught utilizing online learning in 2020.

These findings contradict earlier research on the efficiency of online learning over face-to-face education (Nguyen, 2015; Jancis, 2003; Page & Cherry, 2018). Given that both the students and the course facilitators were unprepared for online learning, this is most certainly the case. The module facilitators, for example, had prepared for face-to-face learning before the coronavirus outbreak, but the outbreak caused them to reconsider their plans for online learning. This is in line with previous research, such as Pinari (2004), as referenced by Al-adwan and

Smedley (2012), who feel that instructors must redesign their courses to incorporate online learning efficiently.

Despite challenges faced by students such as living in areas with poor network coverage, which means it takes them longer to connect, and will therefore have lesser time to complete assessments than those who live in areas with strong network coverage. Furthermore, this argument is supported by Dhawan (2020) that not all students have access to the internet, which results in loss of learning time. In my study though, there is a notable improvement in terms of eligibility to sit for the final examination in 2020. This could be because students write face-to-face under close supervision/invigilation, whereas they write online with little or no supervision. As such, students have access to all the necessary resources for writing, such as the internet and their course materials when doing an online assessment.

Furthermore, there is an improvement when comparing the highest semester mark attained by 2020 students to that of 2019. This increase in the highest semester grade received can be ascribed to several factors, including students sitting in one location while taking exams and having access to reading materials, among other sources of information. On the other hand, Aboagye et al., (2020) suggested that during face-to-face training, students and teachers can easily connect, fostering socialism. Participating in group projects, aiding one another with examinations, and watching for lecturers' facial expressions when a subject is being clarified are all key social challenges (Aboagye et al., 2020), which were lacking in online learning.

9. Conclusion

In this study online learning has proven to be more effective than face-to-face learning, given that significantly more students qualified to write the exams when lectures were facilitated through online method than face-to-face method. However, I cannot deny the fact that in terms of quality, it is possible that the 2019 performance is of better quality than 2020, particularly because there was no prior planning nor proper orientation to online learning for both the students and facilitators. As such, it is not enough to rely on the evaluation based on performance, as there may be other factors, such as lack of supervision during online assessments. In addition, the higher semester marks during online learning, may have increased because of the type of assessments, for example, multiple-choice questions that may require low level thinking. Furthermore, it is important to consider that certain areas of the country lag in terms of infrastructural development, such as access to network connectivity and electricity, therefore migration to online learning should be approached with caution.

10. Recommendations

Before totally migrating to online learning, the author suggests that universities consider students from marginalized areas with low infrastructure, such as lack of electricity and poor network access, as they play a vital part in online learning. Second, the author believes that LMS should be improved to allow for laboratory work and practicals. This will ensure that the face-to-face course offerings are consistent with the online course delivery. Furthermore, facilitators need to be fully equipped, both in terms of teaching as well as assessments, so that online learning does not compromise the quality of learning.

11. Limitations of the Study

E-learning was used for the first time by both the module facilitators and students. This can disadvantage those with less technical experience. Secondly, because the study was limited to one university the findings may not be generalizable to other universities especially those that are not historically disadvantaged.

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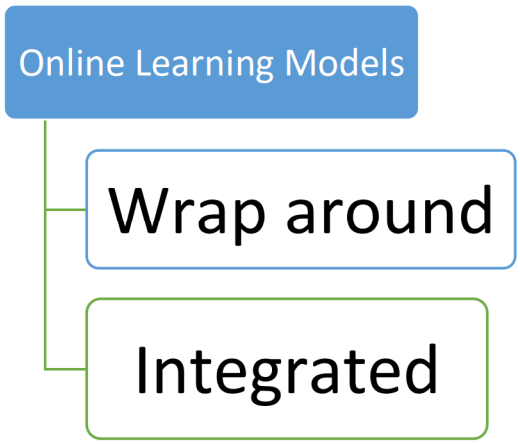

Figure 1. Models of online learning

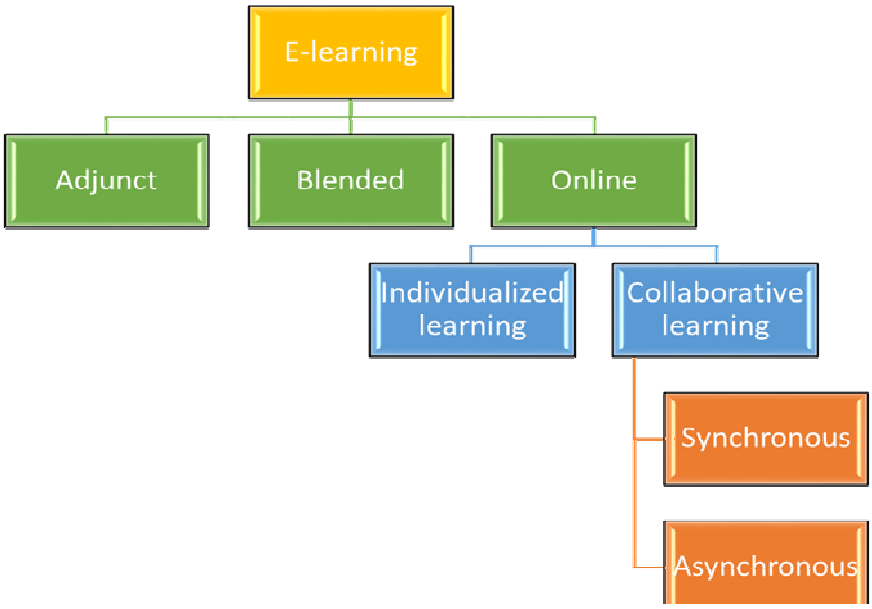

Figure 2. The three models of e-learning

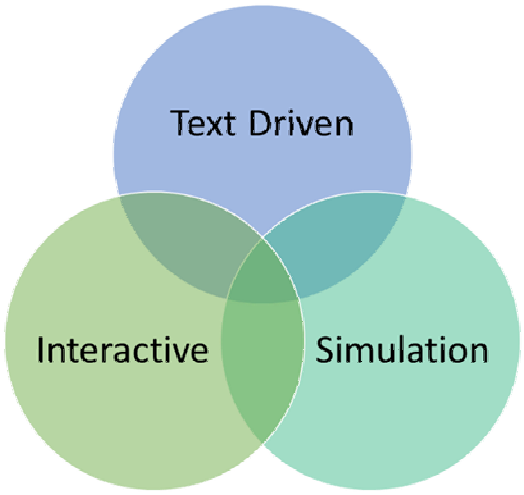

Figure 3. shows the types of E-Learning.

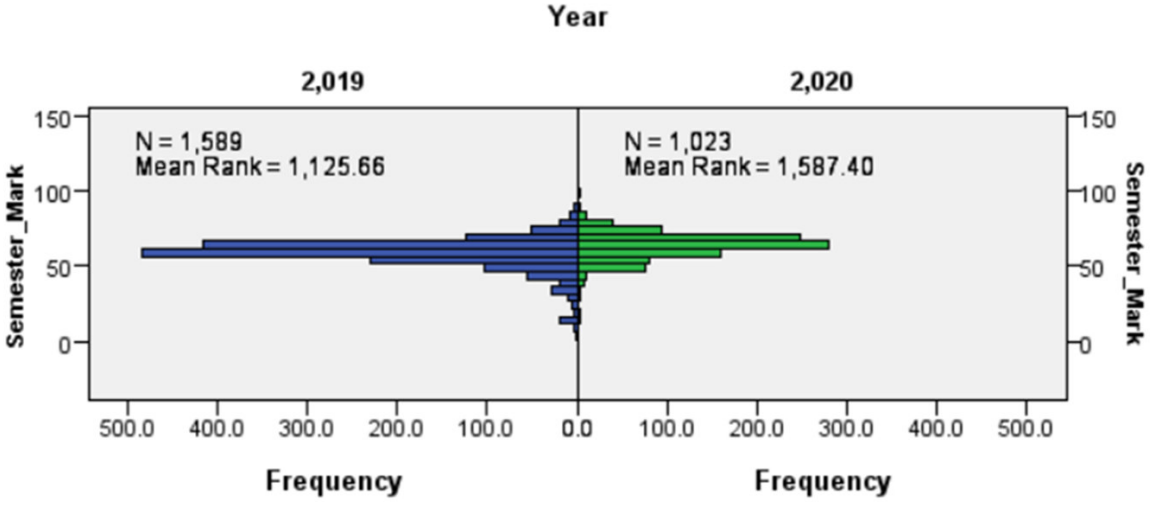

Figure 4. Independent samples of Mann-Whitney U test results for 2019 and 2020 students' semester marks.

Table 1. Good e-learning

Attribute	Benefit
Shorter learning time, often much shorter	Less time away from productive work. Lower training costs
Adapts to learner needs (i.e., learning mastery is fixed but individual learning time may vary)	Minimized time away from productive work (people return to work as quickly as individually able). No waiting for those needing extra time. Extra attention for those needing more help.
Actively involves learners; frequent activity	In-depth learning experiences for each learner, not just for selected learners or those volunteering
Ensures learning	No sliding by. Each learner must achieve and demonstrate competency.
Generates positive learner attitude (When done well, learners often rate e-learning activities as preferable to alternatives.)	More enthusiastic participation. More receptivity. Greater likelihood learning will be applied to on-the-job performance.
Provides consistent quality	E-learning does not have bad hair days, headaches, or late nights out.
Allows instant, world-wide updates	Through networked services, corrections, improvements, and new information can be made available to all learners instantly.
Is available 27/7/365	Learning can start any day employees are hired or immediately upon assignment to new responsibilities. Learning can be worked in and around higher-priority activities. Learner-managed schedules- learners can work late into the night, in short sessions distributed throughout the day, or in long blocks of time; whatever works best for them.
Is patient and treats all learners objectively and fairly	Same options and same performance criteria for all learners. Blind to racial, cultural, and sexual differences. Offers no learning support to any individual.
Is highly amenable to systematic improvement.	Easily provides data necessary for the evaluation of each component.
saves money through low-cost delivery (no or minimized travel; fewer or no instructors; automated administration; no classrooms, supplies whiteboard, etc)	Big savings have resulted from many applications of e-learning. Even taking full account of development costs, e-learning has a big advantage in cost savings.
Allows options for more in-depth study or review whenever needed	Support for learners with special interests or needs to go beyond the bounds of classes. Material used for instruction can be accessed for later use as reference material in a well-designed application.