

Cloud Computing in Education and its Importance to University Students

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Abstract: - Technology known as cloud computing makes it possible for users to use computer resources as a service whenever and wherever they need them, including computing power, computing infrastructure, applications, corporate processes, and personal collaboration. Cloud computing makes it possible to connect instructors and students on a single, multipurpose platform. Schools, colleges, and universities no longer need to own and manage their own information technology infrastructure and data centers thanks to cloud computing. Data and resources saved in the cloud are also guaranteed and safeguarded. Many school districts adopt cloud computing solutions as a result of the desire to discover more affordable ways to integrate technology in the classroom. In addition to being less expensive, cloud computing allows for innovative teaching methods and more student engagement. Students who are entirely comfortable with technology and who have grown up with it are essential for the success of cloud computing technologies in the classroom. They easily acclimate to its use in the classroom since they are constantly using cloud-based technology in their personal life. Teachers who may not be as familiar with the potential of cloud-based solutions must receive some instruction and training. Technology can be used in an effective and economical way using cloud computing.

Keywords: Cloud computing; coronavirus pandemic; education system; cloud technologies; collaboration and communication.

I. INTRODUCTION

Cloud computing in education benefits instructors, administrators, and students equally. Wherever there is an internet connection, teachers may rapidly upload lesson materials, and managers can easily cooperate with one another and spend less money on data storage thanks to cloud computing (Gordon, 2019).

Modern methods for more effectively managing company requirements include cloud computing. The phrase has only changed and grown in popularity with the development of the internet and technology. Applications for cloud computing are widely available across many industries. Many software firms are switching from the pricey licensed software business to the less expensive, more adaptable, and more effective cloud subscription model (Elena, Sabina & Jasminka, 2013).

Ganesh (2012) asserts that the internet has altered how businesses operate and communicate with their clients. Traditionally, a system had both hardware and software. As a result, users could access the system's data. Business owners choose a strategy that enables them to access the appropriate services at the appropriate time, regardless of the device (laptop, smartphone, or tablet), in today's competitive climate.

Through the use of the cloud, you can access resources, apps, databases, emails, file services, or anything that is stored on a different server or location. If you have an electronic device and an active internet connection, you can access the data. You can use the services without purchasing a license and only pay for the ones you actually use (Margianti & Achmad, 2015). Sharing resources, applications, storage, and data via a network is what cloud computing entails. There are two components to cloud computing: the front end and the back end. The user interface makes up the front-end portion, while the platform, application, and infrastructure that make up the cloud environment make up the back-end portion. The way cloud computing works is by distributing a sizable task among resources. The resources needed to operate apps on local computers are minimal. Instead, the task is handled by the cloud environment's network of servers. Consequently, there will be less hardware and software available to users (Asgarali & Bahman, 2014).

The coronavirus pandemic that is currently wreaking havoc on the planet has fundamentally altered how many sectors of the economy operate. The federal government, local governments, institutions of higher learning, and businesses are currently looking for alternatives to the things they are doing while holding onto the hope that normalcy will return as soon as possible. In comparison to what was possible 50 years ago, the education system today has not altered significantly. In a world where technology has affected and fundamentally altered every part of our lives, this is incredibly alarming (Gaddam, 2020). The industrial era's methods of teaching and learning are still applied in the classroom. The instructor is the only figure of authority in the classroom, standing in front of the students and delivering informational clusters in the form of facts and concepts that need to be reviewed and repeated using standardized examinations. Only kids with above-average test scores receive praise and encouragement (Feyisetan, 2021).

Another aspect of this outdated curriculum is the listening approach to learning. A typical feature of today's classroom, an environment where students just sit and listen. The major flaw of this method is this; studies have revealed that the majority of students only remember 20% of what they taught. As a result, the singular use of this method without practice lessons is a good waste of time, because students forget 80% of what they learned. This obsolete system also places enormous pressure on the shoulders of students through standardized testing. Standardized tests serve as the sole scale on which the academic abilities of all students are judged. As a result,

students invest all their energy in pursuit of high scores (Ibraheem, 2015).

The outdated learning and teaching practices that nonetheless underpin the modern educational system contain several significant flaws. Individualized instruction, in which students are taught and assessed according to their skills, strengths, weaknesses, interests, and talents, is not possible in today's classroom (Olemoh, 2021).

Instead, the educational system encourages rigid compliance with arbitrary requirements and academic silos, which results in a learning gap. Every student is unique, and those who score above average typically outperform those who fall short in most areas and assessments. Every student must use the same teaching methods, which not only restricts what they may learn but also promotes a bad learning environment and undermines students' self-confidence. The achievement and equity gap is made worse by holding all students to the same standard, particularly through the use of standardized testing (Neobael imagine collaboration learn, 2021). In addition, the typical classroom limits and trivializes student participation in the learning process. Nowadays, listening, reading, and answering questions are more important than being creative or thinking outside the box. Children are not urged to express their diverse viewpoints or conduct independent inquiry. This has the effect of lowering academic productivity and satisfaction (The commonwealth, 2022). The current educational system prioritizes learning without application or practice, an antiquated teaching strategy supported by the core curriculum and a significant dependence on standardized testing. Given this, it is imperative that educators employ cutting-edge teaching methods that will inspire students to think critically and apply their knowledge to challenging circumstances in the real world. This will increase the requisite abilities for success in a developing freelance economy and lessen the current lack of creativity in schools (Equity for children, 2020). The new coronavirus undoubtedly presents certain difficulties for higher education, some of which include:

- **Financial Issues:** The pandemic is presently costing higher education institutions a lot of money. At this time, it is not possible to raise any further funds through parking fees, restaurant sales, or other means. Additionally, certain colleges must return fees for various reasons. To remain relevant, they must scale virtual engagement modes. The operations have been restructured to meet industry expectations as a result of these increased costs (Moonsamy, & Govender, 2018).
- **Registration Crisis:** In addition, COVID-19 has had a significant influence on student enrollment for the upcoming session. Due to the looming recession, financial priorities have already changed. Due to the uncertainty of the future, there are existing regulations regarding student enrollment that have altered the procedure going forward. There are a ton of questions that enrolment authorities are unable to address, which

may discourage current students and potential local and international applicants. If the tertiary institutions are to continue operating profitably, it will be difficult to avoid these concerns and find workable answers that benefit everyone. These circumstances are made worse by rising tuition prices and a commensurate rise in student debt (UNESCO, 2021)

A novel idea called "flipping the classroom" is steadily gaining popularity, and for excellent reasons. The unanticipated challenges of this time demand a major change from conventional educational approaches to technology-based solutions. For both students and teachers, integrating technology into the teaching and learning process has many advantages and potential. Students will be able to learn at their own pace and according to their individual needs in the future of education, and technology may greatly accelerate this shift through many breakthroughs. If the experts are correct, access to a plethora of data catered to each student's requirements, aspirations, and learning preferences will be possible by 2030 thanks to artificial intelligence working in conjunction with other technologies. This will allow each student to learn at their own speed, time, and location of choice (Hammond, 1998).

The way that talented people learn has the potential to change as a result of new technology like chatbots and video learning. These improvements not only lighten the load on pupils but also greatly aid individual learning and raise the levels of achievement and pleasure in children. Thanks to cloud computing, students can still have outstanding educational experiences despite the pandemic's current disruption (Simon, Lotte, Sine, & Khalid, 2017). Moulay, Hachem, & Cherif (2018) described how cloud computing streamlines university processes. They include:

- **Virtual Classrooms,** which allow educators to communicate in person no matter where they are in the world thanks to cloud computing. They will be able to resolve the problems of the enrollment crisis thanks to useful and well-optimized cloud technologies. The greatest technique to keep students interested in a virtual classroom is to set up tiny break rooms with a facilitator (maximum eight students). The facilitator makes sure that each student has an opportunity to engage and contribute while allowing the students to express their opinions on a particular subject.

- **Lower operating costs:** With cloud computing, the often-expensive costs of resources (such as ebooks and video materials) are eliminated. All parties concerned will pay less for education as a result, and it will be simpler for the institutions to provide education to the students. Students will get access to the most recent material in their fields of study in addition to spending less money (Prabhakar & Balaji, 2018).
- **Access to Cloud-based Apps and Storage:** Thanks to the availability of cloud-based apps, students are no longer need to purchase personal storage devices or software.

- Having virtual labs: This advances the use of virtual learning environments. Through the use of virtual laboratories, students can gain from instructor-led sessions in 24/7 online labs that can be accessed on any device (Saini, Jyoti & Kaur, 2017).

In the near future, cloud computing will have a lot to offer the sector of higher education. It has great advantages, which include:

- The adaptability of Instructional Modes: Using cloud computing, it will be feasible to combine both conventional and cutting-edge teaching and learning approaches. Online courses will be combined with traditional tertiary education thanks to well applied cloud technologies. Some universities had online learning platforms before the pandemic. More colleges will utilize the potential of online education in the future (Suleiman, Zakari, Zainab, & Zainab, 2022). The instruction and training of students in higher institutions will gradually rely more heavily on cloud technologies. The trend will be toward digital learning, but connections to actual campuses will continue. The fusion of the two approaches can take some time. Tertiary education will eventually gain flexibility thanks to the blending of old and modern teaching methods. The concept of community will be incorporated into learning models in the future. Students from different countries will interact more. This will result in a seamless blending of co-learning and the shared offline experience, which will benefit students. Additionally, online channels will enable the interchange of fresh and current content (Tuncay, 2010)
- Greater Accountability: Higher education institutions will have a greater obligation to their alumni and students. Older forms of instruction will be rendered obsolete by the developments that cloud computing will bring about. Students will have access to state-of-the-art equipment and technologies, on the one hand. The content they will have access to, however, will be more recent and better suited to the times in which we live (Mlitwa & Simbarashe, 2019). This is particularly relevant given the adjustments to the status quo that the pandemic has made across organizations, industries, and economies. The requirements of employers will alter, as will how business and corporate environments operate. The modes and techniques of instruction that higher education institutions offer to their students will need to adapt to these developments. This transformation will be made possible by cloud computing since it necessitates awareness of current technologies and practices (Tuncay, 2010).

For businesses of all sizes, technological progress has provided a wide range of alternate methods for running their operations more successfully. A recent development in data center

administration is cloud computing. The requirements of employers will alter, as will how business and corporate environments operate. The modes and techniques of instruction that higher education institutions offer to their students will need to adapt to these developments. This transformation will be made possible by cloud computing since it necessitates awareness of current technologies and practices (Tuncay, 2010).

For businesses of all sizes, technological progress has provided a wide range of alternate methods for running their operations more successfully. A recent development in data center administration is cloud computing. • Security: The majority of cloud computing services are on-demand and can be set up by one person in a matter of minutes. Consequently, you only need a few clicks to provision databases or resources (Margianti & Mutiara, 2016).

- Speed: The majority of cloud computing services are on-demand and can be configured in a few minutes by one person. Consequently, you only need a few clicks to provision databases or resources (Kiryakora, 2017).
- Productivity is increased since cloud computing does not require IT staff to set up hardware. These resources can be applied elsewhere to advance more important corporate objectives.
- Reliability: By retaining numerous copies of data on several computers, cloud computing provides reliability. These copies can be used for disaster recovery or data backup (Akhil, 2021).

With a cloud-enabled educational paradigm, it is simple to facilitate community creation, collaboration, and quick accessible in a secure setting. Similar to this, it is simple for teachers to keep track of student progress and review their schoolwork without having to meet in person. Furthermore, managing students effectively and updating courses online is simple. It is also effortless to collaborate and be productive across departments without having to worry about server maintenance, data security, storage difficulties, etc (Vaishali, 2014).

The following are some advantages of cloud computing for the education sector:

- Better teamwork and communication
- Simpler access to resources
- Long-term cost savings
- Less work for management and operations
- Scalability and flexibility for students and instructors
- Increased productivity and effective educational practices
- Information backup
- Support for financial and HR management
- Promotion of university accreditation (Vaishali, 2014).

Other advantages of cloud computing, according to Walter (2021), include:

- Powerful virtual learning environments: The use of virtual classrooms for students by educational institutions is made possible by cloud-based software. The idea significantly lowers the cost of infrastructure. Even the costs of hiring regular teachers for their faculty can be reduced. Instead, they can work together with knowledgeable trainers who are cost-effective resources and operate remotely. Teachers can also design and deliver online courses to students worldwide. Even better, students can take virtual tests, saving both time and money.
- Accessibility: The cloud's potential is unrivaled in terms of accessibility. Users can quickly and simply access the course materials, software, and data from any location. They are able to enroll in classes and take part in group activities (Faisah, Ubaidullah & Alammari, 2017) The cloud ensures seamless content distribution at all times, eliminating the limitations of space and time. Additionally, it transmits content to mobile devices so that students may effortlessly learn even when they are in motion.
- Significant cost savings: Significant cost reductions are yet another advantage of cloud computing that you cannot overlook. In this environment, both learners and providers can gain significant advantages. Due to the availability of these learning resources in the cloud, students do not need to purchase pricey books and software. By streamlining procedures like enrollment and assignment monitoring, providers can also cut administrative expenditures. Of course, as previously indicated, the expenses associated with infrastructure also decrease. The best thing about cloud computing is that you only pay for what you use, making it economical (Tarandeep, Abdulkadir, Sharma & Muhammad, 2021).
- Safeguarding data storage Secure data storage is another advantage of cloud computing, in addition to accessibility and cost savings. Businesses that use the cloud to deliver learning might use a VPN to protect their data (Bedell, 2014).
- Scalability: This term describes an application's capacity to accommodate an increasing user base. On this front, cloud computing also applies to schools, colleges, and institutions. They may easily and swiftly scale up the learning apps and experiences thanks to it. They are able to manage more students as a result. Scalability also enables them to control use peaks and traffic surges brought on by occasions like training sign-ups and assignment submissions. Similar to this, they can scale back immediately during a period of low activity to avoid wasting resources (Bathon, 2013).
- Agility and innovation: Using agility and innovation, learning providers can gain additional advantages from cloud computing. It enables them to experiment more frequently and quickly. As a result, they can innovate to give the kids improved learning

opportunities. This is made feasible by the ability to create, test, and integrate new tools and features into the apps to enhance their functionality (Alizadeh & Hassan, 20130).

- Broader student reach: The education sector's use of cloud computing gives students the chance to widen their horizons. Those who are dissatisfied with conventional educational methods can now investigate the emerging idea of online education (Alzahrani, 2015).

This is fantastic for those who want to choose remote learning or even study abroad. Working professionals who wish to advance their abilities but are unable to attend traditional classes can also enroll in online courses.

- Minimum hardware specifications: The demands on hardware resources for cloud-based applications are minimal. These programs can run without a hitch on web browsers on computers and mobile devices. Students can learn using their personal mobile phone. Purchasing a costly computer is not necessary in order to participate in the course. Additionally, since they have access to free cloud-based storage, they do not need additional storage devices (Walter, 2021).

Despite many advantages, there are particular difficulties with cloud adoption in the educational setting. The issues faced by academic institutions are directly correlated with the adoption rate and scalability (Brindley, 2018).

Ajay (2022) claims that the following problems are the most frequently experienced by colleges when implementing cloud computing:

- Data Security: For academic institutions, data security in the cloud is the main worry. Ineffective encryption techniques in cloud computing software or models are one of the main causes of data security problems. The residual data footprint, which is still unsafe and hackable, is a serious worry (Chomsky, 2022).
- Privacy Concerns: Another issue facing educational institutions is the security of data pertaining to parents, students, and staff. However, a reliable cloud service provider makes sure that data leakage is impossible and that privacy standards are strict (Yang, 2019).
- Internet connection: Because cloud computing relies on the internet, services may be interrupted by a slow internet connection. Cloud computing may not operate as intended in areas with network or speed challenges, necessitating increased bandwidth and speed.
- Reliability: For academic institutions employing the cloud, reliability is another problem. Data recovery becomes a top priority when a service fails. However, cloud service providers typically provide disaster recovery plans so that in the event of a service breakdown, backups can assist in running the business effectively (Yongfang & Xuan, 2018).

- **Less Control:** Having less control over upgrades, training, and other features is one of the main worries for universities, colleges, and institutions. Institutions have a limited amount of control over infrastructure and system configuration in the cloud because everything is housed off-site and the cloud service provider controls the infrastructure in the majority of cases (Porag, 2014).
- **Vendor dedication:** Choosing the best vendor is essential for the adoption of cloud computing in the education sector. Since transferring vendors in the middle of a project is very challenging, it is essential to work with a vendor who comprehends the requirements, risks, workload, and resolves unforeseen challenges. It is vital to carefully consider the options when selecting a provider to ensure that the entire academic year's classes operate well (Yang, 2021)
- **Costs:** Although putting up a cloud computing system requires some upfront costs, academic institutions can save significantly on infrastructure costs. Depending on the application, services, and data, migration expenses may be greater.

Setting up a new system involves spending money on training. The long-term decrease in operation IT and administrative costs, however, can be considered as a savings (Ajay, 2022).

Sam (2022) claims that some of the most widely utilized cloud-based educational applications are:

- **Google Classroom,** a learning management system that is a component of Google Apps for Education. Students can use PCs, tablets, and cellphones to access the platform using Google Classroom.
- **Blackboard:** Blackboard offers clients, such as educational institutions, businesses, and governmental agencies, software for education, mobile, communication, and commerce. In January 2014, 17,000 institutions and businesses across 100 nations employed its software and services.
- **Knowledge Matters:** Knowledge Matters is an industry-leading cloud-based virtual business platform that provides college and high school students with engaging, game-like business simulations.
- **Coursera:** The most well-known educational portal is Coursera. You can explore a variety of disciplines on Coursera. In the USA, Canada, Thailand, Russia, and Ukraine, barely any student is unaware of the chance to acquire priceless knowledge through Coursera (Brindley, 2018).
- **Microsoft Education Center:** This resource was developed to enable students to keep learning in any situation. They support online education and give each student the best instruction possible.
- **Classflow:** Classflow is a lesson delivery tool for interactive displays that uses the cloud. They give

customers access to lessons and learning resources around-the-clock without requiring a subscription (Sam, 2022).

The benefits of cloud computing are:

- **Cost Savings Profit** results from producing more money than you spend, which is a fundamental financial premise. practically everything pertaining to computers. Purchasing software licensing for expensive programs might make a business bankrupt. For a business, cloud computing offers a solution to each of these issues (Alzahrani, 2015).
- **The infrastructure, upkeep, and utility management** for the servers are all handled by the cloud provider. Applications that are hosted in the cloud typically cost far less than software that is installed locally.
- **Security:** Despite certain well-publicized cloud data breaches, there are many reasons why the cloud is more safe than on-premises computing. The top of the list is that cloud service providers are subject to far more scrutiny and are required to adhere to set criteria. While all businesses are required by law to secure client information, they are free to choose their own security measures. Employee theft is less likely to occur with data stored in the cloud. When you have direct access to the computer that the data is stored on, it is simpler to steal it. Your data is separated from any potential irate employees by cloud computing (Faisal, Ubaidullah & Alammari, 2017).
- **Reliability:** Redundancy is the lifeblood of cloud providers. Your information is not only kept on a server. It is spread out among several servers. It might even be kept on servers spread across different regions, depending on the supplier. only in case a specific server farm experiences a catastrophic failure. This means that no hardware malfunction will really harm your company. Additionally, it means that you can count on extremely reliable access to your data or services. Even 99.99 percent uptime is a common guarantee among providers (Bathon, 2013).

The following are some drawbacks of cloud computing:

- **Downtime:** This is arguably its biggest drawback. You are unable to use the cloud if your Internet connection is down. Strong mobile data plans may be able to temporarily solve the issue. Even when the internet and even the power are down, cellular service frequently continues to function. Of course, data plans have limits and batteries on mobile devices are finite. However, if the power goes out, you likely have more pressing issues than being able to access your cloud services (Waga, Makori & Kefa, 2014).

- **Security:** For the reasons mentioned above, security is, on one level, a benefit of cloud computing. At a separate level, security is a drawback as well. The user is usually always the weakest link in security solutions. Cloud computing is about as secure as leaving your laptop open at a coffee shop if you do not

apply basic digital security measures. Determining the pros and disadvantages of cloud computing in the field of security depends on how you approach the problem (Margianti, & Mutiara, 2016).

- Cloud Service Closes Shop: In an established market, you typically deal with one of a small number of well-known firms who provide tried-and-true services. There are many businesses competing for customers in the fledgling market of cloud computing. It's possible that your cloud service provider will go bankrupt and shut down permanently. A sudden provider shutdown will be more disastrous for your organization the more vital the cloud is to it. The issue of cloud vendor lock-in, where switching from one cloud vendor to another is challenging and expensive, exacerbates this issue (Mlitwa & Simbarache, 2019).

II. CONCLUSION

Cloud computing is a distributed computing technology offering required software and hardware through internet. It also provides storage, computational platform and infrastructure which are demanded by the user according to their requirement. Businesses and individuals have been using cloud-based computer solutions more frequently during the past ten years. Schools are now following this pattern. Institutions in the past connected desktop PCs to a local network. They used their own computer gear to store all of the data. Everything was controlled by a closed system. Computing in the cloud has altered that. Through the use of servers provided by a third party, such as Amazon Web Services, schools can store data online. Due to this, educational districts are no longer need to maintain sizable physical data centers and servers. Instead, they rely on a third party's technology services, which may include storage, processing power, databases, analytics software, and routine automated operations. Importantly, they do not finance the creation and upkeep of their own network; rather, they just pay for services as they are required. Additionally, schools no longer have to spend as much on class-related technology or, in some situations, even textbooks. Schools benefit financially from it. Thankfully, it gives educators access to robust cloud computing technologies, giving them more freedom to engage pupils.

REFERENCES

- [1]. Ajay, S., (2022). Top 14 challenges of cloud computing. <https://www.jigsawacademy.com>.
- [2]. Alizadeh, M., & Hassan, W.H., (2013). Challenges and opportunities of mobile cloud computing. In 2013 9th international wireless communications and mobile computing conference (IWCMC), pp 660-666.
- [3]. Alzahrani, I., (2015). The use of cloud computing in higher education: reality, expectation and challenges. The 2015 WEI International academic conference proceedings. Harvard, USA.
- [4]. Ankhil, M., (2021). Cloud computing in education. <https://www.magicbox.learnmore>blog>
- [5]. Asgarali, B., & Bahman, A., (2014). The necessity of using cloud computing in educational system. *International journal of social and behavioral sciences*. 143 (3), 581-585.
- [6]. Bathon, J., (2013). The fine print on cloud computing. *The journal of technological horizons in education*. 40(9), 23-26.

- [7]. Bedell, C., (2014). The state of cloud computing in K-12. K12 teach decision Nov, 2014. <https://www.k-12teachdecisions.com/images/eds/TD-K-12-DeepDive-cloud, Nov 14 pdf...>
- [8]. Brindley, G., (2018). The role of needs analysis in adult ESL program design. Cambridge university press.
- [9]. Chomsky, N., (2022). Study of language and mind vision. *Beijing foreign language teaching and research press*, 2022.
- [10]. Elena, K. K., Sabina, R. & Jasminka, T., (2013). Cloud computing in education and students needs. International conference: Information & communication technology electronics and microelectronic. 36th international convention.
- [11]. Equity for children (2020). Educational gaps during the pandemic: The persistent challenges of access to learning for all. <https://www.equityforchildren.org...>
- [12]. Faisal, H., Ubaidullah, M., & Alammari, A., (2017). Overview of cloud-based learning management system. *International journal of computer application*. 162(11), 41-46.
- [13]. Feyisetan, C.T., (2021). The resultant effects of COVID-19 pandemic on education in nigeria: special education programme. *African journals online*. 29(1), 50-57.
- [14]. Ganesh, D., (2012). Role of clous computing in education. 2012 international conference on computing electronics and electrical technology. Malaya, Delhi.
- [15]. Gordon, G., (2019). Cloud computing and education. <https://www.builtin.com>cloud-comput...>
- [16]. Hammond, L.D., (1998). Unequal opportunity: Race and education. <https://www.brookings.edu...>
- [17]. Ibraheem, A., (2015). The use of cloud computing in higher education: Reality, expectation and challenges. The 2015 WEI international academic conference proceedings. Harvard, USA. 92-98.
- [18]. Kiryakova, G., (2017), Application of cloud services in education. *Trakia journal of sciences*. 4(2), 277-284.
- [19]. Margianti, E.S., & Achmad, B.M., (2015). Application of cloud computing in education. The 1st international joint conference Indonesia-Malaysia-Bangladesh-Aceh, Indonesia.
- [20]. Margianti, E.S., & Mutiara, A.B., (2016). Application of cloud computing in education. Gunadarma university. Depok 16424, Indonesia.
- [21]. Mlitwa, A. B. W., & Simbarache, M., (2019). A cloud-based architecture for a regional trans university learning management system collaboration on digital content delivery across southern Africa. EDULEARN19 proceedings, 1 (July), 7819-7827.
- [22]. Moonsamy, D., & Govender, I., (2018). Use of blackboard learning management system: An empirical study of staff behavior at a south Africa university. *Eurasia journal of mathematics, science and technology education*. 14(7), 3069-3082.
- [23]. Moulay, H.A.H., Hachem, E., & Cherif, Z., (2018). The benefits of cloud on university system. *International journal of engineering and technology*. 7(4), 32-38.
- [24]. Neobael imagine collaborate learn (2021). Gap in the current education system. <https://www.neobael.com>blog>
- [25]. Olemoh, F.B., (2021). Bridging the technology gap in the Nigerian education system. <https://www.thecable.ng...>
- [26]. Porag, F., (2014). Cloud computing for education and learning. <https://www.slideshares.net>p...>
- [27]. Prabhakar, T.V & Balaji, V.R., (2018). MooKIT- A MOOC platform for developing counties. The international conference on multidisciplinary research (MyRes), 1-11.
- [28]. Saini, L., Jyoti, M., & Kaur, H., (2017). Role of cloud computing in educational system. *International journal of advanced research in computer science*. 8(4), 6-22.
- [29]. Sam, D., (2022). 26 computing examples that keep the world at our fingertips. <https://www.builtin.com>
- [30]. Simon, B. H., Lotte, Q. N.B., Sine, P., & Khalid, M.S., (2017). The potentials of using cloud computing in schools: A systematic literature review. *The Turkish online journal of educational technology*. 16(1), 190-202.

- [31]. Suleiman, M.M., Zakari, I.M., Zainab, M.A., & Zainab, A., (2020). Cloud computing is an integral tool for E-Government: challenges and prospects. *Mukt shabd journal*. 9(6), 2824-2836.
- [32]. Tarandeep, K., Abdulkadir, S., Sharma, A., & Muhammad, M.S., (2021). A review of application of cloud computing in education. *Journal of applied sciences, information and computing*. 1(20, 46-55.
- [33]. The commonwealth (2022). New education study offers strategies to fill COVID learning gaps. <https://www.commonwealth.org/news...>
- [34]. Tuncay, E., (2010). Effective use of cloud computing in educational institutions. *Journal of social and behavioral sciences*. 2(2), 938-942.
- [35]. UNESCO (2021). Gaps in education system will be exacerbated if education is not prioritized within pandemic response plan. <https://www.en.unesco/new>idb...>
- [36]. Vaishali, H.P., (2014). Cloud computing for higher education institutes: Architecture, strategy and recommendations for effective adaptation. *Journal of economics and finance* 11(3), 589-599.
- [37]. Waga, D., Makori, E., & Kefa, R., (2014). Utilization of cloud computing in education and research to the attainment of millennium development goals and vision 2030 in kenya. *Universal journal of educational research*. 2 (2), 193-199.
- [38]. Walter, S., (2019). 8 surprising ways cloud computing is changing education. <https://www>.
- [39]. Yang, L., (2021). The application of cloud computing in college English teaching. *Journal of physics: conference services*. 1748 (2021).
- [40]. Yang, X., (2019). The study of modern educational technology in cloud environment. *China journal of multimedia and network teaching*. 2(2), 1-12.
- [41]. Yongfang, G., & Xuan, X., (2018). Cloud computing in education. *Journal of Kaifeng institution of education*. 2(1), 81-83.