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ABSTRACT

Cloud computing is an important concept that has received a lot of attention in the world of education over the past few years. This popularity has been realized due to its many benefits and the solutions it brings. Unlike traditional methods of computing and data storage, cloud computing offers a distributed type of architecture and includes a number of ideas, concepts, technologies, and services. For vocational education students, cloud computing offers many advantages and opportunities. Students who are trained in technology-oriented professions can be prepared in accordance with current technologies and the needs of the business world by getting acquainted with cloud computing. In this study, explanations of the basic components of cloud computing and application examples of types of use in vocational education are included.

1. INTRODUCTION

In the internet age we live in, edge cloud-enabled management is a key component of the integration approach for teaching resources and significantly improves the quality of education. This approach uses edge computing and cloud computing technologies to enable integration with the management of teaching resources in an intelligent, efficient and scalable way (Wang & Wang, 2023). Posting more educational and language-invasive content are ways radio stations can help revive the use of English in China's Hunan province (Zhang, Zhou & Hai et al., 2023). Welcoming the arrival of the fifth generation communications technology (5G) era, China's independent universities are also conducting educational reforms to adapt to social development (Wang, 2023). A study by Wang (2023) examined and discussed the application of 5G and cloud computing in English vocabulary learning at independent universities. Thanks to 5G technology and the cloud computing environment, certain improvements have been achieved in students' vocabulary and application skills. Students' vocabulary

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learning not only effectively overcomes the constraints of territory and time, but also improves learning interaction and encourages communication between students.

Cloud computing is an important concept that has received a lot of attention in the world of education over the past few years (sapto, Jaya, Hendra, 2016). According to Zhang, Cui, Shen, et al. (2023), cloud computing has gained popularity in recent years, but with its rise have raised concerns about data security. There is a strong relationship between vocational training and cloud technology, and this relationship provides significant opportunities to improve the quality of vocational education and provide students with a better educational experience. Vocational education is a multidimensional, multi-level, diversified and integrated education. As an emerging Internet application model, cloud computing is an internet-based supercomputing model. The network that provides the services is known as the "Cloud". In the cloud computing model, applications, data and IT resources are offered to users in the form of services over the network (Tong, Ruan and Jiang, 2012). A study by Yu (2020) explored the main problems in the construction of teaching resources in China's higher vocational colleges. In addition, the study includes explanations of modern cloud computing and the use of network resources. The findings of this paper show that in the process of teaching design in higher vocational schools, the advantages of cloud computing can be fully exploited to build a good cloud computing educational atmosphere, and the teaching assistance function of cloud computing can be fully utilized.

> *"In the ILO/China Partnership Program; " Cloud computing training was conducted to TVET school partners under South-South Cooperation Skill Development Network". Within the scope of Vocational Training in Myanmar, a series of training courses on Cloud computing have been jointly organized for 30 teachers and students from Hainan Technician College and ILO/China Partnership Programme, Angkor National Polytechnic Institute, Cambodia National Polytechnic Institute, Preah Sihanouk Cambodia-China Friendship Polytechnic Institute and the Centre".*
>
> *Cloud computing training was conducted in three sessions to help participants learn about cloud computing technology, master cloud computing services at the IaaS level (AWS-based), and understand cloud computing open source products at the container level. This on-line training programme is a follow-up to the Launch of Skill Development Network through South-South Cooperation, November 2021, between TVETs from China, Cambodia, Lao PDR and Myanmar (ILO, 2022).*

Literature

Cloud Computing Technology

Cloud computing technology refers to a computing model in which internet-based services are provided and resources are hosted on central servers in an infrastructure called the cloud. This technology allows users to access data storage, computing power through any device, anytime and place via an internet connection. The rapid growth of cloud production services gives users more options. But cloud production service advice remains a challenging topic due to the large number of similar candidate services (Hu, Qi, Huang et al., 2023). Due to the widespread use of cloud computing and the extensive use of next-generation public clouds, individuals are able to share valuable information worldwide through a wireless environment (Khan, Jianbiao, Lim et al., 2023).

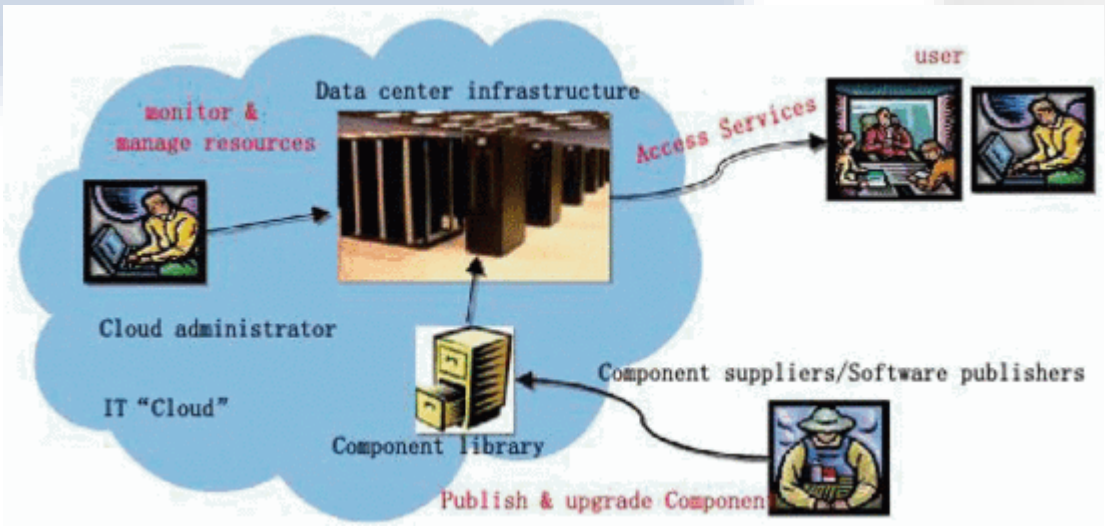

Figure 1. System Architecture of Cloud Computing

Source: http://wenku.baidu.com/view/20849f95dd88d0d233d46a74.html; as cited in Tong, Ruan & Jiang, 2012).

Explanations of the Basic Components of Cloud Computing

1. **Distributed Architecture:** Efficient resource management approaches have become a key challenge for distributed systems, especially dynamic environment systems such as cloud computing data centers (Maiyza, Korany, Banawan et al., 2023). Cloud computing is a type of distributed architecture in which data and processing power are centrally stored and managed on remote servers over the internet. This allows users to access data and access services from any device with an internet connection.

2. **Service-Oriented Approach:** Cloud computing works with a service-oriented approach. Users can perform the operations they need by using services that fit their needs (for example, storage, accounting, database services). Users can scale these services and use them based on the payment model.
3. **Virtualization and Resource Sharing**: Cloud computing has the ability to convert physical resources (for example, servers, storage units) into virtual resources. This way, multiple users can share the same physical resources and use them more efficiently.
4. **Scalability**: Cloud computing provides scalability, allowing more resources to be added automatically when demand increases. In this way, services can always be available and delivered with high performance.
5. **Self-Service**: Users can manage cloud computing services themselves and instantly use the services they want at any time. This makes it possible to trade quickly and effectively.
6. **Payment Model**: In cloud computing, "pay-as-you-go" or subscription-based payment models are often used. Users only pay for the amount of resources and services they use, which optimizes cost.
7. **Security**: Cloud computing providers take advanced security measures to protect users' data and workloads. In this way, the data remains safe and protected against unauthorized access.

This new paradigm allows businesses and individuals to manage computing and data more flexibly, scalably, and efficiently, while also helping them deliver better service at lower costs. For this reason, cloud computing has become a technology that has been rapidly adopted and attracted attention in recent years. Digital teaching in colleges, supported by ICT technologies, serves as a central point for education (Li & Wang, 2023). Cloud computing in vocational education can provide many benefits and make the educational processes of students, teachers and institutions more efficient and effective. Some of the benefits of cloud computing in vocational training include:

1	2	3	4	5	6	7
Accessibility and Flexibility	Reduced Physical Infrastructure Requirements	Up-to-Date and Shareable Content	Collaboration and Interaction	Personalized Learning	Data Management and Analytics	Security and Backup

Figure 2. Benefits of cloud computing in vocational training

Source: Created by the author.

1. **Accessibility and Flexibility:** Cloud-based education allows students and teachers to access it from any device with an internet connection (computer, tablet, smartphone, etc.). This way, students can access their educational materials anytime and anywhere. In addition, teachers can also easily update course contents and materials and share them with students more quickly.
2. **Reduced Physical Infrastructure Requirements:** As cloud services expand, the need to improve the performance of data center infrastructure becomes more important (Senjab, Abbas, Ahmed et al., 2023). Large physical infrastructures may be required for traditional training methods. By using cloud computing, organizations can conduct training processes by acquiring less physical hardware or using available hardware resources more efficiently. This can reduce costs and create a more sustainable educational model.
3. **Up-to-Date and Shareable Content:** Cloud-based training platforms can deliver content that is constantly updated. Thus, students always have access to the most up-to-date information and can keep up with the changes in the industry. At the same time, teachers can easily share content and collaborate.
4. **Collaboration and Interaction**: Cloud-based education platforms make it easy for students and teachers to work and interact together. Through features such as live classroom environments, virtual meetings, discussion forums, and group work, students collaborate and interact with each other more.
5. **Personalized Learning**: Cloud-based education platforms can deliver content tailored to students' interests and learning speeds. This way, each student can progress at their own pace and have a personalized learning experience.
6. **Data Management and Analytics**: Cloud-based education platforms can collect and analyze student performance, engagement level, and other important data. This data can help students and teachers better understand educational processes and make improvements.
7. **Security and Backup:** With the rapid development of cloud computing technology, how to provide secure access to cloud data has become a current research point (Yan, Ge, Wang, et al., 2023). Cloud computing offers advanced measures for data security. Educational materials and student information can be securely stored and backed up without being dependent on a physical device.

Figure 3: Some of the benefits of cloud computing for VET students

Source: Created by the author.

1. **Current Technology Experience:** Cloud computing is one of the most important technologies of today and is widely used in the business world. Vocational education students gain up-to-date technology experience by working with cloud computing and can thus step into business life more prepared.
2. **Accessible Training Content**: In Cloud Computing, the efficiency of task planning is proportional to the effectiveness of users (Saravanan, Neelakandan, Ezhumalai et al., 2023). Cloud computing gives students access to educational content from any device with an internet connection. Students can easily access lecture notes, study materials, and other resources, making their learning process more efficient with supporting content.
3. **Collaboration and Project Management**: Cloud computing provides students with a convenient platform for collaboration and project management. Students can collaborate with cloud-based tools, share documents, and track projects. This gives students the ability to collaborate in a real-world business environment.
4. **Scalability and Flexibility**: Cloud computing offers a scalable and flexible structure. Students can choose cloud services that fit their needs and scale resources based on their needs. This allows students to seamlessly perform high-performance tasks, such as projects or labs.
5. **Personalized Learning:** Cloud computing offers students a personalized learning experience. Students can choose educational materials that suit their interests and needs and learn at their own pace.

6. **Hands-on Training Opportunities**: Cloud computing offers the opportunity to make practical applications on various platforms and services. Students can hone their skills by developing and testing cloud-based applications in real-world scenarios.
7. **Industry Compliance**: Many businesses and industries are aligning their business processes with cloud computing and using cloud-based services. Vocational education students can become more compliant and sought-after employees in the business world by learning and experiencing this technology.

Use Cases of Cloud Computing

Cloud computing emerged long before the global pandemic in 2020, but the digital breakthrough that came with it helped demonstrate its power and utility. Some use cases of cloud computing are as follows:

- Online orders by a fast-casual restaurant chain increased exponentially during the 2020 pandemic lockdowns, from 50,000 to 400,000 per day. The company's online ordering system has been able to handle the volume since it has already moved to the cloud. Thanks to this success, the organization's leadership decided to reduce the five-year transition plan to less than one year.
- Banks use the cloud for various aspects of customer service management. In fraud and debt analytics, cloud solutions are increasing the predictive power of traditional early warning systems.
- Automakers are also joining the cloud journey. A company uses a common cloud platform serving 124 sites, 500 warehouses and 1,500 suppliers to consolidate real-time data from machines and systems and track logistics, as well as provide insights into shop floor processes. Using the cloud could reduce factory costs by 30 percent by 2025 (Mc Kinsey & Company, 2022).

RESULTS

As a result, cloud computing provides a variety of possibilities to provide students with a more accessible, efficient and up-to-date educational experience in vocational education. Thanks to cloud-based education platforms, institutions can offer a higher quality education to students and manage their educational processes more effectively. Cloud computing offers a great opportunity for vocational education students to adapt to the contemporary world of technology and business. By gaining the skills and experience associated with cloud computing, students can take their careers into a brighter future. Cloud computing technology offers a more efficient and flexible computing model for businesses and individuals, and its use is increasing with adoption in more fields and sectors every day.

Cloud computing will maintain its importance in the future with digital transformation and technological developments and will become more widespread. Although cloud computing is used in

various fields where thousands of applications are interconnected and generate a lot of data stored on cloud servers through an open network channel, open transmission is vulnerable to a variety of threats, and its security and privacy is still a big issue (Khan, Jianbiao, Lim et al., 2023). Some of these challenges include:

1. **Data security:** Cloud service providers store user data on central servers. Therefore, data security is of paramount importance. Poorly configured servers, outdated software, or weak security measures can expose data to unauthorized persons.
2. **Data privacy:** Cloud service providers have access to user data. This may cause privacy concerns for some users. Storing particularly sensitive personal or corporate data on cloud servers can reduce the reliance of some organizations and individuals on cloud computing.
3. **Data management:** Large amounts of data can be stored on cloud servers, and it is important to manage this data effectively. Misclassification of data, misconfiguration of access rights, or lack of data management policies can lead to security vulnerabilities.
4. **Data integrity**: During the time that data is stored on cloud servers, it is important to ensure the integrity of the data. If data integrity is not ensured, it is possible that the data may be accidentally changed or corrupted.
5. **Service outages:** Cloud computing service providers may experience occasional service outages. This can block users' access to services and negatively impact business processes.

Despite these security and privacy challenges, cloud computing service providers are constantly improving their security measures and working on data security. It's important for users to use strong passwords, keep their authentication methods up to date, and protect sensitive data through methods such as cryptography. It is also important that agreements with cloud computing service providers have detailed regulations on data security and privacy. Because cloud computing can increase the productivity of your technology, it requires specialized and sometimes hard-to-find skills, including full-skilled developers, data engineers, cloud security engineers, identity and access management specialists, and cloud engineers (Mc Kinsey & Company, 2022) In vocational high schools, it is important to include applications in courses related to this field. The different roles and areas of expertise in the cloud computing ecosystem are important for businesses to be able to manage their cloud infrastructure securely and efficiently. For this reason, in the courses for the field of cloud computing in educational institutions and vocational high schools, it is of great importance to provide students with trainings based on practical applications and real-world scenarios. Due to the acceleration of educational knowledge in China, they have accumulated many resources in teaching and scientific research. However, many teaching resources are inadequate due to the lack of standardized resource creation and the proximity of management methods (Wang & Wang, 2023). It is important to teach students modern methods of identity and access management, as well as the skills

necessary to manage cloud computing infrastructure, build cloud-based applications, and become familiar with cloud security. In this way, the future workforce can adapt to cloud technologies and meet the areas of expertise that businesses need. At the same time, taking into account the rapid technological developments in the sector, educational institutions and vocational high schools should ensure that students keep their knowledge and skills up-to-date by offering constantly updated curricula and practical experiences in cloud computing and information technologies. It's also important to support students in gaining real-world experience by offering internship and work experience opportunities. In this way, by educating well-equipped and specialized cloud computing professionals suitable for the needs of enterprises and industry, it can contribute to the more secure and efficient use of cloud technologies.

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REFERENCES

Haryoko, Sapto and Jaya, Hendra (2016). *Cloud Computing Based Online Learning for Students Vocational Education (D-3) Electronic Engineering Department.* In: The 8th International Convention Of Indonesian Association Of Technological And Vocational Education (APTEKINDO) And 19th Indonesian Congress Of FT/FPTK-JPTK, 3 - 6 Agustus 2016, Medan, Indonesia.

Hu, Q., Qi, H., Huang, W. *et al.* A method to recommend cloud manufacturing service based on the spectral clustering and improved Slope one algorithm. *J Cloud Comp* **12**, 115 (2023). https://doi.org/10.1186/s13677-023-00489-5

ILO (2022). ILO in Asia and the Pacific Events and Meetings. https://www.ilo.org/asia/events/WCMS_853869/lang--en/index.htm

Khan, N., Jianbiao, Z., Lim, H. *et al.* An ECC-based mutual data access control protocol for next-generation public cloud. *J Cloud Comp* **12**, 101 (2023). https://doi.org/10.1186/s13677-023-00464-0

Li, F., Wang, C. Artificial intelligence and edge computing for teaching quality evaluation based on 5G-enabled wireless communication technology. *J Cloud Comp* **12**, 45 (2023). https://doi.org/10.1186/s13677-023-00418-6

Maiyza, A.I., Korany, N.O., Banawan, K. *et al.* VTGAN: hybrid generative adversarial networks for cloud workload prediction. *J Cloud Comp* **12**, 97 (2023). https://doi.org/10.1186/s13677-023-00473-z

Mc Kinsey & Company (August 17, 2022). What is cloud computing? https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-cloud-computing (accesed on 01.04.2023).

Saravanan, G., Neelakandan, S., Ezhumalai, P. *et al.* Improved wild horse optimization with levy flight algorithm for effective task scheduling in cloud computing. *J Cloud Comp* **12**, 24 (2023). https://doi.org/10.1186/s13677-023-00401-1

Senjab, K., Abbas, S., Ahmed, N. *et al.* A survey of Kubernetes scheduling algorithms. *J Cloud Comp* **12**, 87 (2023). https://doi.org/10.1186/s13677-023-00471-1

Yaqin Tong, Huanli Ruan and Yuzai Jiang, "Cloud computing application in health vocational education," 2012 International Symposium on Information Technologies in Medicine and Education, Hokkaido, Japan, 2012, pp. 72-75, doi: 10.1109/ITiME.2012.6291250.

Yan, L., Ge, L., Wang, Z. *et al.* Access control scheme based on blockchain and attribute-based searchable encryption in cloud environment. *J Cloud Comp* **12**, 61 (2023). https://doi.org/10.1186/s13677-023-00444-4

Yu, M. (2020). Design of Higher Vocational Education Auxiliary Platform Based on Cloud Computing Technique. In: Atiquzzaman, M., Yen, N., Xu, Z. (eds) Big Data Analytics for Cyber-Physical System in Smart City. BDCPS 2019. Advances in Intelligent Systems and Computing, vol 1117. Springer, Singapore. https://doi.org/10.1007/978-981-15-2568-1_66

Wang, C., Wang, D. Managing the integration of teaching resources for college physical education using intelligent edge-cloud computing. *J Cloud Comp* **12**, 82 (2023). https://doi.org/10.1186/s13677-023-00455-1

Wang, T. (2023). Effect of using 5G and cloud computing environment for independent college english vocabulary learning. *J Cloud Comp* **12**, 70 https://doi.org/10.1186/s13677-023-00447-1

Zhang, R., Zhou, J., Hai, T. *et al.* A big data study of language use and impact in radio broadcasting in China. *J Cloud Comp* **12**, 28 (2023). https://doi.org/10.1186/s13677-023-00399-6

Zhang, X., Cui, L., Shen, W. *et al.* File processing security detection in multi-cloud environments: a process mining approach. *J Cloud Comp* **12**, 100 (2023). https://doi.org/10.1186/s13677-023-00474-y

Internet Sources

http://wenku.baidu.com/view/20849f95dd88d0d233d46a74.html (accesed on 02.04.2023).