

Impact of Cloud Computing in Enhancing Collaborative Learning among 3rd - Year BSAIS Students at Laguna University

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Abstract:

The study examined the challenges and benefits of Cloud Computing in enhancing collaborative learning among 3rd-year BSAIS students at Laguna University. As digital transformation accelerates globally, the need for students to acquire cloud computing skills becomes increasingly critical. Collaborative learning is an essential component of the BSAIS curriculum that often encounters challenges when conducted through traditional, non-digital methods, particularly in contexts that require remote or asynchronous engagement. Drawing on data from student surveys, this research explores (1) the perceived benefits of cloud computing in collaboration, (2) the frequency and extent of utilization of specific cloud tools, (3) the challenges encountered, and (4) the impact of these tools on students' learning experiences.

Findings showed that cloud computing was extremely beneficial in improving collaborative learning (overall $\bar{x} = 3.61$). Students rated team-based collaboration ($\bar{x} = 3.66$), file sharing and resource access ($\bar{x} = 3.62$), and group communication ($\bar{x} = 3.55$) as highly supported by cloud tools. The extent of utilization was also high (overall $\bar{x} = 3.25$), with Google Sheets being fully utilized ($\bar{x} = 3.54$), followed by QuickBooks ($\bar{x} = 3.16$) and Smart Sheets ($\bar{x} = 3.04$). Students experienced challenges to a very great extent (overall $\bar{x} = 3.32$), particularly internet issues ($\bar{x} = 3.35$), data security concerns ($\bar{x} = 3.37$), and technical proficiency ($\bar{x} = 3.24$). Most respondents (76.47%) agreed that cloud computing greatly improved accessibility and flexibility in collaborative learning, making it the most significant impact identified.

On the other hand, respondents indicated that the challenges associated with using cloud computing tools were experienced to a very great extent, showing that while these tools are beneficial, they also come with difficulties. Issues such as internet connectivity, data security, and technical proficiency highlight that adopting digital platforms still requires continuous practice, adaptability, and persistence from students.

Finally, respondents emphasized the importance of continuous practice and familiarization with cloud computing tools to improve their collaborative learning experience. These findings suggest that cloud computing plays a critical role in supporting effective, inclusive, and flexible collaborative learning while also highlighting areas where institutional support could further improve student outcomes.

1. Introduction

Cloud computing has become an essential tool in modern education, enabling students to collaborate in real time through shared digital platforms. Its ability to support remote access, resource sharing, and continuous communication makes it valuable for

academic tasks requiring teamwork. As learning increasingly shifts toward digital and flexible environments, cloud computing offers opportunities to strengthen collaborative learning among students.

The adoption of cloud computing in the accounting industry has seen a significant uptick in recent years. More accounting firms and businesses are transitioning from traditional accounting software to cloud-based solutions to meet their financial management needs. Recent surveys and reports indicate a growing trend toward cloud adoption, with a notable percentage of accounting firms now utilizing cloud-based accounting software. This shift is driven by the demand for more flexible, scalable, and cost-effective solutions. (Pollard, 2024).

Collaborative learning, which focuses on group efforts, joint problem-solving, and building knowledge together, has emerged as a vital element in university education. Especially within programs such as the Bachelor of Science in Accountancy and Information Systems (BSAIS) at Laguna University, this approach cultivates key abilities like effective communication, analytical reasoning, and successful collaboration in varied groups. Yet, conventional lecture halls and direct personal exchanges often fall short of addressing the requirements of current students, particularly with the increasing preference for adaptable, non-synchronous educational setups.

Laguna University has long been committed to providing quality education and creating a learning environment conducive to student success. As the world rapidly embraces digital transformation, the selected students recognize the imperative to equip themselves with cloud computing, particularly in the course (BSAIS) program, with the technological skills, and the collaborative skills necessary to thrive in the modern workforce.

The BSAIS program at Laguna University, designed to produce graduates capable of navigating the complexities of data-driven business environments, inherently demands a collaborative approach. Students are routinely engaged in projects that necessitate teamwork, critical analysis, and shared problem-solving. However, traditional learning methods may present limitations in facilitating seamless collaboration, particularly in a world increasingly reliant on remote and asynchronous interactions.

This study aimed to explore the impact of cloud computing in enhancing collaborative learning among BSAIS students at Laguna University. By assessing its benefits and challenges, the research seeks to provide knowledge into how cloud-based technologies improve academic performance, teamwork, and engagement in the learning process.

2. Literature Review

The literature underscores that Cloud Computing has significantly transformed educational practices by enhancing collaborative learning, improving accessibility, and offering cost-effective solutions for institutions. By leveraging cloud-based tools, students and educators can engage in real-time collaboration, access resources from any location, and develop essential digital skills for the modern era.

Cloud platforms facilitate seamless collaboration among students and educators, allowing for simultaneous work on projects, real-time editing, and efficient communication. Tools like Google Workspace for Education enable group discussions and collective problem-solving, fostering an interactive and engaging learning environment. This collaborative approach not only improves academic outcomes but also prepares students for teamwork in professional settings.

Integrating cloud computing in education is not just a trend but a substantial evolution in how educational services are delivered and experienced. Its benefits, from enhanced accessibility to improved security, are pivotal in shaping a future-ready educational landscape. As the digital age advances, embracing cloud technologies becomes increasingly imperative for educational institutions aiming to provide a modern, efficient, and comprehensive learning experience. (Pollard, 2023)

According to Thuku, J. K., et al. (2022), Cloud computing has recently been utilized in schools for a variety of services and applications through virtualization of computing resources like processors, memory, storage and networking. It addresses the application of cloud computing in tutorial group discussions as an instructional pedagogy and its impact in learning. It delves into the fundamentals in tutorial group discussions in class such as the preparations, activities, processes, advantages and opportunities. It explains that incorporating cloud computing in tutorial group conversations facilitates both instruction and learning. It provides a participatory, malleable, and open environment for learning, which allows students to work collaboratively, be engaged, and share knowledge. Through virtualized resources, cloud computing meets the challenges in education while presenting fresh opportunities for instruction innovation and student achievement.

Cloud computing offers educational institutions a flexible, scalable, and cost-effective way to access resources and collaborate. According to various studies, cloud-based platforms facilitate the sharing of educational content and tools, enabling educators to create and disseminate learning materials efficiently. These platforms also support remote and hybrid learning environments, a necessity highlighted by the COVID-19 pandemic. For instance, research indicates that cloud computing can enhance student engagement and participation by providing easy access to learning resources and promoting collaborative projects among students. Furthermore, cloud computing allows for storing and analyzing large datasets, making it easier to track student performance and learning patterns. Studies have shown that institutions leveraging cloud technology can gather insights from this data to inform instructional strategies, ultimately improving educational outcomes. However, challenges related to internet access, digital literacy, and infrastructure remain significant barriers, particularly in underfunded or rural educational settings. (Parker, 2023)

Teaching quantitative methods at the undergraduate level is a difficult yet rewarding endeavor due to the challenges instructors face in presenting the material. According to Kunicki, et. al (2020) One way to bolster student learning is through the use of statistical software packages. Google Sheets is a cloud-based spreadsheet program capable of many basic statistical procedures, which has yet to be evaluated for use in quantitative methods courses. This article contains pros and cons to using Google Sheets in the classroom, and provides an evaluation of student attitudes towards using Google Sheets in an introductory quantitative methods class. The results suggest favorable student attitudes towards Google Sheets and that attitudes towards Google Sheets show a positive relationship with quantitative self-efficacy.

The surge in technology adoption has transformed students into ‘digital natives’ who require innovative teaching methods to enhance their engagement and learning. This paper investigates the impact of integrating QuickBooks, an accounting mobile app, on students’ learning, engagement, and interest in the course. It utilizes a survey questionnaire and focus group design to collect data from a sample of 160 undergraduate financial accounting students at a leading public university in the UAE. The findings reveal that students positively viewed the use of QuickBooks on their learning experience. Students reported enhanced class engagement and interest in the course, which was otherwise viewed as generally dull. Using QuickBooks in solving assessments was perceived as more effective relative to pen-and-paper assessments and during uncertain times. This paper contributes to the

literature on the impact of mobile technology in accounting education and suggests innovative tools to enhance graduate attributes and employability for educators' consideration. El Sood (2022).

3. Methodology

The quantitative approach enabled the researchers to gather measurable data which produces critical statistical conclusions relevant to educational research (Bhandari, 2020). The intervention involved the implementation of Cloud Computing Tools for education as the primary tool to enhance group collaboration through a cloud-based educational system. Through this intervention, students engaged in collaborative activities such as real-time document sharing, group discussions and project work within a virtual environment.

The research design focuses on collecting data which will demonstrate how cloud-based tools benefit collaborative learning practices for accounting information system students studying at the university level.

The study was conducted at Laguna University, located at the Laguna Sports Complex, Barangay Bubukal, Santa Cruz, Laguna. The respondents were fifty-one (51) third-year students enrolled in the Bachelor of Science in Accounting Information Systems program. Data collection was carried out through questionnaires distributed via Google Forms.

4. Results and Discussion

Table

1.

Perceived Benefits of Cloud Computing in Enhancing Collaborative Learning

Benefits	Mean	SD	Verbal Interpretation
Group discussion and Communications	3.55	0.59	Extremely Beneficial
File Sharing and Resource Accessibility	3.62	0.55	Extremely Beneficial
Team-based project collaboration	3.66	0.54	Extremely Beneficial
Overall Mean	3.61	0.56	Extremely Beneficial

**3.26-4.00 Extremely Beneficial, 2.51-3.25 Very Beneficial, 1.76-2.50 Slightly Beneficial, 1.00-1.75 Not Beneficial at all
Source: Authors*

The results show that the perceived benefits of cloud computing in enhancing collaborative learning are rated as extremely beneficial, with an overall mean of 3.61. Among the indicators, team-based project collaboration has the highest mean of 3.66, suggesting that cloud computing greatly supports group coordination and task management. This is followed by file sharing and resource accessibility with a mean of 3.62 and group discussion and communications with a mean of 3.55, both also rated extremely beneficial, indicating that cloud tools effectively promote information exchange and collaborative engagement. Overall, the results imply that cloud computing plays a vital role in improving teamwork, communication, and access to shared resources among students.

Cloud computing has significantly enhanced communication by enabling seamless data exchange, collaboration, and resource sharing across various platforms. Through cloud-based communication tools, users can interact in real time, access shared files from anywhere, and engage in efficient remote teamwork. Several studies highlight the impact of cloud computing on communication, focusing on aspects such as security, reliability, and accessibility. For instance, Zhang et al. (2020) explored how cloud computing transforms enterprise communication by integrating distributed systems with scalable computing resources.

Their study emphasized that cloud platforms facilitate instant messaging, video conferencing, and shared document editing, which improve organizational efficiency.

Table 2

Extent of Utilization of Cloud Computing Tools in Enhancing Collaborative Learning

Cloud Computing Tools	Mean	SD	Verbal Interpretation
Google Sheets	3.54	0.62	Fully Utilized
Quickbooks	3.16	0.85	Frequently Utilized
Smart Sheets	3.04	0.91	Frequently Utilized
Overall Mean	3.25	0.79	Frequently Utilized

*3.26-4.00 Fully, 2.51-3.25 Frequently, 1.76-2.50 Rarely, 1.00-1.75 Never Utilized
 Source: Authors

It reveals that the extent of utilization of cloud computing tools in enhancing collaborative learning is generally frequently utilized, with an overall mean of 3.25. Among the tools, Google Sheets obtained the highest mean of 3.54, interpreted as fully utilized, indicating that students commonly use it for real-time collaboration and data sharing. Meanwhile, QuickBooks and Smart Sheets were both rated frequently utilized with a mean of 3.16 and 3.04 respectively, suggesting that these tools are also regularly used but to a lesser extent. Overall, the findings imply that cloud computing tools are actively incorporated in collaborative learning, with Google Sheets serving as the most widely used platform among students.

Using Google Sheets describes learning innovations created by lecturers by utilizing existing features on Google Workspace. Ahmad (2023) offers suggestions for using Google Workspace in accounting learning to improve student engagement. Lecturers could utilize Google Docs, Google sheets, and Google Slides for accounting learning so that student engagement could increase significantly. This feature required students to actively collaborate to complete assignments because lecturers could monitor activities carried out by students in real-time.

Table 3

Extent of Cloud Computing Tools Effect on the Challenges to Collaborative Learning

Challenges	Mean	SD	Verbal Interpretation
Internet Connectivity Issues	3.35	0.76	Very Great
Data Security and Privacy Concerns	3.37	0.74	Very Great
Technical Proficiency and Usability	3.24	0.68	Great
Overall Mean	3.32	0.73	Very Great

*3.26-4.00 Very Great, 2.51-3.25 Great, 1.76-2.50 Slight, 1.00-1.75 Not at all
 Source: Authors

Table 3 shows that the extent of cloud computing tools' effect on the challenges to collaborative learning is rated as very great, with an overall mean of 3.32. Among the identified challenges with means 3.37 and 3.35 respectively, data security and privacy concerns and internet connectivity issues were both rated very great, indicating that these remain major obstacles when using cloud-based platforms for collaboration. Meanwhile, with a mean 3.24, technical proficiency and usability received a great rating, suggesting that while most students can use the tools effectively, some still face difficulties in navigating or maximizing them. Overall, the findings imply that although cloud computing tools enhance collaboration, issues related to security and connectivity continue to significantly affect students' online learning experiences.

Cloud computing strongly depends on the internet for reaching data, operating applications, and maintaining communication with remote servers and users. Unfortunately, internet connectivity-related issues can greatly impair the performance, availability, and reliability of cloud services. Sandhu, A. K. (2021), with the recent advancements in computer technologies, the amount of data available is increasing day by day.

According to Menta (2022), almost 80% of enterprises will shut down traditional data centers and transform them into cloud computing infrastructure by 2025. This will allow the organization to replace the application and hardware, based on network latency that plays a key role in holding all the data of a company. Cloud computing has been defined as its most significant feature to provide an online repository service, broad access network, measured service, pooling, resource, and scalable provisioning of services.

Table 4

Impact of Cloud Computing Integration on Collaborative Learning

Indicators	f	%	Cumulative Frequency
Can track students engagement and contribution in collaborative activities providing educators with data on individual and group performance	3	5.88	3
Enhance accessibility and flexibility of the students in 3rd year BSAIS students to access learning materials, resources and collaborative workspaces from any device with an internet connection	39	76.47	42
Implement Cost effective resource accessibility to the students of Bachelor of Science in Accountancy Information System	2	3.92	44
Provide streamlined workflow and organization so that the students can navigate easier and stay organized in collaborative projects	2	3.92	46
Upgrade collaboration and communication as part of the Accountancy Information curriculum to ensure students learn practical application	5	9.80	51
TOTAL	51	100	

Source: Authors

Table 4 shows the impact of cloud computing integration on collaborative learning among 3rd-year BSAIS students. The majority of respondents, representing 76.47%, indicated that cloud computing enhances accessibility and flexibility, allowing them to access learning materials, resources, and collaborative workspaces anytime and from any device with an internet connection. A smaller portion, 9.80%, recognized its role in upgrading collaboration and communication within the curriculum, while very few cited its impact on tracking student engagement with 5.88%, cost-effective resource access with 3.92%, and streamlined workflow with 3.92%.

Cloud-supported collaborative learning tools in higher education can aid the teaching and learning processes. Cloud tools for collaborative learning may play a vital role in constructing a positive learning experience for students because their applications

are more convenient for chatting, sending queries, recording audio meetings, processing documents, and delivering content. It allows both instructors and students to construct and share knowledge and thus promote the latter's advanced thinking (Baanqud, et. al, 2020).

The findings indicate that cloud computing has a significant impact on collaborative learning due to its ability to improve resource availability and operational flexibility. By providing easy and timely access to learning materials, it enables students to engage more effectively in group activities and shared tasks. The platform's adaptability allows learners to collaborate seamlessly, regardless of time or location, fostering a more inclusive learning environment. These features enhance not only the efficiency of cooperative learning but also the overall quality of interaction among participants. The results highlight the importance of integrating cloud-based tools thoughtfully to maximize their benefits in educational settings. Future research could explore specific strategies to leverage cloud computing for improving collaboration and inclusivity in diverse learning contexts.

Conclusion

To develop a practical approach for improving the effective use of cloud-based tools in the educational setting, the study explored both the challenges 3rd-year BSAIS students face and the benefits they gain when utilizing cloud computing for collaborative learning. By understanding the students' needs, experiences, and levels of engagement with cloud platforms, the study provided a strong foundation for enhancing the integration of cloud computing in academic activities. Such insights aim to better prepare future graduates with the technological skills and confidence necessary to collaborate efficiently and manage shared academic tasks. Based on the results of the study, the following conclusions were formulated:

1. The findings on the perceived benefits of cloud computing in enhancing collaborative learning show that cloud technologies play a vital role in supporting student collaboration. The results imply that cloud computing significantly improves teamwork, strengthens communication, and provides easier access to shared resources.
2. Cloud computing tools are widely utilized to support collaborative learning among students. Google Sheets emerged as the most commonly used platform, indicating its effectiveness in enabling real-time collaboration and shared task management. The extent of utilization suggests that cloud tools play an important role in facilitating group work and improving collaborative learning.
3. The findings indicate that while cloud computing tools effectively support collaborative learning, certain challenges still hinder students' overall online learning experience. In particular, concerns about data security and unstable internet connectivity continue to pose significant barriers to seamless collaboration. These results highlight the need for improved security measures and stronger technological infrastructure to ensure that the full benefits of cloud-based collaboration can be realized.
4. Integrating cloud computing has a strong positive impact on collaborative learning. Its greatest contribution is improving accessibility and flexibility, allowing students to work together more effectively regardless of time or location. This enhanced accessibility supports more inclusive and efficient collaborative learning experiences, demonstrating the vital role of cloud technologies in modern educational environments.

Recommendations

The following suggestions guide the enhancement of cloud computing in collaborative learning to ensure that students are updated with the current demands of the accounting industry. In light of the survey data analysis, the researchers suggest the following recommendations concerning the significance of this study:

1. For Students;
 - a. Participate actively in technical training sessions on Google Sheets, QuickBooks Online, and Smart Sheets to improve navigation, formula use, shared editing, and troubleshooting.
 - b. Seek assistance when encountering platform difficulties, and engage in peer-support during cloud-based activities to improve confidence and proficiency.
2. For Educators;
 - a. Offer consistent hands-on guidance and troubleshooting support during cloud activities to address students' technical proficiency needs identified in the study.
 - b. Provide updated training resources such as tutorials, demo videos, and user guides to support students' and technical proficiency in cloud computing tools.
3. For Future Researchers;
 - a. Investigate deeper usability challenges encountered by students to design more targeted training interventions for cloud-based tools.
 - b. Explore additional cloud applications relevant to the accounting profession to evaluate which tools best enhance usability and long-term skill development.
4. Implementation of the proposed action plan in enhancing cloud computing through cloud computing through collaborative learning.

Action Plan Matrix: Conducting Seminar and Hands – on Workshop in Enhancing Cloud Computing through Collaborative Learning

Objective	Strategies / Activities	Person(s) Responsible	Resources Needed	Time Frame
Raise awareness of the benefits of cloud computing for collaborative learning	Conduct seminar introducing cloud computing tools, emphasizing their features for collaboration	Program Coordinator, Student Organization, Faculty Members and Guest Speaker (in Industry Profession)	Venue, Multimedia equipment, Presentation materials	1 st Sem, Midterm Period
Provide hands-on experience using cloud computing applications	Organize a workshop where students practice file-sharing, group editing, resource access, and collaborative tasks using cloud platforms	Student Organization, Faculty Members, Cloud Tools Trainer	Computers/Laptops, Mobile Devices, Internet Access, Google Workspace/QuickBooks/Smart Sheets accounts	Midterm Period
Enhance students' collaborative engagement and improve technical proficiency in using cloud computing tools	Assign cloud-based group tasks, train students on basic platform use and common issues, and regularly monitor and guide their progress.	Subject Instructor, Researcher, Students, Cloud Tools Trainer, Faculty Member	Cloud platforms, training modules, demonstration videos, laptops/devices, evaluation rubrics, stable internet, and cloud platform access.	1 st Sem to Midterm Period
Evaluate student learning and gather feedback on cloud-based collaboration	Collect feedback through surveys and evaluation forms to measure improvement in communication, teamwork, and knowledge sharing	Student Organization, Researcher	Evaluation forms, Survey (Google Forms), Laptop	End of Sem
Encourage long-term use of cloud tools for academic collaboration	Integrate cloud platforms into class activities and group projects across subjects.	Program Coordinator, Subject Teachers	Continuous access to cloud platforms, Handouts, Online class resources	Post – Workshop, 2 nd Semester

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