Kashihara, A. et al. (Eds.) (2024). Proceedings of the 32nd International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Exploring Learning Analytics: A Case Study of Tertiary Educators' Utilization and Integration of AnimoSpace LMS in the Online Learning Environment

Rozanne Tuesday G. FLORES[a*] & Ethel C. ONG[b^]
[a]*College of Technologies, Bukidnon State University, Philippines*
[b]*College of Computing Studies, De La Salle University, Philippines*
*rtgflores@buksu.edu.ph; ^ethel.ong@dlsu.edu.ph

Abstract: This research study employs learning analytics to analyze data and explore the utilization patterns of AnimoSpace, an online learning environment, and its integration by faculty before and during the pandemic. The study provides valuable insights into optimizing learning outcomes and enhancing pedagogical strategies by examining access frequency, application diversity, and technology integration among tertiary educators across eight terms. A significant increase in AnimoSpace usage during the pandemic, particularly from the second term of the Academic Year 2019-2020 to the third term of the Academic Year 2020-2021, indicates its effectiveness in supporting online learning and facilitating technology integration among educators. The study also identifies the most frequently used features of AnimoSpace, offering insights for developers and administrators for platform enhancements to improve the online learning experience and support faculty teaching practices. The study's focus on ethical considerations and transparency in learning analytics reassures the audience about the responsible use of technology in education, ensuring that these technologies promote ethical practices and literacy. This research highlights the pivotal role of platforms like AnimoSpace in advancing educational technology, reinforcing the importance of continued research in this area.

Keywords: Learning analytics, online learning, faculty integration, technology utilization, digital educational tools, higher education, AnimoSpace LMS

1. Introduction

In recent years, the educational landscape has been transformed through the rise of online learning, a trend significantly accelerated by the global COVID-19 pandemic. Technologies such as Learning Management Systems (LMS), cloud computing, and mobile devices have played pivotal roles in this shift, making education more accessible. Sector et al. (2021) highlight the dramatic impact of these online environments on education, emphasizing how they have opened new avenues for teaching and learning. The flexibility of LMS allows students to access learning modules, submit assignments, and communicate seamlessly with educators and peers (Flores & Ong, 2023; Ziraba et al., 2020).

The pivotal role of Learning Management Systems (LMS) in the shift to online platforms, particularly during the COVID-19 pandemic, cannot be overstated. LMS has been instrumental in overcoming geographical and temporal constraints, enabling education to continue (Alam, 2020; Dhawan, 2020). Teachers have had to adapt to this new landscape, mastering various digital tools to deliver synchronous content, administer assessments, and maintain communication with students (Ali, 2020; Baticulon et al., 2021; Carrillo & Flores, 2020; COL, 2020; Korkmaz & Toraman, 2020).

Despite the technological advancements and the new possibilities they bring, challenges remain in the engagement and motivation among learners and in the underuse of LMS resources (Flores & Ong, 2023; Washington, 2019; Grand-Clement et al., 2017). The difficulty in maintaining relevance and meeting individual learning needs can disengage

students (Eli-Chukwu et al., 2023; Tirado-Morueta et al., 2022; Tan et al., 2022; Hopwood, 2022).

Learning analytics emerges as a beacon of hope in this context, offering a potential solution to the challenges of online learning. By carefully analyzing data collected from learners' interactions with digital platforms, learning analytics can optimize the learning process (Buckingham & Ferguson, 2019). Educational institutions can leverage the insights gained from learning analytics to enhance course relevance, personalization, and engagement, thereby meeting the needs and preferences of educators and learners (Brown, 2012; Uskov et al., 2021; Kew & Tasir, 2022). This strategic use of data not only improves teaching and learning outcomes but also boosts student motivation and engagement, marking a significant step toward the optimization of online educational environments.

Therefore, exploring the pedagogy behind using LMS in education is crucial in ensuring teachers are effectively trained to use LMS and learning analytics to enhance pedagogy and learning quality. The objectives of this study are to (a) analyze the utilization pattern of AnimoSpace LMS features and tools in online learning environments, (b) investigate AnimoSpace LMS on faculty technology integration and access to resources, and (c) evaluate the effectiveness of AnimoSpace LMS in supporting online learning environments. The Task-Technology Fit (TTF) theory will guide this study through its framework for incorporating technology into teaching and learning (Goodhue & Thompson, 1995), while integrating learning analytics. Insights generated from learning analytics can be used to inform adjustments to the technology solution, ensuring that it aligns with the needs and preferences of the users. In contrast, TTF theory can be used to ensure that the technology solution is compatible with the tasks and goals of the organization. Therefore, exploring the pedagogy behind using LMS in education is crucial, as well as ensuring teachers are effectively trained to use LMS and learning analytics to enhance pedagogy and learning quality.

2. Overview of Literature

2.1 Digital Educational Tools in Teaching and Learning

The evolution of online learning since 1995 has introduced terms like virtual learning, e-learning, and blended learning, reflecting various facets of Internet-based education (Ebardo & Suarez, 2023; Hodges et al., 2020). Online learning, characterized by asynchronous and synchronous settings, allows students to connect with instructors and peers at their convenience, eliminating the need for physical co-presence. This shift has made Learning Management Systems (LMS) essential in modern education, especially during crises or temporary closures (COL, 2020). An LMS supports activities such as resource downloads, grade access, quizzes, and online discussions, requiring meticulous preparation in resources, pedagogy, learner support, and administration for effective online teaching (COL, 2020). For universities aiming to provide high-quality online education, building and sustaining a robust technology infrastructure is crucial (COL, 2020). Academic institutions face significant initial and ongoing costs, including infrastructure, hardware, software, and instructor professional development (Mallillin et al., 2020). Consequently, educators must adapt to online instruction demands and acquire relevant skills while institutions invest in competency assessments for online instructors (COL, 2020). This investment is vital for long-term growth in teaching and learning, underscoring the importance of professional development in promoting high-quality education (COL, 2020). Integrating digital technology into learning environments has significantly transformed educational systems, enabling online education to flourish (Karal et al., 2020). Despite its potential, online education poses unique challenges, requiring educators to comprehensively understand and address these issues (Grand-Clement et al., 2017). Digital technology provides learning independence, allowing education to continue beyond geographical and temporal limits, contributing to inclusive education even in adverse situations (Dhawan, 2020). However, adopting online learning has changed traditional teaching roles, with educators needing to select appropriate digital tools for lesson planning and delivery and integrate technology effectively into the learning process (Malik et al., 2019). This transition

from face-to-face to virtual learning environments demands careful consideration and support for teachers.

2.2 Learning Analytics in Higher Education

The multifaceted impact of learning analytics on higher education, as extensively studied in recent years, reveals significant insights into its utility and effectiveness. Kew & Tasir (2022) investigation into the effects of learning analytics dashboards on student motivation found that students receiving feedback through dashboards showed increased motivation, underscoring the potential of analytics tools to boost student engagement and understanding of progress. This sentiment is echoed by Tsai et al. (2021), who explored learning analytics' broader impact on course design and student learning outcomes, indicating significant improvements in course design and better learning outcomes. Wong & Li (2020) highlighted personalized learning experiences enabled by analytics significantly enhance student engagement and performance, complemented by Algayres & Triantafyllou (2020) and Buckingham Shum et al. (2019), who provided an overarching view of methodologies, applications, challenges, and ethical concerns of learning analytics in higher education. Salam et al. (2019)'s comparative study showed learning analytics' superiority over decision tree methods in predicting student success, while Namoun & Alshanqiti (2020) found a generally positive student attitude towards learning analytics despite data privacy concerns. Kuzilek, Hlosta, and Zdrahal (2020) reported an 80% accuracy in identifying at-risk students, and Ifenthaler & Yau (2020) demonstrated significant improvements in student learning outcomes through the integration of learning analytics and adaptive assessment. In summary, these studies collectively highlight the varied and significant roles learning analytics can play in enhancing student learning outcomes and elevating the quality of higher education.

2.3 Theoretical Background

This research is guided by the Task-Technology-Fit (TTF) theory, which evaluates how well technology supports an individual's tasks, considering task requirements, individual competencies, and technology functionality (Goodhue & Thompson, 1995). While TTF theory has been widely studied, it often excludes learning analytics as a fit factor. Previous literature suggests that TTF needs to conceptualize technology integration in learning better (Scherer et al., 2020). Scholars like Echeverria et al. (2019) emphasize incorporating professional knowledge domains, including learning analytics, into the pedagogical environment. Therefore, this study includes the SAMR Framework as an additional criterion to explain TTF outcomes in education.

The proposed conceptual framework (Figure 1) focuses on technology use in education, particularly LMS, for online learning and learning analytics integration. The study, with the utmost respect for the pivotal role of university educators, examines how they integrate emerging technologies, including learning analytics, into their instructional practices.

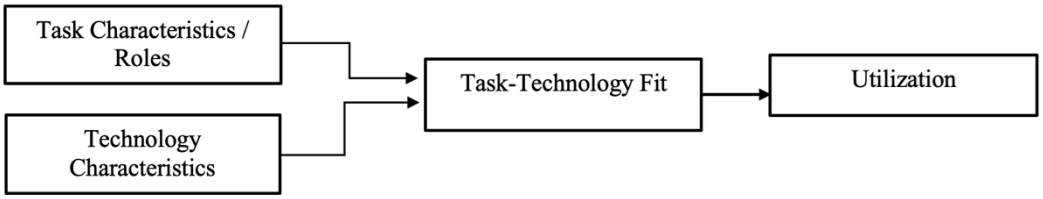

Figure 1. Conceptual Framework of the Study

Using the TTF causal model, this study examines tasks requiring technology, including preparing learning materials, presentations, and assessments in physical settings, delivering content, sharing resources, and assessing students in virtual environments. It considers learning analytics as crucial to task success. Goodhue (1995) defines technology as tools used to perform specific tasks, noting that different technologies have distinct characteristics

based on their use and the tasks they support (Goodhue, 1998; Goodhue & Thompson, 1995). The study aims to reveal how university teachers apply emerging technologies in daily instruction and measure utilization as using technology to complete tasks (Goodhue & Thompson, 1995). It also considers the extent of technology integration, including learning analytics, in LMS utilization, measuring use by frequency, anticipated use, and application diversity.

2.4 AnimoSpace LMS

AnimoSpace LMS is De La Salle University – Manila's official learning management system, utilizing the Canvas Instructure platform since 2017. Recognized for its intuitive design and powerful features, Canvas became DLSU's standardized LMS in January 2019, supporting the university's goal to enhance teaching and learning (John, 2021; De La Salle University, 2019). AnimoSpace aims to blend traditional and virtual learning, improving engagement between teachers and students with its adaptive features (De La Salle University, 2018).

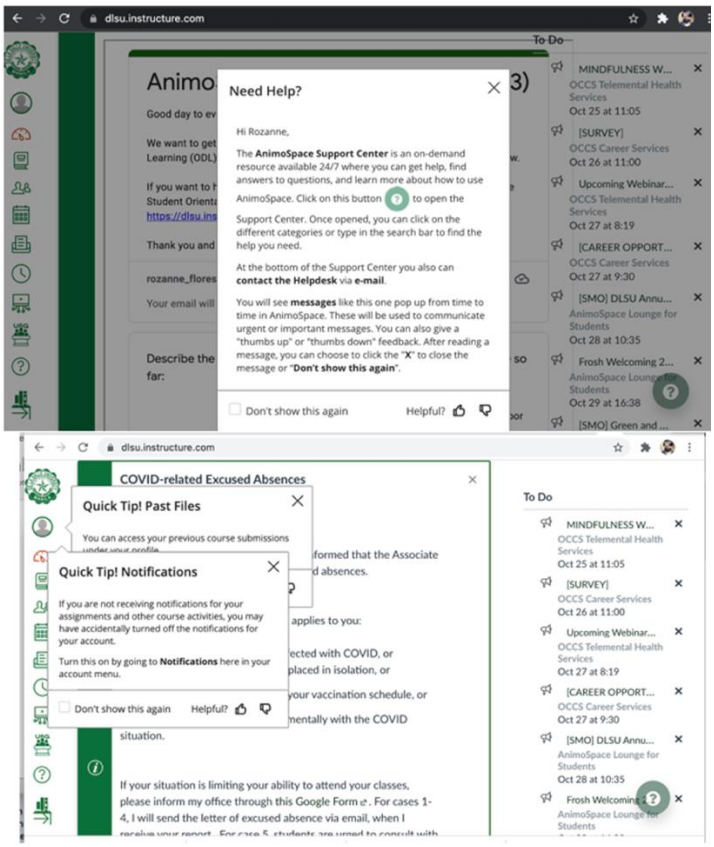

Figure 2. AnimoSpace Help Tips Notification (Flores & Ong, 2023)

3. Methods

3.1 Data collection and analysis

This study primarily employed a quantitative approach to examine faculty and student interactions with Canvas/AnimoSpace, the learning management system at DLSU-Manila. Quantitative data were gathered through learning analytics, focusing on faculty user accounts, access frequency, and course utilization. The platform's analytical tool, Miami, generated data in CSV format, which was then imported into Excel for cleaning, transformation, and analysis. Descriptive statistics, frequency analysis, and correlation analysis were conducted to identify patterns in faculty usage of AnimoSpace LMS features and tools.

Qualitative insights were gathered through interviews with selected faculty members to complement the quantitative data. These interviews were designed to assess the utilization of

platform features based on the Task-Technology Fit (TTF) theory. The qualitative data were analyzed following Creswell's qualitative analysis process, providing a deeper understanding of the factors influencing practical LMS usage.

4. Results and Discussion

According to Goodhue & Thompson (1995), information systems can be evaluated based on usage frequency, application diversity, and integration within specific environments, like AnimoSpace for tertiary education at DLSU-Manila. To further the analysis of the LMS data, nineteen faculty exemplars recommended by Academic Support for Instructional Services and Technology (ASIST) from De La Salle University Manila were interviewed. These interviews aimed to delve into the nuances of how various faculty utilized technology in online learning, highlighting tasks, roles, and technology usage consistent with previous literature. The insights gained from these interviews provided a comprehensive understanding of the practical applications and effectiveness of AnimoSpace. Figure 3 encapsulates this, proving that the shift to online teaching has kept the fundamental educator tasks and roles the same, with AnimoSpace playing a crucial role in maintaining this continuity.

Similarly, data demonstrated that AnimoSpace features and tools go beyond the basic tools required in an online learning environment. It includes advanced tools such as virtual whiteboards, interactive quizzes, and collaborative document editing that, when utilized appropriately, can significantly improve students' learning experiences. AnimoSpace is not limited to the default Canvas features and tools; it incorporates LTI tools such as Zoom, Google Drive, Office 365, and Turnitin, which are add-ons that enrich the student and teacher experience in the virtual classroom. Moreover, AnimoSpace provides access to the University Library's online resources. The use of AnimoSpace facilitated faculty-student communication, which was vital from the outbreak of the pandemic until the present. AnimoSpace can send notifications based on students' preferences. Additionally, faculty and students can communicate within the platform. This illustrates that AnimoSpace has a rich array of features and tools to support the variety of online learning tasks teachers perform, ensuring its versatility and adaptability. These external tools and resources are already incorporated within the platform's dashboard, so users do not need to leave AnimoSpace to access them.

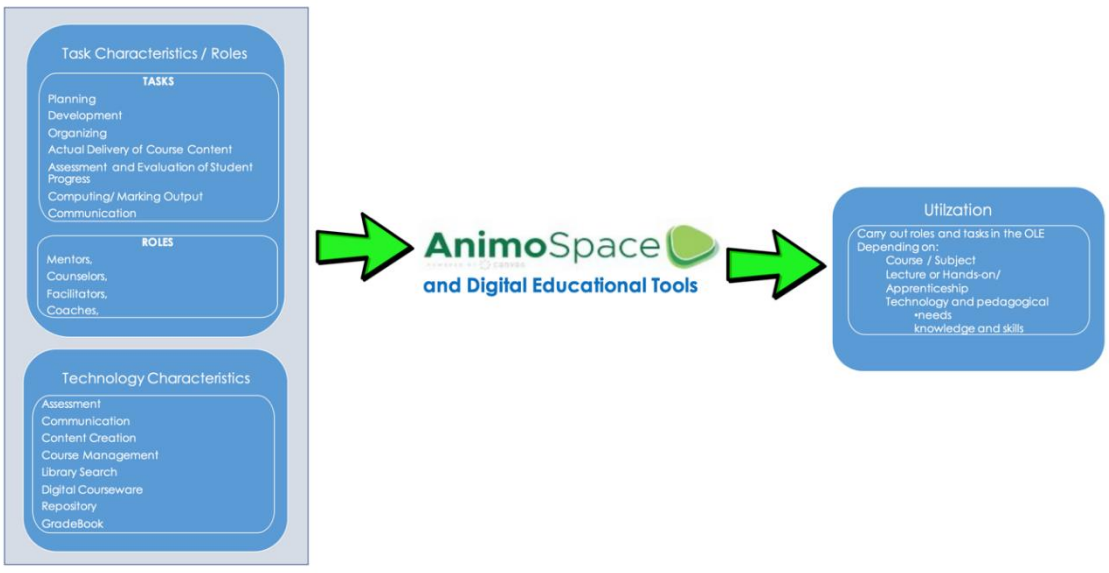

Figure 2. Summary of Tasks Characteristics/ Roles, Technology Characteristics and Utilization of AnimoSpace

However, it is important to note that while AnimoSpace is a comprehensive platform, there are certain tasks that it cannot support. These tasks typically involve laboratory-specific equipment or machines that are difficult to migrate online. For learning tasks that require a laboratory component but can be migrated online, teachers would update laboratory

experiments to be compatible with an environment where students can complete these performance tasks using free mobile apps. The lack of free or cost-effective proctoring tools available to teachers may explain their reliance on alternative forms of evaluation. Understanding these limitations is crucial for educators when planning their online courses.

.

4.1 AnimoSpace LMS Statistical Data

Table 1 summarizes the usage statistics of various AnimoSpace LMS features/tools across different faculties for eight terms, from the second term of 2018-2019 to the third term of 2020-2021. The faculties included are BAGCED, CCS, CLA, COS, GCOE, SOE, and RVCOB. The table displays the total usage for each feature/tool, the overall total, the average usage per faculty, and the ranking based on the average usage.

The table offers a comprehensive view of AnimoSpace LMS feature utilization across different faculties. Notably, the Discussion tool stands out as the most used feature, indicating a high level of interaction and engagement in forums. The Attachment and Assignment tools also rank high, underscoring their crucial roles in course management and coursework submission. On the other hand, features like Calendar, Collaboration, and Learning show minimal usage, signaling potential areas for improvement in user engagement or a possible preference for alternative tools or methods. Understanding these usage patterns is vital for identifying which tools effectively support teaching and learning practices and which may require enhancements or additional faculty training. The data reveals significant trends and provides actionable insights for optimizing LMS features to enhance pedagogical strategies and learning outcomes across various faculties. The contrasting usage patterns offer valuable insights into how faculties interact with the LMS. The high usage of Discussion, Attachment, and Assignment tools suggests that communication, resource sharing, and assessment are key to the teaching strategy. In contrast, the low usage of Calendar, Collaboration, and Learning tools indicates areas where the LMS could be improved or additional faculty training and support may be necessary. Understanding these usage trends can help refine the LMS to better meet the needs of educators and students, ultimately enhancing the overall learning experience.

Table 1. *Aggregated AnimoSpace LMS Faculty Utilization Data*

AnimoSpace Feature/ Tool	BAGCED	CCS	CLA	COS	GCOE	SOE	RVCOB	Total	Average Usage	Rank
Announcements	1928	1319	3679	1982	3957	850	4562	18277	2611	**10**
Assignment	15929	19035	24513	20531	42162	6881	47973	177024	25289	**3**
Attachment	17148	18447	23003	42160	40897	4501	38257	184413	26345	**2**
Calendar	5	4	19	4	42	7	42	123	18	**25**
Collaboration	97	103	134	130	319	35	140	958	137	**23**
Conferences	605	360	1004	732	1150	401	1682	5934	848	**20**
Content	1191	772	2510	1408	1791	639	3311	11622	1660	**17**
Context	4008	2593	7042	5518	8420	1904	12037	41522	5932	**6**
Discussion	23307	16908	49297	26464	47666	10775	70854	245271	35039	**1**
Enrollment	1462	1597	2842	2352	2043	645	5352	16293	2328	**13**
Files	1608	1374	3170	1939	3713	754	4368	16926	2418	**11**
Grades	858	861	1704	1323	2466	438	2728	10378	1483	**18**
Home	3715	2105	6696	4432	6540	1358	7741	32587	4655	**7**
Learning	2	0	0	0	1	0	807	810	116	**24**
LTI/tool	338	136	785	305	660	281	9	2514	359	**22**

Modules	1420	685	2267	1695	2944	509	3407	12927	1847	**16**
Outcomes	273	356	509	365	544	142	802	2991	427	**21**
Pages	870	504	1477	1082	1762	364	1989	8048	1150	**19**
Quizzes	1458	6880	5091	10682	17612	1638	15764	59125	8446	**5**
Roster	2996	1704	5503	3590	5081	1115	6099	26088	3727	**8**
Speed	1259	1203	2184	1429	3166	625	3127	12993	1856	**15**
Syllabus	1929	1085	3098	1971	3641	635	4433	16792	2399	**12**
Topics	1372	887	2785	1466	2597	636	3482	13225	1889	**14**
Web	1715	3227	2597	3038	5016	2112	8245	25950	3707	**9**
Wiki	11581	5346	12443	12601	16998	1307	16270	76546	10935	**4**
Total	97074	87491	164352	147199	221188	3855?	263481			
Rank	**5**	**6**	**3**	**4**	**2**	**7**	**1**			

Similarly, the data reveals that the College of Science (COS) and the College of Liberal Arts (CLA) offer the highest number of courses, showcasing their extensive curriculum. In contrast, the School of Education (SOE) has the fewest courses, possibly due to its specific academic focus. The Ramon V. del Rosario College of Business (RVCOB) leads with published courses, indicating high content readiness and availability. The Business Administration and Governance College of Education (BAGCED) follows with published courses, demonstrating considerable accessible content. RVCOB also leads in total aggregated utilization, indicating high engagement levels with the LMS. The Graduate College of Education (GCOE) and CLA show significant utilization, highlighting their active use of LMS features. The data underscores the need for targeted support in colleges with lower utilization rates. Enhancing LMS engagement through training, support, and resources can help bridge these gaps. The high utilization in RVCOB and GCOE reflects effective LMS integration, which can serve as a model for other colleges aiming to boost their engagement.

Table 2 below provides a comprehensive overview of the utilization of various AnimoSpace LMS features across three academic years: AY 2018-2019, AY 2019-2020, and AY 2020-2021. This data is invaluable in understanding the trends and shifts in the use of LMS tools over time, equipping us with the knowledge to make informed decisions.

Table 2. *AnimoSpace LMS Feature Utilization Over Academic Years 2018-2021*

AnimoSpace LMS Feature/ Tool	AY 2018-2019	AY 2019-2021	AY 2020-2021
Announcements	1905	6734	9638
Assignment	11834	60654	104536
Attachment	9562	60562	114289
Calendar	3	16	104
Collaboration	94	467	397
Conferences	457	3284	2193
Content	394	4047	7181
Context	2956	13329	25237
Discussion	12675	87910	144686
Enrollment	1133	5992	9168
Files	2353	6317	8256
Grades	265	2756	7357
Home	8467	10750	13370
Learning	3	111	696
LTI/tool	1	332	2181
Modules	902	4539	7486
Outcomes	362	1454	1175
Pages	543	3148	4357
Quizzes	2317	19998	36810

Roster	5640	8488	11960
Speed	976	4401	7616
Syllabus	4078	5841	6873
Topics	1631	5230	6364
Web	74	15445	10431
Wiki	1602	23942	51002

The table showcases the positive progression in the usage of AnimoSpace LMS features over three academic years. Notable trends can be observed in the data, such as the increased utilization of tools like **Assignment**, **Attachment**, and **Discussion**. For instance, the usage of the **Assignment** tool grew from 11,834 in AY 2018-2019 to 104,536 in AY 2020-2021, demonstrating its critical role in coursework management during this period. Conversely, features like **Calendar**, **Collaboration**, and **Conferences** saw relatively lower usage. The **Calendar** tool, for example, increased from a minimal 3 in AY 2018-2019 to 104 in AY 2020-2021, but remains one of the least utilized features. This contrast underscores a potential area for improvement, suggesting that these tools either require better integration into teaching practices or more training for faculty to leverage their benefits effectively. This longitudinal analysis of LMS feature utilization provides valuable insights into how faculty and students engage with the LMS, highlighting both heavily relied-upon tools and those that might benefit from strategic enhancements or increased awareness.

The data, presented in Tables 3, provides an analysis of faculty's total aggregated usage of the AnimoSpace LMS, total courses, and utilization across different colleges. These insights are essential for understanding how each college engages with the LMS and identifying areas for potential improvement and support.

Table 3. Total Aggregated Faculty Usage by College

	COLLEGE						
	BAGCED	**CCS**	**CLA**	**COS**	**GCOE**	**SOE**	**RVCOB**
Total Aggregated Faculty Usage	97074	87491	164352	147199	221188	38552	263481
Rank	5	6	3	4	2	7	1

RVCOB demonstrates the highest aggregated faculty usage, indicating a solid adoption and integration of the LMS within its educational practices. GCOE and CLA follow, reflecting significant engagement with the LMS. In contrast, CCS and SOE rank lower in aggregated usage, suggesting these colleges might benefit from additional training or resources to enhance LMS utilization or they have less number of users as compared to other colleges. The high usage in RVCOB, GCOE, and CLA may correlate with positive outcomes in faculty-student interactions and resource accessibility. Conversely, the lower usage in CCS and SOE indicates potential areas for strategic improvements to boost engagement or simply because the LMS does not meet the required tool for their classes.

4.2 Summary of Results

This study highlights the critical role of Task-Technology Fit (TTF) in successfully utilizing AnimoSpace at De La Salle University (DLSU). According to TTF theory, technology is most effective when its features align well with the tasks it intends to support. The analysis of AnimoSpace usage reveals that the platform's most heavily utilized features, such as the Discussion, Assignment, and Attachment tools, demonstrate a strong alignment with the core tasks of educators. These tools effectively facilitate communication, resource sharing, and coursework management, essential online teaching components. Their frequent use reflects a robust task-technology fit that enhances teaching efficiency and student engagement.

On the other hand, tools like Calendar and Collaboration were used less frequently, indicating a weaker task-technology fit. This suggests that these tools may not align as closely with the specific needs of faculty, or alternative methods might be preferred. However, this

also presents an opportunity for improvement, indicating areas where additional training or tool enhancements could be beneficial to better integrate these features into teaching practices.

The study also uncovered limitations in AnimoSpace's ability to support tasks requiring specialized physical resources, such as laboratory-based activities. This underscores the importance of understanding task-technology fit when implementing digital solutions in education. It highlights the inherent constraints of digital platforms in replicating specific physical tasks, thereby enlightening the audience about the challenges involved. The findings reflect a broader trend at DLSU toward greater adoption and more sophisticated use of digital tools in pedagogical practices. Faculty engagement with AnimoSpace has increased, showcasing a shift toward a more profound integration of digital platforms in education. However, the variability in tool utilization across faculties suggests the need for further optimization. Identifying the most and least used tools can help tailor faculty training to fully leverage all platform aspects to support diverse teaching and learning needs, thereby engaging the audience in the process of improvement.

This research underscores the importance of continuously monitoring and refining the use of learning management system (LMS) tools to ensure that they remain effective and adaptable to the evolving demands of higher education. Additionally, the findings can guide the development of future digital tools, ensuring they are better aligned with the tasks they are designed to support, ultimately enhancing teaching effectiveness and student outcomes.

5. Conclusions and Recommendations

The research highlights AnimoSpace LMS's capacity as an effective online learning platform, underscoring its role in centralizing communication and learning. It reveals that while AnimoSpace efficiently integrates technology and resources among faculty, ongoing support and professional development are crucial to maximizing its utility. The analysis also emphasizes the need for continuous evaluation to enhance the platform's response to the dynamic needs of students and educators.

Learning analytics offer insights into the platform's utilization and effectiveness in online environments, acknowledging AnimoSpace's advanced tools despite facing limitations such as the inability to support specific laboratory equipment and a lack of affordable proctoring tools. Teachers have creatively adapted, using free mobile apps for lab experiments and incorporating third-party tools to bypass these constraints, showcasing their adaptability and resourcefulness.

Despite its shortcomings, AnimoSpace remains a pivotal tool for education, promoting a unified space for learning and communication. Several strategies are recommended for AnimoSpace and Canvas LMS to augment its efficiency. It would enhance its versatility by customizing the platform to cater to various disciplinary needs, like differentiating between the arts and STEM fields. Leveraging data analytics to drive improvements ensures that enhancements align with the educational community's actual needs. Furthermore, analyzing the per-capita usage of LMS features across different colleges can provide deeper insights into its effectiveness and areas for enhancement.

Overall, AnimoSpace LMS emerges as a valuable asset in online learning, with room for growth through focused strategies that bridge gaps in technology integration, discipline-specific requirements, and leveraging analytics for continuous improvement.

References

Alam, Md. A. (2020). Challenges and Possibilities of Online Education during Covid-19. *Preprints*, *1*(June), 12–14. https://doi.org/10.20944/preprints202006.0013.v1

Algayres, M., & Triantafyllou, E. (2020). Learning Analytics in Flipped Classrooms: A Scoping Review. *Electronic Journal of E-Learning*, *18*(5). https://doi.org/10.34190/JEL.18.5.003

Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic. *Higher Education Studies*, *10*(3), 16. https://doi.org/10.5539/hes.v10n3p16

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., Tiu, C. J. S., Clarion, C. A., & Reyes, J. C. B. (2021). Barriers to Online Learning in the Time of COVID-19: A National Survey of Medical Students in the Philippines. *Medical Science Educator*. https://doi.org/10.1007/s40670-021-01231-z

Buckingham Shum, S., Ferguson, R., & Martinez-Maldonado, R. (2019). Human-Centred Learning Analytics. *Journal of Learning Analytics*, *6*(2). https://doi.org/10.18608/jla.2019.62.1

Carrillo, C., & Flores, M. A. (2020). COVID-19 and teacher education: a literature review of online teaching and learning practices. *European Journal of Teacher Education*, *43*(4), 466–487. https://doi.org/10.1080/02619768.2020.1821184

COL. (2020). Guidelines on Distance Education during COVID-19. *Burnaby:COL*.

De La Salle University. (2018). *AnimoSpace: The Lasallian Learning Management System*. https://dlsumanila.medium.com/animo-space-the-lasallian-learning-management-system-ff836eb17970

De La Salle University, A Canvas Case Study: Higher Education 3 (2019).

De Paepe, L., Zhu, C., & Depryck, K. (2018). Online Dutch L2 learning in adult education: educators' and providers' viewpoints on needs, advantages and disadvantages. *Open Learning*, *33*(1), 18–33. https://doi.org/10.1080/02680513.2017.1414586

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018

Ebardo, R., & Suarez, M. T. (2023). Do cognitive, affective and social needs influence mobile learning adoption in emergency remote teaching? *Research and Practice in Technology Enhanced Learning*, *18*, 014. https://doi.org/10.58459/rptel.2023.18014

Echeverria, A., Nussbaum, M., Albers, C. J., Heller, R. S., Tsai, C. C., & van Braak, J. (2019). The impact of Computers & Education measured beyond traditional bibliographical metrics. *Computers and Education*, *140*(June), 1–6. https://doi.org/10.1016/j.compedu.2019.05.018

Eli-Chukwu, N. C., Igbokwe, I. C., Ifebude, B., Nmadu, D., Iguodala, W., Uma, U., Onyeneke, R. U., & Akudo, F. U. (2023). Challenges confronting e-learning in higher education institutions in Nigeria amid Covid -19. *Journal of Applied Research in Higher Education*, *15*(1), 238–253. https://doi.org/10.1108/JARHE-09-2021-0346

Flores, R. T. G., & Ong, E. C. (2023). AnimoSpace LMS Transcending Physical Learning Barriers. In P. Escudeiro (Ed.), *Handbook of Research on Advancing Equity and Inclusion Through Educational Technology* (pp. 239–262). IGI Global. https://doi.org/10.4018/978-1-6684-6868-5.ch012

Gillett-Swan, J. (2017). The Challenges of Online Learning: Supporting and Engaging the Isolated Learner. *Journal of Learning Design*, *10*(1), 20. https://doi.org/10.5204/jld.v9i3.293

Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and Individual. *MIS Quarterly*, *19*(2), 213–236.

Grand-Clement, S., Devaux, A., Belanger, J., & Manville, C. (2017). Digital Learning: Education and skills in the digital age. *Digital Learning: Education and Skills in the Digital Age*. https://doi.org/10.7249/cf369

Hopwood, I. (2022). Peerless? How students' experience of synchronous online teaching can disrupt the development of relationships to peers, teachers, subject and self. *Research and Practice in Technology Enhanced Learning*, *18*, 007. https://doi.org/10.58459/rptel.2023.18007

Ifenthaler, D., & Yau, J. Y.-K. (2020). Utilising learning analytics to support study success in higher education: a systematic review. *Educational Technology Research and Development*, *68*(4), 1961–1990. https://doi.org/10.1007/s11423-020-09788-z

John, R. (2021). Canvas LMS Course Design. In *Canvas LMS Course Design* (2nd ed.). PacktPub. https://ebookcentral.proquest.com

Karal, H., Kokoc, M., Colak, C., & Yalcin, Y. (2020). A Case Study on Online Mathematics Teaching with Pen-based Technology: Experiences of Two Instructors. *Contemporary Educational Technology*, *6*(4), 319–337. https://doi.org/10.30935/cedtech/6157

Kew, S. N., & Tasir, Z. (2022). Learning Analytics in Online Learning Environment: A Systematic Review on the Focuses and the Types of Student-Related Analytics Data. *Technology, Knowledge and Learning*, *27*(2), 405–427. https://doi.org/10.1007/s10758-021-09541-2

Korkmaz, G., & Toraman, Ç. (2020). Are We Ready for the Post-COVID-19 Educational Practice? An Investigation into What Educators Think as to Online Learning. *International Journal of Technology in Education and Science*, *4*(4), 293–309. https://doi.org/10.46328/ijtes.v4i4.110

Malik, S., Rohendi, D., & Widiaty, I. (2019). *Technological Pedagogical Content Knowledge (TPACK) with Information and Communication Technology (ICT) Integration: A Literature Review*. *299*(Ictvet 2018), 498–503. https://doi.org/10.2991/ictvet-18.2019.114

Mallillin, L. L. D., Mendoza, L. C., Mallillin, J. B., Felix, R. C., & Lipayon, I. C. (2020). Implementation and Readiness of Online Learning Pedagogy: a Transition To Covid 19 Pandemic. *European Journal of Open Education and E-Learning Studies*, *5*(2), 71–90. https://doi.org/10.46827/ejoe.v5i2.3321

Namoun, A., & Alshanqiti, A. (2020). Predicting Student Performance Using Data Mining and Learning Analytics Techniques: A Systematic Literature Review. *Applied Sciences*, *11*(1), 237. https://doi.org/10.3390/app11010237

Salam, M., Awang Iskandar, D. N., Ibrahim, D. H. A., & Farooq, M. S. (2019). Service learning in higher education: a systematic literature review. *Asia Pacific Education Review*, *20*(4), 573–593. https://doi.org/10.1007/s12564-019-09580-6

Scherer, R., Siddiq, F., & Tondeur, J. (2019). Computers & Education The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers ' adoption of digital technology in education. *Computers & Education*, *128*(0317), 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Scherer, R., Siddiq, F., & Tondeur, J. (2020). All the same or different? Revisiting measures of teachers' technology acceptance. *Computers & Education*, *143*, 103656. https://doi.org/10.1016/j.compedu.2019.103656

Sector, E., Systems, L. M., Learning, E.-, Development, L., & Systems, L. M. (2021). *Learning Management Systems (LMS) towards helping Teachers and Students in the pursuit of their E-Learning Methodologies CHRISTOPHER M . LEE Technological Institute of the Philippines - Manila March , 2021 ABSTRACT : INTRODUCTION : LITERATURE REVIEW : March*, 1–9.

Tan, A. J. Y., Davies, J., Nicolson, R. I., & Karaminis, T. (2022). A technology-enhanced learning intervention for statistics in higher education using bite-sized video-based learning and precision teaching. *Research and Practice in Technology Enhanced Learning*, *18*, 001. https://doi.org/10.58459/rptel.2023.18001

Tirado-Morueta, R., García-Ruíz, R., Hernando-Gómez, Á., Contreras-Pulido, P., & Aguaded-Gómez, J. I. (2022). The role of teacher support in the acquisition of digital skills associated with technology-based learning activities: the moderation of the educational level. *Research and Practice in Technology Enhanced Learning*, *18*, 010–024. https://doi.org/10.58459/rptel.2023.18010

Tsai, Y.-S., Kovanović, V., & Gašević, D. (2021). Connecting the dots: An exploratory study on learning analytics adoption factors, experience, and priorities. *The Internet and Higher Education*, *50*, 100794. https://doi.org/10.1016/j.iheduc.2021.100794

Uskov, V. L., Bakken, J. P., Putta, P., Krishnakumar, D., & Ganapathi, K. S. (2021). Smart Education: Predictive Analytics of Student Academic Performance Using Machine Learning Models in Weka and Dataiku Systems. In V. L. Uskov, R. J. Howlett, & L. C. Jain (Eds.), *Smart Education and e-Learning 2021* (pp. 3–17). Springer Singapore.

Washington, G. Y. (2019). The Learning Management System Matters in Face-to-Face Higher Education Courses. *Journal of Educational Technology Systems*, *48*(2), 255–275. https://doi.org/10.1177/0047239519874037

Wong, B. T., & Li, K. C. (2020). A review of learning analytics intervention in higher education (2011–2018). *Journal of Computers in Education*, *7*(1), 7–28. https://doi.org/10.1007/s40692-019-00143-7

Ziraba, A., Akwene, G. C., Nkea, A. nee A. M., & Lwanga, S. C. (2020). the Adoption and Use of Moodle Learning Management System in Higher Institutions of Learning: a Systematic Literature Review. *American Journal of Online and Distance Learning*, *2*(1), 1–21. https://ajpojournals.org/journals/index.php/AJODL/article/view/489/609