BEYOND FLEXIBILITY: ASSESSING PRE-SERVICE TEACHER SATISFACTION IN A UDL-ENHANCED BLENDED LEARNING INTERVENTION

MUHAMMAD, Y.[1*] – YAHAYA, W. A. J. W.[1]

[1] *Centre for Instructional Technology and Multimedia, Universiti Sains Malaysia, Penang, Malaysia.*

**Corresponding author*
e-mail: myahaya[at]student.usm.my

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Abstract. This study assessed pre-service teachers' satisfaction with blended learning modes of delivery aligned with Universal Design for Learning. Participants' (N=123) responses were collected using a validated satisfaction scale. Given the violation of parametric test assumptions, a Wilcoxon rank test was employed to determine whether students' ratings of the satisfaction scale items differed from a predefined neutral value (median=3) (two-tailed). The findings revealed a significant deviation from the predefined neutral median values across all the satisfaction scale items ($p<.001$), with effect sizes ranging from ($r=0.642$) to ($r=0.911$) across the items. However, the study noted significant agreement with negative experiences such as feelings of isolation ($r=0.703$), anxiety ($r=0.773$), and weak effects for the Learning Management System's usability ($r=0.275$). Thus, the study concluded that participants generally perceived the blended learning as satisfying overall but experienced unintended psychosocial and technical challenges, signifying the need for more balanced and usable design that could harmonise flexibility with social and emotional support. In the light of these challenges and limitations, the paper provides recommendations for practitioners and future research directions.
Keywords: *Universal Design for Learning, blended learning, student satisfaction, pre-service teachers, higher education*

Introduction

The COVID-19 pandemic has accelerated the implementation of blended learning in higher education institutions worldwide (Jiang et al., 2024; Sukirman et al., 2022; Rahmat et al., 2019). This shift has been driven by rapid advancements in educational technology and the increasing demand for more flexible, convenient, and adaptable instructional systems (Dron, 2022; Wang et al., 2020). Blended learning (BL) is an instructional approach that combines face-to-face and online instructional modalities (Boelens et al., 2017; Garrison and Kanuka, 2004). In BL modalities students engage in learning with some control over time, pace, and space, while also attending teacher-directed classes at a physical location (Kim et al., 2016). BL has a transformative potential to remove barriers to learning by providing a balanced solution to the needs and preferences of diverse learners (Ali, 2024; Kim et al., 2016). BL is one of the most used instructional strategies to maximise learner's engagement, satisfaction and improved learning outcomes (Ashraf et al., 2021) increases access, convenience, and provides greater cost-effectiveness (Muxtorjonovna, 2020). BL flexibility accommodates the needs of learners who may have other commitments or prefer a more Individualised learning approach (Viswanathan, 2022; Hrastinski, 2019). However, the effectiveness of blended learning depends on how well it meets the expectations and satisfaction of its beneficiaries, particularly pre-service teachers who are preparing to enter a profession increasingly reliant on technology (Pozas et al., 2024). Learner

satisfaction was considered a key measure of perceived effectiveness of blended learning model from students' perspectives (Bowyer and Chambers, 2017). A substantial body of empirical evidence indicates that the implementation of Blended Learning (BL) strategies across disciplines and educational contexts is positively correlated with increased learner satisfaction (Cao, 2023; Da Costa Penha et al., 2023; Zeqiri et al., 2021; Ghazal et al., 2018). Moreover, satisfaction with blended learning components can influence learners` willingness to adopt similar approaches in their future classrooms (Bruggeman et al., 2021). To fully harness the potential of blended learning, the proponents of Universal Design for Learning demonstrated that incorporating UDL guidelines into blended learning implementation enables educators to align education with the evolving dynamics of learners, improve the flexibility contents delivery, responsive to the needs of diverse learners (Smith, 2023; Zhang et al., 2022a; 2022b).

Universal Design for Learning (UDL) is an educational framework informed by a range of pedagogical theories aims at providing all learners equal opportunities to succeed (Rao et al., 2023; Rao, 2021). UDL emphasises optimising student engagement, satisfaction and success by presenting information in multiple ways, engaging learners, and allowing them to demonstrate the acquired knowledge in diverse ways (Bray et al., 2023; Mackey et al., 2023; Rose, 2001). The blend of UDL and BL allows educators to personalise instruction, empower students to make choices and work closely with learners to facilitate their progress through multiple pathways for engagement, representation, action, and expressions (Rao et al., 2023; Zhang et al., 2022a), and meet the needs of diverse learners regardless of time, place, or learning style (Smith, 2023; Zhang et al., 2022a; 2022b). Despite these advantages, there is a lack of empirical research determining the effectiveness of UDL-enhanced blended learning intervention on pre-service teachers` satisfaction, which is the focus of this study. Thus, this study aims to assess pre-service teachers' satisfaction with face-to-face, online, and blended course components. The study addresses the following research question: Is there significant satisfaction with the Universal Design for Learning enhanced blended learning (UDL-BL) mode of delivery among pre-service teachers following the implementation of UDL-BL intervention? Understanding how pre-service teachers perceive varied course formats of learning contents delivery is beneficial in designing and delivery of more responsive curriculum capable of addressing the unique needs and preferences of diverse learners.

Literature review

Instructional modalities

Institutions of higher education are increasingly adopting diverse instructional modalities to meet the evolving needs of their students across their campuses. The traditional mode of instruction (classroom-based or face-to-face) model emphasizes direct interaction between instructors and students, allows immediate feedback and a broad range of topics can be covered within a single class period. This is particularly beneficial when dealing with large student numbers and limited resources (Alaagib et al., 2019; Kaur, 2011). However, the traditional method has faced increasing criticism for its one-way communication style, which can result in low engagement and dissatisfaction among learners due to limited opportunities for interactions, collaboration, and active learning (Xue et al., 2021; Obiosa, 2020). It often assumes a

one-size-fits-all learning pace, ignoring the unique strengths, weaknesses, and interests of individual learners (Nazarenko, 2015), which may not cater for diverse learners` needs, backgrounds, and cultures, potentially leading to exclusion of many students. The rigid structure and limited flexibility of traditional approach have prompted the adoption of online learning, which offers accessibility, self-paced learning, and the use of digital tools (Schmid et al., 2023) Despite its advantages, online learning as sole option often struggles with challenges of isolation and engagement of diverse learners (Başal and Eryılmaz, 2021; Gillett-Swan, 2017). This highlights the need for a more responsive learning environment and approaches that can effectively accommodate varied learners` abilities, interests, backgrounds, preferences, and needs. To overcome these challenges, BL has emerged as a response to the evolving needs of contemporary educational landscapes (Hubackova and Semradova, 2016; Beaver et al., 2014), by combining the strengths of face-to-face and online modalities to enhance flexibility, active participation, personalisation, and collaborative learning opportunities (Olatunde-Aiyedun and Adams, 2022; Manwaring et al., 2017; Bryan and Volchenkova, 2016; Garrison and Kanuka, 2004).

Blended Learning (Bl) is an umbrella term for various learning wide range of models that educators can use to deliver learning opportunities (Wright et al., 2022; Beaver et al., 2014). The models differ based on the needs and learning situation, course structure along with factors such as the school`s mission, institutional support, technology capabilities, and professional development opportunities (Wright et al., 2022; Cleveland-Innes and Wilton, 2018). Some of these models are face-to-face drive, rotation model, flex model, labs model, self-blend model and online driver model (Wright et al., 2022; Cleveland-Innes and Wilton, 2018). A large set of online and learning management systems platforms (such as Moodle, Blackboard, CodeTantra, and g suite) have been developed to help students for meaningful learning through flexible learning pathways (Kumar et al., 2021). Through these platforms, learners can collaborate, participate in discussions, and engage in multimedia-rich content. This dynamic and interactive environment stimulates interest, promotes critical thinking, and enhances learner engagement, satisfaction and improved learning outcomes (Dziuban et al., 2018; Nazarenko, 2015). The significance of blended learning lies in its capacity to offer a dynamic and adaptable learning environment that resonates with diverse learners (Chiu, 2021). By seamlessly integrating the strengths of conventional and technologies, blended learning addresses the limitations of each while optimizing the benefits, fostering engagement, and promoting deeper understanding (Molina-Cristobal et al., 2021; Öncü and Bıchelmeyer, 2021; Halverson and Graham, 2019;). The key characteristics of blended learning include flexibility in scheduling and delivery, personalized learning pathways, opportunities for self-paced study, and enhanced accessibility through digital technologies (Auster, 2016). However, challenges such as technical glitches, poor internet connectivity, or insufficient access to requisite tools were identified as potential impediments that could adversely affect learners' satisfaction with the overall learning experience in BL learning contexts (Rasheed et al., 2020; Regha, 2015).

Instructional modalities and learner satisfaction

Learner satisfaction (LS) with BL refers to the extent to which students find a mix of classroom-based conventional methods and online learning experiences engaging, effective, and fulfilling (Askar et al., 2008). Factors influencing LS include flexibility,

convenience, and accessibility that blended learning offers learners (Cleveland-Innes and Wilton, 2018). Others are course design, instructor support, and the quality of online resources (Kintu et al., 2017). Moreover, LS has been linked to their perceived usefulness of the course, engagement levels, and the alignment of course components with their learning preferences. Furthermore, effective communication between instructors and students, clear expectations regarding course requirements, and technical support for online platforms are essential in maximising LS and overall success (Yadav, 2022). Studies comparing face-to-face, online, and blended learning modalities have yielded mixed results. While some researchers report higher satisfaction with blended learning due to its flexibility and interactive elements, others highlight the challenges of balancing online and face-to-face components, particularly for pre-service teachers with limited technological proficiency (Bruggeman et al., 2021). A study by Bouilheres et al. (2020) explored learners` perceptions regarding the benefits of Blended Learning. The study found that engagement, flexibility of learning, online learning experience, and self-confidence were significant factors. The study emphasised the need for shift from traditional teaching methods to a more inclusive approach that incorporates peer interaction, teacher-student interaction, and online digital interaction. These underscore the need for a better understanding of how different instructional modalities impact pre-service teachers' satisfaction.

Materials and Methods

This study employed quantitative method, involving pre-service teachers (aged 19-25 years) who are pursuing teacher education programme at Adamu Augie College of Education, Argungu, North-West Nigeria. Participants' satisfaction levels were collected using an adapted, validated satisfaction scale. Originally the scale consisted of 31 items, of which 25 were on a 5-point Likert-style scale (with 1 representing Strongly Disagree and 5 representing Strongly Agree) and 6 questions were measured on non-Likert-scale categories. The Cronbach's alpha for the original 25 Likert items were (.908) (Owston et al., 2013). The Cronbach's alpha coefficient calculated before the administration of the adapted scale in this stud was (.882) for the overall 25 Likert-style scale items, which suggests high reliability of the instrument. The intervention module was designed, developed, and delivered using the Universal Design for Learning (UDL) framework to ensure flexibility in content presentation (using text, video, and audio) and diverse engagement pathways (including online pre-class activities, quizzes, online discussions, and collaboration). The UDL-based blended learning (UDL-BLM) also offered choice in assessment formats, such as self-reflection and peer assessment via the Learning Management System (LMS) and social media platforms. Participants were offered choice to demonstrate their learning through various methods, including written assignments, slides, and recorded audio/video presentations.

Results and Discussion

Assumption checks and hypothesis testing

To determine whether the dataset follows normal distribution, a Shapiro-Wilk test was conducted. Results of W test indicated significant deviations from normality for all satisfaction scale items ($W=0.353-0.856$, $p<.001$), suggesting that the distribution of

student responses violates normality assumptions which justified the use of non-parametric methods for hypothesis testing. Given the violation of parametric test assumptions, a Wilcoxon rank test was employed to compare the medians instead of the means to determine whether students' ratings of the Satisfaction Scale Likert-style scale items differed significantly from a predefined neutral value (median=3) (two-tailed). As indicated in *Table 1*, the effect sizes are given by matched Rank Biserial Correlation (RBC), interpreted using Cohen's benchmarks where .2 (small), .5 (medium), and .8 (large) (Goss-Sampson, 2020; Pallant, 2020). While the Hodges-Lehmann Estimate (HLE), measures the median difference between the observed scores and the predefined neutral value.

Table 1. *Wilcoxon test for satisfaction.*

Satisfaction scale items	V	P	Hodges-Lehmann Estimate	Rank-Biserial Correlation	SE Rank-Biserial Correlation
Overall, I am satisfied with this course	5772	< .001	1	0.891	0.109
Given the opportunity I would take another course in the future that has both online and face-to-face components	6490	< .001	1	0.88	0.106
This course experience has improved my opportunity to access and use the class content	5350	< .001	1	0.887	0.111
The online and face-to-face course components of this course enhanced each other.	4593	< .001	1	0.894	0.116
The course Learning Management site is well organized and easy to navigate	3282.5	0.006	4.850×10^{-5}	0.275	0.114
The web resources in this course are helpful	6025.5	< .001	1	0.871	0.108
When I encounter a problem with the use of the technologies in this course, the College ICT technical support service helped me with my problem in a timely and effective manner.	5252.5	< .001	1	0.818	0.111
This course offered the convenience of not having to come to campus as often.	4842	< .001	1	0.774	0.112
This course allowed me to reduce my total travel time each week and related expenses.	5384	< .001	1	0.899	0.111
...I am more engaged in this course	3903	< .001	1	0.642	0.116
...I am likely to ask questions in this course.	5832	< .001	1	0.911	0.109
...feel that the amount of interaction with other students in this course increased.	4092	< .001	1	0.758	0.117
.feel that the quality of my interaction with other students in this course was better.	4920	< .001	1.5	0.802	0.112
...feel connected with other students in this course.	5186.5	< .001	1	0.669	0.109
...I feel isolated during this course.	4559.5	< .001	1	0.703	0.113
...I feel that the amount of my interaction with the instruction in this course increased.	5190	< .001	1	0.796	0.111
...I feel that the quality of my interaction with the instructors in this course was better	4789	< .001	1	0.897	0.115
...I am overwhelmed with information and resources in this course.	4968.5	< .001	1	0.688	0.11
...I have trouble using the technologies in this course.	5075	< .001	1	0.663	0.109
.I feel more anxious in this course.	5217	< .001	1	0.773	0.11
...this course required more time and effort.	4455	< .001	1	0.696	0.114
...This course has improved my understanding of key concepts.	5445.5	< .001	1	0.885	0.111

Note: For the Wilcoxon test, the alternative hypothesis specifies that the median is different from a neutral value (median=3).

As indicated in the table 1, the results of Wilcoxon test revealed statistically significant deviations from the neutral median values across all measured satisfaction scale items ($p<.001$), except for "The course Learning Management site is well organized and easy to navigate" ($V=3282.5$, $p=.006$), which still reached significance at a more conservative alpha level (e.g., $\alpha=.01$). The HL estimates, which quantify the median difference between observed responses and the predefined neutral value (3), were predominantly 1.0 for most items. This indicates that students' median ratings were consistently 1 point above the neutral midpoint (median=4 on the 1-5 Likert scale), suggesting strong agreement with all the positively worded statements as well as endorsement of all negatively phrased challenges. The rank-biserial correlation, a non-parametric effect size, indicates the magnitude and direction of these deviations. For example, items such as "Overall, I am satisfied with this course" ($r=0.891$, $SE=0.109$) and "This course allowed me to reduce travel time" ($r=0.899$, $SE=0.111$) demonstrated very large effects, indicating very strong satisfaction with the UDL-BLM format. However, the item assessing whether "the course Learning Management site is well organized and easy to navigate" yielded a much smaller effect ($r=0.275$, $SE=0.114$), suggesting weaker agreement about its usability. Similarly, the positive rank-biserial values for all the negatively worded items such as "I feel isolated during this course" ($r=0.703$, $SE=0.113$) and "I feel more anxious in this course" ($r=0.773$, $SE=0.110$) indicate that participant`s median ratings for these items were above the neutral midpoint (median=3), meaning they agreed with all the negative statements such as isolation and anxiety more than expected. This means that while participants appreciated the UDL-BLM format's learning benefits as in reduced travel time, likelihood to enroll in similar blended courses in the future, improved interaction with the instructors, improved understanding of key concepts, the blended format may have resulted in reduced opportunities for natural social interaction, leading to feelings of isolation. Also, the demands of navigating both online and face-to-face components, technology use, and time management might explain heightened anxiety, despite the perceived convenience and flexibility of the course. Thus, addressing these challenges is critical for improving blended educational courses.

Categorical responses

The results of 4 dichotomous questions about learning format preferences (course delivery, lectures, tutorials, and discussions) are presented in *Table 2* as frequencies and percentages, providing a comprehensive overview of student preferences across different formats.

Table 2. *Learning format preferences.*

Learning format preferences	Frequency (N=123)	Percentage (%=100)
Course Format Preferences		
Online Course Format	19	15.447
Face-to-Face Course Format	31	25.203
Blended Course Format	73	59.350
Lectures Format Preference		
Online Lecture Format	7	5.691
Face-to-face Lecture Format	33	26.829
Blended Lecture Format	83	67.480
Tutorial Format Preferences		
Online Tutorial Format	15	12.195
Face-to-Face Tutorial Format	16	13.008
Blended Tutorial Format	92	74.797

Discussion Format Preferences		
Online discussion	27	21.951
Face-to-Face discussion Format	14	11.382
Blended Discussion Format	82	66.667

Course format preferences

Most students (59.35%) preferred a blended course format, which combines online and face-to-face components, with a small proportion favoring a fully face-to-face course format (25.20%), and fully online course format (15.45%). This indicates that while face-to-face and online learning have their advantages, most students value the flexibility, convenience, and interactive benefits of blended courses.

Lecture format preferences

Similarly, for lectures, the blended lecture format was the most popular choice (67.48%), followed by face-to-face lectures (26.83%) and online lectures (5.69%). The strong preference for blended lectures aligns with the overall course format preference, reinforcing the idea that students appreciate a mix of delivery methods. The low preference for fully online lectures may reflect challenges with engagement or comprehension in a purely virtual setting.

Tutorial format preferences

The preference for a blended tutorial format was even more pronounced, with 74.80% of students favoring this option. This is likely because tutorials often involve more interaction and collaboration, which students may find more effective when combining online flexibility with in-person support. Fully online tutorials (12.20%) and fully face-to-face tutorials (13.01%) were less preferred, further emphasizing the appeal of a hybrid approach for interactive learning activities.

Discussion format preferences

For discussions, the blended discussion format was again the preferred option (66.67%), followed by online discussions (21.95%) and face-to-face discussions (11.38%). The preference for blended discussions suggests that students value the ability to engage both synchronously (in person) and asynchronously (online), which may accommodate different learning styles and schedules. The relatively higher preference for online discussions compared to face-to-face discussions may reflect the convenience and accessibility of virtual platforms for asynchronous communication.

The findings indicated that participants positively rated the UDL-based blended learning as satisfying to their preferences and varied needs. However, the low rating of the Learning Management System's organization (r=0.275) suggests that while the platform was functional, its design does not fully satisfy some participants' needs and expectations. Additionally, the rating/endorsement of negative experiences such as "increased workload", "the course required more time and effort", "felt overwhelmed by information and resources", and "trouble using technologies", signifies the need for balanced design of the LMS to harmonize flexibility with social and emotional support. The importance of addressing both logistical and psychosocial dimensions to optimize student success in blended learning was stressed by multiple user experience and usability (De Oliveira, 2022; Mkpojiogu et al., 2021). To fully to minimise stressful situations, alleviate anxiety associated with the blended format, there is a need for

structured peer interactions by maximising discussion forums, group projects, providing clear guidelines and support for technology use.

Overall, the findings aligned with multiple studies which demonstrate that when implementing a blended learning model, particular attention should be paid to instructional design, which encompasses adequate course structure, frequent student support, timely feedback, activation of learning strategies and interaction, as well as social presence (Müller et al., 2023; Yılmaz and Malone, 2020; Kintu et al., 2017). The findings of this study strongly aligned with a study by Owston et al. (2013) who reported that 35.2% participants preferred fully face-to-face, 48.6% blended, and 16.3% fully online. Multiples research suggests that learners are more satisfied and engaged in blended learning due to convenience and flexibility in time, place and a higher degree of self-regulation as well as motivation strategies (Heilporn et al., 2021). BL has the potential to enhance active participation, personalisation, and collaborative learning opportunities irrespective of leaners locations or time differences (Olatunde-Aiyedun and Adams, 2022; Manwaring et al., 2017). The convenience and flexibility of blended courses are appealing to most students because the format can help students learn more effectively and freely (Hamad et al., 2024).

Conclusion

In conclusion, the findings revealed that participants were highly satisfied with the UDL-based blended learning mode of delivery, particularly due to its flexibility and convenience. Notably, the findings showed clear preference for blended learning format, as evidenced by the high proportions of respondents favoring a combination of face-to-face and online formats for lectures, tutorials, and discussion. These preferences highlight the value students place in the flexibility and convenience of online learning, combined with the engagement and interaction offered by face-to-face component. The strong preference for blended learning formats has important implications for educational institutions and instructors. First, it underscores the need to invest in robust blended learning models that effectively integrate online and face-to-face components. Second, the findings suggest that students value flexibility and accessibility, which can be achieved through a well-designed blended system. Third, the preference for blended tutorials and discussions highlights the importance of fostering interaction and collaboration in ways that accommodate both in-person and online participation. Thus, practitioners should consider these preferences when designing courses and allocating resources to ensure that learning experiences align with student needs. Practitioners should also prioritize enhancing technical support through user-friendly tools and accessible help desks to reduce barriers. Fostering social connections via collaborative projects and moderated discussions can minimise isolation and anxiety. By implementing these recommendations, educators can better align their course offerings with student preferences, ultimately improve their educational outcomes.

While the study provides valuable insights into participants' satisfaction with the course mode of delivery, it is not without some limitations, highlight areas for enhancement and opportunities for further studies. Firstly, the study was limited to one institution, limiting generalizability of the findings to broader populations. Secondly, reliance on self-reported data introduces the possibility of response bias. Thirdly, the study collected data at a single time, limiting insights into how satisfaction or noted challenges evolve over time. Fourthly, the study does collect data about some influential

satisfaction factors such as prior experience with blended learning, and technological proficiency. Future research could benefit by tracking student perceptions across multiple time points or compare blended learning satisfaction with purely online or traditional formats to isolate the impact of hybrid delivery format, employing qualitative approaches to explore why students feel isolated or overwhelmed. To enhance external validity, future study may consider inclusion of participants from varied institutions, cultural backgrounds, and disciplines.

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Conflict of interest

The authors declare no conflict of interest.

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