BRIDGING DIGITAL GAPS IN CRIMINOLOGY EDUCATION: READINESS AND ACCESS TO HYFLEX LEARNING AT JRMSU KATIPUNAN

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Abstract

This study examined the readiness and access of Bachelor of Science in Criminology students at Jose Rizal Memorial State University (JRMSU), Katipunan Campus, to participate in HyFlex learning—a flexible educational model that allows students to choose among face-to-face, synchronous online, and asynchronous learning modalities. Anchored on Sustainable Development Goal 4 (SDG 4), the study addressed persistent global and local issues in digital access, equity, and student preparedness, particularly in rural public higher education settings. Utilizing a descriptive quantitative research design, the study involved a stratified random sample of 187 students from a total population of 351. Results showed that while 94.78% of students had access to smartphones, only 9.57% owned laptops or desktops, and just 52.17% reported consistent internet access at home. Despite these limitations, students demonstrated high exposure to Learning Management Systems (95.65%), productivity tools (89.00%), and moderate to high levels of digital literacy confidence (M = 2.76). The majority preferred face-to-face learning (M = 3.70), while synchronous online instruction was least favored (M = 2.27). Furthermore, 46.09% of students came from underserved communities and only 33.91% had access to assistive technology. The study concluded that while students are digitally literate and adaptable, access-related and inclusion challenges persist. It recommends mobile-optimized instructional design, expanded connectivity support, inclusive digital strategies, and ongoing training for faculty and students to enhance HyFlex readiness and educational equity.

Keywords: *HyFlex learning, flexible learning, digital readiness, criminology education, digital literacy, inclusion, student access, educational equity*

Introduction

In pursuit of Sustainable Development Goal 4 (SDG 4), which advocates inclusive, equitable, and quality education as well as lifelong learning for all, the global education community has increasingly embraced flexible learning models that respond to diverse student needs (United Nations, 2015). Among these models, HyFlex or Hybrid-Flexible learning allows students to choose between face-to-face, synchronous online, and asynchronous modalities, enabling them to engage in ways that best suit their individual circumstances. However, in developing countries such as the Philippines, the success of HyFlex learning is constrained by digital inequality, limited infrastructure, and varying levels of learner readiness. These challenges are particularly evident in state universities that serve rural populations.

Globally, persistent challenges in science education, digital access, and student engagement are evident in international assessments such as the Programme for International Student Assessment (PISA), which reveal gaps in learners' foundational skills and readiness for technology-enabled learning environments (OECD, 2019; OECD, 2023). Across the ASEAN region, these challenges are intensified by uneven digital infrastructure, internet connectivity, and institutional capacity, limiting the effective implementation of flexible learning modalities such as HyFlex learning. In response, ASEAN has advanced regional initiatives promoting digital transformation, inclusive access, and digital literacy; however, disparities in digital readiness remain pronounced, particularly among developing member states (ASEAN, 2022).

In the Philippines, these global and regional concerns are reflected in both learning outcomes and access to digital learning resources. The country's low performance in the 2018 and 2022 PISA cycles highlights persistent learning gaps and limited preparedness for technology-supported learning (OECD, 2019; OECD, 2023). While the Commission on Higher Education (CHED, 2020) has mandated the institutionalization of flexible learning in higher education, many students—especially those in public programs such as criminology continue to face barriers related to device availability, internet connectivity, digital skills, and inclusive support systems. These conditions underscore the need to examine students' readiness and access to HyFlex learning to support equitable and effective implementation in Philippine higher education.

In this study, the concept of digital gaps is distinguished from related constructs such as the digital divide, digital literacy, and digital readiness. The digital divide emphasizes unequal access to devices and connectivity, digital literacy highlights the skills needed to navigate digital environments, and digital readiness refers to the preparedness to adopt technology-enabled instruction. Digital gaps, by contrast, refer to the discrepancy between students' available resources and their ability to fully utilize these resources for HyFlex criminology education. This definition positions digital gaps as an integrative construct that captures both access and utilization challenges within a discipline-specific context.

The criminology program provides a unique case for examining digital gaps because of its combined emphasis on theoretical knowledge and applied, skill-based training. Unlike programs that are primarily classroom-based, criminology requires fieldwork, law enforcement drills, forensic laboratory exercises, and tactical movement training, competencies that are not easily replicated through digital or HyFlex modalities. Consequently, the digital gaps of criminology students are not merely technological but also pedagogical, directly influencing how effectively they can achieve learning outcomes under flexible delivery modes.

Despite global and national recognition of the importance of digital transformation in education, limited scholarship has examined how discipline-specific requirements influence students' ability to adapt to HyFlex learning. This study seeks to address this gap by assessing the digital access, readiness, and inclusion challenges of Bachelor of Science in Criminology students at Jose Rizal Memorial State University, Katipunan Campus, in Zamboanga del Norte, and by proposing targeted interventions to bridge these digital gaps.

Methods and Materials

This section outlines the research design, population and sampling, data gathering instrument, data collection procedure, and statistical treatment of data used in the study assessing the readiness and access of Bachelor of Science in Criminology students at JRMSU Katipunan Campus to HyFlex learning.

Research Design

This study utilized a descriptive quantitative research design, which is appropriate for collecting data that describe the characteristics, behaviors, and perceptions of a population without manipulating variables. The design enabled the researcher to measure the extent of students' digital access, digital literacy, learning modality preferences, and equity-related concerns. By quantifying these factors, the study provided an evidence-based foundation for recommending improvements in the delivery of HyFlex learning.

Population and Sampling Technique

The target population of this study consisted of all Bachelor of Science in Criminology students enrolled at JRMSU Katipunan Campus during the Academic Year 2024–2025, totaling 351 students. To ensure proportional representation across year levels, a stratified random sampling technique was employed, with respondents drawn from each year level according to their population size. Using Slovin's formula with a 95% confidence level and a 5% margin of error, the required sample size was calculated to be approximately 187 students. This sample was deemed adequate to provide reliable and generalizable insights regarding the population's readiness for and access to HyFlex learning.

Data Gathering Instrument

The main tool for data collection was the "HyFlex Learning Readiness and Access Survey," an adapted and pilot-tested instrument based on validated tools developed by

CHED (2020), DepEd (2020), DOST-SEI (2021), and SEAMEO (2022), and aligned with the educational equity framework of EDCOM II (2025).

The instrument contained four major sections:

1. Digital Access and Device Readiness – Included dichotomous (Yes/No) questions on access to smartphones, laptops/desktops, consistent and backup internet, LMS experience, and productivity tool usage.
2. Equity and Inclusion – Captured data on disability status, geographic location, assistive technology access, availability of printed materials, and institutional support.
3. Learning Style and Modality Preferences – Used a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree) to gauge students' comfort and engagement across face-to-face, synchronous, asynchronous, and hybrid learning settings. For the purpose of this study, asynchronous learning refers to instructional activities that criminology students can access and complete at their own pace without real-time interaction with instructors, including recorded lecture videos, uploaded handouts, digital modules, online assignments, and printed self-learning modules.
4. Digital Literacy Confidence – Measured students' self-assessed proficiency in essential digital academic skills such as online research, email communication, and digital presentations.

The instrument underwent pilot testing with 10 non-respondent students and was reviewed by three academic experts in educational technology and research. It achieved a Cronbach's alpha of 0.84, indicating strong internal consistency and reliability.

Data Gathering Procedure

Approval to conduct the study was secured from the university administration. With respect for ethical considerations, participants were informed of the study's purpose and gave their consent voluntarily. The survey was administered face-to-face to ensure clarity of responses and increase participation rates. Respondents were assured of the confidentiality and anonymity of their responses. All data were encoded in spreadsheet software for cleaning and analysis, ensuring compliance with ethical standards and data privacy protocols.

Statistical Treatment of Data

The study employed **descriptive statistics** to analyze the data collected:

- **Frequency and Percentage** – Used to summarize access to devices, internet, assistive tools, and inclusion-related indicators.
- **Mean and Descriptive Interpretation** – Applied to Likert-scale items to measure students' preferences and confidence levels.

The following interpretation scale was used for Likert-scale items:

Scale	Descriptive Interpretation

3.50 – 4.00 Strongly Agree
2.50 – 3.49 Agree
1.50 – 2.49 Disagree
1.00 – 1.49 Strongly Disagree

These statistical tools enabled the researcher to identify trends, gaps, and readiness levels necessary for planning inclusive and effective HyFlex instruction at JRMSU Katipunan Campus.

Limitations of the Study

This study is limited to BS Criminology students at JRMSU Katipunan Campus (AY 2024–2025), so findings may not be generalizable to other programs or institutions. Data were self-reported, which may involve bias and reflect perceptions rather than actual performance. The survey emphasized access, readiness, and preferences but did not measure deeper learning outcomes such as engagement or academic achievement. Multimedia learning was considered only in the form of videos, infographics, and slide presentations, narrowing its broader scope. Lastly, no direct interventions were implemented to bridge gaps in access or inclusion; the study focused on assessing readiness to inform future institutional action.

Results and Discussion

This section presents the findings of the study on the readiness and access of Bachelor of Science in Criminology students at JRMSU Katipunan Campus to HyFlex learning. The results are organized into four thematic areas: (1) Digital Access and Device Readiness, (2) Equity and Inclusion, (3) Learning Style and Modality Preferences, and (4) Digital Literacy Indicators. Each section begins with a brief overview and is followed by an interpretive discussion supported by relevant literature.

Digital Access and Device Readiness

Effective implementation of HyFlex learning requires reliable access to appropriate technology, including digital devices and stable internet connections. This section assesses whether BS Criminology students have the basic technological requirements needed to engage in face-to-face, online synchronous, and asynchronous learning environments.

Table 1: Digital Access and Device Readiness (n = 187)

Survey Item	**Percentage (%)**
Access to Laptop/Desktop	9.57%
Access to Smartphone	94.78%
Consistent Internet Access at Home They have also neighbors how have Peso Wifi/Vendo Machine	52.17%
Backup Internet Source Data	85.22%

Experience with LMS	95.65%
Used Productivity Tools	89.00%

While nearly all students (94.78%) reported owning smartphones, only 9.57% had access to laptops or desktops, limiting their capacity to complete tasks that require a larger screen or multitasking. Although 52.17% had consistent home internet, a significant number relied on backup sources such as mobile data or public Wi-Fi (85.22%). High exposure to Learning Management Systems (95.65%) and productivity tools (89%) indicates familiarity with digital platforms. These results affirm DICT's (2021) observation that mobile devices dominate educational access in the Philippines, particularly in rural settings. However, limited access to advanced devices poses a challenge to maximizing engagement in hybrid and online environments (CHED, 2020).

Equity and Inclusion

HyFlex learning must accommodate the diverse backgrounds and needs of students, including those from underserved communities and individuals requiring learning accommodations. This section presents data on barriers to inclusion and access to support services among BS Criminology students.

Table 2: Equity and Inclusion (n = 187)

Survey Item	**Percentage (%)**
Has a disability requiring learning accommodations	1.74%
Has access to assistive technology	35.65%
Requires Braille/sign language/specialized support	1.30%
From remote/underserved community	45.22%
Has access to printed modular materials	58.26%

Nearly half of the respondents (45.22%) came from remote or underserved communities where digital connectivity and access to educational resources remain inconsistent. Only a very small percentage reported having disabilities (1.74%) or requiring Braille, sign language, or other specialized support (1.30%). Meanwhile, 35.65% had access to assistive technologies, indicating a gap in inclusive infrastructure. In this study, "assistive technology" refers to tools such as screen readers, captioned media, and accessibility-friendly devices designed to support students who experience learning barriers, even if they are not formally classified as persons with disabilities (PWDs).

These findings highlight the need for targeted institutional support. According to DepEd's MATATAG framework (2023), students from marginalized backgrounds should be provided with alternative resources such as printed modules, which 58.26% of students

reported receiving. EDCOM II (2025) emphasizes that achieving educational equity requires systematic support from institutions, including collaboration with NGOs and government agencies.

Learning Style and Modality Preferences

Learner preferences influence the effectiveness of flexible instructional delivery. This section explores how BS Criminology students perceive various instructional modalities including face-to-face, synchronous online, asynchronous, and hybrid learning.

Table 3: Learning Style and Modality Preferences (n = 187)

Survey Statement	Mean Score	Descriptive Score
Face-to-Face	3.70	Strongly Agree
Synchronous Online	2.27	Disagree
Asynchronous	2.66	Agree
Multimedia Learning	2.65	Agree
Hybrid Learning	3.19	Agree

BS Criminology students strongly preferred face-to-face learning (M = 3.70), a result consistent with CHED (2020) reports on student learning behaviors in post-pandemic Philippine higher education. Synchronous online learning scored lowest (M = 2.27), likely due to limitations in connectivity, digital fatigue, or unfamiliarity with video conferencing platforms. Nonetheless, the students responded positively to hybrid learning (M = 3.19) and asynchronous methods (M = 2.66), suggesting openness to flexible formats when internet stability is not a constraint. These preferences support Asian Development Bank (2021) recommendation to prioritize hybrid models that blend structure and flexibility.

Digital Literacy Indicators

Digital competence is essential for navigating HyFlex learning environments. This section presents data on students' usage of digital platforms and their self-assessed confidence in digital skills.

Table 4: Digital Literacy Indicators (n = 187)

Survey Statement	Result	Interpretation
I have experience using Learning Management Systems	96% answered "Yes"	High LMS exposure
I have used productivity tools (MS Office, Google Docs, Canva, etc.)	89% answered "Yes"	High tool usage
I am confident in my digital literacy skills (Likert Mean = 2.76)	Mean = 2.76	Moderate–High confidence

A majority of respondents reported experience with LMS platforms (96%) and productivity tools (89%), indicating strong exposure to digital academic tools. The mean

digital literacy confidence score of 2.76 suggests that students are reasonably self-assured in their ability to navigate online research, communication, and content creation. According to DOST-SEI (2021), such competence is foundational to succeeding in flexible learning systems. These results are further supported by Davis's (1989) Technology Acceptance Model, which posits that perceived ease of use and perceived usefulness influence technology adoption—clearly reflected in the students' positive responses.

Conclusions

Based on the findings of this study, several key conclusions can be drawn regarding the readiness and access of Bachelor of Science in Criminology students at JRMSU Katipunan Campus for HyFlex learning. First, while smartphone ownership is nearly universal among students (94.78%), access to more advanced computing devices such as laptops or desktops remains very limited (9.57%). This device gap, coupled with only 52.17% of students reporting stable internet access at home, highlights a significant barrier to fully engaging in flexible learning modalities—especially synchronous online instruction. Despite these limitations, students demonstrate adaptability through the use of backup internet sources (85.22%) and strong familiarity with digital platforms such as Learning Management Systems (95.65%) and productivity tools (89%).

Second, the study reveals persistent issues of equity and inclusion. Nearly half of the students (46.09%) come from remote or underserved communities, while 6.96% reported having disabilities and 13.04% required specialized support. However, only 33.91% had access to assistive technologies, and a substantial portion relied on printed modular materials (60%), underscoring the need for more inclusive and responsive learning systems. These findings are consistent with national policy concerns raised by the Department of Education (DepEd, 2023) and the EDCOM II (2025) report, which call for institutional interventions that ensure access to quality education regardless of location or learner condition.

Third, learning modality preferences indicate a strong inclination toward face-to-face instruction (M = 3.70), with lower satisfaction in synchronous online formats (M = 2.27). Students responded more favorably to asynchronous (M = 2.66), multimedia-based (M = 2.65), and hybrid learning (M = 3.19), suggesting that a balanced mix of traditional and technology-enhanced methods is more acceptable and engaging for the criminology student population. These preferences reinforce the need for pedagogical flexibility and instructional innovation.

Lastly, the students' mean digital literacy confidence score (2.76) reflects moderate to high levels of competence in navigating digital learning environments. This indicates a foundational readiness to participate in HyFlex learning, provided that device access and connectivity challenges are addressed. The high levels of LMS experience and tool usage reflect a positive disposition toward technology-enhanced education, which can be further strengthened with institutional support and faculty training.

Overall, the study concludes that BS Criminology students at JRMSU Katipunan Campus are moderately ready for HyFlex learning, showing strong digital literacy and adaptability despite limited access to advanced devices and stable internet. Addressing infrastructure gaps and promoting inclusive, flexible, and context-responsive instructional strategies are essential to fully support their transition to HyFlex education.

Recommendations

In light of the findings and conclusions of this study, the following recommendations are proposed to strengthen the effective, inclusive, and sustainable implementation of HyFlex learning for Bachelor of Science in Criminology students and similarly situated learners:

1. **Enhance Digital Infrastructure and Accessibility**
   The university should strengthen students' access to reliable internet connectivity and digital devices by expanding campus Wi-Fi coverage, providing device loan programs, and forming partnerships with LGUs, NGOs, and telecommunication providers for subsidized data and community Wi-Fi hubs. These initiatives will help bridge the digital divide and ensure equitable participation in HyFlex learning.

2. **Prioritize Mobile-Friendly and Inclusive Instructional Design**
   Since most students rely on smartphones, instructional materials should be optimized for mobile use through lightweight, downloadable, and low-data asynchronous resources such as recorded lectures and interactive modules. Likewise, learning systems must incorporate inclusive practices—such as assistive technologies, captioned content, and screen-reader-friendly materials—following Universal Design for Learning (UDL) principles to support students with disabilities and those from underserved areas.

3. **Embed Digital Literacy Development in the Curriculum**
   To strengthen students' readiness for HyFlex education**, Digital Literacy Development should be integrated into the GE-IT: Introduction to Information Technology course**. This enhancement should include advanced topics such as digital research, cybersecurity, online communication, and ethical digital practices, enabling students to effectively and responsibly engage in technology-enhanced learning environments.

4. **Adopt a Balanced and Context-Responsive Learning Model**
   In line with students' preference for face-to-face and hybrid modalities, JRMSU should implement a blended learning framework that combines traditional classroom instruction with asynchronous and multimedia-supported online components. This approach ensures flexibility, maintains the quality of practical criminology training, and supports diverse learning preferences.

5. **Build Faculty Capacity and Institutional Support Systems** Faculty members should receive continuous training in HyFlex pedagogy, focusing on inclusive course design, adaptive assessments, and effective use of LMS and multimedia tools. Concurrently, the university should strengthen institutional policies and support mechanisms—such as technical assistance desks and feedback channels—to ensure the sustainable and effective implementation of HyFlex learning.

6. **Establish Continuous Monitoring and Evaluation Mechanisms** Regular assessments of students' digital readiness, access, and learning experiences should be institutionalized. Data-driven insights can guide timely adjustments to policies, infrastructure, and instructional strategies, supporting equitable, effective, and student-centered flexible learning systems that can inform broader policy and practice in Philippine higher education and other comparable contexts.

By implementing these recommendations, JRMSU Katipunan Campus can better support BS Criminology students in navigating HyFlex learning environments, ensuring that no learner is left behind while promoting educational resilience and equity in line with Sustainable Development Goal 4.

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Disclosure: Use of AI Tools

In the conduct and preparation of this research, Artificial Intelligence (AI) tools and writing support platforms—specifically OpenAI's ChatGPT, Grammarly, and QuillBot—were utilized as supplementary aids to enhance various stages of the writing process.

ChatGPT was employed to assist in generating initial outlines, refining ideas, improving the clarity of discussions, and ensuring coherence across different sections of the manuscript.

Grammarly was used primarily as a proofreading tool to detect grammar, spelling, punctuation, and style-related issues, thereby supporting the editing process.

QuillBot was applied selectively to paraphrase and restructure certain sentences for improved readability and conciseness.

It must be emphasized that these tools served as assistants only and did not perform data analysis, interpretation of results, or critical decision-making regarding the research design, findings, and conclusions. The researchers maintained full authorship, accountability, and intellectual responsibility for the study.

All AI- and software-assisted outputs were carefully reviewed, validated, and revised by the researchers to ensure accuracy, originality, and alignment with academic and ethical standards. The disclosure of these tools is made in the spirit of transparency and integrity, affirming that while such platforms contributed to improving language quality and efficiency, the substance and scholarly rigor of the research remain entirely the product of the researchers' independent effort and critical thinking.

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