

TLIC PAPER

Efficacy Testing of the Comprehensive Institutional Model (CIM) using Design-Based Research: Instrumental Case Study

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ABSTRACT

COVID-19 was a “black swan” event that forever altered higher education’s adult teaching and learning landscape by requiring a pathway shift in institutional resources to meet student and faculty support needs for academic success and institutional sustainability. Over the last two years, thousands of scholarly articles have been published about the challenges that higher education institutions (HEIs) faced during COVID-19 and their lasting impact on student learning, faculty engagement, and institutional operations in the post-COVID environment. Many researchers offer strategies and guidance to help address the challenges; however, research is limited to testing these strategies and proposed models designed to mitigate the challenges and manage such a crisis in the future. The proposed study will help close this gap by assessing the efficacy of the Comprehensive Institutional Model (CIM), developed based on the findings of *Perceptions of Online Strategies and Digital Readiness in the COVID-19 Environment: An Instrumental Case Study* by McCray et al. [19]. The CIM aims to provide HEIs with a model to support Hy-flex learning environments to ensure readiness for new emergencies and the aftermath of a “new normal” in higher education. The model organizes how aligning administrators, faculty, and graduate students impacts effective Hy-flex teaching and learning environments. Design-Based Research (DBR) will be used to systematically collect and analyze evidence-based testing results of the CIM across three iterations.

KEYWORDS

Comprehensive Institutional Model (CIM), Design-Based Research (DBR), blended educational models, hybrid educational models, Hy-flex models, COVID-19, higher education institutions (HEIs), evidence-based testing

1 INTRODUCTION

COVID-19 was a “black swan” event that forever altered higher education’s adult teaching and learning landscape by requiring a pathway shift in institutional

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resources to meet student and faculty support needs for academic success and institutional sustainability [10], [12], [25]. Over the last two years, thousands of scholarly documents have discussed these challenges and how the economic impacts of reduced enrollment, decreased public funding, increased operating costs, and higher borrowing rates impact infrastructure investments to support flexible education offerings [3], [7], [9], [16]. In using a bibliometric analysis of the Web of Science (WOS) database to search for articles on flexible education models, the key terms of blended and Hy-flex produced limited results for models that address COVID-driven challenges through an integrated lens of administrators, faculty, and graduate students [3], [9], [16]. The search results indicate a larger gap in the evidence-based testing of Hy-flex learning and teaching models, especially studies using a DBR approach to iteratively test educational interventions in this environment [3], [9], [16].

This study will help close these gaps and add to the existing knowledge base by testing the efficacy of the CIM using Reeves' DBR methodology [18], [32]. The CIM specifically builds on the case study findings of *Perceptions of Online Strategies and Digital Readiness in the COVID-19 Environment: An Instrumental Case Study* by McCray et al. (2023) [19], which examines one private University's efforts to transition from primarily face to face (F2F) graduate education courses to a fully online modality during the pandemic. The CIM, built on two years of longitudinal data, provides step-by-step actions to guide HEI administrators, faculty, and graduate students in addressing post-COVID-19 challenges [19].

2 LITERATURE REVIEW

The literature review identifies existing models and their theoretical propositions for guiding HEIs in addressing pandemic-induced challenges in Hy-flex environments using a bibliometric analysis of the Web of Science (WOS) database [3], [9], [16]. Three lenses were used to identify relevant strategies and models to compare against the CIM: integrated HEI key stakeholders such as administrators, faculty, graduate students, Hy-flex teaching and learning environments, and DBR evidence-based testing results. The theoretical frameworks and comparative study findings helped fine-tune the study focus and corresponding research questions.

Biswakarma et al. [3] offer HEIs a common framework of strategies to help prepare for future challenges and emergency preparedness for future uncertainties by outlining responsibilities for the University Administration, Department (Faculty), and Research Group (support for institutional group members). The authors seek to provide HEIs with a framework that can rapidly adapt or enhance institutional systems to support changing operations and diverse student needs in future crisis-based situations [3]. The activities listed under the three key stakeholder areas encourage interaction and collaboration with policymakers, funders, and educational support resources [3]. Like the CIM, the conceptual framework presents an integrated approach among institutional stakeholders in addressing key academic challenges, but the researchers offer no evidence for testing their conceptual model.

Imran et al. [16] systematically examined 68 articles from the Scopus Database to identify HEI's influential and prevalent themes impacting the adoption of digital learning through flexible, blended modalities in the post-pandemic environment. The authors define blended modalities as a mixture of traditional F2F, asynchronous and synchronous online learning, and Hy-flex. They compare these modalities to understand how they address diverse student needs, but they suggest combining

them will enhance and better support flexible learning environments [16]. The study highlights the growing importance of blended teaching modes, such as Hy-flex, to facilitate flexible learning [16]. The authors provide institutional guidance on the roles and responsibilities of institutional stakeholders instead of providing a specific model with activities by role, and there is no evidence-based testing of their recommendations.

Guppy et al. contend that technology requirements for HEIs “will not return to a pre-COVID-19 normality, and there is foreseeable growth in blended and Hy-flex forms of digital learning” [12]. Their findings are based on a study launched across six countries with HEI stakeholders to gather predictions of digital technology in higher education. Like the CIM, the authors highlight an integrated problem-solving approach with institutional stakeholders. They share the importance of administrators incorporating the insights and experiences of faculty, institutional support resources such as course designers, and students in designing blended and hybrid/Hy-flex learning and teaching environments in the post-COVID era [12]. Data is collected from HEI stakeholders across six countries and combined to identify overall trends instead of a specific model or case study analysis. In contrast, the CIM uses longitudinal data from an instrumental case study design, and it provides prescriptive actions for each stakeholder group supported by a cyclical feedback loop to promote continual improvement.

Graham and Halverson [11] discuss the influential frameworks that offer guidance for institutional adoption and the transition to blended and Hy-flex learning and teaching environments since COVID-19. They offer an interesting perspective on how individual adoption characteristics can impact institutional adoption strategies based on the Technology Acceptance Model (TAM) [1], [11], [29]. The TAM-based education research has increased substantially over the last three years, examining how COVID-19 Emergency Remote Training (ERT) impacted the need for faculty and students to immediately adopt new digital technologies [1], [11], [29]. The TAM’s focus can complement the CIM’s intervention design and testing activities for perceived ease of use and usefulness. However, the CIM provides a broader, more holistic model that systematically collects data on various factors impacting teaching and learning across the key institutional stakeholder groups and incorporates a cyclical feedback loop among the stakeholders.

The Hy-flex model, introduced in 2006 by Brian Betty at San Francisco State University, gained heightened attention and popularity during the COVID-19 pandemic because of its flexibility for institutional stakeholders [13], [15]. Hy-flex can expand an institution’s reach and capacity given institutional technology affordances, such as adequate digital infrastructure and available support resources [13], [15]. One of the modality’s advantages is that it provides students and faculty with meeting flexibility and the ability to combine tools and methods to enhance learning. However, research suggests that Hy-flex course design requires specific instructional practices to enhance student learning [13], [15]. Therefore, Howell et al. [15] discuss new media literacies, or pedagogies, in a digital culture that represent how people think, read, write, and communicate in informal and formal contexts. The authors use DBR to analyze pedagogical strategies necessary for the success of Hy-flex across four courses based on two iterations to develop an emergent course design model [14].

Although the DBR process was used to develop the emergent course design model, it was not used to test the new model. In our study, DBR will test an existing conceptual model, the CIM, which focuses on multiple factors across three institutional stakeholder groups. Additionally, the CIM will use multiple iterations to

test educational interventions, and the results will be further analyzed using Miles and Huberman's Code to Theory [23] to crystalize the findings for emergent theory development.

Zydney et al. [35] examine how DBR can address technological and pedagogical challenges with learning protocols for blended synchronous learning environments that include Hy-flex. The authors define learning protocols as structured discussion strategies to promote "trust, equity, and diversity" in the educational environment [35]. Although Zydney et al. use DBR to develop their course design, testing information still needs to be provided. Their study has a much narrower focus, examining the impact of pedagogical factors on instructors and students, compared to the CIM, which evaluates multiple factors across three institutional stakeholder groups across three iterations.

3 PROBLEM STATEMENT AND RESEARCH FOCUS

The global COVID-19 pandemic required a pathway shift in institutional resources to meet student and faculty support needs for academic success and institutional sustainability [12], [24], [25]. HEIs faced challenges involving faculty readiness, investments in classroom technology and instructor training, adequate graduate student support provision, and the pressing need to meet changing student expectations [4], [10], [17]. These HEI challenges are further exacerbated in the post-pandemic era by reduced enrollment, decreased public funding, increased operating costs, and higher borrowing rates that impact investments necessary to support flexible education options [7]. The CIM was developed to address these multilayered issues by integrating various supportive elements within an HEI and offering practical, innovative solutions tailored to enhance learning outcomes in a Hy-flex environment [19].

However, despite the theoretical promise of the CIM, it is necessary to examine its efficacy in a real-world setting. The findings from refs. [12], [13],[19] point to the necessity of HEIs adapting to the ongoing shift towards digital learning. However, these findings were mostly perception-based and collected from a limited sample at a private University in San Antonio, Texas [19]. Therefore, testing the efficacy of the CIM to validate the conceptual, theoretical model is important; many researchers offer strategies and guidance, but research is limited on testing how they mitigate HEI challenges and prepare for such emergencies in the future [3], [9], [16]. This study will help close this gap by testing the efficacy of CIM in addressing multilayered HEI challenges through integrated institutional supportive elements in a Hy-flex environment. Design-Based Research (DBR) will systematically collect and analyze evidence-based testing results of how the CIM's integrated strategies and solutions impact Hy-flex environments over multiple testing iterations.

3.1 Study background

The case study [19] highlights four key challenges that impacted HEIs during the COVID-19 pandemic and still exist in the current environment: faculty readiness, technology investments, graduate students' support needs, and readiness expectations. The alignment and constructive interaction of actions among the institution's key stakeholders are needed to address these challenges while pursuing a new normal in teaching and learning environments [4], [10], [24].

According to ref. [19], the lack of faculty readiness was impacted by limited acceptance of new technologies, and it was compounded by a need for readily available infrastructure and operational support resources. Institutions must have the right affordances in place, such as institutional-wide platforms and competency training for faculty and graduate students, before a crisis to avoid course inconsistencies and student confusion [6], [24], [26]. Faculty must be willing to accept and adopt new teaching technologies, such as a consistent Learning Management System (LMS), and become proficient in using their newly acquired skills to drive enhanced teaching and learning environments.

A need for investment and training for Hy-flex modalities remains challenging in the post-COVID-19 environment [10], [19], [24]. Adult learners have different technology experiences and digital literacy competencies, so technology platforms should be consistent and provide an engaging learning experience for all. Faculty need access to readily available technical support resources to promote a seamless learning experience for in-person and remote students [4], [19]. They also need access to course designers to help incorporate best practices for effective learning (pedagogy/andragogy) into their hybrid/Hy-flex teaching and learning environments [19].

Student support needs for academic success remain a priority in the post-COVID environment. Adult learners need flexibility and stability to manage work, life, and academic responsibilities [6], [25]. Graduate students expect faculty and administrators to recognize their diverse and unique challenges and for the institution to find innovative accommodations, regardless of age, background, and economic factors [4]. Graduate students also look to their institutions and faculty to help close the gaps in community building and social maintenance activities created by the pandemic [19].

Expectations for faculty readiness remain critical to graduate students in the post-COVID world. The institution's leadership and faculty need an innovative mindset to embrace the changing landscape of digital literacy [10], [12], [26]. Graduate students expect institutions to have a comprehensive plan for Hy-flex environment success accompanied by clear student and faculty guidelines for participation [10], [19], [26]. HEIs are expected to have contingency plans to cope with risks and uncertainties and a go-forward plan for stability and assurances of student financial investments [19].

These findings highlight that the success of Hy-flex modalities depends on addressing the challenges outlined above. Educational institutions must work to ensure that all stakeholders are ready for teaching and learning in an unfamiliar environment [19], [24], [25]. "Faculty can't go back to the "old way" of teaching, only F2F, or not be willing to change based on the industry trend of moving to digital learning" [19].

3.2 Alignment of institutional resources using the CIM

Based on the prior research study [19], the CIM was developed to provide HEIs with a model to support Hy-flex learning environments and promote readiness for new emergencies and the aftermath of a "new normal" in higher education [19]. The CIM organizes how aligning administrators, faculty, and graduate students impacts effective Hy-flex teaching and learning environments. Administrators provide the infrastructure and operational support for graduate students and faculty readiness [15], [16], [19]. Faculty skill development enables instructors to teach online and hybrid/hybrid flex environments effectively [15], [16], [19]. Graduate student support and assessable tools provide the ability to engage in

flexible learning environments [15], [16], [19]. The CIM incorporates the Hy-flex principles of engagement by offering a unique and comprehensive approach to synergizing all layers of the institution; it articulates a step-by-step process, aligning leadership and academic affairs elements that impact graduate education in Hy-flex environments and incorporates a cyclical feedback mechanism for continual improvement [13], [16], [19].

Administrator Recommendations:

1. *Develop Proactive Emergency Planning.*
 - a. Develop a comprehensive emergency plan that includes faculty digital competencies and pedagogical best practices for Hy-flex.
 - b. Ensure the plan is regularly updated and communicated to all stakeholders.
 - c. Conduct regular training and simulations to prepare faculty and staff.
2. *Invest in Educational Infrastructure and Operational Support for Hy-flex.*
 - a. Ensure the institution has the necessary technological infrastructure.
 - b. Provide technical and operational support to faculty and staff for course design and delivery.
 - c. Ensure that faculty/staff have access to digital and professional development.
3. *Prioritize the Needs of Graduate Students and Faculty.*
 - a. Develop a clear plan for the future of education based on graduate students and faculty priorities.
 - b. Solicit graduate students' and faculty feedback to inform decision-making.
 - c. Ensure the institution is responsive to graduate students and faculty's evolving needs and expectations.
4. *Promote Social Interaction and Address Diverse Challenges.*
 - a. Develop strategies to promote social interaction in Hy-flex environments.
 - b. Address diverse adult learning and professional challenges.
 - c. Ensure the institution is inclusive and welcoming to all.

Faculty Recommendations:

1. *Provide Necessary Training and Resources.*
 - a. Develop training programs that provide faculty with Hy-flex skills.
 - b. Ensure faculty are trained to use LMS and Hy-flex technology tools.
 - c. Provide faculty access to instructional designers and technical support staff.
2. *Enhance Course Design Competencies.*
 - a. Provide faculty training on developing effective Hyflex courses.
 - b. Encourage faculty to adopt and embed digital pedagogy with Hy-flex teaching best practices, such as leveraging multimedia content, digital tools (Padlet, Kahoot), and in-class chat features.
3. *Use Innovative Teaching Techniques to Promote engagement.*
 - a. Encourage faculty to use various teaching techniques.
 - b. Encourage faculty to use interactive tools like quizzes and polls.
 - c. Provide faculty access to educational technology to create engaging and immersive learning experiences.
4. *Communicate Effectively with Graduate Students.*
 - a. Encourage faculty to establish and communicate clear expectations for Hy-flex participation.
 - b. Provide faculty tools to support instructor presence and engagement.
 - c. Encourage faculty to provide timely student feedback.

Graduate Student Recommendations:

1. *Flexibility.*
 - a. Offer various course delivery and modality options.
 - b. Provide graduate students with concise information about course format, schedule, and expectations.
 - c. Review and update course delivery options based on student feedback.
2. *Engagement.*
 - a. Use a range of teaching techniques to promote graduate student engagement.
 - b. Provide graduate students with collaboration and discussion opportunities.
 - c. Encourage feedback to improve course and teaching methods.
3. *Accessibility.*
 - a. Ensure course materials are accessible to graduate students with disabilities.
 - b. Train faculty to create accessible content and use accessible technologies.
 - c. Provide accommodation to graduate students with disabilities.
4. *Support.*
 - a. Offer academic support services: tutoring, advising, and writing centers.
 - b. Provide mental health counseling services to support well-being.
 - c. Institutions must communicate regularly on support programs and resources.

4 PURPOSE

The purpose of this instrumental case study is to explore the effectiveness of the CIM in addressing the multifaceted challenges HEIs face in transitioning to digital learning. Set within the context of a private University in South Texas, this study will investigate the experiences and perspectives of key stakeholders, namely administrators, faculty, and graduate students, with how the CIM facilitates the adoption of digital learning technologies, fosters faculty readiness, promotes investment in technology and training, and supports graduate students' needs and expectations. The research aims to generate robust, empirical evidence from testing the CIM using DBR over multiple iterations. The findings will inform and enhance strategies other HEIs can employ to navigate the Hy-flex learning landscape using an integrated stakeholder approach with cyclical feedback loops.

4.1 Primary research question

The study's primary research question is focused on how and why particular innovations work using insights into course learning challenges:

- What are the perceptions of administrators, faculty, and graduate students about the effectiveness of the CIM on the sustainability and enhancement of learning environments using Hy-flex graduate teaching and learning modalities?

5 RESEARCH DESIGN

The research design is a qualitative instrumental case study that focuses on developing deep insights into the efficacy testing of the CIM's integrated stakeholder

responsibilities and cyclical feedback loops for continual improvement in addressing multilayered institutional challenges [8], [21], [27], [31]. The study context is one case, bounded by the HEI stakeholders (administrators, faculty, and graduate students) participating in a Hy-flex learning, teaching, and support environment at a private university in South Central Texas [8] [31]. An instrumental case study focuses on specific issues; it is used to accomplish something other than understanding a particular situation and uses various data sources and methods [5], [8], [31]. Another important consideration for using an instrumental case study design is the concept of general transferability of the CIM's theoretical construct to other situations [5], [8], [22], [31].

6 METHODOLOGY, DATA COLLECTION, AND DATA ANALYSIS

DBR [28] was chosen as the methodology for this study because its iterative design-intervention testing approach supports the CIM's cyclic nature of relationships, specific actions, and feedback loops among key stakeholders in a Hy-flex environment [2], [14], [28]. For example, DBR supports the CIM's cyclical communication and feedback loops that encourage cycles of design and redesign occurring in a real-world HEI environment and undergoing continual testing and refinement of the technology-driven interventions [2], [14], [28]. Although many researchers provide DBR conceptual models, Reeves's DBR approach was chosen based on his continued research focus for over 15 years and the citations his work has received for higher education studies [2], [18], [32]. As part of the DBR iterative process, intervention data will be systematically reexamined and reflected upon within and between cycles for continuous improvement. A detailed data collection and analysis plan that combines methods and instruments from Merriam, Stake, and Yin will support the DBR process [20], [33].

6.1 Participant selection and sample size

Purposive sampling will be used to recruit participants from the school of graduate education at one private University. Participants will include graduate students (full and part-time), graduate faculty (full-time and adjunct), and administrators responsible for academic oversight, instructional technology design, and faculty professional development at the institutional level during this period. The sample size will be emergent, but initial recruit targets include: 15 graduate students enrolled in Hy-flex graduate educational courses during 2023–2024; 4 faculty members teaching Hy-flex graduate educational courses during 2023–2024; 4 administrators and institutional leaders supporting the Hy-flex environment during 2023–2024.

6.2 Data collection and instrumentation

The data collected from the DBR iterations will follow the methods of Merriam, Stake, and Yin for specific data collection procedures for each source of evidence [20], [31], [34]. Yin's emphasis on data collection to maximize the quality of inquiry will add validation elements to help address qualitative research's validity and reliability concerns [33], [34]. Study participants will be carefully screened against participation criteria. Multiple data sources, such as individual interviews, focus groups, documentation, direct observations, and other physical artifacts, will be collected.

The study will follow all the researchers' suggestions that specific data collection procedures be associated with each source of evidence, the use of scripted interview guides, and strong research questions [20], [22], [31], [34]. The researcher will use an interview guide with questions leveraging the CIM stakeholder recommendations.

6.3 Data analysis

The study data analysis is another area that will incorporate strengths from all three researchers in consolidating, reducing, categorizing, and interpreting the data. Based on the iterative testing of the CIM using DBR, the researcher will collect and analyze data simultaneously. Merriam advocates that data collection and analysis should be recursive and dynamic, "is not to say the analysis is finished when all the data have been collected" [33]. The qualitative data will be analyzed using Saldana's coding strategies and Miles and Huberman's code-to-theory conceptual model to identify related themes and theoretical insights [23], [30]. In-vivo coding strategies will be used to identify language patterns within the data, and conceptual insights will be identified through the various data sources [30]. Emerging categories will be synthesized into themes supported by theoretical sampling [20], [23], [34].

6.4 Data validation

The study's data will be validated using theoretical sampling, member checking, triangulation, and saturation. Yin's cohesion and consistency strategies for study design components and phases will be leveraged [34]. Yin's chain of evidence that links research questions, data collection, and conclusions will help keep the research focused on the study objectives of ensuring the data answers the research questions [33], [34].

7 SUMMARY AND SIGNIFICANCE

The CIM organizes how aligning an HEI's key stakeholders of administrators, faculty, and graduate students can assist in building more resilient and adaptable education systems for Hy-flex teaching and learning environments. The CIM can help administrators proactively plan and identify investments in educational infrastructure and operational support. The CIM's cyclical feedback loops can highlight graduate students' and faculty's diverse academic and personal support needs and challenges. The CIM also provides recommendations for instructional technology support to encourage graduate student success and enable faculty with the necessary training and resources to build their Hy-flex course design and delivery skills.

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