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EVALUATING HEALTHCARE STUDENT LEARNING PERFORMANCE DURING THE INITIAL YEAR OF THE COVID-19 PANDEMIC: A CASE STUDY

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by

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Abstract

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The COVID-19 pandemic caused a mass interruption to daily life lasting almost an entire academic year. Return to normalcy was hard won and phased over the following academic year. Neither time-period offered "traditional" learning experiences in academic institutions. The extent to which the operational shut-down affected academic institutions and their learners is just now beginning to be elucidated. Human resource development (HRD) is uniquely positioned to apply established and newly developed theories and applications to the study of this phenomenon.

One particular case lends itself to observation. A major academic medical center launched a technology-driven state-of-the-art simulation education center mere months before the shut-down. Subsequently, campus leadership invested heavily in technologies to offer first-of-the-kind online learning platforms for students in the healthcare professions including medical, nursing, health professions, and graduate school of biomedical sciences. This study tracked their grades across years to provide a snapshot of academic performance trends for the institutional leadership. The study took advantage of the institutionally created student survey and tailored questions to address COVID-19 effects and challenges on students. These data were publicly available and accessed for this study, as the university published deidentified responses

to the survey online. The institution also shared the published licensure exam pass rates that were used for this study.

In this case study with a mixed-methods research design, I analyzed these data to shed light on the effects of the pandemic on the student population of the case institution. Triangulation of the data revealed a multi-faceted challenge resulting from the many hardships caused by the pandemic. Students suffered direct effects including the loss of loved ones, financial troubles, as well as difficulty in engaging online in their new learning environment. However, the data showed that though the statistical impact of the pandemic was considered significant, it had a minimal effect size. The mitigation of the negative effects on the student population was partially attributed to the leveraging of virtual reality and simulation activities used to substitute for in-person clinicals.

Reviewing these datasets for correlations provided valuable insight into the timeless application of HRD principles relevant to interrupted training and education as a result of increasing campus disruptions caused by political unrest, natural disasters, and climate change. Of paramount importance, are the contributions provided to the study population by Virtual HRD (VHRD) tools and resources. As the world continues to experience an increase in the frequency with which we see these disruptions happening, the tenets of both HRD and VHRD will help stabilize the training environment for learners as they cope with the events of their particular disaster.

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during the pandemic. This study documents their struggles, their strength, and their resilience as

the world around them plunged into chaos. And to the researchers I supported as they

endeavored to save the 6,958,499 lives lost worldwide to COVID-19 during the pandemic.

Table of Contents

Chapter One: Introduction

This chapter presents an overview of the dissertation research. I first offer the background of the study and the research problem. I then describe the purpose of the study along with research questions. I further provide an overview of the research design and discuss the significance of the study to human resource development (HRD) research and practice. Lastly, key terms relevant to the study topic are defined as they apply to the study's parameters.

Background of the Study

On January 2, 2020, the World Health Organization (WHO) reported a novel coronavirus outbreak in Wuhan, China (WHO, 2020). Within 90 days, the virus would become commonly known as COVID-19 and impact operational procedures worldwide (WHO, 2020). On March 17, 2020, one week after the WHO declared a global pandemic, the American Association of Medical Colleges (AAMC) recommended the removal of medical students from clinical settings, in part to preserve valuable and scarce personal protection equipment (Goldenberg et al., 2020). The subsequent interruption of class schedules and clinical rotations posed a challenge to the traditional preparation of students (Çoruh, 2020; Goldhamer et al., 2020; Ryan et al., 2022; Streiff et al., 2021). Specifically, medical educators questioned whether the disruption of core curricula resulted in compromising the ability of their students to complete the prerequisites necessary for graduation and board certifications (Çoruh, 2020; Goldhamer et al., 2020; Ryan et al., 2022; Streiff et al., 2021).

In response to the AAMC's recommendation, many academic medical centers migrated to online learning platforms (Harreis et al., 2020; Toquero, 2020). Many of these institutions were forced to adopt technology applications into their curriculum, in some cases, for the first-time (Harreis et al., 2020; Toquero, 2020; Yan et al., 2020). These substitutions were revised versions

of well-designed and vetted resources to help mitigate any educational and career development delays experienced by healthcare students (Goldhamer et al., 2020; Hall et al., 2020; Singaram et al., 2022). Additionally, recent technological advances allowed some institutions with preexisting high-tech infrastructure to substitute in-person clinical rotation experiences with simulation laboratories (Ekert et al., 2021; Newman, 2020). These activities leveraged virtual reality, healthcare manikin simulators, and artificial intelligence augmentations to provide healthcare laboratory sessions (Ekert et al., 2021; Newman, 2020). Many of these resources were pre-existing laboratory experiences that had been augmented to an enhanced and extended simulation laboratory learning and training session for the healthcare student (Alves Bastos e Castro & Lucchetti, 2020; Patil et al., 2022; Saverino, 2021; Shima-Tabatai, 2020; Tabatabai, 2020). One lasting effect of the pandemic has been its influence on the utilization and leveraging of technology to allow for the evolution of the learning and training environment (Dhawan, 2020; Ene et al., 2023).

Research Context

Online educational programs have been utilized for several decades now (Means et al., 2013). Popularized in the early 1990s by organizations catering to non-traditional students seeking an opportunity to earn a degree, the novel establishments initially faced challenges in the adoption of online curricula by respected and traditional academicians (Jaggars & Bailey, 2010). Slowly, over the decades, online learning has proven itself a legitimate and valuable pedagogical medium for accredited academic institutions (Bacow et al., 2012; Dutta et al., 2011; Murphy, 2013). Accredited colleges and universities have readily leveraged the learning platform to augment their enrollment rosters resulting in additional tuition revenue streams (Israfilov et al.,

2020). Online platforms also allow institutions to significantly scale their educational capacity at a minimal expense (Israfilov et al., 2020).

Nevertheless, some educational programs lagged in embracing online formats. The lag in conversion was sometimes associated with traditionalists' in-person educational preferences but mostly based on legitimate challenges in transitioning specific course subject matter (such as chemistry and pathology laboratory sessions) to an online learning modality (Waldrop, 2013; Zulfikar et al., 2019). Recent advances in software development have eliminated some of these challenges making it permissible to teach previously mandatory in-person sessions in an online format (Fiedler et al., 2014; Konstantinidis et al., 2021; Malvey et al., 2006). As technology and innovation continued to expedite the reimaging of online learning and workforce development, the field of HRD was left with an abundance of subject matter to further explore and refine in pursuit of training advancements (Fiedler et al., 2014; Konstantinidis et al., 2021; Malvey et al., 2006).

Program Evaluation

Human resource development (HRD) initiatives must be continually evaluated to remain effective in eliciting targeted results in ever changing environments (Baek & Kim, 2014). Aiming to evaluate the success of any programmatic application is inherently desired if the program were to be continually applied toward HRD training and educational initiatives (Baek & Kim, 2014). Although occurrences such as the experiences generated by the COVID-19 pandemic are characteristically rare and infrequent, the programs put in place to adjust to the needs and restrictions that arose from that unique event may be viable tools to be leveraged in the future for instances of disrupted scheduling including campus closure scenarios (Dayagbil et al., 2021; Huang et al., 2020; McGee, 2020). For example, as severe weather events continue to

force campus shutdowns and political change creates limited access to disputed training and educational materials, distance or online learning coupled with virtual training can be leveraged to meet HRD needs (Dayagbil et al., 2021). Compared to traditional training and education programs, the hastily composed pandemic-response curricular revisions to long-standing procedures and protocols did not have the benefit of draft reviews, team buy-ins, and design elements to assist in program evaluation (Singh et al., 2022). For this and other similar cases, a retrospective evaluation-based study was performed to learn about the effects elicited by the implementation of these online, virtual, and hybrid programs in the higher education and training field (Kumar et al., 2021; Sahu, 2020; Tabatabai, 2020).

Statement of the Problem

The environment created by the global pandemic resulted in a nationwide education and training challenge for healthcare organizations (Rose, 2020; Toquero, 2020). The ensuing strain on the healthcare workforce impacted the teaching faculty, resulting in reduced learning and observation opportunities offered to healthcare students and trainees (Gupta et al., 2021; Wilcha, 2020). Furthermore, contact hour teaching time was canceled to preserve practitioners' time in favor of patient care (Allen et al., 2020). Online coursework and simulation labs replaced these unforeseen reductions in face-to-face experiential learning opportunities (Alshutwi et al., 2022; Jeffries, 2022; Shea & Rovera, 2021).

Several studies have shown increased participation in online activities versus traditional lecture design when learners are provided the opportunity to select online formats (Soffer & Nachmias, 2018). Furthermore, other studies have shown increased student confidence in learning and understanding online modules compared to traditional in-person formats (Eldenfria & Al-Samarraie, 2019; Reeves et al., 2017; Sandars et al., 2007). The inability to provide

learners options regarding participation and selection of resources during COVID-19 could have affected learner willingness to utilize online tools and, therefore, the effectiveness of the learning modality (Daniel & Wolbrink, 2019; Harries et al., 2020; Sandars et al., 2020; Tolks et al., 2016). Therefore, proper analyses are required to assess the effectiveness of the hastily implemented processes and resources provided to students during the COVID-19 pandemic (Chavarria-Bolanos et al., 2020; Zhang, 2022).

Interruptions in workflow, education, and training tend to persist as political unrest, extreme weather events, and natural disasters interrupt our increasingly structured and tightly scheduled lives (Panganayi, 2020). This study aims to contribute to the literature that addresses the educational and training needs found at the interception of the planned-for interruptions and the unforeseen disruptions. Academic institutions and training centers of all types may benefit from understanding the capacity, efficiency, and impact of online and virtual tools in instances of interruptions (Delaney & Morales, 2006; Fernandez & Shaw, 2020; Foster et al., 2022; Gruhn, 2022). These evolving training tools may yet further develop and contribute to the field of Virtual Human Resource Development (VHRD; Bennett &McWhorter, 2021; 2022; Thite, 2022).

Indubitably, the ability of HRD to bridge training modalities will result in recommendations harnessing the versatility of virtual resources (McWhorter, 2014; 2023, in press). Furthermore, accurately evaluating program performance reflecting on the VHRD role would be critical in the bid to continue developing quality resources for students in the face of campus disruptions, including weather events, closures from hurricane damage, fire evacuations, etc. (Bennett & McWhorter, 2021). Developing proactive processes to address these challenges would inevitably need to employ HRD processes (Bennett & McWhorter, 2022). Moreover,

HRD professionals have long studied the applications of online learning or e-learning (Slotte et al., 2004). Specifically, HRD research and practices may contribute to higher education by leveraging studies and best practices observed in online education and training via VHRD (Fazarro & McWhorter, 2011).

An associated issue of healthcare education during COVID-19 involves the students as learners and the challenges they faced as parents, caregivers, and frontline workers during the pandemic (Billings et al., 2020; Singh et al., 2022; Spalluto et al., 2020; Walton et al., 2020). Much has been published in the way of course review, curriculum development, and training processes, yet little is known regarding resources necessary to support these individuals during an all-encompassing crisis like the pandemic (Goldrick-Rab et al., 2020; Knight et al., 2021; Mcmurtrie, 2020; Weldon et al., 2021). Studying the effect of online resources and associated technologies leveraged during the unprecedented campus closures provides researchers compelling insight into the viability of processes implemented while pivoting to exclusively online teaching (Oliveira et al., 2021; St. Onge et al., 2022; Weldon et al., 2021). Additionally, these findings can be leveraged to implement best practices and processes during potential future crises (Izumi et al., 2020; Karakose, 2021; Leaver et al., 2022

). Furthermore, evaluation of programs that successfully implemented online resources and simulation technologies may provide viable training options as overextended programs begin to proactively explore the scalable potential of these resources in the effort to augment current program bandwidth limitations (Carless et al., 2017; World Health Organization, 2013).

HRD practitioners have, over the last several decades, contributed to the development of a rich domain where the applied field of practitioners draws from various disciplines housing a wealth of subject content (McGuire & Cseh, 2006). Core components of the HRD field have

been defined as including "strategic change management, integration of learning processes, knowledge management, career development, healthy and productive workplaces, insourcing and outsourcing of training, team building, leadership development, application of technologies, and sociotechnical fit," just to name a few (Dilworth, 2003, p. 23). Additionally, the retrospective review of resource and technology implementation in educational programs was vital to the evolution of the educational process (Barteit et al., 2020; Castro & Tumibay, 2021; Costan et al., 2021; Molino et al., 2020).

Each component of these core principles was relevant to the application of online learning in the healthcare sector (Barteit et al., 2020). More specifically, strategic change management was paramount in the deployment of new technologies (Tabrizi et al., 2019). Furthermore, integrating learning processes should be prioritized when launching new online learning activities. In the changing environment due to the global pandemic, these processes became vital to successful online learning integration (Conceição & Howles, 2023; García-Morales et al., 2021; Peimani et al., 2021; Sandars et al., 2020). Likewise, establishing precise baseline requirements for training, implementation, and the structured use of the provided resources was instrumental in the ability to conduct program evaluations (Baniasadi et al., 2020; Conceição & Howles, 2023). With these resources and processes, HRD professionals could inform the program evolution and help shape online healthcare training and education (Li, 2016).

The COVID-19 pandemic has provided a unique opportunity for change in healthcare education (Brandão et al., 2021; Alves Bastos e Castro & Lucchetti, 2020; Patil et al., 2022). Initiated due to an emergent need to evolve practices to embrace technology and online resources, these revisions to traditional training were now to be institutionalized permanently (Alves Bastos e Castro & Lucchetti, 2020; Pan & Rajwani., 2021; Tabatabai, 2020). The success

of adopting these processes depended heavily on the proper review and assessment of programs to reflect best practices for student success (Gardner et al., 2023; Schreiner et al., 2020). The permanent adoption and the resulting transformation of healthcare education to evolve into a heavier reliance on Virtual Reality (VR), Artificial Intelligence (AI), and varying modes of simulation depended on the ability to validate the effectiveness of these educational resources (Alam & Mohanty, 2022; Ledwos et al., 2020; Mirchi et al., 2020).

However, the education and training of healthcare professionals through online coursework remained inherently controversial (De Oliveira Dias et al., 2020; Giordano et al., 2021; Naciri et al., 2021). While beginner courses are based on a traditionalist instructivist learning style, healthcare education online lends itself to an evolved constructivist learning model typically employed once students reach a more senior level of learning (Pittenger & LimBybliw, 2013; Rose, 2020). As such, HRD professionals may assist in framing the applications and activity presentations to allow for a more controlled educational and training environment (Jena, 2020). With HRD measurement and evaluation approaches, healthcare instructors could carefully guide students through an online learning process by creating a learning activity from which the students could balance the volumes of information being taught with their individual learning experiences as part of the training process (Anderson, 2020). In short, HRD professionals were uniquely positioned to establish processes designed to obtain the goal at hand, delivering knowledge and promoting learning to the shaping of a skilled labor force (Wang et al., 2017).

Research Context

A case study was designed to examine and evaluate the effects of the imposed COVID-19 campus closure on the healthcare student population of a major academic medical center. The

case institution offers degree programs at the baccalaureate, master's, and doctoral levels. During the campus closure, much effort and funding was redirected into launching novel initiatives for student learning and support. The campus opened a state-of-the-art simulation center six months before the COVID-19 pandemic. The 77-bed simulation hospital included an Emergency Ambulance Bay, Operating Room Suite, Intensive Care Unit, and a Labor and Delivery Ward, among other traditional hospital configurations. The simulation center was heavily leveraged to provide rich learning experiences and tools to the student population during the pandemic. This study was to focus on the effectiveness of student outcomes (i.e., grades) and performance on certification exams.

A preliminary longitudinal phase one study examined the variances in student grades spanning a timeline that includes two years before the campus closure and ending during the final stages of the pandemic. Preliminary quantitative analyses of student outcomes at the macro (school) level (i.e., SON, SOM, SHP, and GSBS) were performed to provide data for triangulation with future research proposals. A qualitative approach was utilized to explore influences on grade outcomes among the student population. In other words, such a mixed-methods approach warranted an understanding of the variables and factors mitigating student perceptions and outcomes at the institutional level. These research processes allowed insight beyond the interpretations yielded by quantitative or qualitative analyses alone (Venkatesh et al., 2013).

As such, the qualitative review regarding student perceptions of institutional COVID-19 pandemic support and handling was conducted. The goal of this method was to provide additional context and incorporate data representing the effect of the pandemic experienced in

the students' lives. These data provide insight into the multi-layered effect of interrupted campus operations on student experiences resulting from the COVID-19 pandemic.

Statement of the Purpose and Research Questions

The overarching purpose of this study was to explore and evaluate healthcare student performance during the COVID-19 campus closure and the resulting online learning and educational course implementation. Specifically, the following research questions guided this study:

R1. What was the direct impact of COVID-19 on experiences and perceptions of the healthcare student population as reflected in their academic performance?

R2. How effective were the institutional resources in supporting the students learning during the pandemic?

Overview of Research Design

This study adopted a mixed-methods approach with a case study design (Yin, 1984). Case studies are useful and traditionally leveraged to investigate sociological studies but have become increasingly utilized in instruction review (Tellis, 1997). As Yin (1994) described, this method was structured as a study designed to address the causal links in real-life interventions. Acknowledging that case studies are not sampling-based research, the sample for this study included the entire student population of the case organization.

The case organization is a United States major academic medical center comprised of four accredited schools, the School of Medicine (SOM), the School of Nursing (SON), the School of Health Professions (SHP), and the Graduate School of Biomedical Sciences (GSBS). The unit of analysis for qualitative review was at the school level of the case institution and provided through the annual student satisfaction survey. To capture the multi-perspective

analyses required of mixed-methods research, multiple data sources were utilized to allow for a triangulated research strategy (Feagin et al., 1991). Specifically, student outcomes (i.e., grades) and performance on certification exams provided the quantitative data points to be triangulated with the survey results.

These data provided insight into the multi-layered effect of interrupted campus operations on student learning experiences. Data that were triangulated include career licensure and program exam pass rates for the nursing, physician assistant, and medical degree programs. These results were published annually by the institution in an aggregated format for each program. Further, the institution initiated an augmented student survey in 2021 that included perceptions of COVID-19 services and resources. Survey questions were submitted anonymously and accompanied by limited demographic data identifying which school the respondent was registered to, among other data points. Triangulation with multiple sources of data provided the required validity of the research process. Data source triangulation was achieved by reviewing data and possible variances within the dataset between different contexts.

The preliminary longitudinal phase one study was commissioned to evaluate student performance, as reflected by quantitative analyses of grades, across five years, beginning in 2017 and ending with the entire academic year following the unprecedented campus closure. The scope of this study extended beyond the interpretations from the quantitative analyses alone for a holistic, in-depth understanding of the mechanisms at work. As such, a qualitative review regarding student perceptions of institutional COVID-19 pandemic support and handling was conducted. Triangulating grades (scores), professional exam pass rates, and student perceptions helped illustrate and describe a more comprehensive environmental assessment of the campus and the student population during this period of time. The goal was to identify programs,

resources, and tools successfully leveraged during the pandemic to sustain student learning and academic performance.

Significance of the Study

The knowledge required to shape and skill the future healthcare workforce via a virtual domain must be supported by evidence-based research findings rooted in sound theory and program evaluation reviews (Bennett & McWhorter, 2022). Although case study research was frequently criticized for lacking generalizability, the effect of the pandemic was widely felt and generalizable in a broad sense (Peyton et al., 2022; Taber, 2000). As such, program review becomes essential to validating invested resources to produce cutting-edge, technologically advanced programs (Guppy et al., 2022; Jili et al., 2021; Tawafak et al., 2021; Treve, 2021). The qualitative analysis review was critical for a holistic evaluation of the situation, environment, and personal experiences associated with implementing any new program (Benito et al., 2021; Wagiran et al., 2022).

First, through empirical data-driven results, one may provide educated conclusions or explanations (Merriam, 2002; Patton, 2002). Therefore, great relevance can be assigned to collecting and interpreting data studying the effectiveness of healthcare online learning activities (Topping et al., 2022; Wong et al., 2020). The translation of these data to determine the quality and effectiveness required of these contemporary healthcare training processes lies squarely in the HRD domain (Arora & Suri, 2020; Bennett & Bierema, 2010; Li et al., 2020).

Second, this study was important for the research area on the Virtual HRD domain, emphasizing healthcare education and training (Bennett & Higgens, 2016). Understanding the role of VR, AI, and simulation on student outcomes during the pandemic would underscore the versatility of VHRD and expand on the degree to which it can be leveraged in healthcare training

and education (Bierema, 2020; Stanica et al., 2018). The medical education sector was mainly concerned with the validation of technological advancements and the resulting ability to leverage new technologies for the advancement of education and training (Le et al., 2018; Liaw et al., 2023; Pottle, 2019). Furthermore, as the healthcare field currently faces a steadily increasing workforce shortage, the findings of this study may inform the field of HRD by providing a framework from which to design plausible and viable scaling of education and training solutions leveraging advances in VHRD (Flaherty & Bartels, 2019).

Third, of particular interest to the HRD field, is the continued support and alignment towards the recognition of the role played in Higher Education (HE) as a sub-field of HRD practice (Harte & Stewart, 2010). Education, in the broadest sense of the definition, has been repeatedly emphasized as a pivotal HRD intervention (Steward, 2007). Consequently, findings from this study are likely to enrich general HRD literature on crisis management and associated implementation practices.

Last, but not least, program evaluation is one of the most essential cornerstones of the HRD discipline (Banton, 2019). This study contributed to the established body of work focused on program evaluation literature but with an emphasis on online learning in healthcare training and education in the HE sector. The findings of this research contributed to a rapidly developing sector of this field of study. Specifically, this study informed summative or outcomes-based evaluations as the field evolves past the initial stages of the practice-oriented atheoretical stage (as represented by the Kirkpatrick four-level model) and contributed to the development of process-driven operational stage evaluation theory represented by the system-level measurement models (Wang & Wilcox, 2006).

Definition of Terms

Academic medical center: an institution in which education, research, and clinical care are combined to provide students and patients with a resource-rich environment.

ADDIE (Analysis, Design, Develop, Implement, Evaluate) Model: An HRD development model, the ADDIE model is an acronym of five stages of program development presented in the intended order of application with the intent on each stage's retrospective and prospective influence on the others.

Clinical rotation setting: a hospital or clinical environment where healthcare students participate in patient care as part of their educational programs; often includes surgical, emergency, and intensive care exposure.

COVID-19 pandemic: The SARS-CoV-2 virus-derived pandemic consists of an upper respiratory infection. Before vaccination, this resulted in high hospitalization rates and increased mortality.

External Influences: Activities, changes, or acts of nature able to influence operational norms. In this case, the effect of COVID-19 campus closure and implementation of online courses for traditionally in-person classes.

Global pandemic: A pandemic is a global disease outbreak. It differs from an outbreak or epidemic because it affects a wider geographical area, often worldwide; infects a more significant number of people than an epidemic; is often caused by a new virus or a strain that has not circulated among people for a long time. Pandemics typically spread because humans usually have little to no immunity against the infectious agent; the virus spreads quickly from person to person worldwide; causes much higher numbers of deaths than epidemics; often creates social disruption, economic loss, and general hardship.

Healthcare programs: educational programs producing degrees ranging from Bachelor's degrees to doctoral level graduates in healthcare-related fields, including nursing, respiratory care, physical therapy, medicine, medical research, physician's assistants, etc.

Healthcare simulation: using electronic manikins equipped to mimic healthcare scenarios (i.e., birthing) in teaching. Simulation can also include Virtual Reality (VR) and Augmented Reality (AR) in the simulation of patient clinic visits and surgical pathology studies.

Higher Education: post-graduate work of college level and greater that contributes to the training and employability of the individual partaking in the course work.

Kirkpatrick Model: a globally recognized method of evaluating the results of training and learning programs. It assesses both formal and informal training methods and rates them against four levels of criteria: Reaction, Learning, Behavior, and Results.

Leadership: The practice of facilitating processes, organization, and leading transformational change for the survival of the organization.

Learning Processes & Practices: Those activities undertaken to promote learning, validation, and competency in chosen disciplines and tasks.

Online learning: or eLearning, this platform allows students to access class materials from online platforms such as Blackboard or Canvas, participate in class discussions online, and in certain instances, complete course work asynchronously, allowing flexibility unavailable in traditionally scheduled face-to-face lectures.

Personal protective equipment (PPE): any material used to protect workers from workplace hazards; in healthcare, this includes gloves, gowns, masks, and glasses or face shields.

Program Evaluation-Formative: Program evaluation activities and practices that intend to inform on program improvements, including design, implementation, and execution. Formative

program evaluation is specifically tailored to identify weaknesses in instructional materials, program methodologies, and learning objectives with the intent to provide tailored solutions during the program design and development stage.

Program Evaluation-Summative: Program evaluation activities and practices that intend to inform on training program outcomes. Summative program evaluation is performed after the training program has been completed and is the final step in the ADDIE model.

Virtual Human Resource Development (VHRD): A process of using Internet- or Web-based technologies to enhance individual, group, and organization effectiveness through training and development, organization development, and career development.

Chapter Summary

This chapter offered an overview of my dissertation study. I started with articulating the research background and problem first, followed by presenting the research purpose and research questions. I then outlined the research design and method adopted in the study and discussed the significance of the study. The key concepts relative to this study were specified, and their applicability to the research methods selected has been discussed.

Chapter Two: Review of the Literature

This chapter reviews and analyzes relevant literature associated with the rapid onset of online education during the COVID-19 pandemic. The literature included healthcare learning and education-related change management for adopting online learning under the pandemic context and technology-based learning in the Healthcare Professions. Furthermore, HRD literature related to training, higher education, and program evaluation were also reviewed. With the integrative review and literature analysis, this chapter identified the research gap and research questions for the study.

Literature Review Methodology

Given the scope of the study, my literature review was concentrated on peer-reviewed academic journal publications with secondary documents typical of gray literature, including conference proceedings and relevant practitioner books. The literature search and selection process included three comprehensive phases. The first phase consisted of a keyword search to identify potentially relevant documents. In the subsequent two phases, the identified documents were screened, and relevant articles were identified. Lastly, an in-depth review of the remaining articles was conducted, and data was synthesized for reporting.

In the first phase, the literature was identified through a keyword search. The SCOPUS bibliometric tool was utilized for the search. SCOPUS databases encompass over 5,000 publishers, resulting in searches that access nearly 25,000 active titles. Furthermore, SCOPUS is hosted by Elsevier, a global information analytics publisher specializing in science and healthcare. Falagas et al. (2008) found that SCOPUS offers more coverage when compared to Web of Science and increased accuracy over Google Scholar. SCOPUS also offers a superior journal range, pivotal for keyword and citation searches (Falagas et al., 2008).

The following keywords were used alone or in combinations: "pandemic*" "workforce" "training"; "training*" "pandemic" "response"; "healthcare*" "education*" "online"; "education*" "training*" "pandemic"; "program evaluation*" "training*" "healthcare"; "program evaluation*" "NSDP" "pandemic" "higher education". To maximize data capture, no date restrictions were placed on the database searches. The six separate searches resulted in a total of 371 documents identified as having been associated with these keywords. Of these, 283 were eliminated due to duplication, publication in language other than English, and document type other than article. Removing the eliminated items resulted in a pool of 88 peer-reviewed journal articles for the literature review.

The abstracts and methods sections of the 88 selected articles were first reviewed for content relevance in the second screening stage of the literate search and review. Exclusion criteria were clear and allowed the determination to eliminate specific articles to be carried out in a straightforward process. Some articles did merit a secondary review to identify and categorize studies that presented a more complicated or less direct application to the current study. For example, a study on IT staff during the pandemic (Chapman, 2020) presented exciting and valuable findings. However, the healthcare application failed to be identified, so the article was not included in the final pool of relevant articles. Additionally, an article discussing the risk of infection among healthcare workers during a pandemic (Hudson et al., 2013), though supporting the foundational basis of this study, did not provide workforce development, training, or program evaluation contributions and thus was excluded from the review.

The Pandemic and Healthcare Education and Training

The sudden onset of the global pandemic presented a unique and multifaceted challenge to healthcare systems worldwide (AlSaif et al., 2020; Ghai, 2020). Initially originating in Wuhan,

China, the novel Sudden Acute Respiratory Syndrome Coronavirus -2 (SARS-CoV-2) was discovered in December 2019 by Chinese physicians reporting an increase in respiratory hospitalizations in the Hubei Province (Cheung et al., 2020; Crawford et al., 2020; Yan et al., 2020). Soon revealed to possess a transmissibility value (R_0) of six, the virus outbreak rapidly intensified into a pandemic as every infected individual was potentially spreading the virus to six others during the contagious stage of the illness (Sanche et al., 2020). Within months, due to the high transmissibility of the viral contagion, the outbreak escalated to the rare level of a global pandemic, affecting the integrity of international supply chains worldwide (Kumar et al., 2020; Phan & Narayan, 2020).

One of the areas detrimentally impacted early on by the pandemic was the globalized healthcare personal protection equipment (PPE) supply chain (Ehrlich et al., 2020; Miller, 2020). Following unprecedented recommendations published on March 17, 2020, by the American Association of Medical Colleges (AAMC) and facing an increased challenge in obtaining PPE, many academic healthcare centers in the United States (U.S.) decided to remove students from clinical training environments to conserve limited PPE supplies (American Association of Medical Colleges, 2020; Ferrel & Ryan, 2020). These prompt actions helped preserve PPE for those healthcare professionals treating COVID patients, reduce the students' exposure to contracting the virus and possibly spreading the illness, and alleviate some of the task burdens on teaching healthcare faculty members (Coe et al., 2020). As a result, healthcare students received a mixture of simulation, online, and augmented reality training to supplement their educational experiences without clinical patient-facing training experiences (Carter & Chiocca., 2020; Henderson et al., 2020; Wyers & Taylor, 2020).

The synergistic effect of a highly infectious virus coupled with lockdown challenges, supply chain disruptions, and healthcare workforce depletion resulted in the creation of an environment that accelerated the growth and development of healthcare education and training (Bosveld et al., 2021; Byrne et al., 2020; Ioos & Gallicchio, 2020; Lang et al., 2021; Mian & Khan, 2020; Newman & Lattouf, 2020; Rose, 2020). The resulting healthcare learning and education evolution relied heavily on the tenets set forth by Virtual HRD and previously established online education programs (Bennett & McWhorter, 2022). During the pandemic, healthcare educators were required to pivot rapidly to provide comprehensive, enriched, and credible substitution activities in the face of the sudden withdrawal of the clinical teaching arena (Alves Bastos e Castro & Lucchetti, 2020; Chen et al., 2020; Cleland et al., 2020; Hall et al., 2020; Harries et al., 2020; Rajab et al., 2020). Additionally, many institutions were simultaneously faced with the challenge of over-worked clinical teaching faculty tasked with patient care, leaving little to no time for teaching responsibilities (Alvin et al., 2020; Astorp et al., 2020; DeWitt, 2020; Keswani et al., 2020).

The resulting implementation of hybridized curricular activities resulted in the leveraging of existing technologies and a heavy reliance on online formats and platforms, including the implementation of many virtual teaching sessions (Ahmed et al., 2020; Moszkowicz et al., 2020; Reinholz & French, 2020; Wijesooriya et al., 2020). Though not new, these types of activities were implemented, in many cases, for the first time, in programs attempting to mitigate the effects of the COVID-19 pandemic on healthcare education (Khurshid et al., 2020; Li et al., 2020; Saeed et al., 2020; Toquero, 2020). The resulting healthcare teaching environment had absorbed many changes rapidly and had been studied in order to facilitate what had been openly recognized as the latest evolution in healthcare education and training (Cheung et al., 2020;

Jiménez-Rodríguez et al., 2020; Kapoor et al., 2020; Kumar et al., 2020; McKimm et al., 2020; Pears et al., 2020; Ramsetty & Adams, 2020; Raymond-Hayling, 2020; Ting et al., 2020).

Healthcare learning during COVID-19

Healthcare students have traditionally been enrolled in programs designed to encompass varying levels of clinical immersion depending on their roles and seniority (Rose, 2020). For entry-level nursing, respiratory therapy, physician assistant, medical students, and similar specialties, learning typically includes 12 to 18 months of interactive, problem-solving small group activities highlighting an increased emphasis on "team-facilitated, active, and self-directed learning" promoting interprofessional education conducted in traditional in-person physical settings (Irby et al., 2010; Skochelak & Stack, 2017). Additionally, in later stages of learning, healthcare programs typically placed students in clerkships or clinical rotations in direct contact with the patient population where they learn, among other professional skills, to model altruism and role identity from firsthand experiences with preceptors (Ehrlich et al., 2020; Irby et al., 2010; Ohl & Shnekendorf, 2015; Petraglia, 2009).

The removal of students from the clinical setting drastically impacted their learning and training experiences due to the pedagogical design of most of the healthcare educational programming (Ahmed et al., 2020; Ehrlich et al., 2020; Ferrel & Ryan, 2020; Harries et al., 2020; Rose, 2020). Without clinical learning opportunities, students were offered augmented online resources, including synchronous and asynchronous courses, to supplement their curricular activities (Crawford et al., 2020; Rose, 2020; Wijesooriya et al., 2020). Adopted changes included online live lectures, allowing for interactions between the faculty members and the students (Henderson et al., 2020; Rajab et al., 2020; Ramsetty & Adams, 2020). Additionally, healthcare simulation technology was leveraged to enhance skills labs via VR materials and

augmented reality (AR) offerings (Alves Bastos e Castro & Lucchetti, 2020; Le et al., 2018;

Pears et al., 2020). Lastly, many activities were modified to adapt to social distancing

requirements, including standardized patient practice and examination experiences (Hall et al.,

2020). These scripted patient encounters were converted into telehealth visits, allowing students

to continue practicing the mechanics and procedures of a clinic visit in an online format (Wyers

& Taylor, 2020).

As a result of the wide variability between institutional coursework offered during

COVID-19, academicians voiced concerns regarding the "preparedness" of students graduating

during this time (Qarajeh et al., 2020; Roberts, 2020; Sahi et al., 2020; Wayne et al., 2020).

Many scrutinized substituting virtual reality and simulation labs for clinical rotations (Ahmady et

al., 2020; Casto & Lucchetti, 2020; Gaur et al., 2020; Nikas et al., 2022; O'Byrne et al., 2020;

Sahi et al., 2020). However, opportunities to implement new technologies and expand on the

current utilization of existing simulation coursework proved to be the go-to resources most

institutions relied on during the pandemic (Daniel & Wolbrink, 2019; Singh et al., 2022). Lastly,

many institutions found the technologies user-friendly, readily adopted by users, and (under the

circumstances) manageable alternatives to in-person learning platforms (Haridy et al., 2021;

Ishak et al., 2022; Shea & Rovera, 2021). Furthermore, many believed virtual reality and

enhanced simulations had permanently evolved following their hastily planned applications

during COVID-19 (Chang et al., 2021; Consorti et al., 2021; Jeffries, 2022; Kapoor et al., 2020;

Krasowki et al., 2021; Labao et al., 2023; Ray et al., 2021; Wallett et al., 2022).

Change Management and the Adoption of Online Learning

Online learning had been exponentially increasing in participation since the early 1980s

(Allen & Seaman, 2010). Offering valuable flexibility, online learning or e-learning had also

been witnessed to create a flattening of communication in the classroom (Masters & Elleway, 2008). Enhancing student roles and transforming the instructor role to assume more of a facilitator and moderator identity, the online classroom offered many learning opportunities to those students prepared to participate in the activities (Dziuban et al., 2013). The most effective online course participation tools included orientation sessions and the technology required for online course participation (Reeves et al., 2017). Similarly structured and organized syllabi were required in all online courses, allowing students to reference timelines, materials, and course assignments at will (MacNeill et al., 2014). Most important, however, was the synergistic influence of an instructor-led approach to online learning adoption and assimilation (Hanna et al., 2013).

However, instructor-led assimilation of online learning was unable to address the associated challenges inherent with this learning medium (Bacow et al., 2012; Lim et al., 2019). Some platforms utilized to host online learning courses come with expensive subscription fees, especially for the healthcare field (Voss, 2013). Limitations expand when organizations invest considerable funds and person-hours in training and maintaining platforms only to eventually migrate onto a different product (Rucker& Frass, 2017). Frustration and lack of engagement naturally followed a product update or switch, resulting in user interface challenges (Docherty & Sandhu, 2006). If a switch were necessary, these transitions would be required to be competently handled with change management protocols and best practices in mind (Walstrom, 2014). Lastly, technical difficulties, including server stability, password management, firewall protection, and ease of website navigation contributed to the frequency and extent of use of online learning platforms and associated learning resources (Sivamalai et al., 2011).

Leveraging the strengths of e-learning when applying the learning modality to healthcare settings was critical for complete adoption by both faculty and students (Docherty & Sandhu, 2006). Enhancing the availability of text materials for asynchronous learning was a significant boon for learners (MacNeill et al., 2014). Embedded learning videos and lectures provided students with the opportunity to review material with the inclusion of supplemental resources (Button et al., 2014). Gone were the days of the note-taker, as learning evolved to a more sophisticated mode of communications (Reimer et al., 2009; Small & Paling, 2002). Nevertheless, the inherent need for face-to-face activities, such as skills labs, would continue to require a blended learning experience in healthcare (Costello et al., 2014; Rowe et al., 2012).

Successful programs have incorporated standardized requirements for the inclusion of online courses into their curriculum (Doroudi et al., 2019). Of note, few healthcare courses were entirely conducted online; most included online lectures and group activities combined with in-person lab experiences (D'Alfonso & Halvorson, 2002). Faculty had to produce cohesive course materials, including meeting the requirements for structured syllabi corresponding to online courses (Thomas et al., 2010). Furthermore, faculty had to be supported with technical assistance to create their online course presentations uniformly and in an organized fashion (Petrusa et al., 1999). These packaged presentations reinforced students' orientation to online learning and presented a cohesive and digestible product (Thomas et al., 2010).

Even so, mastering the online portion of the e-learning hybrid experience was not the most significant challenge for healthcare education; that distinction corresponded to the coordination and hosting of the limited in-person sessions (Childs et al., 2005). Becoming more and more popular, "distance learning" programs, especially for nursing schools, often found the rate-limiting step for most programs to be the ability to distribute campus resources (i.e.,

laboratory/simulation time, clinical rotations, etc.) for their growing cohorts (Brett-Fleegler et al., 2012; Lewis et al., 2012). As the lion's share of online learning in healthcare would, by default, be defined as blended or hybridized learning activities, the management of student experiences when they did present to a campus course activity was crucial to sustaining the course success and reinforcing online learning modalities (Costello et al., 2014). For optimal program success, students had to be informed of in-person activity schedules, including material preparation (Thomas et al., 2010). Recent technological enhancements have offered additional resources for online learners preparing for healthcare labs (Chen et al., 2020; Krishnamurthy et al., 2022; Jeffries, 2022). Resources included online video tutorials, virtual reality medical applications, and practice kits that allowed students at home preparation for in-person coursework (Hawkins, 2012). Many of these resources, though advanced, had yet to be tested for accuracy and fidelity to actual medical scenarios (Tun et al., 2015). Hence, the permissibility and application of "practice" online materials should have been taken with careful consideration as they apply to the course specific learning objectives (Bredmose et al., 2010; Lapkin & Levett-Jones, 2011; Lee et al., 2008; Levett-Jones et al., 2011; Norman et al., 2012).

This technology's power enhanced the learner's ability to migrate away from an instructivist paradigm and self-select into a constructivist learning model (Alqahtani et al., 2023; Porcaro, 2011; Sayaf, 2023). The consensus from the literature underscores that the concern in healthcare learning was to adequately prepare well-rounded candidates for the medical professions, not to produce encyclopedias of information without the ability to perform under pressure (Ayaz & Ismail, 2022). Though fraught with caution and wariness, the progression of healthcare learning into an online format had been mainly paved by student enthusiasm and satisfaction (Shorey et al., 2021; Ulrich et al., 2021). Students had overwhelmingly reported (or

illustrated through test results) increased retention of course materials (Loke, 2012; Moule et al., 2010; Rowe et al., 2012). Additionally, students reported increased self-confidence in the subject matter covered when applying the learning in a clinical setting (Bughrara et al., 2023; Lewin et al., 2009; Masters & Ellaway, 2009). Furthermore, students exhibited active interest in learning new technologies, such as virtual reality and augmented reality platforms, spurring the expansion of the application of these tools in new subject areas and coursework (Delello et al., 2015; Dziuban et al., 2013).

Technology-based learning in the Healthcare Professions

For the most part, online learning in the healthcare professions had slowly assimilated into the curriculum but, according to some, remained to be proven and required additional study (Dearnley et al., 2013; McCutcheon et al., 2015). The movement in healthcare learning to harness the market of online higher educational offerings had been slow due to the development needs required of the technologies necessary to simulate healthcare courses and laboratory work (Costello et al., 2014; Rowe et al., 2012; Sue et al., 2005). On the other hand, one of the driving forces behind the incorporation of online learning or e-learning in the healthcare sector had been the intricacy of the healthcare arena and the prevalent impact that context had on the implementation and improvement efforts within an organization (Augustsson et al., 2018). An example of a complex healthcare change adaptation included advances such as the laborious and multifaceted implementation of electronic medical records (EMR) systems (Barnett et al., 2013; Button, 2014). However, the rapid assimilation of EMR systems across major healthcare centers was not mirrored in the academic areas, notably due to the role the technology holds in each context, enabling one sector to adapt to need and regulatory requirements more successfully

while the other, the academic sector, lagged in adoption (Chambers et al., 2013; Costello et al., 2014; Sebelius, 2010).

Recent advances in technologies and infrastructure had provided alternatives for those areas yet to adopt online learning to revisit the possible assimilation into online learning platforms (Robin et al., 2011). One such area was the plethora of primary healthcare degrees (Cook et al., 2010; Doroudi et al., 2019; Murad et al., 2010; Ruiz et al., 2006). Specifically, most healthcare degrees' lab and clinical portions had notoriously been a challenge when designing online curricula (Cook et al., 2008). Hence, though many course-specific and online elective alternatives had been incorporated into healthcare education, few programs relied heavily on online resources alone (Cook, 2010; Pullen, 2006). These practices suddenly stopped in March 2020 as many universities canceled in-person classes following the annual Spring break holiday at the onset of the COVID-19 global pandemic (Harries, 2020). As a result, many self-paced courses, online lectures, and technologically advanced simulation experiences were offered to healthcare students across the domain of healthcare professions (Brandão et al., 2021; Alves Bastos e Castro & Lucchetti, 2020; Saverino, 2021; Tabatabai, 2020).

Efficacy of Virtual Reality, Augmented Reality, and Telehealth Simulations

The pandemic response and its heavy reliance on technology and online resources underscored the accelerated need for healthcare virtual reality, augmented reality, and immersive learning that was hard to contest moving forward (Gaur et al., 2020; Goh & Sandars et al., 2020). The genie was out of the bottle, effectively leading to the incorporation of this technology in training programs to a degree that was hard to walk back (Pottle, 2019; Tabatabai, 2020). For decades, the development of these technologies had been spurred on by major technology companies, including CAE, Inc. (formerly Canadian Aviation Electronics), the single most

prominent purveyor of sophisticated simulation equipment, including everything from birthing manikins to flight simulators utilized for space travel (Cooper et al., 2008). These technologies had achieved simulation accomplishments to rival operating room scenarios (Seymore, 2008). As such, increasing the incorporation of advanced technologies in healthcare simulation did substitute for real-world (i.e., clinical) experience while providing a wide variety of cases that would be hard to find in a typical clinical setting and potentially enhanced the quality of healthcare training overall (Papapanou et al., 2022; Paranjape et al., 2019).

Simulation equipment had now been adapted to include realistic processes, including oxygen exchange rate during surgery, maternal contractions in labor, and premature infant intubations (Campbell & Dadiz, 2016; Mitchell Waldrop, 2013). Skills labs continued to expand on the teaching techniques available by utilizing these advanced tools (Kim et al., 2020; Richardson et al., 2020; Woo et al., 2022). Additionally, healthcare simulation had begun to blur the lines between virtual reality and simulation experiences with augmented reality accessories (Qian et al., 2019). These processes, equipped with highly sophisticated haptics, allowed students to wear virtual reality headsets while coordinating with a highly sophisticated simulation manikin to deliver an infant in breech presentation (Chang et al., 2016). During the exercise, the student would be able to see a transparent rendering of the maternal pelvis and visualize the infant's position to assist in the high-risk birth (Cuerva et al., 2018). Similar simulations for activities, including surgical simulations, anesthesia administration, and even operating room fires, were readily available (Carey & Rossler, 2020; Jeffries, 2022; Pottle, 2019). As these technologies achieved a new level of sophistication, their acceptance by credentialing boards slowly increased (Bredmose et al., 2010; Jones, 2011; Lapkin & Levett-Lee, 2008; Levett-Jones et al., 2011; Norman et al., 2012; Rutherford-Hemming et al., 2016).

Telehealth simulations using standardized patients also evolved due to the COVID-19 inhibition of high-stakes exams (Gabrielson et al., 2020). Typically held in heavily controlled simulated clinical settings, these exams employed a highly trained actor to portray a patient during a clinic visit (Donovan & Mullen, 2019). Unfortunately, due to social distancing restrictions, students could not participate in directly examining their test subjects (Unrue, 2021). However, many medical schools rapidly deployed resources to establish an organized and secured set of standardized telehealth visits to substitute for these in-person activities (Unrue, 2021; Melendez et al., 2022; Harendza et al., 2020). Students were trained on the particulars of telehealth visits versus routine in-person visits, and standardized patients participated in the exams from the safety of their own homes (Melendez et al., 2022). These alternative yet realistic activities helped to serve the educational needs in the training void left during the COVID-19 student restrictions on clinical participation (Harries, 2020; Rose, 2020). Nevertheless, much study was needed to assess the effectiveness of these training techniques (Harries, 2020; Rose, 2020).

Computer literacy, Information literacy, and Digital literacy

A significant setback in the advancement of online learning in the healthcare sector was students' and educators' limited computer, information, and digital literacies (Costello et al., 2014; Jain & Paul, 2020). Information literacy had been defined as the ability of a practitioner "to recognize the need for information, determine the extent of information needed, access information efficiently, critically evaluate information and its sources, classify, store, manipulate and redraft information collected or generated and incorporate selected information into their knowledge base" (Bundy, 2004, p. 13). With this working definition, one can expand on the responsibilities of students to access, assimilate, understand, incorporate, and independently

apply online lessons. Furthermore, computer literacy was established as "the knowledge and ability to use computers and existing technologies or applications efficiently" (LeadCS.org, 2015, p3). It is important to note that the rate of technological advancement in the healthcare sector had also introduced the need for digital literacy, or the ability to manage participation and communication in online forums for the advancement of educational and professional purposes (Chopra & Strickling, 2011; Costello et al., 2014).

In the milieu of these advancements, the obstacles facing the online implementation of healthcare learning objectives were significant (Berman et al., 2008). With the rapid launch of EMR in the clinical setting coinciding with new instrumentation to track and enhance patient care (i.e., Pyxis™, Omnicell™, etc.), healthcare educators were already facing a tidal wave of change to adjust courses for virtual offerings leveraging the new educational platforms being brought online such as Canvas®, Blackboard®, etc. (Shelton et al., 2017). With limited time to train critical clinical skills coupled with course load accreditation requirements, many educators opted to teach the basics, slowly integrating the most valuable technologies, and leaving the rest of the innovative technological advancements for students to learn as recruits in their professional roles (Lewin, 2009).

For healthcare education, a scenario in which the classical didactic learning style has been heavily intertwined with the clinical setting, it has been nearly impossible to rapidly assimilate technological advancements found in the clinical enterprise without sacrificing time and effort in the classroom that has been formerly dedicated to preexisting topics (Jensen et al., 2009). Adopting new technologies into the curriculum introduced an almost subspecialty of technologists to medical fields (Sikdar & Guha, 2020). Furthermore, the ever-growing presence of social media platforms introduced the concern that healthcare students may utilize online

platforms inappropriately, ultimately stunting the development of an appropriate academic style (O'Connor, 2005). Within these topics was a wealth of possibilities for the role of VHRD and the application of modern, versatile organizational training modalities to carry HRD into the future.

Scholars attested to the need for a pre-registration requirement of baseline computer, information, and digital literacy for healthcare students (Button et al., 2014). Acknowledging the role of technology and the ability to leverage these advances for student gain required that students be familiar with the medium's hardware, platforms, and etiquette (Lerner, 2013). Introducing students to these resources only after matriculating into a healthcare program was found to be too late in the educational timeline to ensure proper utilization and management of the tools offered to the students (Stathakarou et al., 2014). However, platforms and technology rapidly evolved, making it possible for a student to join an institution with little to no experience utilizing preferred platforms or associated technologies (King, 2012, King et al., 2022). As a result, a reinforcing exposure to technology had to be incorporated in a blended learning context, providing structure and guidance as students matriculated (Button et al., 2014; Gray & Tobin, 2010). Therefore, the recent rapid adoption of blended learning in healthcare education without preexisting orientation and preparation should have been studied (Ahmed et al., 2020; Ferrel & Ryan, 2020; Harries et al., 2020; Toquero, 2020).

Online Learning: The No Significant Difference Phenomenon

When contemplating the efficacy of online learning the literature that established the "No Significant Difference Phenomenon" (NSDP) deserved our attention. Established by Thomas Russell, the NSDP website cataloged hundreds of studies beginning as far back as 1928. Inclusive of many different measures, the populous consensus was that among the groups

studied, there was no significant difference between traditional classroom students and those enrolled in non-traditional courses (Russell, 2001).

This phenomenon had been ascribed to define the lack of variance between two groups; additionally, other factors have come to light. Many benefits and uses of online learning have been observed (Koller & Ng, 2014; Lorentzetti, 2013). Among the many benefits were included increased effectiveness in education, leveraging the modality for professional development, and the versatility of the educational platform (Hansen, 2008). Online learning platforms also provided a reduced cost for learners, increased revenue for teaching organizations, and feasibly reduced the time it took to earn a degree due to schedule flexibility of course offerings (Fisher, 2012; Lewin, 2012; Selingo, 2014).

Although there seemed to be much to be lauded for online learning, critics shared concerns over the not-so-novel teaching approach (Back et al., 2006; Elfirdoussi et al., 2020; Sharpe & Benfield, 2005). Among the initial concerns were the conclusions of Richard Clark as he shared, "Give up your enthusiasm for the belief that media attributes cause learning" and "there are no benefits to be gained from employing different media in instruction" (Clark, 1994, p. 28; Clark, 1983, p. 450). In his conclusions, Clark led a field of thought that attributed teaching methods shared between traditional and non-traditional study groups that ultimately displayed no significant difference in student outcomes as the culminating factor behind gaining understanding and knowledge (Layton, 1999). Hence, the studies measured the effectiveness of teaching methods, and by finding no difference between the groups, underscored the lack of association between student outcomes and the form of teaching media (Layton, 1999; Nguyen, 2015; Phipps & Merisotis, 1999; Ramage, 2002;). Interestingly, the Clark studies, provided an absence of any difference in student performance between teaching media and underscored

online courses' ability to transfer knowledge on par with face-to-face traditional lecture formats (Ramage, 2002).

As online learning matured, an appreciation of both arguments had been assimilated into the development of field-specific theory (Nguyen, 2015). As we approached an age where nearly all college students had taken at least one online course, we could appreciate a clearer understanding of the required best practices for online teaching. Similarly, the voluminous increase of these course offerings spoke to their overwhelming benefits while mitigating any negative impacts on educational quality (Phipps & Merisotis, 1999; Ramage, 2002).

HRD, Training, and Higher Education

Higher education has been inherently related to job training and preparation, leading to overlap or inclusion with HRD (Stewart & Rigg, 2007). According to Harbison and Myers (1964), "HRD is the process of increasing the knowledge, the skills, and the capacities of all people in a society" (Harbison & Myers, 1964, p. 2). Furthermore, Marsick and Watkins (1994) built on this definition by clarifying that HRD encompassed "a combination of training, career development, and organizational development" (Marsick & Watkins, 1994, p. 355). Lastly, Swanson (1995) took the perspective that HRD sprang from organizational roots and defined HRD as "a process of developing or unleashing human expertise through organizational development and personnel training and development to improve performance" (Swanson, 1995, p. 208). Naturally, controversy ensued as some practitioners claimed the field was developed purely for organizational financial gains while others argued a clear and present role of HRD in individual development (Fenwich & Bierema, 2008; Garavan & McGuire, 2010; Sambrook, 2008). Nonetheless, the interdisciplinary role of HRD has been indisputable (Russ-Eft et al., 1999).

The research of programs, practices, and organizational changes as they affected student outcomes during the COVID-19 pandemic inherently invoked the field of HRD program evaluation and measurement practices as supported by Stewart (2007), positioning that education had been an HRD intervention per se. Further, Harte and Stewart (2010) posited that HRD was directly linked to studying higher education efficiencies in career development, employability, and associated factors. As such, the program evaluation of hastily arranged courses to prepare healthcare students for professional careers helped address the concerns of "preparedness" in light of virtual reality and hybrid course substitutions (Ferrel & Ryan, 2020; Franklin et al., 2021; Raymond-Hayling, 2020; Roberts, 2020; Sahi et al., 2020; Shahrvini et al., 2021; Sneyd et al., 2020; Wayne et al., 2020).

HRD Program Measurement and Evaluation

Primarily originating from Kirkpatrick's four-level evaluation model, the evolution of measurement and evaluation (M&E) for HRD programs has slowly progressed over the last sixty years. Evaluations had been fundamentally designed to investigate and reveal the merit and effectiveness of the targeted programs (Scriven, 1999). In HRD, a holistic approach to program evaluations brought into focus cofactors that influenced the responses to the evaluation, the analysis of the evaluation responses, and the interpretation of the evaluation results (Russ-Eft & Preskill, 2005). Paramount among the factors influencing evaluation design and interpretation had been the organization's mission and vision (Dracup, 2004; Russ-Eft & Preskill, 2005). Likewise, leadership, culture, and strategic goals had been deemed to play a significant role in the processes and outcomes of an evaluation (Russ-Eft & Preskill, 2005; Zomorrodian, 2011). Lastly, evaluator characteristics, including researcher flexibility, had been observed and

appreciated in the context of the program review results (Russ-Eft & Preskill, 2005; Vassar et al., 2010; Volkov, 2011).

Inevitably, researchers in HRD may be employed or affected by their studies' results (Russ-eft et al., 2008). As such, understanding the reflexivity involved in a particular research project or "being aware in the moment of what is influencing the researcher's internal and external response while simultaneously being aware of the researcher's relationship with the research topic and the participant's" was of paramount importance to the integrity of the study (Dowling, 2006, p10). Acknowledging the influences and possible biases of the researcher increased transparency and lent credibility to the study via careful interpretation and reflection (Alvesson & Skoldberg, 2000).

HRD program measurement often involved managing a study's reflexivity or inherent bias (Phillips & Phillips, 2016). Building processes to manage reflexivity had been essential to the validity of qualitative data (Creswell & Miller, 2000; Fitzpatrick, 2019; Franklin & Ballan, 2001). Supporting those data with quantitative data increased the translatability of a study providing support for conclusions through triangulation of data points and rigorous review (Begley, 1996; Lemon & Hayes, 2020; Turner & Turner, 2009). Program evaluation in HRD often involved multiple methods including both qualitative and quantitative processes to review, catalog, track, and validate program merit, progress, and return on investment (Golafshani, 2015). These processes are typically categorical, involved multiple sources, and occurred over a series of sequential periods building upon each other as the study evolved based on prior findings (Ang et al., 2016). HRD program evaluation and measurement had been critical to organizational and individual development as the processes had been provided through organizational channels (Anderson et al., 2019). When changes to these processes had been introduced, they were

observed and studied through the same organizational channels that provided the resources (Patton, 2000).

Kirkpatrick: Four-level Evaluation Model

One of the most popular program evaluation models utilized by HRD practitioners had been the Kirkpatrick four-level model first published in 1959 (Kirkpatrick, 1996). This model consisted of four levels and had been lauded for the ease with which it assisted practitioners in evaluating training programs (Alliger & Janak, 1989). Although the model had been popular, it had also been criticized for having implied a hierarchical order and interdependent relationship between its levels (Bernthal, 1995).

As a simple and practical classification of evaluation, it included four aspects of evaluation: reaction, learning, behavioral change, and organizational performance or outcomes (Kirkpatrick, 1996). Bernthal (1995) stated that levels one and two contributed data that can easily be measured and resulted in meaningful change. Because studies conducted on two or more levels, as defined by Kirkpatrick's model, had resulted in disparate effects of training, a holistic understanding of the study and study design was required (Alliger & Janak, 1989; Arthur et al., 2003; Reio et al., 2017). Specifically, how each level had been interpreted by the design and the study outcomes had been integrated carefully to reach a consistent conclusion (Tamkin et al., 2002).

Level one centered on the reactions of learners to their learning experiences (Kirkpatrick & Kirkpatrick, 2006). Kirkpatrick focused this level on the learner's satisfaction with learning materials, facilities, faculty, instruction delivery methods, and learning content to provide meaningful feedback (Kirkpatrick, 2006). Positive responses would ensure repeated enrollment and promotion of the program to other potential training program participants (Reio et al., 2017).

Negative responses threaten the viability of the program and called for revisions to the program in order to ensure the successful continuation of the course (Kirkpatrick, 2006). Institutional leaders could utilize positive and negative responses from level-one reaction observations to tailor support for the program (Tamkin et al., 2002). However, various HRD studies warned that level one observations in isolation were often misconstrued, as positive responses did not in and of themselves ensure the achievement of learning (level two) nor changes in performance (level three) (Alliger & Janak, 1989; Holton, 1996; Warr et al., 1999).

Level two observed the learners' knowledge and skills acquisition changes due to the program (Kirkpatrick & Kirkpatrick, 2006). Delving beyond the learner's attitude towards the program, level two had strived to capture "the extent to which participants change attitudes, improve knowledge, and increase skill as a result of attending the program" (Kirkpatrick & Kirkpatrick, 2006, p. 22). The cornerstone of what had made Kirkpatrick's model so popular, level two, had been the inherent interest of most HRD professionals as they sought to provide the merit of the program under evaluation (Bersin, 2003). Incidentally, Kirkpatrick stated, "Evaluating learning is important. Without learning, no change in behavior will occur." (Kirkpatrick & Kirkpatrick, 2006, p. 50)." Hence, achieving success in level two would naturally lend support for evaluating level three behavioral change (Tamkin et al., 2002).

Level three encompassed the evaluation of behavioral changes that resulted from the training program. In essence, this level had observed the extent to which newly learned skills were applied following the completion of the training program (Kirkpatrick & Kirkpatrick, 2006). Admittedly, Kirkpatrick acknowledged that level three had been the most complicated and time-consuming of levels to observe (Kirkpatrick & Kirkpatrick, 2006). It often needed more initial investment of time and resources by training professionals readily devoted to levels one

and two (Kirkpatrick & Kirkpatrick, 2006). Additionally, level three did not typically rate the

same level of executive leadership support as level four (Kirkpatrick & Kirkpatrick, 2006). Level

three was, therefore, the least supported and often orphaned level in the evaluation model (Reio

et al., 2017).

Level four focused on the evaluation of organizational performance (Kirkpatrick &

Kirkpatrick, 2006). More specifically, level four was the final step in which a practitioner was

tasked with identifying a return on investment for the implemented training program (Reio et al.,

2017). Level four sought to identify changes in the monetary or numerical value of the evaluated

program and was regarded as the most critical and challenging level to assess (Werner &

DeSimone, 2006). Programs tailored to increase revenue, retention, safety, and efficiencies had

been best suited to this level of evaluation (Tamkin et al., 2002). Overall, this level was intended

to provide executives with justification for the continued investment in program activities

(Kirkpatrick & Kirkpatrick, 2006).

Figure 1

Kirkpatrick's Four Level Model
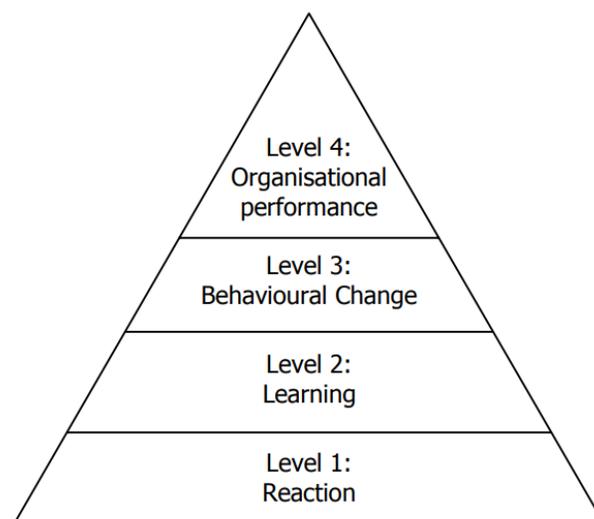
Note. The Kirkpatrick four-level model from Kirkpatrick (1996).

The Kirkpatrick four-level model of program evolution served as a template and foundational premise for multiple models derived from its basic four levels (Alliger & Janak, 1989; Tamkin et al., 2002). These evolved models included proposed revisions and extensions to the model by critics (Tamkin et al., 2002). Among them, the Hamblin model, Organizational Elements Model (OEM) model, Indiana University model, Phillips Return on Investment (ROI) model, and Holton Evaluation model all shared the core tenets, or four levels of the Kirkpatrick program evaluation model as shown in Figure 1 (Tamkin et al., 2002).

Hamblin: Ultimate Value Model

Hamblin (1974) was one of the first to modify the Kirkpatrick four-level model. His modifications included the addition of a fifth step, the ultimate value step. The first three steps of the Kirkpatrick and Hamblin models remained highly similar (Holton & Naquin, 2005). Both models began with a level to study learner reaction. The second level was also identical and identified as learning (Ali et al., 2022; Sadler-Smith et al., 1999). Hamblin identified the third level more explicitly as job behavior vs. Kirkpatrick's behavior label (Ali et al., 2022). Lastly, Hamblin split the fourth step of the Kirkpatrick model, results, into two unique steps: organization effects and ultimate value effects (Clement, 1982).

Figure 2

Hamblin Model for Evaluation
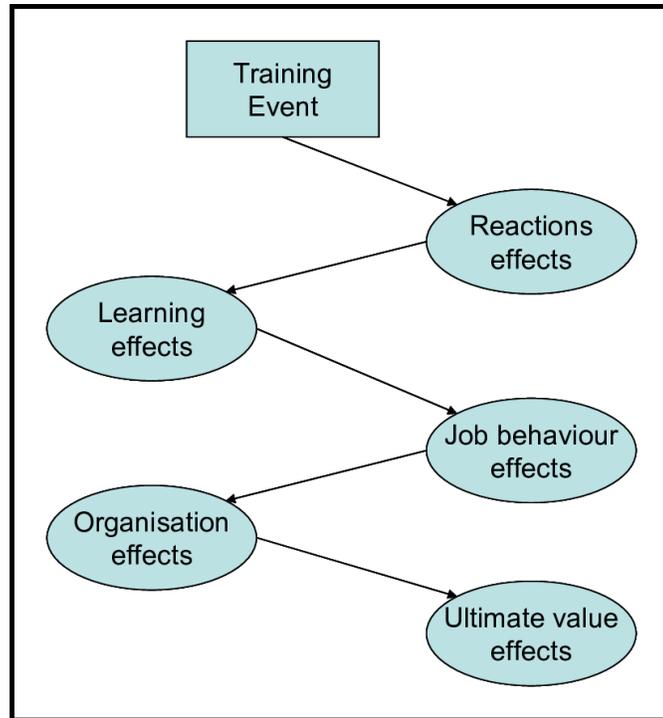
Note. The Hamblin Model from Developing Managers Using Simulations (2010).

Kaufman, Keller, and Watkins: Organizational Elements Model (OEM)

Following in Hamblin's footsteps, Kaufman and Keller (1994) continued to expand on the Kirkpatrick model. Where Hamblin added a step to his hierarchical model, the Organizational Elements Model (OEM) revised additional steps to evolve Kirkpatrick's model to reflect societal contributions (Watkins et al., 1998). Modifying each stage, the OEM model comprised six levels, beginning with level one, input, which held similarities to Kirkpatrick's first level, reaction (Watkins et al., 1998). Level two, process, was again highly similar to Kirkpatrick's first level, reaction, but included an analysis of the implementation of the first level (Watkins et al., 1998). At level three, the OEM continued to closely mirror Kirkpatrick's model with a micro-acquisition level that closely resembled the learning level (Kaufman & Keller, 1994). Level four, micro

performance, matched the behavior level (level 3) of the Kirkpatrick model and examined the utilization of skills and knowledge gained in prior levels (Tamkin et al., 2002). Level five, macro, corresponded to the results level compared to Kirkpatrick's model, while level six, mega, was a novel step that sought to identify the societal outcomes of the evaluated program (Kaufman et al., 2008).

Molenda, Persing, and Reigeluth: Indiana University Approach

Molenda, Persing, and Reigeluth (1996) continued to develop iterations of the Kirkpatrick model with a focus on societal impact (Tamkin et al., 2002). Known as the Indiana University Approach, the model consisted of a six-level evaluation taxonomy (Molenda et al., 1996). The Indiana University Approach did not intend its six levels to be organized in a hierarchy of importance, unlike prior iterations of the Kirkpatrick evolution of models (Tamkin et al., 2002). As such, the levels were introduced as a stratum and began with an activity to examine participant training. Strata two and three evaluated participant reactions and learning, respectively (Molenda et al., 1996). Stratum four focused on the transfer of training, while the final two strata evaluated business and societal impact (Molenda et al., 1996).

Phillips Return on Investment (ROI) Measurement Model

Phillips (1998) continued the trend of modifications to the Kirkpatrick model moving on from societal impact and instead initiated a focus on examining financial return (Phillips, 1998). The majority of the model remained predominantly unchanged except for a new fifth level, return on investment (ROI; see Figure 3; Phillips, 1998). Specifically designed to pursue financial impact of programs, this model relied heavily on converting programmatic applications into units of monetary measure to calculate financial gain for the organization (Phillips, 1998).

Phillips added a fifth level on the utility to the Kirkpatrick's model and outlined the criteria and processes for effective ROI measurement (Phillips, 1998).

Figure 3

Phillips ROI Process Model
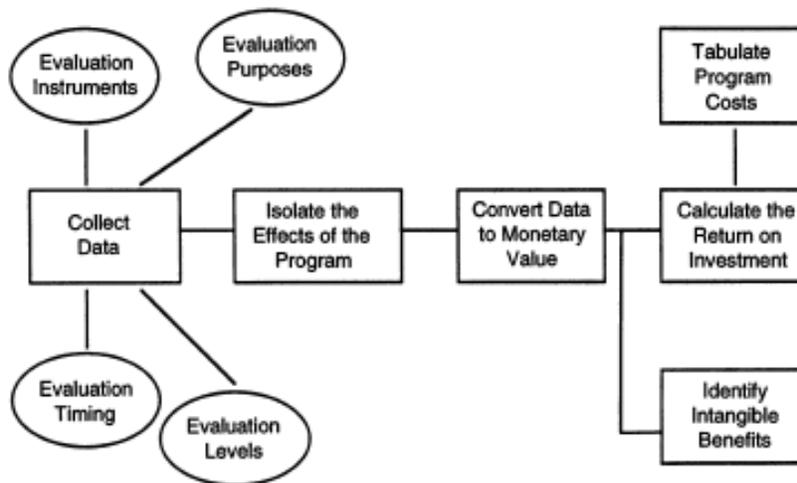
Note. Phillips ROI Process Model from Phillips (1998).

As shown in Figure 3, the ROI process model detailed complex data collection, including output, quality, cost, and time, and soft data, including work habits, working environment, and workplace attitudes (Phillips, 1998).

Phillips further elaborated the needed processes and procedures of the ROI set to include the "[isolation] of effects on education and training" (Phillips, 1998, p. 12). Necessary steps in this process included establishing a control group, observing trend lines, producing a forecasting model, participant perceptions of percent improvement, supervisor perceptions of performance improvement, senior manager perceptions of percent improvement, expert consultant observations, subordinate perceptions of work environment changes, appreciation of other influencing factors, and customer perceptions of improvement (Phillips, 1998). These data were then assigned monetary value (1998, p. 13):

Beyond Kirkpatrick's Four-Level Model

Holton: HRD Evaluation and Research Model

Holton (1996) criticized the Kirkpatrick four-level model, highlighting the taxonomy's inability to differentiate influences on outcomes based on moderating variables (Holton, 2005). Holton proposed an HRD evaluation research and measurement model that included secondary influences of individual learner characteristics, interventional readiness, job attitudes, and intervention fulfillment (Holton, 1996). Holton observed the challenges organizations would face if, for example, learning outcomes (level two) were positive, but behavior changes (level three) were not. The redefined evaluation model he proposed would accurately address the need to evaluate the transfer climate of the organization and recommend not a change to the training program but an organizational intervention to support the adoption of the training processes (Holton, 2005).

Holton's model addressed individual characteristic measures influencing learning motivation, including conscientiousness, neuroticism (emotional stability), openness to experiences, goal orientation, and locus of control (Phillips & Phillips, 2005). Phillips found that these characteristics influenced motivation to learn and learning itself (Phillips & Phillips, 2009). Motivation to learn, Phillips found, was also influenced by job attitudes. He found that job involvement significantly predicts motivation (Naquin & Holton, 2002). Organizational commitment was also identified as a contributor to job attitudes (Holton, 2005). Naquin and Holton (2002) identified the importance of these characteristics on a higher-order construct they labeled Motivation to Improve Work Through Learning (MTIWL).

Phillips' model also appreciated the role of perceptions of training on learning and learning transfer (Phillips, 2005). Mainly, Morgan and Casper (2000) found that reaction

measures were multidimensional, lending additional support to Holton's model. Additionally, utility reactions labeled by Morgan and Cooper (2000) had incremental validity in predicting learning and performance outcomes following training program participation (Holton, 2005). Tan et al. (2003) developed a utility reaction scale that included behavioral intentions and could measure reactions to learning and performance. Furthermore, Ea Ruona et al., (2002) showed that utility reactions were a significant predictor when entered into a hierarchical regression model (Holton, 2005). In conclusion, the Holton model offered an analysis of evaluation variables that could be measured in defined conceptual construct domains leading to a model that could be empirically tested and validated as seen in Figure 4 (Holton, 2005).

Figure 4

HRD Evaluation Research and Measurement Model
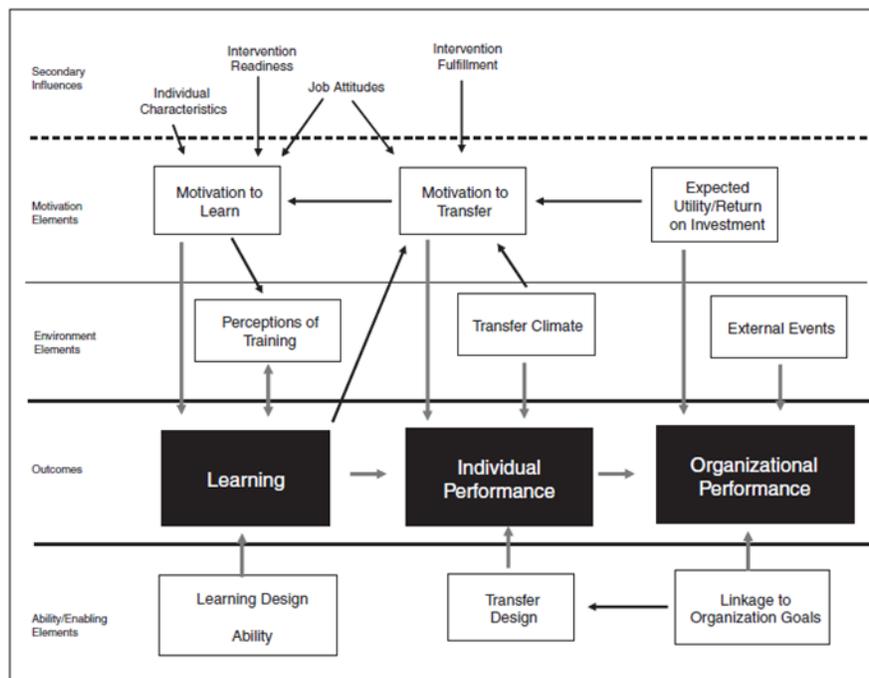
Note: HRD Evaluation Research and Measurement Model from Holton (1996).

System Models for HRD Evaluation

Building on the evolution of the Kirkpatrick four-level model and Holton's inclusion of secondary influences naturally led to the appreciation of a greater systems approach to HRD measurement and evaluation. Wang and Wang (2005) recognized the importance and undeniable growth of the M&E market. As M&E consulting continued to grow, HRD training costs would often have to pass the scrutiny of comparison against other organizational investment needs (Wang & Wang, 2005). The concept of HRD program evaluation formulaically incorporated the financial aspects of ROI into processes utilized to produce data that would ultimately be used to decide whether a program was to be continued, enhanced, or abandoned (Wang & Wang, 2005). Ultimately, "ROI measurement for HRD programs requires identifying the HRD benefits and separating them from other impacts if the ROI measurements are to be accurate" (Wang et al., 2002, p. 204). In this fashion, Wang and Wang (2005) presented the role of the organizational system as a whole in evaluating a subsystem training intervention. In Figure 5, the HRD subsystem is clearly defined as being comprised of input (level 1), process (level 2), and output (level 3), and the entire subsystem output feeds into the organizational system input level (Wang & Wang, 2005).

Figure 5

A System View of HRD Interventions

Note: The Relationship of Systems Interactions and the Four-level Evaluation from Wang and Wang (2005).

Understanding the full scope of the organizational system was pivotal to properly evaluating a subsystem HRD initiative (Wang et al., 2002). The net effect of HRD interventions or training could be measured as stated by Wang and Wang (2005, p. 31):

> With specified functional form and estimated coefficients using appropriate quantitative processes (e.g., multiple regression), it is possible to measure the net effect of HRD programs on output variable *Y* with other relevant variables taken into account. For continuous data, the effect of HRD interventions on the overall organization system can be identified through the partial regression coefficients (Gujarati, 1988; Kachigan, 1986; Neter et al., 1990; Nicholson, 1990), namely, taking the partial derivative of the output variable (*Y*) with respect to the HRD variables (*H*), while accounting for the influence of all other systems variables. For Equation 3, assuming HRD programs have no effect on environmental variable (β), that is, $(\partial Y/\partial\beta)(\partial\beta/\partial H) = 0$, we have

$$\frac{\partial Y}{\partial H} = \frac{\partial h}{\partial L}\frac{\partial L}{\partial H} + \frac{\partial h}{\partial A}\frac{\partial A}{\partial H} + \frac{\partial h}{\partial K}\frac{\partial K}{\partial H} + \frac{\partial h}{\partial O}\frac{\partial O}{\partial H}$$

Wang and Wang (2005) provided a framework that could be utilized to measure HRD initiatives such as online learning, training courses, quality initiatives, leadership and management development, and organizational development at the organizational level. Through this evaluation process, the fair share of contributions HRD brought through the subsystem and into the organization could be fully measured and valued appropriately (Wang & Wang, 2005).

Agreeing with the premise proposed by Wang and Wang (2005) and Holton (2005), Russ-Eft and Preskill (2005) identified three critical factors faced by HRD M&E initiatives. First, the authors cited the "complex, dynamic, and fluid environment" that undoubtedly impacted an organization being evaluated (Russ-Eft & Preskill, 2005, p. 327). Additionally, when initiating an M&E process, an inherent political component had to be taken into consideration as part of the evaluation (Russ-Eft & Preskill, 2005). Lastly, M&E initiatives had been "implemented in a purposeful, planned, and systematic manner" to yield valid data (Russ-Eft & Preskill, 2005, p. 72).

The system framework model considered the external environment that influenced the functionality of an organization (see Figure 6) (Russ-Eft & Preskill, 2005). The external environment could include factors such as market competition, customer satisfaction, policy or guideline changes, workforce diversity, the evolution of technology, and "the demands of working within a global context" (Russ-Eft & Preskill, 2005, p. 74). The model also emphasized and aligned the evaluation process with the organization's mission and vision, returning to their strategic plans (Russ-Eft & Preskill, 2005). These factors could influence the apparent information needs of organizational leadership and stakeholders (Tamkin et al., 2002). As such, the authors cautioned against conducting HRD evaluations in isolation from other data collection forms (Preskill & Russ-Eft, 2003).

Russ-Eft and Preskill (2005) further described the importance of "focusing on an evaluation." They described this activity as understanding the background of the HRD initiative and applying that knowledge to the organizational context, allowing for the development of evaluation questions that would guide the study (Russ-Eft & Preskill, 2005). They described an effective way of focusing an HRD M&E activity was to convene a group of stakeholders to produce a logic model (Russ-Eft & Preskill, 2005; W.K. Kellogg Foundation, 2000; Wholey, 1994; 2015). Organizing a group of stakeholders would assist in identifying assumptions regarding the program being evaluated, dispel misunderstandings, and come to a consensus on factors of importance (Preskill & Russ-Eft, 2005). To produce a logic model, Russ-Eft and Preskill (2005) specified a series of questions for the evaluators to consider.

Once the logic model had been created, a clear definition of the evaluation program's purpose emerged (Russ-Eft & Preskill, 2005). The questions could often be used to reflect the evaluation's objectives (Russ-Eft & Preskill, 2005). As a conclusion of the logic model phase, an

HRD evaluator could find that an ROI evaluation was not called for or desired as part of the

M&E activity (Russ-Eft & Preskill, 2005). However, requests for ROI evaluations often needed

to be more understood as the goal of all M&E work (Tamkin et al., 2002). In these cases, the

systems approach allowed for the diagnostic identification of an organizational evaluation

deviating from the Holy Grail of ROI (Russ-Eft & Preskill, 2005). HRD practitioners should

guide clients away from the "knee-jerk" reaction to seek the ROI evaluation and instead "should

be searching for the most effective means for determining the critical issues and questions of

stakeholders, understanding the most appropriate methods for answering these questions, and

ultimately using the information for decision making and action" (Russ-Eft & Preskill, 2005, p.

82).

Figure 6

A Systems Framework for Evaluation

A Systems Framework for Evaluation
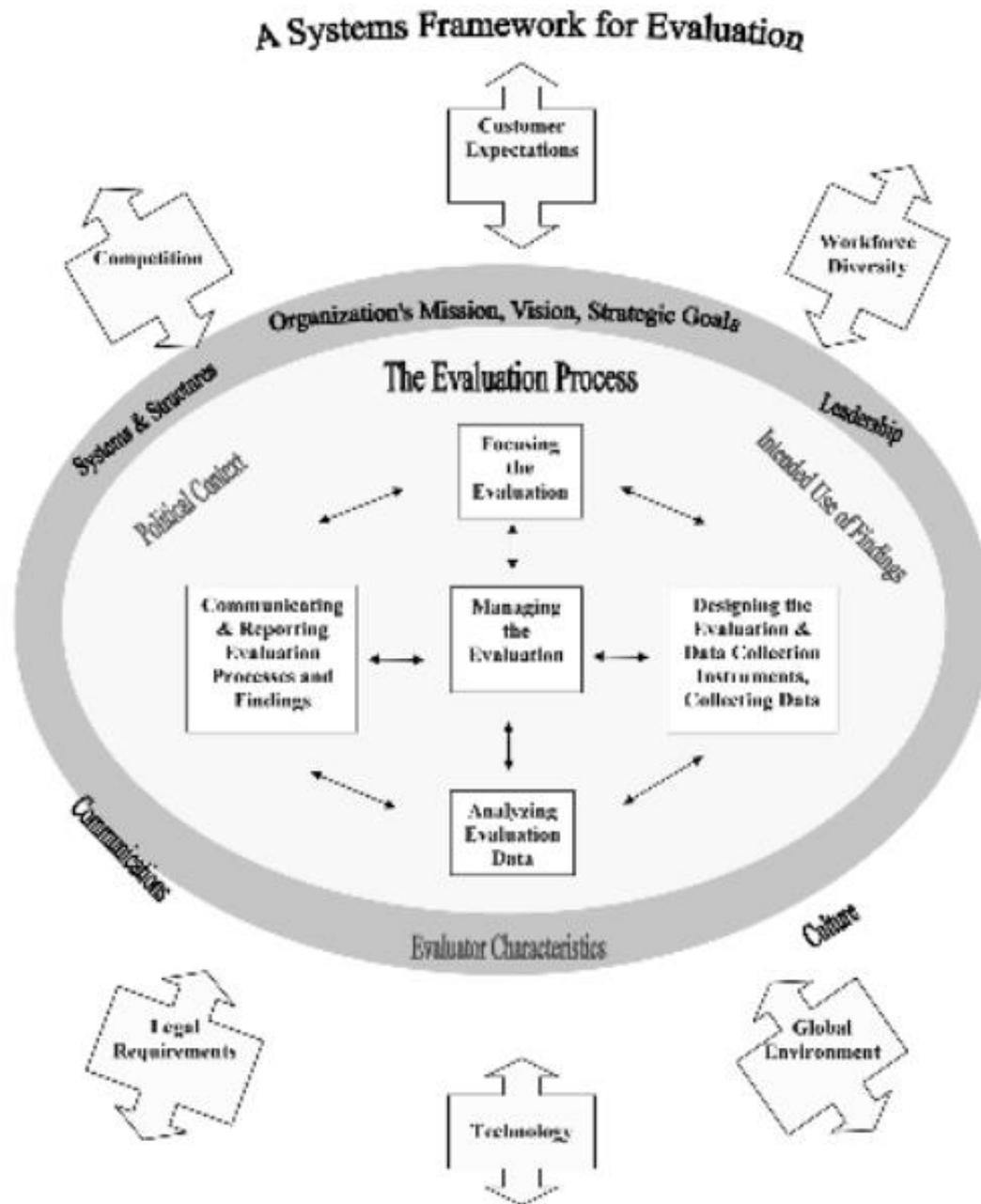
Note: A Systems Framework for Evaluation as presented in Russ-Eft and Preskill (2005).

The Research Gap

This targeted literature review revealed two schools of thought regarding online

healthcare training. Though lacking support in the past, recent publications called to action a

loosening of restrictions on online activities for healthcare students (Ahmed et al., 2020; Ferrel &

Ryan, 2020; Maas et al., 2014; Nimavat et al., 2021). Furthermore, a movement was underway to

encourage the professions to adopt heavier simulation time requirements in the absence of

clinical rotation availabilities, spurring the licensing boards to keep the expanded allowances

temporarily put in place for COVID-19 training relief measures (Gaur et al., 2020; Kim et al.,

2020; Wayne et al., 2020; Wyres & Taylor, 2020). This study targeted the sudden application of

online resources to one academic healthcare center to establish foundational knowledge on the

degree of impact these training alternatives elicited in the healthcare student populations.

Additionally, research was needed to address student perceptions of online learning in programs

that were typically unable to employ these innovative and versatile tools.

The HRD M&E literature offered a comprehensive set of approaches. While each may

have its inherited limitations, when combined and synergized, they offer meaningful insights and

perspective for continued pursuit of the evaluation research. On the other hand, the evolution of

healthcare education itself was based on data from studies such as this. Practitioners abound in

optimistic portrayals of the ability of the professions to adopt modernized teaching and training

procedures (Gaur et al., 2020; Kim et al., 2020; Nimavat et al., 2021; Papapanou et al., 2022).

Continued use and adoption of new technologies and training methodologies would depend

heavily on the ability of HRD professionals to validate the effectiveness of the novel programs.

Encouragement to utilize virtual training activities could be reinforced through the evaluation of

programs via HRD M&E processes. Researchers had identified a need for a deeper

understanding of the newly created educational programs to assuage insecurities surrounding the

quality and validation of simulation training (Kneebone & Aggarwal, 2009; Wang et al., 2005).

Furthermore, successfully demonstrating the effectiveness of the novel program would result in

the potential to significantly scale workforce development, addressing a longstanding HRD

challenge for the healthcare professions and beyond.

Therefore, informed by a comprehensive perspective of HRD M&E approaches and

consider the much needed evaluation in healthcare education and training programs, especially in

challenging crisis management times, this study was focused on investigating the effectiveness

of healthcare education and training programs during COVID-19 period.

Chapter Summary

This chapter presented multidisciplinary literatures focusing on the impact of COVID-19

on healthcare learning and education and HRD M&E approaches. The role of change

management in adopting online learning was reviewed, as was technology-based learning in the

healthcare professions. The efficacy of virtual reality, augmented reality, and telehealth

simulations were discussed along with the role of computer literacy, information literacy, and

digital literacy in the context of the research study. Moreover, I also reviewed on online learning

and the No Significant Difference Phenomenon literature as well as HRD training, higher

education, and HRD program M&E literature as significant contributions to the foundational

premise of the study.

Chapter Three: Research Method

This chapter reported the mixed-methods sequential research design approach to this study. I first reiterate the purpose of the study, research questions, and further report the research design, and the procedures used to gather and analyze the data. I also provide research assumptions and parameters influencing the study.

Purpose and Research Questions

The purpose of this study was to identity and evaluate observed online learning outcomes of healthcare students' performance during COVID-19 as a result of revised course offerings. Additionally, exploration of variations among cohort outcomes when compared to the total population, was of interest.

R1. What was the direct impact of COVID-19 on experiences and perceptions of the healthcare student population as reflected in their academic performance?

R2. How effective were the institutional resources in supporting the students learning during the pandemic?

The Case Institution

A case study was proposed to investigate the impact of the forced COVID-19 campus closure on the healthcare students' learning outcomes of a major academic medical center. This particular institution was selected for the convenience of its data availability as it published survey results and aggregated licensure exam pass rates on its website annually. The institutional leadership also shared deidentified student outcomes for research purposes. Additionally, I was directly affiliated with the Provost's Office and the Academic Enterprise in the case institution during the pandemic.

The institution offers degrees at the baccalaureate, masters, and doctoral levels. During the campus closure, much effort and funding was redirected into launching novel resources to support student learning and education. The case institution includes the following four schools and colleges as described below.

The School of Nursing

Enrolling the complete spectrum of degree levels, the School of Nursing (SON) awards Bachelor of Science in Nursing (BSN), Master of Nursing or Nurse Practitioner (NP), and Doctor of Nursing Practice (DNP) degrees. In the undergraduate programs, students were enrolled at the junior level transferring from community colleges or four-year universities. Undergraduate nurses were expected to take state board exams following completion of their studies to become licensed professionals. The National Council of State Boards of Nursing (NCSBN) develops the National Council Licensure Examination for Registered Nurses (NCLEX-RN®) administered independently of the teaching institutions. The Master's and Doctoral graduate programs were comprised of mostly working (practicing) nurses seeking career development opportunities. These groups represented different populations in that the undergraduates typically had no work experience and lacked career development opportunities compared to their senior graduate counterparts.

The School of Health Professions

Like the SON the School of Health Professions (SHP) consisted of a combination of undergraduate and graduate level programs. The former includes Respiratory Therapy and Clinical Laboratory Sciences, and the latter includes Occupational Therapy, Transfusion Science, Health Professions, Clinical Sciences, Nutrition and Metabolism, Pathologist Assistant, and Respiratory Care. The doctoral degrees offered by the SHP include Clinical Laboratory Sciences,

Occupational Therapy, and Physical Therapy degrees. Similar to the SON, undergraduates possessed little to no work experience while graduate students tended to be practicing healthcare professionals with the exception of the PA program.

The School of Medicine

The School of Medicine (SOM) enrolled students into a four-year graduate medical doctor, MD, and a two-year Master of Physician Assistant Studies, PA, program. Students in the MD program earned Pass/Fail grades and attended clinicals beginning in their second year. Medical students had to take and pass the Unites States Medical Licensing Examination (USMLE) Step 1 and Step 2 while enrolled in the program, results are reflected in residency matches. PA students earned letter grades and began clinical rotations in the second semester of year one. The PA students were expected to pass the Physician Assistant National Certifying Examination® (PANCE) for certification. Both programs depended heavily on the standardized patient simulation labs for clinical rotation experience and preparation for standardized exams.

The Graduate School of Biomedical Sciences

The Graduate School of Biomedical Sciences (GSBS) was comprised of PhD programs in Cell Biology, Biochemistry and Molecular Biology, Structural Biology and Biophysics, Experimental Pathology, Human Pathophysiology and Translational Medicine, Vaccinology, Microbiology and Immunology, Neuroscience, and Pharmacology and Toxicology. Students earned a stipend as graduate assistants working in laboratories conducting cutting edge research. They attended classes for the first two years of a typical four-year program. Graduate students in these programs included individuals who had matriculated directly from an undergraduate institution upon completion of a Bachelor's degree, students in an MD/PhD program, and individuals seeking a second degree after earning a related degree (e.g. Master's degree in

affiliated discipline) or earning a similar degree in a foreign country. The majority of graduate students in this case study were able to continue working in their laboratory settings by adopting rotating schedules to reduce exposure to lab co-workers. They were also offered self-paced online courses to accommodate their shift work.

Design of Study

The design of this study was a mixed-methods sequential model founded on research processes utilized for multi-program evaluation. The purpose of this study was to explore and evaluate the variability in healthcare student performance during the COVID-19 campus closure and resulting online course implementation. As such, a mixed-methods research approach was utilized to first gather quantitative data followed by the associated qualitative analyses to inform how generalizable results are to comparable studies (Creswell, 1999; Tashokkori & Teddlie, 1998, Creswell, 2000).

Quantitative data analyses techniques including analysis of variance (ANOVA), Chi-square, and Cramer's V were utilized to study the entire student population grade results from 2017 to 2021 as the initial stage of the study. The qualitative analyses included the review and coding of survey responses in free-format questions deployed as part of the institution's Annual Student Satisfaction Survey. These data and results were collected to further compare to the results from the evaluation of the licensure exam pass rates.

Rationale for the Methodological Approach

Program evaluation was critical in that assessment provided a conduit for feedback regarding student outcomes, program performance, teaching and engagement. Mixed-methods research designs enable a deeper review and the ability to develop meta-inferences regarding specific research topics such as program evaluation (Corrigan & Onwuegbuzie, 2020; Curry et

al., 2009). Mixed-methods sequential research processes provided holistic methodology by which to systematically evaluate program performance and study specific effects of the COVID-19 pandemic effects on the study population (Glazunova et al., 2023).

Rationale for the Use of Mixed-Methods Research

Curry et al., (2009) highlighted the increased need for leveraging mixed-methods in program evaluation because this method was useful across multiple disciplines, particularly in healthcare. The evaluation of an educational program, that by design includes patient care as a subset of learning outcomes, must be carefully reviewed for proper assessment. Although some studies touted the application of mixed-methods in program evaluation, few met the definition of mixed-methods in the analysis portion of the studies (Reeping et al., 2019). Properly leveraging all data and utilizing powerful research techniques blending qualitative and quantitative processes in both data collection and analysis allowed researchers to pursue hard to measure outcomes often ignored due to lack of measurability (Riley, 2016).

Quantitative research provided the ability to answer "what" but often left more questions to be answered (Agresti, 2017; Mouritsen et al., 2016). Qualitative research addressed the "why" but often lacked foundational validity based on constructs that could be provided by mixing methodologies with quantitative research processes (Maxwell, 2021; Merriam & Tisdell, 2015). The ability to develop research questions by applying deductive (quantitative) and inductive (qualitative) research methods resulted in a focused approach segregating the research data type and evolving the research to emphasize analytical procedures instead (Agresti & Franklin, 2013; Small, 2011). To address the inherent controversial nature of the conceptualization of a deductive plus inductive research design, leaders in the field had developed typologies guiding the standardization of mixed-methods study design (Creswell, 2009).

The primary characteristics of mixed-methods approach was considered to be timing, priority, and mixing strategy. Combining these pillars ensured the ability and quality for conducting a structured mixed-methods research study (Creamer, 2018). These primary characteristics provided guidance to not only allow the researcher to properly identify and prioritize data strands (Reeping et al., 2019), but also helped the researcher to define when and how data collection, analyses, and the integration of data sets needed to be implemented (Tellis, 1997). Often, multiple mixed-method analytical techniques could be applied to maximize data analyses (Caracelli & Greene, 1993).

Strategies for the Mixed-Methods Approach

Extreme case sampling utilized the identification of the extraordinary cases and expedited the analyses of the dataset by purposely sampling these data (Caracelli & Greene, 1993). In this study, an emphasis on the outliers, the subpopulation of students that either struggled or readily overcame challenges during COVID-19, made up the extreme case sample population. These individuals were a small group consisting of an overall minimal effect size. Extreme case sampling allowed the study of outliers and exploring the differences between them utilizing separate data strands (Cochrane, 2017). As such, the study sought to identify the factors involved with the divergent student outcomes experienced by some of the healthcare programs. Furthermore, utilizing the versatility and elegance of the mixed-methods research tools available to HRD scholars, the study design identified the outliers in one quantitative strand of data and sought to corroborate their performance perspective anew in alternate data strands in qualitative student satisfaction survey responses and quantitative certification exam pass rates.

Inevitably, the mixing strategies available to researchers stretch the definition of the data (Zhang & Creswell, 2013; Maudsley, 2011). It is here that the mixing strategy of converting

allows for expanded observation and appreciation of data points (Mason, 2006; Morse, 2009). The transformation of a qualitative data set into a quantitative strand is called quantitatizing (Sandelowski et al., 2009). On the other hand, converting a quantitative dataset into a qualitative strand is called qualitizing (Sandelowski, 2000). These strategies allowed, for example, the study to illustrate in a quantitative fashion to represent self-reported challenges during COVID-19. Similarly, frequency counts, and the summary of quantitative data into a narrative for purposes of comparison provided the foundation by which well-established research questions were able to be explored and further investigated as demonstrated in Figure 7.

Figure 7

Sequential order for mixed-methods research design
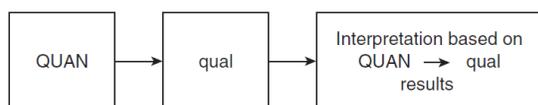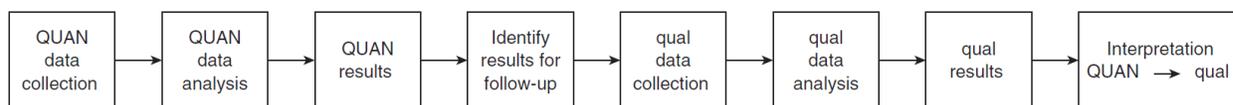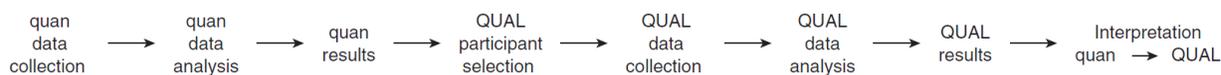
Note. Sequential order of mixed-methods research design derived from Creswell, 2000.

Sampling Strategies, Research Population, and Data Structuring

The research population for this study included all students attending the case institution between 2017 and 2021. The datasets gathered for this study included all grades for all students during the period of 2017-2021, and pass rates for licensure exams from all four schools. The

grades were collected by semester per school by program per section. Grades were analyzed following the steps outlined in Table 1.

Table 1

Research Procedures

Phase	Procedure	Data Format
Quantitative Data Collection	Collate deidentified semester grade rosters for all students from 2017-2021	Numeric Data
Quantitative Analysis	Data Screening (univariate, multivariate) using Excel Microsoft 365	Descriptive Statistics, linearity, homoscedasticity, normality, multivariate outliers
Qualitative Data Collection	Collate deidentified student survey responses published online (2021)	Text data from survey instrument
Qualitative Data Analysis	Coding and thematic analysis, Within-program and cross-program theme development, Cross-thematic analysis, coding via MAXQDA 2022 qualitative software	Visual model of case analysis, codes and themes, similar and different themes and categories, cross-thematic matrix
Integration of the Quantitative and Qualitative Results	Interpretation of the qualitative and qualitative results	Discussion, Implications, Future research directions

Note. Mixed-methods Research Procedures as informed by Creswell 2003.

Sampling Procedures

Mixed Purposeful Sampling

The research design required various purposeful sampling techniques. First, a purposeful total population sampling was conducted on the entire student population of the case institution. Additionally, a purposeful simple sampling was conducted for the qualitative component created from the student satisfaction survey.

Total Population vs. Simple Sampling

In order to derive valid and reliable conclusions regarding the effect of COVID-19 on the healthcare student population, the entire student body of the case study institution was observed (Israel, 1992). This purposeful sampling strategy allowed for capturing each student enrolled in the years targeted in the quantitative longitudinal study. Following the quantitative analyses of the complete student grade dataset, a qualitative survey composed of both closed and open-ended questions was issued to the entire student population enrolled during the 2020-2021 academic year. Those students which volunteered responses to the survey questions were included in the qualitative analyses that followed the survey data collection utilizing a simple sampling technique.

IRB approval.

The quantitative phase one study of the research proposal was reviewed by the case institution's IRB and found to meet the criteria for exemption from review in accordance with 45 CFR 46.104 and classified under exempt category four. The second phase and qualitative portion of the study was conducted utilizing opensource documentation disseminated publicly by the case institution. UT Tyler IRB reviewed the proposal and granted approval for the study as exempt under expedited review in exempt category four: secondary research for which consent was not required.

Data Triangulation

The mixed-method for triangulation or confirmatory methodology is intended to be used when the research seeks to verify an observation or hypothesis by leveraging multiple data sources established or created by the study phenomena (Cotton et al., 1999; Greene, 1989). In the case of the sudden campus closure as a result of COVID-19 social distancing guidelines, a

phenomenon was established. Furthermore, to immediately begin the observational study of the phenomenon effect on students and programs a quantitative phase one study was launched. The phase one study established an observation in the results of that study. Those results required further research and were the basis for the utilization of confirmatory methodology enabling the researcher to triangulate the phase one quantitative data with ancillary qualitative and quantitative data sets.

Data Collection

This study was conducted in two phases. First, quantitative data was collected in phase one on the student learning outcomes (grades) of every student enrolled in a degree seeking program at the case study institution from 2017-2021. The second phase of the study, the qualitative portion, included a self-selected sub-population of 441 students that responded to the 2021 Annual Student Satisfaction Survey. Their responses were grouped by school (SON, SOM, SHP, and GSBS) and included limited demographic data, and a Likert-Scale questionnaire consisting of 10 questions regarding online learning and healthcare simulation. Lastly, the annual survey included five open-ended questions addressing students' perceptions of their campus experiences during the pandemic.

Phase One Data Collection: Quantitative data sets

The quantitative phase one of the study was conducted by accessing data reports pulled from the campus solutions enrollment dashboard system housed in the Office of the Registrar. The reports included deidentified student data including semester, course ID, grade, and student enrollment status. Reports for student grades were pulled for semesters spanning Fall 2017 to Spring 2021.

In this mixed-methods study, the first phase was to gather quantitative data. The study on this phase was structured to specifically address student learning outcomes as represented by course grades. All student grades were gathered for a period from 2017 to 2021. A longitudinal study design was applied to identify any variances in student outcomes. The samples consist of all students enrolled in the case institution from 2017 to 2021. The samples included all grades from all students per semester, per school and program across the five years.

The study period was intentionally selected to include the impact of weather disruptions on the campus including Hurricane Harvey (2017) and Winter Storm Uri (2021), as well as the impact of the COVID-19 campus closure (2020). The student samples captured in these analyses was a total of 12,680. These students included 3,302 students from 2017; 3,372 from 2018 encompassing 1,014 newly enrolled students; 3,342 from 2019 including 964 newly enrolled students; 3,458 from 2020 including 1,006 newly enrolled students; and 3940 students from 2021 including 1,450 newly enrolled students. The students were from four schools, the SON, SOM, SHP, and GSBS. Only those enrolled in a degree program were included in the phase one study.

Through the proactive processes in the phase one study, the study design was to address whether or not the pandemic had an effect on student outcomes. Furthermore, the phase one data yielded insight into specific programs affected and established trends in student outcomes across the institution's multiple programs. Utilizing these quantitative data to triangulate to the findings gathered from the qualitative phase provided a rich dataset from which to deduce implications regarding student performance, institutional support processes, and academic program development processes to improve during future instances of sudden course disruptions.

Phase Two Data Collection: Student Satisfaction Survey

The case institution distributed a Student Satisfaction Survey annually to all enrolled students. Every year, some revisions were incorporated into the survey to address specific incidences and/or challenges faced by the campus community. The 2021 annual Student Satisfaction Survey included questions tailored to ask about student experiences during the COVID-19 pandemic. These results were published and openly available to the public via the Office of Institutional Effectiveness for the case institution and were used to triangulate qualitative data derived from the student population with the student outcomes phase one data.

Pass Rates for National Certification and Licensure Exams

Similar to the Student Satisfaction Survey, the Office of Institutional Effectiveness published program certification and licensure pass rates for the SON, SOM, and SPH programs. Specifically, the office reported the pass rates for Clinical Laboratory Sciences, Physical Therapy, Occupational Therapy, Respiratory Care, and Nutrition and Metabolism for the SHP. For the SOM, the licensure exams include Residency Match for the medical students and the PANCE for the Physician Assistant Studies. For the SON, program certification and licensure pass rates for NCLEX-RN, Adult Gerontology Acute, Adult Gerontology Primary, Family Nurse Practitioner, Neonatal Nurse Practitioner, and Clinical Nurse Leader programs were reported. All pass rates were reported in aggregate as percentages per program per year. These data were used to triangulate with the survey data from the annual student satisfaction survey and the student outcomes grades analyses from the phase one study.

Due to the complexity of the data sources used in this study, Figure 8 visualized the origin and affiliation of the disparate datasets to show their relationships.

Figure 8

Qualitative and Quantitative Data Sources
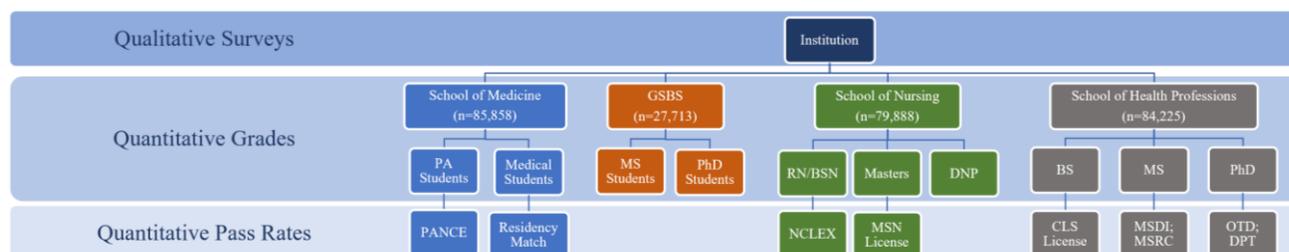
Triangulation

Triangulation, or the use of multiple data strands to research and support findings is utilized in mixed-methods as a strategy to support validity. In this research project both quantitative and qualitative data strands are utilized to triangulate research findings. Data sources for triangulation included:

- Phase one data: Quantitative analyses of longitudinal student grades (2017-2021)

- SOM Residency Match

- Pass rates for NCLEX

- Pass rates for PANCE

- Student Satisfaction Survey open ended qualitative data

- Student Satisfaction Survey demographic data

- Student Satisfaction Survey close ended quantitative data

Data Documentation

All quantitative data were collected via Excel reports generated from the campus-based solutions software system through the Office of the Registrar. Qualitative data was collected via PDF reports published in the English language publicly available through the Office of

Institutional Effectiveness. Reports were published by program per year for each of the

respective schools (SON, SOM, SHP, and GSBS).

<div align="center">**Data Analyses**</div>

Quantitative Data Analyses

Statistical analyses were conducted employing an analysis of variance (ANOVA) to

compare the means of the five academic year cohorts across each academic year. The ANOVA

analysis was an appropriate method because the model provided an indication if the mean course

grades for the five years were statistically different based on year (Agresti et al., 2017; Ferrão et

al., 2020; Keselman et al., 1998). As such, any differences in year means per cohort was

elucidated across the five-year study window. Standard deviation estimates determined the level

of difference in grade variations within each group. Additionally, a Chi-Square analysis was used

to further explore the relationship between course pass rates (categorical grades, i.e. A, B, C,

etc.) and program affiliation (i.e., SON-BSN, SOM-MD, SOM-PA, SHP-RT, etc.). Lastly, in

order to study strength of association Cramer's V were reported for this dataset. All data for the

phase one study were analyzed using Excel Microsoft 365.

Coding of Qualitative Dataset

For qualitative data analysis, MAXQDA 2022 was used. A text analysis was adopted to

identify word frequency and produce a word cloud (see Appendix H). Via the illustrated word

cloud, the elimination of preposition words and additional filler/pause words was conducted.

Following the filtering out of non-impactful text, the remaining word content was analyzed via a

software enhanced semi-automated process resulting in the identification of code themes across

the data file. Upon completion, the process concluded with identified frequency analytics for

themes and codes. Analyzing the themes and codes manually, patterns were identified between

data strands produced by the various open-ended questions included in the Student Satisfaction Survey.

Methodological Rigor and Credibility

As stated in Creswell (2000) a well-designed research project would be to able yield rigorous, high-quality results. To maintain the methodological rigor and credibility, the research design of this study followed the process recommended by Creswell as outlined in Figure 9. In the figure, the sequential and methodical decision tree were used to guide the research design providing the study a rigorous foundation for the research procedures.

Utilizing the mixed-methods decision tree provided, I could precisely delineate the timing element of the study. Conducting the study in sequential timing lent credibility and rigor to research findings (Creswell, 2000). Electing to independently conduct the qualitative phase of the study separate from the quantitative phase one study allowed for transparent utilization of deductive reasoning moving into the analyses of triangulated data. Placing an unequal weight distribution on the data, with higher emphasis on the quantitative data set further supports the rigor of the approach. Lastly, the mixed-methods research design requires a dedicated method to mix the two datasets. Possible strategies available to the researcher included merging the data, embedding the data, and connecting the data. In this study, connecting these various data sets resulted in the development of the qualitative findings corroborated by the quantitative results.

Figure 9

Mixed-methods Decision Tree

(a) What will the timing of the quantitative and qualitative methods be?

- Concurrent timing
- Sequential timing
  - Quantitative first
  - Qualitative first

(b) What will the weighting of the quantitative and qualitative methods be?

- Equal weight
- Unequal weight
  - Quantitative emphasis
  - Qualitative emphasis

(c) How will the quantitative and qualitative methods be mixed?

- Merge the data
  - Merging results during interpretation
  - Merging data during analysis
- Embed the data
  - Embed qualitative data in a quantitative design
  - Embed quantitative data in a qualitative design
- Connect the data
  - Quantitative leads to qualitative
  - Qualitative builds to quantitative

Note: Mixed-methods decision tree from Creswell (2000) adopted for this study.

Credibility of Mixed-Methods Approach

The mixed-methods approach is inherently aligned to a writing structure that lends an elegance to the presentation of research results (Truijens et al., 2022). Presenting findings in a sophisticated and developed manner, organically deriving one set of conclusions based on the support of the findings from the corroborating data strands enhances the credibility (Salmona et al., 2020). To underscore the credibility, the research must also address validity of both the

quantitative and qualitative phases of the study independently and when in combination of the

two (Maxwell, 2021; Truijens et al., 2022). The rigor of mixed-methods is inclusive of strategies

leveraged in both quantitative and qualitative research practices. To underscore the validity and

rigor of a study, the researcher must imbue the data reporting with credible, transferable,

dependable and confirmable data (Lincoln, 1985).

Validity of the data for this study was based on the accuracy and credibility of the

findings. Reliability was established by the consistency and dependability of the data collection

methodology and analyses protocols. To ensure validity for the study careful consideration of

the research design was taken to ensure the ability to align the collected data sets with the

analyses selected for each. Various program evaluation models were reviewed for best fit and

informed the final data analyses methods. Furthermore, these mixed-methods analyses were

specifically selected to address the evaluation goals of the study following proven program

evaluation model examples.

Reflexivity

In quantitative research the findings are typically reported and interpreted based on how

the survey questions were answered. Furthermore, comparisons can be made between the results

of the study and those of related studies in the same specialized topic (Maxwell, 2021). However,

in the interpretation of qualitative research results, the researcher's past experience and expertise

often intervening with the final interpretation of the findings. Thus, conscious reflexivity of the

researcher is required to throughout the research process to mitigate or minimize potential bias in

data analysis and reporting.

As an HRD researcher, I have conducted multiple qualitative studies in the field of

Interprofessional Education. As a trained pharmacologist, I possess over a decade of experience

analyzing research findings in both quantitative and qualitative studies involved in drug design and clinical trials. Serving in a leadership role as an administrator for a major academic medical center also allowed me exposure to both the academic and clinical enterprises including in-depth experience in the strategizing, organization, design, and operations of healthcare educational programs.

In this instance, my direct job responsibilities during the pandemic included organizing, procuring, and launching new simulation resources for the student population (hosted through a new 77-bed Healthcare Simulation Center). I conducted the first phase of the mixed-methods study as a special request from the institutional leadership (my immediate supervisor, the Vice President of Education, and the Provost and Dean of the Medical School). They sought to understand if student performance was experiencing a "pandemic-effect." At the conclusion of that phase one study, I designed the questions embedded in the Annual Student Survey, as the phase two study, to supplement, confirm or disconfirm the results from the phase one study. Therefore, as an insider to the case institution, I place a strong degree of conscious and sensitivity in bracketing my subjectivity in the study to avoid potential bias in data analysis and interpretations of the findings.

<div align="center">**Assumptions and Limitations of the Study**</div>

Assumptions

Assumptions for this study included the appreciation and understanding of the holistic impact of the COVID-19 pandemic on both students and their families. It was expected that both individual and institutional factors affected student performance and success rates. The population at large experience deep changes in mental health, financial stability, food insecurity, etc. during the pandemic. It was anticipated that healthcare students were similarly affected.

Limitations

This study focuses on the students and their learning performance and perceptions during the COVID-19 pandemic. However, a limitation of the study was the lack of triangulation data points that could be provided by the inclusion of educator sentiment and experience during the same period of time. Due to the fact that most healthcare educators were called to serve in their professional capacities in an attempt to mitigate the drastic strain on their professional workforce, it was decided to forgo any polling or surveying of this overburdened population.

Chapter Summary

In this chapter, I presented a mixed-methods research approach including the sequential research design to address the research questions. I offered rational for the selection of this methodological approach. I further articulated the research design, data collection procedures for both the quantitative and qualitative portions of the study, and the data analyses procedures. I also addressed research rigor and credibility issues related to the research approach. Lastly, assumptions and limitations of the study were described as applicable to the study.

Chapter 4: Results and Findings

This chapter reported the results and findings of the study. I first report phase one quantitative analyses of the impact of pandemic-era online learning on student grades. This was followed by the quantitative portion of the explanatory mixed-methods research design, the second phase of the study, which involved qualitative coding and analyses of student survey responses to help explain the COVID-19 phenomenon on student academic experiences.

Purpose of the Research Questions

The purpose of this mixed-methods study was to explore the effects of COVID-19 campus closures and ensuing changes in curriculum delivery on the student population of a major academic medical center. The study was designed to capture data from four schools within the case institution: the SON, SOM, SHP, and GSBS student populations. The research questions explore both the student perceptions (qualitatively) from responses to the Annual Student Satisfaction Survey and the student outcomes (quantitatively) from course grades during the tumultuous switch to online learning and hybridized curriculum because of the COVID-19 campus closures. By triangulating (1) the quantitative student grade analyses, (2) qualitative student perceptions of online teaching and comfort level with technology, (3) quantitative cohort performance on licensure exams, and (4) qualitative analyses of survey responses to the Student Satisfaction Survey the following research questions are addressed:

Research Question One: What were the direct impacts of COVID-19 experiences and perceptions by the healthcare student population as reflected in their academic performance?

Research Question Two: How effective were the institutional resources in supporting the students learning during the pandemic?

Phase One: Quantitative Results

Overall, grade fluctuations were observed between the years, especially during the 2019-2020 and 2020-2021 school years. The GSBS experienced a drop in the number of "A's" earned during the period immediately following Hurricane Harvey (2018). Fully recovering the level of "A's" by 2019, the GSBS increased in "A's" through 2020 and into 2021. However, the school saw a marked decrease in the number of "B's" in 2020 with a corresponding increase in "C's" and "F's". Analyzing the data by categorical grouping, a Chi-Square test for independence found a link between year and grades (see Table 8). Additional analyses for effect size denoted a small effect size (see Table 8). Furthermore, an ANOVA was conducted by translating the data into quantitative GPA datasets. The results are included in Table 2 and Table 3. While statistically significant (the results suggest there was a relationship between academic year and student outcomes) the effect size was small.

Table 2

GSBS Summary Statistics

Groups	n	Sum	Average	Variance
2017	1021	3886	3.806	0.227
2018	950	3583	3.772	0.324
2019	984	3723	3.784	0.369
2020	845	3247	3.843	0.273
2021	508	1964	3.866	0.171

Table 3

GSBS ANOVA Results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	4.581	4	1.145	4.043	0.003	2.374
Within Groups	1218.892	4303	0.283			
Total	1223.473	4307				

SON witnessed a steady decrease in "A's" following Hurricane Harvey, plateauing, and then declining again into the COVID-19 pandemic period. Though the post-Harvey decline in "A's" was absorbed by incremental increases in "B's" and "C's" the pandemic period saw an increase in the percentage of "C's" compared to previous years. Analyzing the data by categorical grouping, a Chi-Square test for independence found these results suggested there was a relationship between academic year and student outcomes (see Table 8). However, the effect size was small. Further analyses of program specific striation were conducted to elucidate the effects between undergraduate and graduate programs.

Meanwhile, SON undergraduate programs saw a slight decrease in "A's" following Hurricane Harvey. However, the undergraduate program bore much of the decrease in student outcomes during the pandemic period. The SON undergraduate program saw the most drastic grade percentage representations between 2017 (pre-Harvey) and 2021. Briefly, as "B's" continue the steady upward trend, "A's" appear to be plateauing along with the number of "C's." The pandemic period also saw the first increase in "D's" within the study timeline. Analyzing the data by categorical grouping, a Chi-Square test for independence found a relationship between academic year and student outcomes, although with a small effect size (see Table 8). Additionally, an ANOVA was conducted by translating the data into quantitative GPA datasets. These results are included in Table 4 and Table 5.

Table 4

SON RN-BSN Summary Statistics

Groups	Count	Sum	Average	Variance
2017	5448	18280	3.355	0.437
2018	5442	17929	3.295	0.492
2019	5576	18404	3.301	0.491
2020	5236	16837	3.216	0.537
2021	3811	12168	3.193	0.552

Table 5

SON RN-BSN ANOVA Results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	84.927	4	21.232	42.617	1.09366E-35	2.372
Within Groups	12707.889	25508	0.498			
Total	12792.815	25512				

Moreover, SON Master's degree programs experienced a slight decrease in student performance following Hurricane Harvey, but interestingly illustrated the same benefit as the GSBS during the pandemic period. Analyzing the data by categorical grouping, a Chi-Square test for independence found minimal effect of time across years. Additionally, Cramer's V denoted a small effect size (see Table 8). Furthermore, the SON DNP program illustrated an increase in performance by students following Hurricane Harvey but suffered during the pandemic period. It is important to note that unlike the Master's program, the DNP program required a research component often involving the requirement of a patient setting. Further, the pandemic period saw the introduction of "C" grades in the DNP program not seen earlier in the study period. Analyzing the data by categorical grouping, a Chi-Square test for independence found little to no effect of time on grades across years (see Table 8). Additionally, Cramer's V denoted a small effect size.

The SHP maintained a steady student outcome grade ratio following the landfall of Hurricane Harvey. Student performance continued to increase until 2019. The pandemic period had a marked effect on student performance during 2020 and 2021 decreasing the overall ratio of "A's" while increasing the number of "B's" and "C's." Historically evaluating the grades ratios for the SHP, we can observe a marked difference in student outcomes between 2017 and 2021. Analyzing the data by categorical grouping, Chi-Square test for independence found a significant effect of time on grades across years. Additionally, Cramer's V indicated a small effect size. Furthermore, an ANOVA was conducted by translating the data into quantitative GPA datasets. The results are included in Table 6 and Table 7. Further analyses of program specific striation were conducted to elucidate the effects between undergraduate and graduate programs.

Table 6

SHP Summary Statistics

Groups	Count	Sum	Average	Variance
2017	8943	32723	3.659	0.351
2018	9045	33363	3.689	0.322
2019	8110	29924	3.690	0.329
2020	6304	22658	3.594	0.381
2021	2681	9518	3.550	0.431

Table 7

SHP ANOVA Results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	72.8315	4	18.208	52.019	9.31486E-44	2.372
Within Groups	12278.1	35078	0.350			
Total	12351	35082				

SHP undergraduate student outcomes illustrated an increase in student outcomes ratio following the landfall of Hurricane Harvey. Student performance held steady until 2019. The

pandemic period had an effect on student performance during 2020 and 2021 decreasing the overall ratio of "B's" while increasing the number of "C's" and "D's." Historically evaluating the grades ratios for the SHP undergraduate programs, I observed a marked difference in student outcomes between 2017 and 2021. Analyzing the data by categorical grouping, Chi-Square test for independence found minimal effect of time on grades across years. Additionally, Cramer's V indicated a small effect size.

On the other hand, the SHP Master's programs (excluding the PA program which moved to the SOM in 2020) illustrated an increase in student outcomes ratio following the landfall of Hurricane Harvey. Student performance held steady until 2019. However, the pandemic period influenced student performance during 2020 and 2021 decreasing the overall ratio of "A's" while increasing the number of "B's" and "C's." Analyzing the data by categorical grouping, Chi-Square test for independence found a minimal effect of time on grades. Additionally, Cramer's V indicated a small effect size. Furthermore, the UTMB SHP Doctoral programs illustrated an increase in student outcomes ratio following the landfall of Hurricane Harvey. Student performance held steady until 2019. The pandemic period had an effect on student performance during 2020 and 2021 decreasing the overall ratio of "A's" while increasing the number of "B's" and "C's." Analyzing the data by categorical grouping, Chi-Square test for independence found minimal effect of time on grades in these cohorts. Additionally, Cramer's V indicated a small effect size.

The PA program was moved from the SHP to the SOM in the summer of 2019. Prior to being moved, the program illustrated an increase in student outcomes ratio through FY19. The pandemic period had an effect on student performance during 2020 decreasing the overall ratio of "A's" however, grades were seen to recover in the following academic year. Analyzing the

data by categorical grouping, Chi-Square test for independence found minimal effect of time on grades across years. Additionally, Cramer's V indicated a small effect size.

As for the SOM, it reported medical student outcomes on a tiered scale of Honors, High Pass, Pass, and Fail. For first- and second-year students, the ratings were limited to Pass and Fail. For third- and fourth-year students Honors and High Pass were discontinued effective 2021. The post-Harvey period saw a slight decrease in Honors and Pass ratings with the corresponding increase in High Pass, illustrating an overall uptick in student outcomes. However, entering into the pandemic period, a sharp decline in Honors and High Pass ratings could be observed through 2020. For first- and second-year SOM students displayed no change in grades following Hurricane Harvey. However, the start of the pandemic saw student performance improve with more "P's" versus "S's" ratings. Analyzing the data by categorical grouping, Chi-Square test for independence indicated a minimal effect on grades across years among the first- and second-year medical school students. For third- and fourth- year SOM students, a slight change in grades was observed following Hurricane Harvey. However, the start of the pandemic saw student performance decrease as "High Honors" and "High Pass" rates trended down while "Pass" rates increased. Analyzing the data by categorical grouping, Chi-Square test for independence found minimal effect of time on grades across years. Additionally, Cramer's V indicated a small effect size among the third- and fourth- year medical school students.

Table 8

Results for Chi-Square and Cramer's V Analyses

Program	Chi-Square	Cramer's V
GSBS	X2 (16, N = 4,313) = 34.52, p < .01	0.05
SON-All	X2 (16, N =36,369) = 77.59, p < .001	0.02
SON-BSN	X2 (16, N = 25,513) =177.26, p < .001	0.04
SON-Master's	X2 (16, N = 11,793) =15.95, p > .05	0.01
SON-Doctoral	X2(16, N = 1,034) = 18.17, p > .05.	0.06
SHP-All	X2 (16, N = 35,088) = 281.88, p < .01	0.04
SHP-BS	X2 (16, N = 6,476) = 37, p < .01	0.03
SHP-Master's	X2 (16, N = 3,640) = 11.89, p > .05	0.02
SHP-Doctoral	X2 (16, N = 19,672) = 116.59, p < .01	0.04
SOM-PA	X2 (16, N = 14,199) = 52.34, p < .01	0.03
SOM-MD 1&2	X2 (16, N = 16,003) = 494.78, p < .01	0.08
SOM-MD 3&4	X2 (12, N = 7.549) = 1820.34, p < .01	0.28

Qualitative Survey Respondent Demographics

The Annual Student Satisfaction Survey was deployed in March 2021 and received 441 completed surveys accounting for 11% of the total enrolled student population. The respondents were comprised of SON (18%), SOM (30%), SHP (23%), and GSBS (28%) as shown in Figure 10. The mix of new versus returning students for the academic year among the respondents was broken down as follows: in the SON 75% of respondents were new to campus and 25% were returning ones; in the SOM 43% of respondents were new and 57% were returnees; in the SHP 57% of respondents were new and 43% were returning students; and the GSBS had 32% of new ones with 68% returning students (Figure 11).

Figure 10

Total Survey Response by School

Total Response Mix by School

- 28% GSBS
- 23% SHP
- 30% SOM
- 18% SON
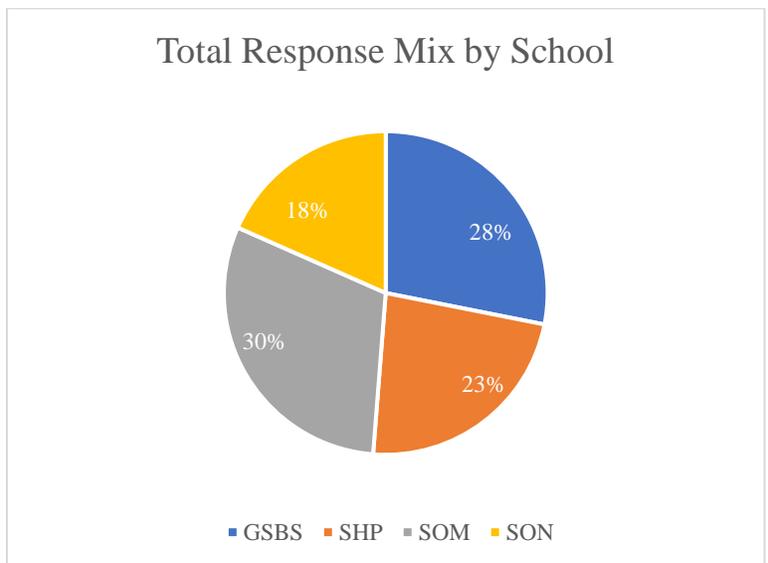
Note: Percentage of student respondents per school program for the 2021 Annual Student Satisfaction Survey.

Figure 11

Composition of New versus Returning Students per School

New vs. Returning Students

New to Campus ▪ Returning to Campus

School	New to Campus	Returning to Campus
SON	75%	25%
SOM	43%	57%
SHP	57%	43%
GSBS	32%	68%
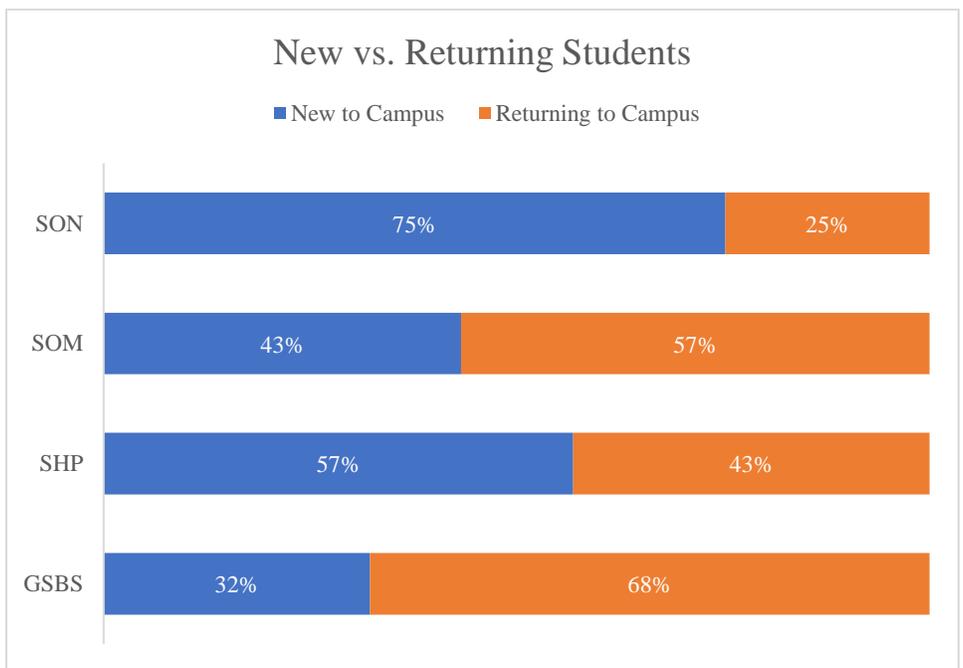
Note: Composition of new versus returning student respondents per school for the 2021 Annual Student Satisfaction Survey.

Among the respondents, 11% had responsibility for minor dependents (see Appendix E). The majority of these were found in the GSBS (18%), followed closely by the SHP (15%). The SON and SOM had a marginal number of students with minor dependents, 4% and 5% respectively (see Appendix E). Additionally, of the 11% identified as having minor dependents, the majority (67% for SON, 57% for SOM, 60% for SHP, and 55% for GSBS) declared one dependent under the age of 18 years old. For those declaring two dependents under the age of 18, percentages dropped by half or more (0% for SON, 29% for SOM, for 27% SHP, and 18% for GSBS 27%). The GSBS saw a slight increase in students that declared three minor dependents while the rest of the schools saw a sharp decline (0% for SON, 14% for SOM, for 7% SHP, and 23% for GSBS) as seen in Appendix E. The SON saw a sharp increase in students declaring three or more dependents under the age of 18 while the other three schools reported a downward trend: 33% for SON, 0% for SOM, for 7% SHP, and 4% for GSBS as seen in Appendix E. Additionally, 5% of respondents declared primary responsibility for a dependent elder. Among the four schools, the SON lead in students responsible for the care of elders (10% SON), followed by SHP and GSBS (6% and 5% respectively) as seen Appendix E. The SOM had a minority of students responsible for the care of an elder (2%).

Findings from the Survey

When addressing student satisfaction with institutional support and resources during the COVID-19 transition to online and hybrid curriculum, the overwhelming majority of respondents either strongly agreed or agreed with the institutions ability to pivot during the pandemic, including 16% strongly agreed and 32% agreed for the SON, 16% strongly agreed and 57% agreed for the SOM, 27% strongly agreed and 53% agreed for SHP, 31% strongly agreed and 42% agreed for GSBS, respectively (see Appendix E). A minority of students held neutral

opinions or disagreed with the institution's performance during the Covid-19 pandemic (28% neutral, 16% disagreed, and 7% strongly disagreed for the SON, 16% neutral, 8% disagreed, and 2% strongly disagreed for SOM, 18% neutral, 1% disagreed, and 1% strongly disagreed for the SHP, and 24% neutral, 0% disagreed, and 3% strongly disagreed for GSBS) as seen Appendix E.

To address student satisfaction with campus communications during the pandemic, the institutional satisfaction survey polled students regarding campus-wide communications and policy implementation. The majority of the respondents considered that the campus communicated well through the pandemic with 19% strongly agreed and 40% agreed for the SON; 19% strongly agreed and 43% agreed for the SOM; 34% strongly agreed and 47% agreed for the SHP; and 37% strongly agreed and 41% agreed for the GSBS. However, a minority of students held either neutral or negative opinions of the institutional communications (20% neutral, 14% disagreed, and 9% strongly disagreed for the SON; 25% neutral, 7% disagreed, and 4% strongly disagreed for the SOM; 10% neutral, 5% disagreed and 4% strongly disagreed for the SHP; and 13% neutral, 5% disagreed, and 4% strongly disagreed for the GSBS).

Furthermore, the 2021 Annual Student Satisfaction Survey sought to understand the level of satisfaction students felt with their specific academic program communications and policies during the pandemic. This was because each school and academic program had autonomy in the implementation of protocols and communications to their student populations. Similar to the institutional results, most of the respondents reported satisfaction with their academic program communications and responses during this period of time (14% strongly agreed and 36% agreed for the SON; 19% strongly agreed and 40% agreed for the SOM; 34% strongly agreed and 41% agreed for the SHP; and 40% strongly agreed and 40% agreed for the GSBS).

To gauge the level of comfort students felt while attending in-person activities for hybridized course work, the institution included two questions regarding employee and student compliance with COVID-19 prevention policies including masking, group size compliance, etc. Overwhelmingly, the respondents reported that campus employees reflected compliance with virus-spread precaution policies (34% strongly agreed and 43% agreed for the SON; 31% strongly agreed and 54% agreed for the SOM; 46% strongly agreed and 44% agreed for the SHP; and 45% strongly agreed and 45% agreed for the GSBS). While slightly lower, results for fellow student compliance with COVID-19 safety protocols closely mirror those for the campus employees (32% strongly agreed and 41% agreed for the SON; 21% strongly agreed and 56% agreed for the SOM; 38% strongly agreed and 46% agreed for the SHP; and 42% strongly agreed and 45% agreed for the GSBS).

As a balance to student perceptions of campus safety and comfort, the survey included a set of 10 Likert Scale questions to gauge the students' comfort in both on-campus simulation sessions and at-home/distance learning activities. Only SON, SOM, and SHP students responded to the questions regarding simulation and online learning since the GSBS students are not enrolled in courses involving simulations. For these questions, the SON had the lowest overall "Almost Always and Often" percentages when asked if they could clearly communicate and ask questions of their instructor in an online course. The SON also presented a less secure ability to form friendships in an online course format.

To continue probing the respondents' perceptions regarding online learning and affiliated topics additional questions were asked regarding self-assessment of computer skills. Here, the degree of positive responses increased significantly among all three cohorts. These results are presented in Table 9. Additionally, establishing the comfort levels experienced by the student

population participating in online courses addressed only part of the new educational dynamic introduced by COVID-19 campus restrictions. To explore the students comfort level with the replacement of clinical rotations with simulation activities, the remainder of the survey focused on their attitudes towards simulation activities. The overwhelming majority of students agreed that healthcare simulations were relevant to their professional training (see Table 9).

Table 9

Likert-Scale Survey Questions

	Almost Always	Often	Sometimes	Seldom	Almost Never
How confident are you that you could do the following social interaction task with your Instructor in an online course: Clearly ask my instructor questions?					
SON	29%	25%	21%	17%	7%
SOM	38%	34%	19%	5%	4%
SHP	42%	25%	28%	5%	0%
How confident are you that you could do the following social interaction task with your Classmates in an online course: Develop friendships with my classmates?					
SON	15%	24%	17%	28%	16%
SOM	7%	14%	34%	28%	17%
SHP	42%	23%	31%	20%	13%
I have a sense of self confidence in using computer technologies for specific tasks.					
SON	32%	40%	23%	3%	3%
SOM	37%	43%	15%	3%	2%
SHP	37%	43%	15%	4%	0%
I am comfortable expressing my opinion in writing to others.					
SON	24%	31%	28%	13%	4%
SOM	33%	35%	22%	8%	2%
SHP	30%	35%	29%	3%	2%
What I learned (in healthcare simulation) was important for my professional practice.					
SON	33%	29%	20%	13%	4%
SOM	28%	36%	23%	8%	4%
SHP	46%	40%	12%	2%	0%
What I learned in simulation activities connects well with my professional program studies.					
SON	29%	37%	17%	15%	1%
SOM	28%	33%	23%	12%	3%

SHP	37%	41%	21%	1%	0%

Healthcare simulation activities stimulate my
thinking.

SON	35%	32%	19%	12%	1%
SOM	30%	34%	21%	10%	6%
SHP	38%	36%	22%	3%	0%

Healthcare simulation activities encourage me
to participate.

SON	29%	36%	21%	9%	4%
SOM	31%	33%	20%	10%	7%
SHP	33%	43%	16%	7%	1%

Healthcare simulation facilitators model good
discourse.

SON	29%	36%	25%	4%	5%
SOM	28%	37%	24%	7%	3%
SHP	34%	40%	23%	2%	0%

I make good sense of the simulation
facilitator's lessons.

SON	27%	43%	24%	5%	1%
SOM	25%	41%	22%	7%	4%
SHP	28%	49%	21%	2%	0%

Qualitative Responses and Coding

The 2021 Annual Student Satisfaction Survey included open-ended questions to seek additional information regarding students' perceptions of campus experiences during the pandemic. The qualitative data analyzed for this mixed-methods study included responses to the following five questions:

1. Please make any recommendations for improvement regarding your overall experience or the institutional environment at [the case study institution].

2. Please make any recommendations for improvement regarding the [case study institution] academic experience.

3. What has [the case study institution] handled well with pivoting educational experiences because of the COVID-19 pandemic?

4. Where could [the case study institution] improve with the changes necessary for pivoting educational experiences because of the COVID-19 pandemic?

5. Have you been directly affected by COVID-19?

The same 441 students that provided responses to the Likert Scale questionnaire responded to the five open-ended questions. Their responses varied in length from single word answers to multiple paragraphs. The survey responses were loaded into MAXQDA for coding, theme development, and thematic analysis. Collectively, their responses generated a 539 page code book.

The Coding Scheme

An open coding approach was used to analyze the data for respondents "lived experiences" as they relate to the case institution for the specific academic time-period during the pandemic. The responses of the 441 students were organized by school to create four separate group transcripts based on school affiliation. The SON submitted 82 individual responses to the five open-ended questions. The SOM returned 133 survey responses. The SHP provided 102 written responses. Lastly, the GSBS provided 124 responses. Each individual respondent was assigned to a unique 11 digit identification number by which to track and log their qualitative perceptions.

Based on the five opened-ended questions from the survey, coding was structured around three main categories based on the questions asked: Directly Affected by COVID-19, Academic Experience, and Institutional Experience. Each of these categories was based on the wording of the open-ended questions from the Annual Survey. Directly Affected by Covid-19 revealed five themes identified with 73 discreet codes and 670 data strips. Academic Experience had three themes identified with 109 discreet codes and 1446 data strips. Institutional Experience had three themes identified with 122 discreet codes and 904 data strips. In conclusion, from the three

categories, 11 themes were identified with 304 discreet codes and 3020 data strips (see Table 10).

Table 10

Categories and Themes: Distribution of Codes and Data Strips

Category	Themes		Codes	Data Strips
Directly Affected by COVID-19	No		3	54
	Yes: Academic Impact		9	169
	Yes: Financial Hardship		24	82
	Yes: Mental Health Needs		34	354
	Yes: Loss of a Loved One		3	10
		Subtotal	**73**	**670**
Academic Experience	Online Course Work		52	437
	Faculty Interactions		21	560
	Academic Offerings		36	450
		Subtotal	**109**	**1446**
Institutional Experience	Policies		27	145
	Communication		62	624
	Need for Space/Study Areas		33	135
		Subtotal	**122**	**904**
	Total		304	3020

The COVID-19 Impact

Arguably, most individuals would deem themselves affected by the COVID-19 pandemic. The purpose of the questions was to identify the student perceptions regarding their level of affectedness and if they perceived being impacted by the campus changes brought on by the pandemic. Specifically, the campus closed to students in March of 2020 and remained largely unavailable for student activities throughout the following year. The impact of the campus closure varied among the student populations of the SON, SOM, SHP, and GSBS.

Initially segregated into themes of "No" and "Yes" the data yielded degrees of affectedness. Respondents who did not perceive being directly affected by the pandemic based

their self-assessment on their ability to remain healthy or uninfected during the pandemic.

However, the majority of the respondents who claimed being directly affected by the pandemic

elucidated that they had been affected in multiple ways including mental health needs, loss of a

loved one, financial hardship, and most of all, being impacted academically by the pandemic's

effect on the operations of the campus. As a result, the category yielded five distinct themes.

Table 11 organizes the coding system and lists the themes and their frequencies between the four

subject groups (SON, SOM, SHP, and GSBS).

Table 11

Table of Coding Frequencies

Code System	SON_SSS Results	SOM_SSS Results	SHP_SSS Results	GSBS_SSS Results	SUM
Directly Affected by Covid-19					0
No	1	1	1		3
DataStrip_No	23	16	15		54
Yes: Academic Impact	1	1	1	6	9
DataStrip_Yes: Academic	40	82	40	8	170
Yes: Financial Hardship	4	8	9	3	24
DataStrip_Finance	10	30	37	5	82
Yes: Mental Health Needs	4	7	2	21	34
DataStrip_Mental Health	72	126	106	50	354
Yes: Loss of a Loved One	1	1	1		3
DataStrip_Loss	2	3	5		10
Academic Experience					0
OnlineCourseWork	1	5	7	39	52
DataStrip_OnlineED	87	184	111	54	436
FacultyInteractions	4	1	4	12	21
DataStrip_Facutly	242	234	50	34	560
AcademicOfferings	7	8	4	17	36
DataStrip_Academic	228	154	4	64	450
Institutional Experience					0
Policies	11	4	5	7	27
DataStrip_Policies	43	43	17	42	145
Communication	5	10	3	44	62
DataStrip_Communications	256	203	93	72	624
Need for space/study area	4	9	4	16	33
DataStrip_StudySpace	26	32	48	29	135
SUM	1072	1162	567	523	3324

Note: Coding system table from MAXQDA view module illustrating the frequency of each code for each of the document groups (SON, SOM, SHP, GSBS).

Mental Health Issues

This theme emerged as respondents self-identified as suffering from mental health issues. Students also documented witnessing or experiencing mental health crises of both fellow students and family members. Ultimately, this theme encompasses all reports of mental health needs be they for the individual student, colleague, or family member.

In the SON, several students reported mental health needs. For example, some of the coded segments expressed the following statements:

we have lost hope (SON_SSS Results, Pos. 40)
This was already a stressful time, and you make it worse (SON_SSS Results, Pos. 2)

am truly terrified (SON_SSS Results, Pos. 5)

it's just not okay (SON_SSS Results, Pos. 27)

students don't feel it's safe (SON_SSS Results, Pos. 31)

The majority of the student mental health responses perceived stressors associated with the cascading effects of the pandemic on their education. Further, rotation students found the danger of exposure to be unsettling and questioned the risk benefit of participating in clinicals. In the SOM, students continued the trend of both self-identifying and recognizing mental health needs in others. For example:

I am concerned for the mental well being of a student (SOM_SSS Results, Pos. 34)

it makes me very uncomfortable (SOM_SSS Results, Pos. 40)

affected our home life and added additional layers of stress (SOM_SSS Results, Pos. 143)

students are exceptionally stressed (SOM_SSS Results, Pos. 3)

students feel like unprofessional failures (SOM_SSS Results, Pos. 143)

For the SOM, students focused primarily on the effect of online learning on their professional development. They reported an uncertainty in their educational accomplishments through the pandemic period. Board exams were a big concern among the medical student respondents.

In the SHP students echoed their SOM counterparts in the concern over lost clinical experiences. A sample of their responses included:

losing too many opportunities (SHP_SSS Results, Pos. 51)

challenging to deal with school (SHP_SSS Results, Pos. 29)

[Being more] understanding of students who are struggling (SHP_SSS Results, Pos. 72)

makes it hard for students (SHP_SSS Results, Pos. 80)

Isolation has become a major issue (SHP_SSS Results, Pos. 89)

The SHP students denoted a need to return to in-person activities. They voiced concerns regarding underdeveloped skills sets as well as mental strain from consecutive hours of online lectures. They also voiced concerns regarding depression symptoms brought on by isolation due to the pandemic lock-down.

Lastly the GSBS students had a different experience than their counterparts as they were put into shifts to remain in their labs contributing to the research efforts to develop testing technologies, vaccines, and anti-viral medications. To the same degree, they too expressed mental health concerns. A sample of their responses included:

My main issues are with access to mental healthcare (GSBS_SSS Results, Pos. 37)

We're stuck trying to figure everything out on our own while completely isolated. (GSBS_SSS Results, Pos. 113)

(F)eel extremely disconnected with the graduate school as a whole (GSBS_SSS Results, Pos. 127)

[The institution] has consistently failed to provide support for the mental well-being of students […] The student health and counseling system seems to be straining under the

weight of the mental health crisis facing our students and the only help we've received has been a few empty emails expressing support. (GSBS_SSS Results, Pos. 131)

Loss of a Loved One

A minor subset of students shared that part of their pandemic experience included losing a loved one. Though grief at the loss of a loved one might be classified as a mental health need, this theme highlighted the compounding stressor of grieving during the pandemic. In many cases, these students were not afforded the ability to visit loved ones in the ICU, and many might not have had the benefit of attending funerals for their family members. Additionally, the struggling Student Health Care services clinic, which typically provided counseling services to the entire student population, was unable to provided adequate support for these students. A brief example from each school includes the following:

The SON reported:

family members died (SON_SSS Results, Pos. 103)

The SOM reported:

Yes, it killed members of my family. (SOM_SSS Results, Pos. 206)

The SHP reported:

Yes, I lost three family members to covid (SHP_SSS Results, Pos. 111)

Though there were multiple examples of students expressing bereavement needs, the GSBS reported no students suffering family losses.

Financial Hardship

The survey responses revealed an increased focus on financial hardship. Students repeatedly voiced their concerns regarding increasing institutional expenses as a result of online learning. Several also reported loss of income due to the pandemic. Many of the comments emphasized the lack of campus resources and a desire for tuition reimbursement.

From the SON, the following sample of statements was received:

We pay insane fees (SON_SSS Results, Pos. 18)

[I was directly affected by COVID-19] Financially, yes (SON_SSS Results, Pos. 102)

[I was directly affected by COVID-19] Yes, financially and psychologically (SON_SSS Results, Pos. 135)

We pay all this money (SON_SSS Results, Pos. 20)

The school was charging us extra fees for online education. (SON_SSS Results, Pos. 18)

The SOM student also suggested solutions to financial hardships they experienced during the

pandemic. For example:

Decrease tuition (SOM_SSS Results, Pos. 11)

I would like to be reimbursed (SOM_SSS Results, Pos. 51)

I believe that […] online resources […] should be part of our materials provided (SOM_SSS Results, Pos. 52)

Important outside resources that are required for passing exam/boards should be included within tuition (SOM_SSS Results, Pos. 62)

be reimbursed even a small amount (SOM_SSS Results, Pos. 122)

The SHP respondents echoed the concern regarding additional fees incurred during the pivot to

online learning. For instance:

why the fees were required and not optional (SHP_SSS Results, Pos. 7)

not all fees are applicable to the various programs (SHP_SSS Results, Pos. 18)

I was not very pleased to be charged an additional, unexpected, and obligatory $30 minimum per semester in exam fees (SHP_SSS Results, Pos. 70)

they must pay out of pocket an ADDITIONAL fee for EVERY EXAM (SHP_SSS Results, Pos. 18)

If [the case institution] was going to continue to incorporate online learning and potential online exams, exam fees should be included in tuition (SHP_SSS Results, Pos. 78)

The GSBS paid student stipends during their academic appointments. Additionally, the Primary

Investigator (the Professor in charge of mentoring the student through their dissertation) was also

responsible for paying their tuition and fees from their sponsored projects or grants revenue. As

such, the feedback on financial concerns from the GSBS deviated from that of their counterparts

in other schools. Instead, the concerns for the GSBS students centered around living expenses,

the power dynamics of having their professors pay their stipends, and cost of ancillary

educational courses. Some of their requests included:

Lower rent for the student 2-bedroom apartments (GSBS_SSS Results, Pos. 15)

[The institution] should fund PhD students throughout the lifetime of the program instead of putting that burden on the PI. Having the PI fund a student creates a massive power imbalance (GSBS_SSS Results, Pos. 21)

Pricing and offering of courses (GSBS_SSS Results, Pos. 122)

Academic Impact

The written responses from all four schools reported concerns with the impact of the

pandemic on the academic career training and development. Students equally expressed

uneasiness with their perceived lack of experience and training. Many also complained that pre-

recorded lectures did not provide them with the same quality of education as in-person lecture

would deliver. The SON respondents stated that:

I think we should go back to in-person classes (SON_SSS Results, Pos. 7)

COVID has changed the way students learn (SON_SSS Results, Pos. 110)

less face to face clinicals (SON_SSS Results, Pos. 140)

due to COVID we have not been able to [review for exams] (SON_SSS Results, Pos. 80)

SON first semester professors did not adapt to COVID-circumstances (SON_SSS Results, Pos. 37)

Similar to the SON, the SOM respondents were concerned about their online learning.

Additionally, some further shared dissatisfaction on clinicals, rotations, and peer based learning

group activities. The following was clearly expressed:

> COVID/online instruction ultimately demanded more from students, I saw classmates attend PBL even though they were extremely sick, febrile, in pain […] There was this pervasive idea that we need to "suck it up"" now because we won't be able to afford these leniencies in the future which was only enforcing physician burnout/depression rates/suicide. (SOM_SSS Results, Pos. 4)

> The pandemic has put a lot of students in vulnerable positions (SOM_SSS Results, Pos. 143)

> I am reminded everyday how this pandemic has negatively impacted my education. (SOM_SSS Results, Pos. 139)

Aside from agreeing with their peers' concerns regarding online learning, the SHP also voiced

issues as members of the healthcare workforce during the pandemic. Many of the SHP students

were practicing respiratory therapists that were required to work extra shifts to support swelling

ICU census numbers as the pandemic swept through the region. Their sentiment included the

following:

> [I was directly affected by COVID-19] As much as any practicing health care worker (SHP_SSS Results, Pos. 100)

> I have been directly affected in many ways (SHP_SSS Results, Pos. 101)

> being in clinical practice and an online student myself. (SHP_SSS Results, Pos. 103)

> program has been altered and missed critical Interprofessional activities (SHP_SSS Results, Pos. 111)

> I feel like it has affected the quality of my learning (SHP_SSS Results, Pos. 138)

The GSBS students experienced, for the first time, an exclusively online curriculum devoid of

seminars and teaching laboratory rotations. A sample of their concerns included the following:

> As a GSBS student, it has sometimes been hard for me to find place to do my class discussions over Zoom (GSBS_SSS Results, Pos. 3)

> Expectations for class not clearly communicated across programs. Classes offered from other universities for credit are terribly ineffective. (GSBS_SSS Results, Pos. 7)
>
> The pandemic has had a tremendous negative impact towards schooling.
> (GSBS_SSS Results, Pos. 46-47)
> Only course i am taking was through [another university] and a waste of time (GSBS_SSS Results, Pos. 42)

Overall, students from all four schools expressed concerns regarding the quality of learning and education they were receiving online versus the traditional in-person format. However, several expressed their satisfaction with the institutions ability to rapidly pivot to online learning and the growing flexibility gained through the switch to online education. An example of these supportive statements was provided below:

> All of my classes going online went pretty well (SON_SSS Results, Pos. 55)
>
> For the most part, shifting to an online platform was done well (SON_SSS Results, Pos. 61)

Academic Experience

A significant majority of survey responses was focused on the sudden switch to online learning. The coding scheme revealed three themes within this category: Online Course Work, including all topics related to online learning, Faculty Interactions, and somewhat unexpectedly Academic Offerings. Students expressed both relief and frustration with the online learning format. On one hand they appreciated the institution's efforts to keep them safe while continuing to offer classes. On the other hand, many voiced their concerns regarding the quality of some lecture materials and the loss of valuable in-person training that was traditionally offered as part of their healthcare educational program. Additionally, many respondents expressed their deep displeasure with Faculty Interactions, mostly based on the lack of faculty availability for mentoring. Lastly, the respondents revealed an unexpected theme in the coding surrounding their

perceptions of Academic Offerings. This theme was inclusive of all related topics to quality,

number of courses, and overall satisfaction with their professional education.

Online Coursework

Online course work has become common place for many educational programs.

However, the case institution, had few fully online degree programs. The healthcare programs

were mostly comprised of hybridized recorded lectures, in-person seminars, focus group or peer

based learning (PBL) interprofessional group activities, and in-person laboratory or clinical

experiences. The SON respondents shared their sentiment regarding the online courses:

> [with online learning] I don't feel as if I am being made into the best nurse possible
> (SON_SSS Results, Pos. 5)

> There should be alternatives to every lecture […] Half of our lectures in first semester
> never even happened. (SON_SSS Results, Pos. 18)

> Almost the entire program was independently taught (SON_SSS Results, Pos. 25)

> I believe the academic experience could be improved if the instructors were required to
> lecture live instead of depending on voice thread or panopto recorded lectures (SON_SSS
> Results, Pos. 29)

The SOM students seemed to be more concerned with the restrictions and policies surrounding

online education versus the quality of the lecture materials. For instance:

> they must be more lenient to students during COVID with regards to deadlines,
> (SOM_SSS Results, Pos. 2)

> Faculty are far too concerned with students following attendance policy (SOM_SSS
> Results, Pos. 3)

> communication for MS1 was horrible and we had to learn info within days of exams
> (SOM_SSS Results, Pos. 8)

> I haven't really gotten to see much of campus this year (SOM_SSS Results, Pos. 24)

> I wish PA students had access to simulation labs to practice clinical skills (i.e. suturing,
> venipuncture, etc.) like the medical students do (SOM_SSS Results, Pos. 25)

The SHP feedback focused on the need to improve online educational resources and

infrastructure including fully leveraging resources, educational quality, and content updates.

Representative statements included the following:

> Professor need to update some info in powerpoints (SHP_SSS Results, Pos. 24)
>
> there was still a problem with technology throughout the school (SHP_SSS Results, Pos. 11)
>
> Be mindful of converging project deadlines and exams (SHP_SSS Results, Pos. 19)
>
> the first year in the program was pretty rocky to our dismay (SHP_SSS Results, Pos. 20)
>
> Softchalk was awful to work with. Even the teachers say it was hard to work with. The IT department also has a hard time with it. (SHP_SSS Results, Pos. 25)

Lastly, the returning GSBS students expressed appreciation for the flexibility online learning

offered. They were assigned shift rotations (either day, evening, or night shifts) to maintain

distancing protocols in the tightly spaced laboratories. As a result, GSBS courses became

asynchronous and adopted a self-paced approach to learning. The first year students, however,

were not brought onto campus to experience in-person classes or laboratory rotations. Some

expressed a lack of orientation and understanding in the use and of online resources. Their

comments include the following:

> [What was handled well with pivoting educational experiences because of the COVID-19 pandemic] Recording lectures (GSBS_SSS Results, Pos. 78)
>
> Quickly and effectively transitioned to online teaching (GSBS_SSS Results, Pos. 77) The change to online virtual learning has been pretty smooth (GSBS_SSS Results, Pos. 79)
>
> I know they tried to provide instruction to professors on how to use online resources (GSBS_SSS Results, Pos. 89)
>
> [Where could UTMB improve with the changes necessary for pivoting educational experiences because of the COVID-19 pandemic] Training faculty and students with the online communication platforms (e.g., Teams, Zoom) (GSBS_SSS Results, Pos. 130)

Additionally, comments from all four schools clearly expressed concerns with communications challenges mostly surrounding the accessibility of faculty to answer lecture related questions. Returning students bemoaned the lack of office hours and new students expressed frustrations with lack of instruction.

Faculty Interactions

"Faculty Interactions" was the second highest discussed topic in the survey responses behind "Communications". Students expressed the need for more faculty interactions, higher quality interactions, and more structured faculty support for their learning programs. The SON, in particular, had concerns regarding the communication style faculty presented during the pandemic. Some of their statements are provided below:

> The professors need to not have an attitude of its their way or the highway (SON_SSS Results, Pos. 8)

> I don't believe "read the book" was a proper response (SON_SSS Results, Pos. 6)

> faculty not being respectful of our time (SON_SSS Results, Pos. 10)

> Some professors are extremely rude and disrespectful to students (SON_SSS Results, Pos. 14)

> It wasn't very pleasant to be told that we are not doing enough or getting blown off when asking questions regarding the exam (SON_SSS Results, Pos. 17)

The SOM shared these concerns and stated:

> all inconveniences and extenuating circumstances are burdens ultimately shouldered by the students at the admin's/coordinators/faculty's' luxury (SOM_SSS Results, Pos. 3)

> Above all, students deeply missed a sense of understanding from faculty/admin (SOM_SSS Results, Pos. 5)

> Faculty communications could be more professional (SOM_SSS Results, Pos. 13)

> Faculty in SOM needs a do over […] You need to get rid of everyone and start over fresh (SOM_SSS Results, Pos. 14)

> Some faculty have been surprisingly callous towards students (SOM_SSS Results, Pos. 39)

The SHP shared admiration for their faculty but also a desire to communicate more with them. They offered opinions including dedicated office hours, the addition of teaching assistants, and reducing faculty workload. A sample of their statements include:

> upper level classes professors are PHENOMENAL (SHP_SSS Results, Pos. 20)

> The professors are all incredible and experts in their field (SHP_SSS Results, Pos. 21)

> professors have their schedules filled with […] too many classes […] that means hiring more professors, creating TA/research assistant positions (SHP_SSS Results, Pos. 22)

> The faculty are overworked and don't have much time for office hours. (SHP_SSS Results, Pos. 28)

Similar to their peers in the SON and SOM, the SHP faculty held clinical positions, particularly in respiratory therapy. In the meantime, GSBS faculty were tasked with running their labs at peak performance during the pandemic. It was important to note, the university system that housed the case institution was the second largest academic research enterprise by federal funding in the United States. It also housed a National Laboratory funded by the National Institute of Allergy and Infectious Diseases. The National Laboratory typically studied diseases like HIV and Ebola. However, during the pandemic the faculty were tasked with contributing to the research effort to produce vaccines, antivirals, and testing technology for COVID-19. The same university system also collaborated within its 12 other institutions to produce the stabilization of the SARS-COV2 spike protein within an astonishing three weeks of the publication of the SARS-COV2 genome sequence (Chung, 2022). This breakthrough made it possible to develop every single mRNA vaccine on the market today (Chung, 2022). To that end, the immense pressure the faculty and students of the GSBS experienced was clearly expressed in the respondents' comments as shared below:

Their attitudes reinforce our already bad imposter syndrome (GSBS_SSS Results, Pos. 12)

The faculty sometimes seem to forget that students have more than one class as well as labs (GSBS_SSS Results, Pos. 35)

many professors do not respect the students and in fact bully them (GSBS_SSS Results, Pos. 38)

Every faculty was "qualified" to be a mentor, but not everyone has the soft skills to mentor students. (GSBS_SSS Results, Pos. 43)

We could do more to establish mentor-mentee relationship, it's seriously lacking. (GSBS_SSS Results, Pos. 52)

As the entire student body expressed a need to more deeply connect with their faculty they also shed light on the related topic of academic offerings.

Academic Offerings

In particular, many students expressed fear and frustration at the limited academic offerings as a result of the pandemic. Revisions to the traditional program were often met with skepticism. Many complained that lecture materials did not correlate with exam questions. Some examples from the SON include:

[…] gas-lighting […] should NOT be tolerated anywhere, much less a learning environment (SON_SSS Results, Pos. 10)
This change should not have been made without student input (SON_SSS Results, Pos. 4)

Many questions from the exams are NOT the material in the lecture nor textbooks (SON_SSS Results, Pos. 14)

The questions on the exam are very confusing. (SON_SSS Results, Pos. 16)

[…] learning environment uncomfortable for me and my cohort (SON_SSS Results, Pos. 26)

The SOM focused more on the quality of offerings and stated:

At this point, I don't need a medical school if I'm just using external resources to study. (SOM_SSS Results, Pos. 50)

Both our POM and pre-clinical curriculum are outdated. They should be updated, shortened, and the arbitrary OSCE criterion designed for Step 2 CS should be removed/changed (SOM_SSS Results, Pos. 48)

"Teaching" mainly consists of reading powerpoint slides to the class during lecture. (SOM_SSS Results, Pos. 46)

The school should have more interprofessional events to help students (SOM_SSS Results, Pos. 9)

I have been very underwhelmed by the mistakes that faculty make in teaching us medicine. (SOM_SSS Results, Pos. 56)

The SHP focused mostly on reporting proactive solutions to address their concerns including:

[Improving] unity through all departments (SHP_SSS Results, Pos. 74)
People learn better in person (SHP_SSS Results, Pos. 81)

[Improve upon] major school schedule changes […] lost clinical experience (SHP_SSS Results, Pos. 128)

The curriculum this semester has been incredibly overwhelming and in some classes very unorganized (SHP_SSS Results, Pos. 27)

Similarly, the GSBS students, especially the new ones, felt a sense of dissatisfaction with the academic offerings during the pandemic. A sample of their statements included:

The Institute for Bioethics and Health Humanities should stand apart from Public Health (GSBS_SSS Results, Pos. 22)

The classes I have taken thus far are closer to undergraduate courses (GSBS_SSS Results, Pos. 9)

Expand research initiatives and programs (GSBS_SSS Results, Pos. 31)

I feel that many of the courses are not at a graduate level and need to be more in depth and challenging (GSBS_SSS Results, Pos. 34)

Many other graduate schools have some form of practical methods class which teaches basic techniques to help students get more out of rotations (GSBS_SSS Results, Pos. 41)

Overall, the student experiences reflected challenges based mainly on infrastructure provided at the institutional level. Comments offered in response to the survey questions provided an opportunity to delve deeper into the subject matter.

Institutional Experience

The coding scheme identified the role of the institution in the respondents' pandemic-era lived experiences. This category yielded three themes: Institutional Communications, Policies, and, quite unexpectedly, Need for Space.

Communications

The case institution, like many other academic sites, relied heavily on email communications to distribute the latest updates on policies and procedures. Noticeably, some students found the communications effective while others did not. Likewise, the changes to faculty accessibility, for example the lack of ability to stop by a faculty members office to ask for clarification on a topic exacerbated the already strained lines of communications between the institution/faculty and students. The SON provided the following feedback in addressing the open question of: What has the case institution handled well with pivoting educational experiences because of the COVID-19 pandemic?

Adequate communication via emails (SON_SSS Results, Pos. 45)

For the question of "Where could the case institution improve with the changes necessary for pivoting educational experiences because of the COVID-19 pandemic?" The following statements were representative:

COMMUNICATION. Stop using class reps. Never let students communicate through GroupMe without a staff proctor. (SON_SSS Results, Pos. 75)

Expectations can be unclear (SON_SSS Results, Pos. 76)

> They need to understand if they are not going to give us information in a timely manner then we can not be held responsible […] things get misinterpreted and it becomes a problem. (SON_SSS Results, Pos. 95)

The SOM not only reflected on the quality of communications but also the content. Their feedback included the following:

> Communication has always been an issue. Communication was either lacking, delayed, or incongruent with previous communication. (SOM_SSS Results, Pos. 10)

> Better and faster communication between admin and students, communication for MS1 was horrible (SOM_SSS Results, Pos. 8)

> More communication from the respective program directors (SOM_SSS Results, Pos. 132)

> The faculty could be better trained to use online modalities (SOM_SSS Results, Pos. 135)

> There should be a more streamlined virtual setup. There was an inconsistency with virtual setup which just leads to increased anxiety for your students (SOM_SSS Results, Pos. 147)

The SHP also illustrated critical thoughts regarding institutional communications. Yet, this cohort also reported satisfaction with communications from the institution. Statements regarding their perceptions include:

> I think that there was a lack of transparency top - down (SHP_SSS Results, Pos. 7)

> maintained open lines of communication (SHP_SSS Results, Pos. 63)

> Good communication (SHP_SSS Results, Pos. 43)

> Keeping students informed (SHP_SSS Results, Pos. 48)

> keeping [u]s updated (SHP_SSS Results, Pos. 59)

The GSBS respondents displayed an element not presented in their peers responses regarding communications. They turned inward and reflected on their personal needs during the pandemic and how the institutional communications did and did not meet those needs. A sample was provided below:

> We have received so many emails expressing sympathy with students and faculty and declaring that we are heroes for the work we do, yet employees who were considered essential at the beginning of the pandemic have received no break or extra help (GSBS_SSS Results, Pos. 37)

> [Providing] Constant communications (GSBS_SSS Results, Pos. 59)

> Communication, updates, positive testing (GSBS_SSS Results, Pos. 58-59)

> Great communication with the transition to online learning (GSBS_SSS Results, Pos. 63)

> They have had an abundance of communication and resources as to what was going on (GSBS_SSS Results, Pos. 85)

A natural transition to the next institutional theme emerged from communications to the policies those communications were delivering. While many understood the communications the reactions were not synonymous throughout the groups.

Policies

Many policies were adjusted and revised to meet the needs of the pandemic environment. Given the changing pandemic circumstance, these policies were inevitably changing and evolving almost as rapidly as the variants produced by the virus. Students had mixed perceptions to the ever-changing landscape and shared their opinions through their responses. The SON students focused primarily on being deprived of educational activities and on the successful implantation of social distancing guidelines. Their feedback included:

> We aren't able to receive our final grades until our cohort reaches an 80% completion rate on the course evaluations. This creates strife and animosity amongst my peers who want/need to see their grades, and the students who have yet to complete the evaluation. (SON_SSS Results, Pos. 2)

> [Study rooms] should be open for students to study. We have been informed of a change in closing time from 12am to 10:30. This change was never run by the students. This change should not have been made without student input, especially during finals (SON_SSS Results, Pos. 4)

> If we're able to go to the school for testing, we should be able to go for test review (SON_SSS Results, Pos. 18)

> Implemented social distancing and CDC guidelines effectively and succinctly (SON_SSS Results, Pos. 55)

> Social distancing, feel very safe (SON_SSS Results, Pos. 61)

The responses from the SOM were equally mixed. They praised the institution's ability to implement COVID-19 restrictions in some sectors yet complained regarding the implementation of affiliated policies implemented to support online learning. A sample of their reposes are provided below:

> must be more lenient to students during COVID with regards to deadlines (SOM_SSS Results, Pos. 2)

> There needs to be a lot more emphasis on the permissibility and encouragement to take health days (SOM_SSS Results, Pos. 4)

> There needs to be a lot more proactiveness from the administration/faculty in […] being flexible, understanding, accommodating (SOM_SSS Results, Pos. 5)

> We've performed beyond all humanly reasonable expectations and are waiting for you to lower the bar just a little (SOM_SSS Results, Pos. 6)

> Given the COVID pandemic, I understand the restrictions but compared to other medical programs within the institution, the PA was extremely limited of what we could /could not do (SOM_SSS Results, Pos. 15)

The SHP echoed many of these views. They focused on the affiliation between the closure of campus sites due to COVID precautions and the continued charging of fees:

> I understand that because of Covid, the study rooms […] have been closed. However, I believe there was a way for them to be safely reopened (SHP_SSS Results, Pos. 10)

> it seems like there was a narrative that students are involved in decisions made for the school but there doesn't seem to actually be (SHP_SSS Results, Pos. 12)

> It seems like we cannot use study rooms […] which would be very useful when doing schoolwork or trying to meet with groups for projects (SHP_SSS Results, Pos. 13)

> […] fees being distributed to all students, nonoptionally, although student were not yet back in in-person classes (SHP_SSS Results, Pos. 9)

> I understand that students may not understand all the ins and outs of the finances required to maintain certain buildings, etc., but a transparency of documentation available to students would be appreciated (SHP_SSS Results, Pos. 8)

An interesting GSBS-specific topic arose in the policy theme. Among other topics, GSBS students suggested that the current funding infrastructure, which has stood since the NIH began funding research in 1887, needs to change (NIH, 2022). The argument posed was well communicated and sensical in its reasoning. A sample of these responses include:

> The graduate school should fund PhD students throughout the lifetime of the program instead of putting that burden on the PI. Having the PI fund a student creates a massive power imbalance and puts students in a situation where they have next to no protections or safeguards. The current system was set up to allow abuse of power because students are dependent on their PI and a project-based curriculum for graduations. Their options often come down to put up with abuse or start completely over (GSBS_SSS Results, Pos. 21)

> If we really want to compete with the best of the best, we have to invest funding into hiring, scaling up current projects and creating new ideas (GSBS_SSS Results, Pos. 31)

> It was also well known that mental health was a major issue in graduate programs yet the institution was doing next to nothing to help that (GSBS_SSS Results, Pos. 37)

> The planned increase of bioethics at the expense of rigorous engagement in the humanities coinciding with the IMH's shift to the IBHH will continue to drastically suffocate the intellectual richness of the Institute (GSBS_SSS Results, Pos. 47)

> Mask policies and limiting large meetings (GSBS_SSS Results, Pos. 68)

While the pandemic may have exacerbated some of the preexisting pressures of graduate students in the GSBS, the overall consensus from the Institutional Experience category was that the pandemic caused one major issue, the absence of study space.

Need for Space/Study Areas

An unanticipated finding from the student responses was the uniform outcry from all four schools to restore study spaces. Responses included admissions of needing spaces to study both independently and as a group. A sample from the SON was provided below:

[Study Rooms] should be open for students to study. We have been informed of a change in closing time from 12am to 10:30. This change was never run by the students. This change should not have been made without student input, especially during finals (SON_SSS Results, Pos. 4)

More on campus study rooms would be nice. Or study rooms that you don't have to reserve ahead of time (SON_SSS Results, Pos. 9)

Open the [study rooms] back up 24 hours. Closing it at 10:30 hinders students' abilities to have a quiet space to study at night. (SON_SSS Results, Pos. 12)

Please open study room back up. (SON_SSS Results, Pos. 13)

Open study rooms (SON_SSS Results, Pos. 11)

The SOM shared more of the same as provided below:

terrible job of offering resources and study spaces (SOM_SSS Results, Pos. 7)

study rooms should be open (SOM_SSS Results, Pos. 17)

Library should be open on the weekends. (SOM_SSS Results, Pos. 31)

Would like to have more access to study rooms (SOM_SSS Results, Pos. 43)

Please make more study rooms accessible! And at one point the library was barely open. That's as terrible. (SOM_SSS Results, Pos. 37)

The SHP included comments regarding a new faculty lounge:

A large portion of the 3rd floor of the library was taken over for a faculty lounge that seems like a poor use of space. That took away a lot of quiet student study space (SHP_SSS Results, Pos. 2)

actually have study rooms open (SHP_SSS Results, Pos. 3)

Due to COVID I have not had access to many study spaces (SHP_SSS Results, Pos. 4)

Open study rooms (SHP_SSS Results, Pos. 23)

Study rooms that are closed, limiting capacity, makes it hard for students to study on campus (SHP_SSS Results, Pos. 80)

The GSBS pointed out lack of breastfeeding rooms in some buildings as well as requests for

relaxation spaces:

Campus buildings lack breastfeeding rooms. (GSBS_SSS Results, Pos. 5)

Adequate personal spacing for graduate students and a facility to relax was quintessential (GSBS_SSS Results, Pos. 2)

GSBS dedicated relaxation space? (GSBS_SSS Results, Pos. 8)

Would be really nice to have an actual common room or somewhere we can congregate, relax, and interact (GSBS_SSS Results, Pos. 13)

The third floor of the library should not have been turned into a faculty lounge. This was great student space. (GSBS_SSS Results, Pos. 23)

In conclusion, the respondents admitted to needing study areas outside their homes to accomplish their academic goals.

Licensure Exam Pass Rates

The case institution published licensure exam pass rates for all of the healthcare programs taught in its four schools. For the SON, the programs included in the report were: Nursing, BSN; Adult Gerontology Acute Care, MSN; Acute Gerontology Primary Care, MSN; Family Nurse Practitioner, MSN; Neonatal Nurse Practitioner, MSN; and Clinical Nurse Leader, MSN. The case institution saw a decrease in pass rates in all programs following the completion of the 2021 academic year (see Table 12 and Figure 12). All programs saw a decrease in pass rates.

Table 12

Licensure Pass Rates: SON Programs

SON	2018	2019	2020	2021	2022
BSN	97	99	99	98	96
Adult Ger	n/a	n/a	100	90	86
Acute Ger	100	94	95	100	92
FNP	99	98	92	93	90
NNP	71	96	90	92	75
CNL	56	85	80	100	50

Note: License exams are typically taken following graduation and reported the following year (i.e. for 2021 graduates, exam pass rates would generally be captured in 2022).
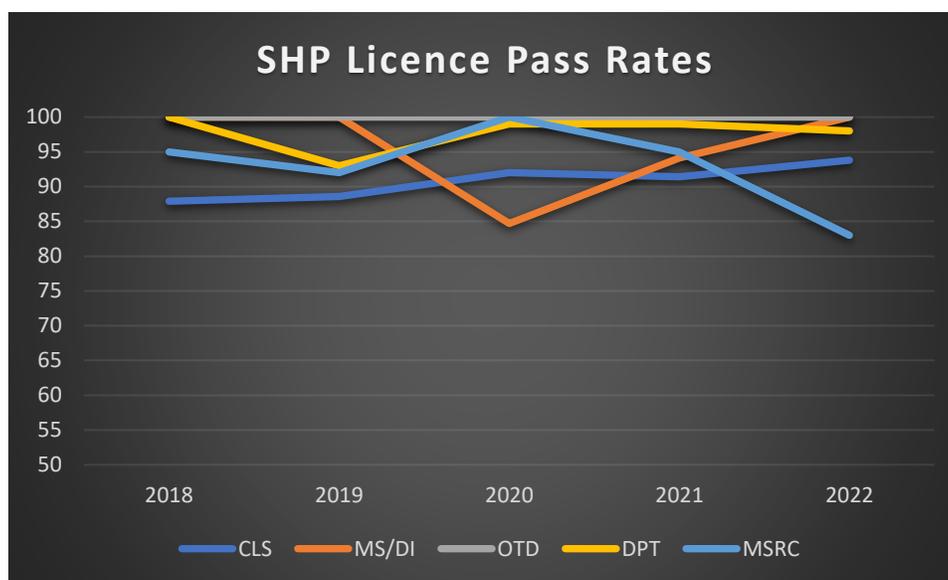
Figure 12

Learning Outcomes: SON Licensure Pass Rates
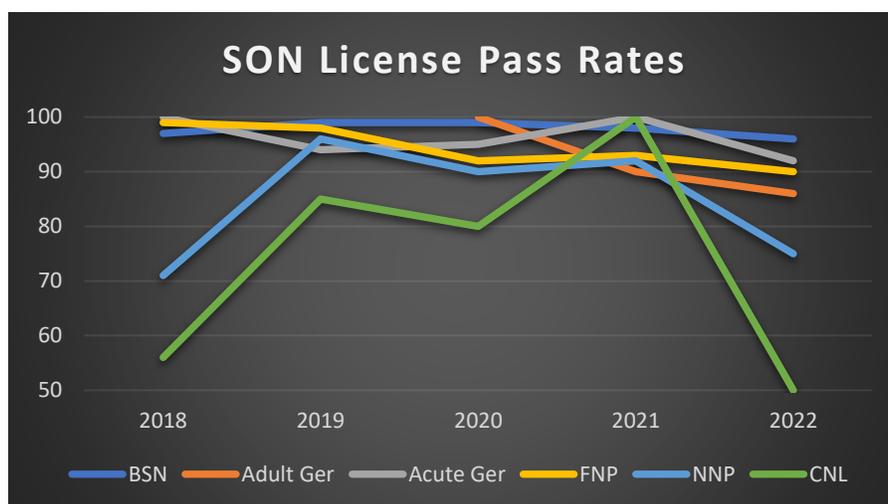
For the SHP license pass rates for Clinical Laboratory Science, CLS; Nutrition and Metabolism,

MS/DI; Occupational Therapy, OTD; Physical Therapy, DPT; and Respiratory care, MSRC were

reported in Table 13 and Figure 13. The CLS, MS/DI, and OTD programs all saw increases in

performance. The DPT saw a marginal decrease and the MSRC suffered a 12 point drop.

Table 13

Licensure Pass Rates: SHP Programs

SHP	2018	2019	2020	2021	2022
CLS	87.9	88.6	92	91.4	93.8
MS/DI	100	100	84.7	94.1	100
OTD	100	100	100	100	100
DPT	100	93	99	99	98
MSRC	95	92	100	95	83

Note: License exams are typically taken following graduation and reported the following year (i.e. for 2021 graduates, exam pass rates would generally be capture din 2022).

Figure 13

Learning Outcomes: SHP Licensure Pass Rates

For the SOM Residency match rates, MD licensure and PA licensure pass rates were reported in Table 14 and Figure 14. While the MD programs saw marginal decreases in performance, the PA program saw a healthy recovery from the initial 2021 impact resulting from moving the program from the SHP to the SOM.
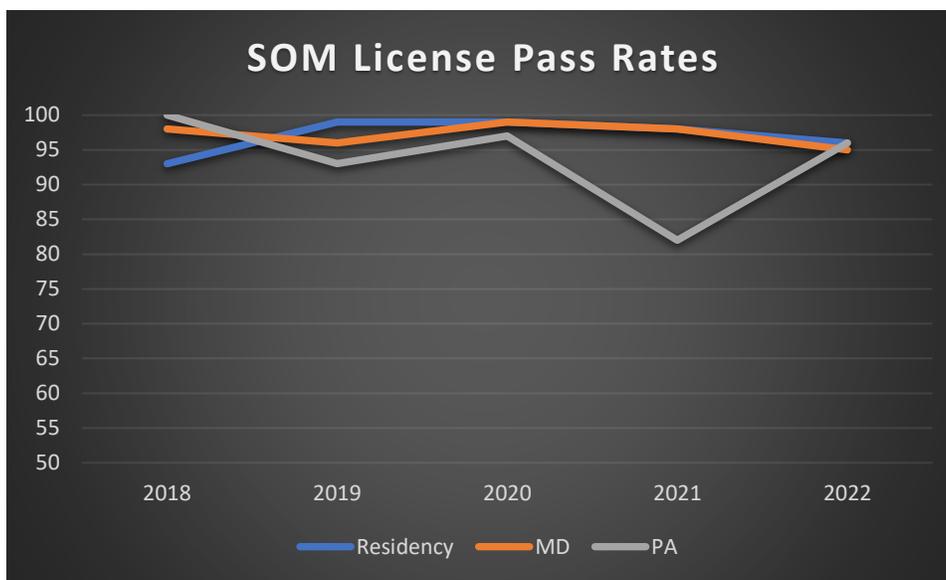
Table 14

Licensure Pass Rates for SOM Programs

SOM		2018	2019	2020	2021	2022
	Residency	93	99	99	98	96
	MD	98	96	99	98	95
	PA	100	93	97	82	96

Note: License exams are typically taken following graduation and reported the following year (i.e. for 2021 graduates, exam pass rates would generally be captured in 2022).

Figure 14

Learning Outcomes: SOM Licensure Pass Rates

Chapter Summary

This chapter reported both the quantitative results of phase one and the qualitative

findings of phase two. The phase one quantitative study included the analyses of the grades for

cohorts spanning 2017 to 2021. The second phase of the student incorporated student responses

to the annual survey. Results were presented sequentially beginning with student outcome

analyses followed by survey questionnaire feedback, coding theme findings, and lastly licensure

exam pass rates.

Chapter 5: Discussion and Conclusion

In this chapter I discuss the results and findings derived from the study in relevance to program evaluation literature emphasizing on the applications of HRD and VHRD. Contributions to the field of research and implications for practitioners are also discussed. Research limitations are reviewed, and future research directions are presented.

Highlight of the Study

Purpose and Research Questions

The purpose of this mixed methods study was to explore the effects of COVID-19 campus closures and ensuing changes in curriculum delivery on the student learning in a major academic medical center. Specifically, to conduct a program evaluation on the altered or revised education programs that hastily adopted online formats as a result of pandemic safety protocols. The study was designed to capture data from four schools (SON, SOM, SHP, and GSBS) derived from four sources: the phase one grade analysis, the qualitative survey responses, the Likert scale questionnaire, and the program licensure pass rates. By triangulating (1) the quantitative student grade analyses, (2) qualitative student perceptions of online learning and satisfaction with technology, (3) quantitative cohort performance on licensure exams, and (4) qualitative analyses of open-ended survey responses to the Student Satisfaction Survey, the following research questions was explored:

Research Question One: What were the direct impacts of COVID-19 experiences and perceptions by the healthcare student population as reflected in their academic performance?

Research Question Two: How effective were the institutional resources in supporting the students learning during the pandemic?

Mixed-Methods Case Study

This mixed-methods case study aimed to apply an HRD program evaluation model utilizing data gathered through a two-phase quantitative-qualitative research design. Through the various phases of the study, different datasets were obtained and analyzed to provide ample data strands for program evaluation. As a case study of a major academic medical institution, the study was initiated as a response to the sudden introduction of online courses as the institution sought to meet the safety guidelines put forth by academic governing boards regarding in-person activities. Additionally, like all other medical establishments, the institution faced a critical shortage of healthcare providers during the pandemic. This shortage resulted in many teaching-faculty either rejoining the clinical workforce or increasing their patient-care time. As a result, many lacked the time to hold office hours or live lectures. Instead, pre-recorded lectures were offered to students through synchronous and asynchronous course offerings. Additionally, hybridized courses were created to offer students simulation activities in place of canceled clinical rotations.

The results of the quantitative study found that student grades were affected by the pandemic. A "watermark" was left on the pandemic period when compared to years prior to the onset of the pandemic including campus shutdowns due to weather. Instances of overall GPA reductions were seen in two schools, the SHP and SON, as online courses were introduced and clinical rotations were interrupted or replaced by simulation training activities. This suggested that, in some instances, the effectiveness of the online educational programs did not perform to the same level as the in-person sessions. The GSBS was affected positively and reflected an increase in overall student GPA during the study period. This positive influence on grades was mostly attributed to asynchronous offerings of online courses. The SOM removed the Honors

and High Pass rankings from the Pass/Fail grading system during the pandemic as these rankings were typically earned during clinical rotations. This reflected on overall inflation effect on "Pass" grades for the pandemic cohort. However, detrimental effects on residency applications were reported as a result of an inability to distinguish superior student performance from the acceptable or satisfactory ranking.

The analysis from the qualitative portion of the study identified three overarching categories in the dataset: Directly Affected by COVID-19, Institutional Experience, and Academic Experience. These categories were closely related as illustrated in Figure 14. Institutional Experience was closely tied with Academic Experience as related themes were expressed in association to each other. For example, the respondents' experiences with online courses were influenced by institutional policy implementations. Likewise, institutional experiences were influenced by academic experiences including faculty interaction and communications. This meant that in many cases, the case institution was unable to segregate institutional directives aimed at abiding by local, state, and federal safety guidelines from influencing the academic experiences of the student body. The academic experience was therefore overshadowed by the operational procedures of the institution, some of which were not necessarily controlled or at the discretion of institutional leadership.

Both Institutional Experience and Academic Experience categories were heavily influenced by the third category, Directly Affected by COVID-19. This category contained findings closely associated with the overall effect of the pandemic on the students including financial hardship, mental health struggles, and even death of a loved one. The code hierarchy was illustrated in the complete thematic map for the coding scheme (see Figure 15). Although the institution, and to a lesser degree the academic programs, did not have an influence on, nor

the ability to control these pandemic related experiences on the student body, these external

factors played a role in the respondents' experiences and academic performance during the

pandemic. In many cases, students did report being detrimentally affected by external factors

directly impacting their academic performance. These findings correlate with the results of the

quantitative phase reflecting a significant effect by year on student performance, albeit with a
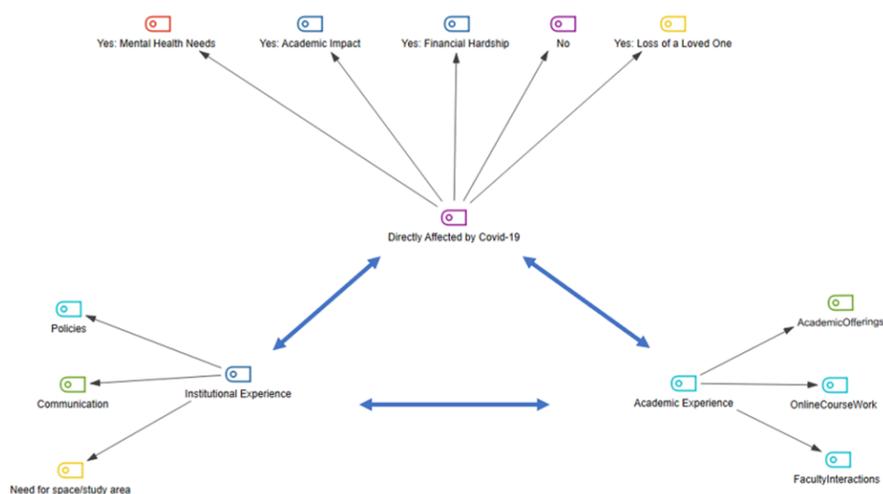
minimal effect size.

Figure 14

The Relationship between Categories: Institutional Experience, Academic Experience, and Directly Affected by COVID-19
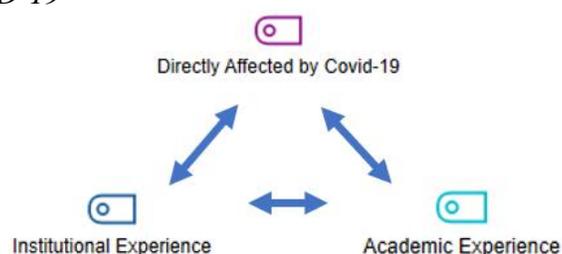
Note: The relationship between the three Categories: Institutional Experience, Academic Experience and Directly affected by COVID-19 as illustrated by MAXQDA.

Figure 15

Illustration of Code Hierarchy

Note: Code Hierarchy Map as Illustrated by MAXQDA.

In short, this study, by taking a mixed-methods approach, offered a fuller picture for the effects of COVID-19 on the overall learning, administration, and leadership. While the quantitative portion revealed student learning outcome in terms of grade and licensure accomplishments, the qualitative offered finer-grained perceptions in organizational resources and program evaluation. Therefore, the overall results and findings of the study provided a unique yet comprehensive assessment and evaluation from which to observe the effects of online learning on healthcare programs.

Contributions and Relationship to HRD Evaluation Framework and Models

This study was, in part, informed by HRD M&E framework and models. Lacking the luxury of a planned, proactive set-up, the after-the-fact evaluation for the education programs implemented during and immediately after the pandemic lockdown leveraged the versatility of Kirkpatrick's Four Level Model (1996), the System Framework Model, the Organizational System Model (Russ-Eft & Preskill, 2005; Wang et al., 2002), and Wang's Four Types of Control Groups framework (2002). To properly understand the results and findings of this mixed-methods study, these data were interpreted through the lenses of these resources. Ultimately, these analyses contributed to a novel and unique synergistic program evaluation methodology applicable to similar emergency implementations of online HRD and VHRD trainings.

In relation to Kirkpatrick's Foul Level taxonomy (Kirkpatrick, 1996), this study was mainly conducted at the first three levels. Level 1 corresponds to the learners' reactions to the training input and environment (Wang, 2008). This level of evaluation was achieved by analyzing the qualitative responses to the student survey. Level 2 represents the achievement and assessment of learning. This was assessed by analyzing the student grades quantitatively from

2017 to 2021. Level 3 aims to observe the application of learned processes. This was studied by reviewing the licensure exam pass rates for the professional healthcare programs. The remaining Level 4 aims to evaluate organizational impact of the HRD initiative. Due to the fact that evaluating organizational impact required relatively longer time period, such key measures or observations at the case institution are largely based on the academic accreditation cycles, this level was considered to be out of the scope for this study during the research design.

However, Kirkpatrick's model as a taxonomy had limited applicability to actual evaluation practices other than arranging evaluation efforts into a certain level. The System Framework Model by Russ-Eft and Preskill (2005) offered some general guidelines to inform the study. For example, based on the guidelines, stakeholders, evaluation assumptions, resources for the programs under evaluation, activities undertaken to accomplish the program's goals, and short versus long-term outcomes of the program. It was important in this case to acknowledge the effects of COVID-19 and hence the development of the specific survey questions designed to address external factors (Russ-Eft & Preskill, 2005). In this case and other emergency implementation cases, this meant that any program evaluation must include the collection and analyses of data specifically addressing the disruption or catastrophe. Furthermore, this model cautioned against conducting HRD evaluations in isolation from other data collection forms which underscored the need to appreciate the Organizational System Model input and process applications (Preskill & Russ-Eft, 2003; Wang et al., 2002).

However, projections based on averages of the current data provided an indication of a stable if slightly decreasing performance for the institution overall. It is hard to imagine that any institution would escape from the reflection of a pandemic "watermark" on their student

outcomes. It is the degree of impact that we now seek to define, and the HRD methods that can

mitigate the level of affectedness.

Analyses of Findings

The analyses of the different data strands by the mixed-methods design provided rich

findings. Because the study was initiated and designed as in the nature of program evaluation,

and it was conducted in stagewise layers, the rich findings allowed for the determination of what

worked and what did not in the case institution. Likewise, when something was found to function

on one level, the corresponding thread of data was reinforced with supporting findings or results

through each of the program evaluation levels. From these methods we learned how one might

proceed in future potential instances of emergency for implementation of learning programs,

especially those which contain online learning and VHRD.

Overall, the findings and results from this study showed that the case institution's

interventions during the pandemic successfully mitigated and minimized negative effects to

student learning outcomes. Of particular interest to VHRD practitioners was the effect of

simulation activities on student perceptions and learning outcomes. Those students that were

provided hybridized course materials containing the inclusion of enhanced or first-time

simulation activities were found to perform similarly to previous cohorts taught in person. The

evaluations of these sessions confirmed the NSDP observations in that the teaching medium did

not determine the learning outcome; it was the teaching and learning quality that mediated the

student performance (Layton, 1999; Nguyen, 2015; Phipps & Merisotis, 1999; Ramage, 2002).

Furthermore, online courses received both positive and negative reviews in the qualitative

data. The positive aspects of the implementation of online courses were reported to include

asynchronous offerings allowing GSBS students to focus on laboratory duties without being

interrupted by lecture times. These findings were consistent with the literature stating this flexibility as one of the leading benefits of online learning (MacNeill et al., 2014). Additionally, online course offerings provided SHP and SON students with the ability to access course materials including recordings at any time, allowing the students to review materials at will. These added benefits supported the online learning literature and were highly commended by students and resulted in positive student outcomes (Button et al., 2014, Means et al., 2009).

However, some online coursework and training was not as positively received by the learners. The respondents voiced specific concerns regarding the inability to reach faculty with questions, lack of office hours, inability to study on campus, and lack of post-exam reviews due to COVID-19 safety restrictions. The SOM students also voiced concerns over long sequential hours of lectures without a break from screentime. These findings were in line with the literature addressing online learning for healthcare fields which would inherently require hybridized activities to include face-to-face sessions for skills associated with laboratories (Costello et al., 2014; Rowe et al., 2012). Furthermore, the hastily prepared online coursework for some of the programs would have benefitted from better organized syllabi as stated in the literature (Thomas et al., 2010).

Moreover, the students expressed concerns regarding the lack of digital literacy among some instructors and students. These concerns confirmed the literature on the pre-requisite of digital literacy for successful online education implementation and adoption (Alharthi, 2023; Chopra & Strickling, 2011; Costello et al., 2014). Although the case institution might have been able to proactively provide additional IT support for online learners and instructors, it would have been difficult to meet the increased demand with existing staffing levels. Should the institution aim to continue to leverage the utility of online learning in these new sectors,

supplemental training for both instructors and students would be required to assure the best outcomes.

Other areas of potential improvement include faculty and institutional communications. The case institution had little control over the lack of availability of healthcare faculty during the pandemic as they were diverted to their patient-care duties. Even so, to address the decreased faculty availability and ensuring faculty communications, the institution could have provided additional teaching assistants. Furthermore, the rapid and immense increase in blanket emails distributed by the institution during the pandemic resulted in diluting the communication efforts. Proper communication training would benefit the case institution in future instances of emergency response as stated by Wert et al. (2023).

Implications, Limitations, and Future Research Directions

This study contributed to the fields of M&E and VHRD under the umbrella of HRD and offered important implications for research and practices. Formalizing the legitimacy of program evaluation-based studies and results in this context is critical to lay the foundation for continued review and verification of online learning resources in the healthcare field. In particular, the incredibly diverse and technologically advanced resources coming on the market in the VHRD sector will need to be vetted as proper training tools for healthcare professionals (Bredmose et al., 2010; Jones, 2011; Lapkin & Levett- Lee, 2008; Levett-Jones et al., 2011; Norman et al., 2012).

Implications for HRD Research

First, this study is among the first to explore the effects of the pandemic on an academic medical organization. This work documented the effects of the campus lockdown on student learning outcomes and included student perceptions of their academic resources and services.

The findings contribute to the limited literature on evaluating the program effectiveness in academic medical institutions, especially during unprecedented worldwide pandemic. As such, this study offered a baseline for studies focusing on future potential circumstances.

Second, this study provides a contribution to the M&E literature in the application of HRD evaluation frameworks for the study of online learning programs during an emergency implementation. The application of various evaluation frameworks in this study provided a template for the program evaluation studies launched to address emergency needs including the forced closure or inability to return to normal learning settings. Additionally, this study offered a unique case to synergistically apply HRD evaluation models for future research to the evaluation of academic organizations.

Lastly, this study provides insight into the successful application of VHRD techniques for healthcare learning during the pandemic. Answering the call for the evaluation of these applications in healthcare learning during the pandemic, this study provided insight into the ability of the cutting-edge resources to convey learning on par with traditional activities (Costello et al., 2014; Rowe et al., 2012). These findings support the NSDP theory that the teaching medium is not responsible for learning, only the quality of the teaching can dictate the successful transfer of knowledge (Layton, 1999; Nguyen, 2015; Phipps & Merisotis, 1999; Ramage, 2002).

Implications for Practice

This study offers important implications for practice. First, the findings of this study provide evidence that proper training and digital literacy is required to ensure success of any online course initiative. This includes the implementation of best practices for online learning including organized and relevant syllabi, complete course documentation availability, and

making lectures available for reference as established by the literature (Button et al., 2014; Chopra & Strickling, 2011; Costello et al., 2014). Therefore, proper training may need to be considered for areas of prerequisite before jumping start learning in content areas.

Second, this study demonstrated the need for institutions to consider additional HRD resources when dealing with catastrophic circumstances. These include providing additional support for faculty, trainers, and counseling services for the target audience and online forums to help students stay connected (Ross et al., 2020). Emergency response for catastrophic events resulting in the closure of campuses should incorporate the needed resources to launch virtual substitutions for interrupted services. Leveraging the versatility of existing online learning platforms, mandating training on online communications, and maintaining emergency protocols for such instances are strongly recommended the analysis of the observations and findings from this study.

Lastly, this study enriched the growing body of literature on the use of VHRD applications in learning. The extended capability in virtual connections by VHRD for learning and training of many fields is just beginning to be explored. In the healthcare field, the pandemic allowed for a more permissible adoption of new applications utilizing VHRD in healthcare teaching (Crawford et al., 2020; Rose, 2020; Wijesooriya et al., 2020). This study documented a case of success in these applications and their ability to meet the needs of programs lacking in-person clinical experiences.

Limitations

This study was not without limitations. First, it was conducted in a retrospective manner. That is, the researcher was unable to design for the study for program evaluation as embedded in the program implementation prior to the pandemic due to its sudden and extended occurrence

and immediate responses required. However, informed by Wang (2002), the study was able to minimize the pitfalls in retrospective data collections. Furthermore, this case-based study was focused on one academic medical institution. Thus, it has very limited generalizability to other organizational scenario and settings. However, this study offered a unique lens to and insight on how to approach a program evaluation in the complex social and organizational context.

Future Research Direction

From an HRD learning evaluation perspective, future research directions may include the exploration of instructor experiences as they taught during an emergency or widespread long-lasting disastrous situations. Appreciating their challenges, needs, and personal struggles during their experience in such events may help design support tools to better prepare for future emergency implementations of online learning activities. Additionally, gaining the teachers' opinions on the utilization of VHRD and online learning and hybridized courses may further assist in the continued vetting and implementation of those programs in the healthcare field.

From the perspective of this particular case, a future direction may be conducting higher level organizational impact study on the implemented changes in programs for organizational performance. This may include comparing the next or future accreditation outcomes to those obtained prior to the pandemic, among other quantitative and qualitative assessment.

<div align="center">

Chapter Summary

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In this chapter, I first provided a cumulative highlight of the study. I then offered discussion and analysis of the results and findings in relation to HRD measurement and evaluation literature and VHRD and online learning literature, as well as learning for the case institution based on the findings. I further presented the implications for HRD research and practice. Lastly, the chapter offered recommendations for future research.

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Appendix A

Figure A1: Timeline of Data Generation
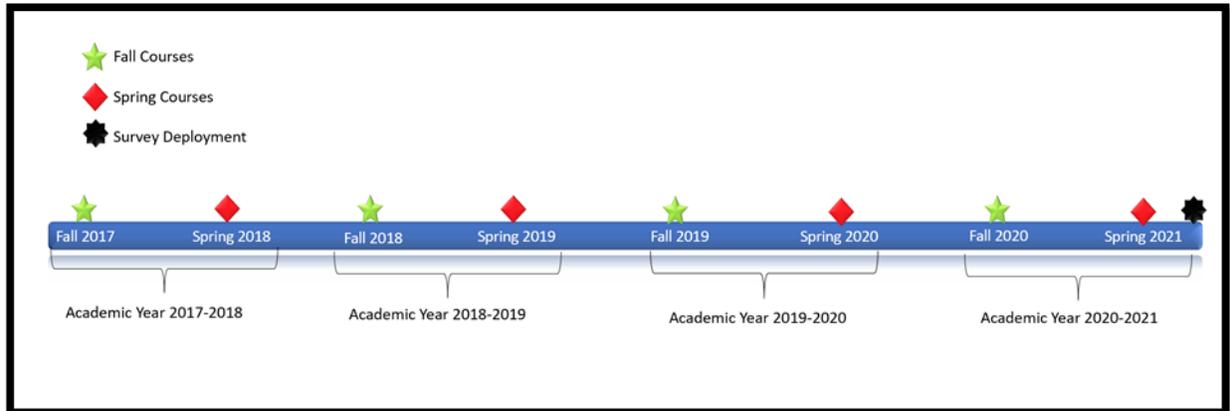
Note: Timeline of Semesters included in Phase One Study and Survey Deployment for Phase Two

Appendix B

Table B1: Phase One Study Statistical Analyses for Student Outcomes Data

Research Question	Independent Variable	Dependent Variable	Analyses
What is the relationship between academic programs and course specific outcomes?	Academic Years	Course specific outcomes, Academic Programs	ANOVA, Chi-square, Cramer's V

Note. Statistical Analyses for Phase One

Appendix C

Figure C1: VosViewer Analyses of Research Gap based on study keywords

Figure C2: VosViewer Analysis of HRD related themes and keywords

Note: VosViewer analyses of over 1000 related manuscripts via Google Scholar correlated with the manual literature review revealing quality, online learning, and teaching as research gaps.

Appendix D

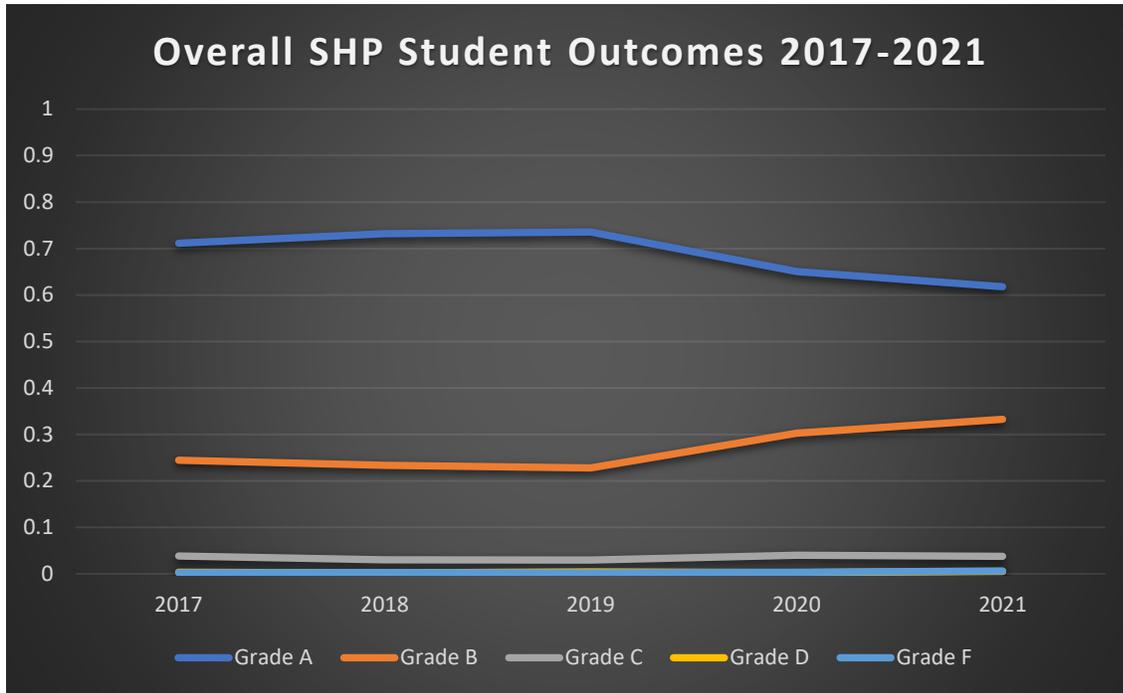*Figure D1: Phase One Study Results*
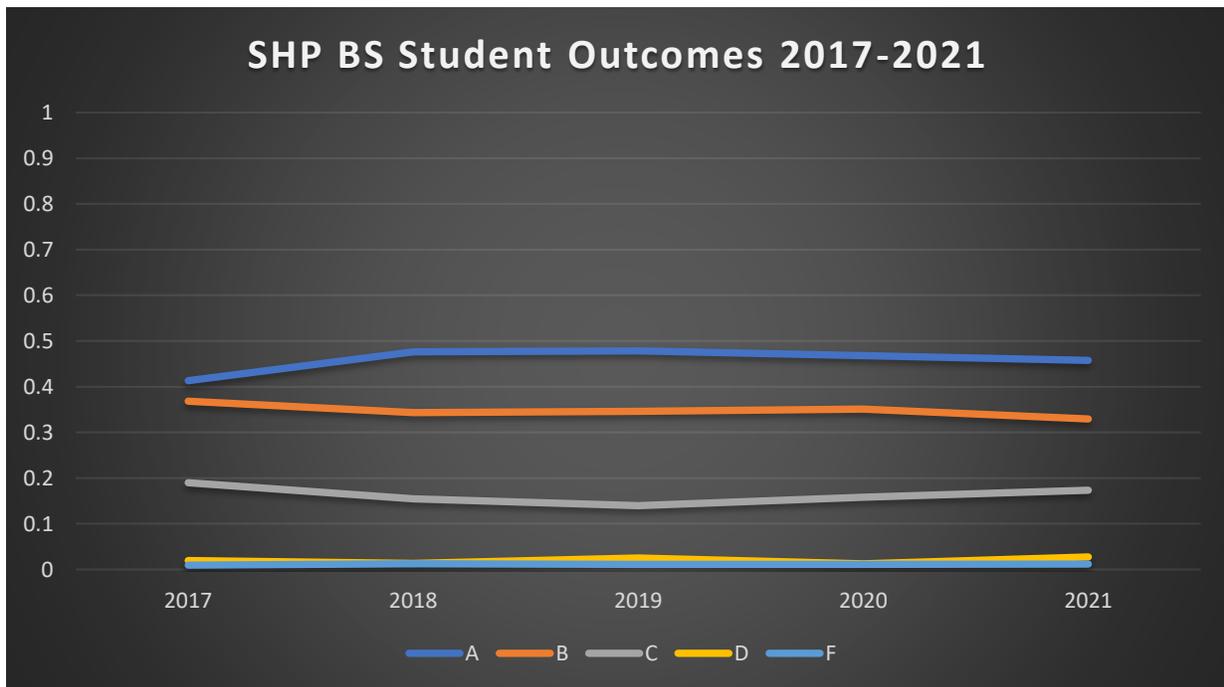

Figure D2: Phase One Study

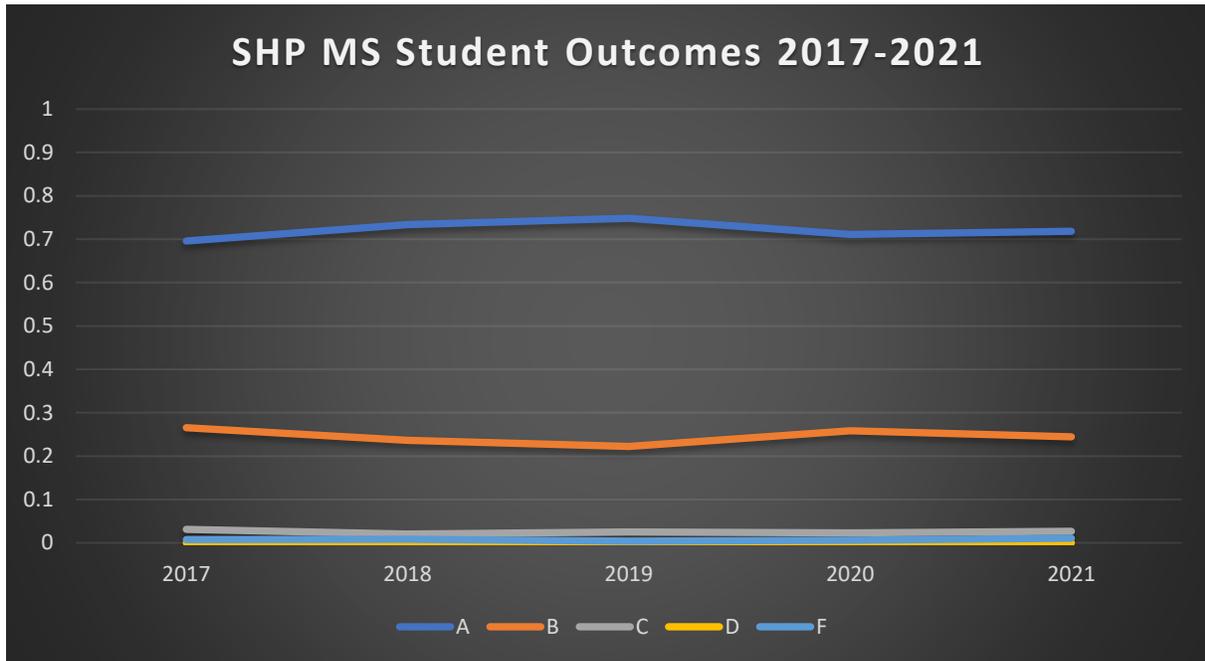*Figure D2: Phase One Study*

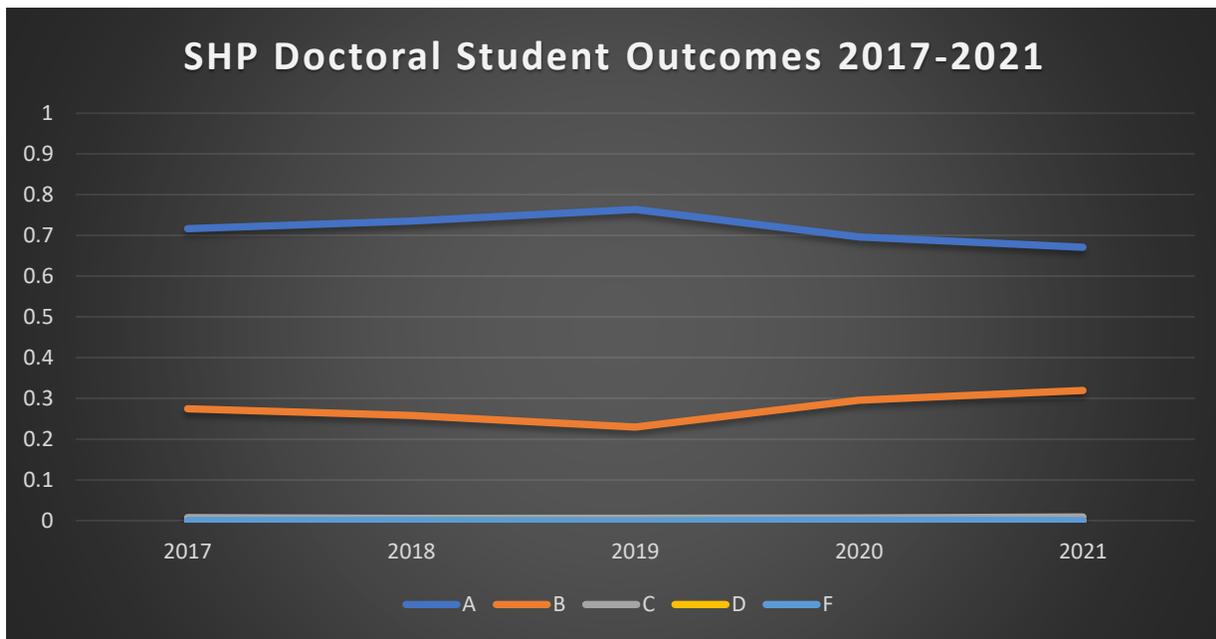*Figure D4: Phase One Study*

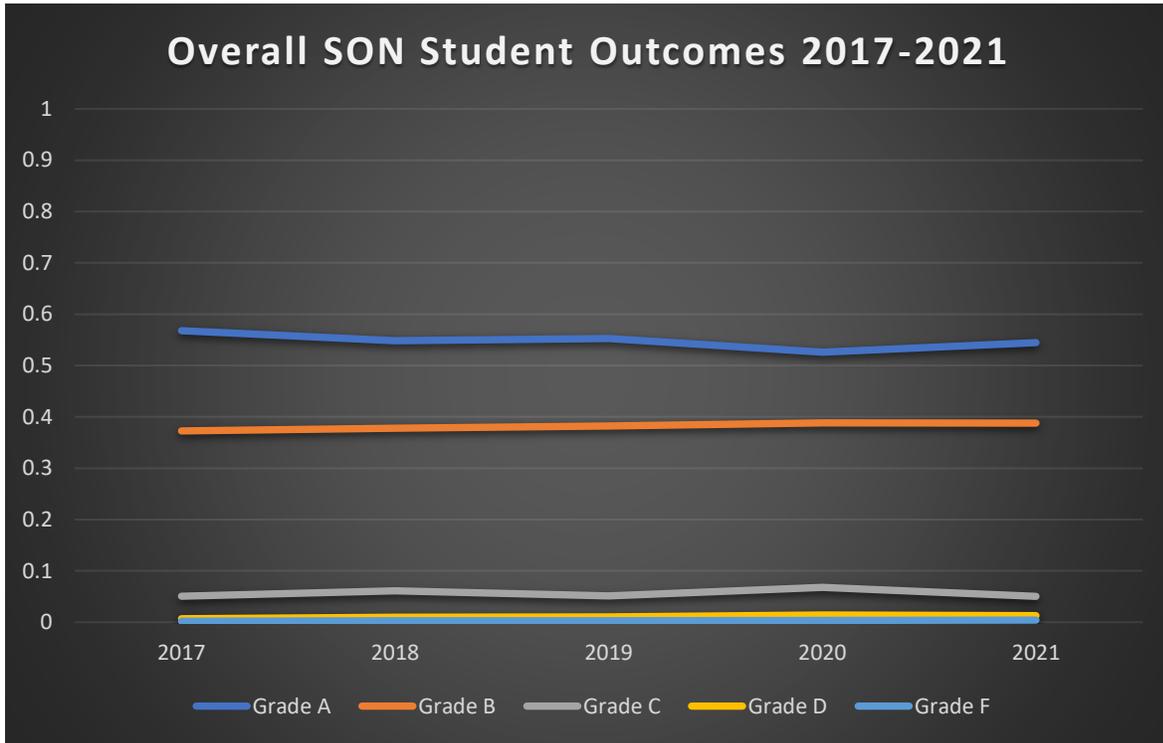*Figure D5: Phase One Study*

Figure D6: Phase One Study
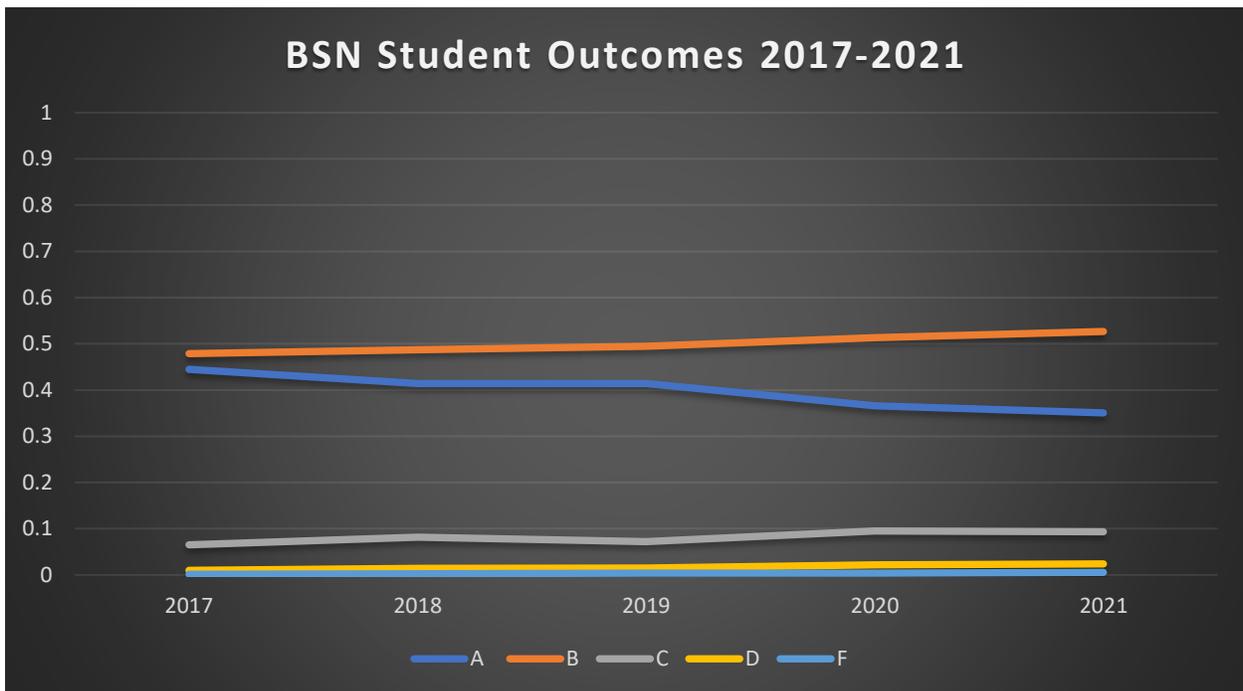
Figure D7: Phase One Study
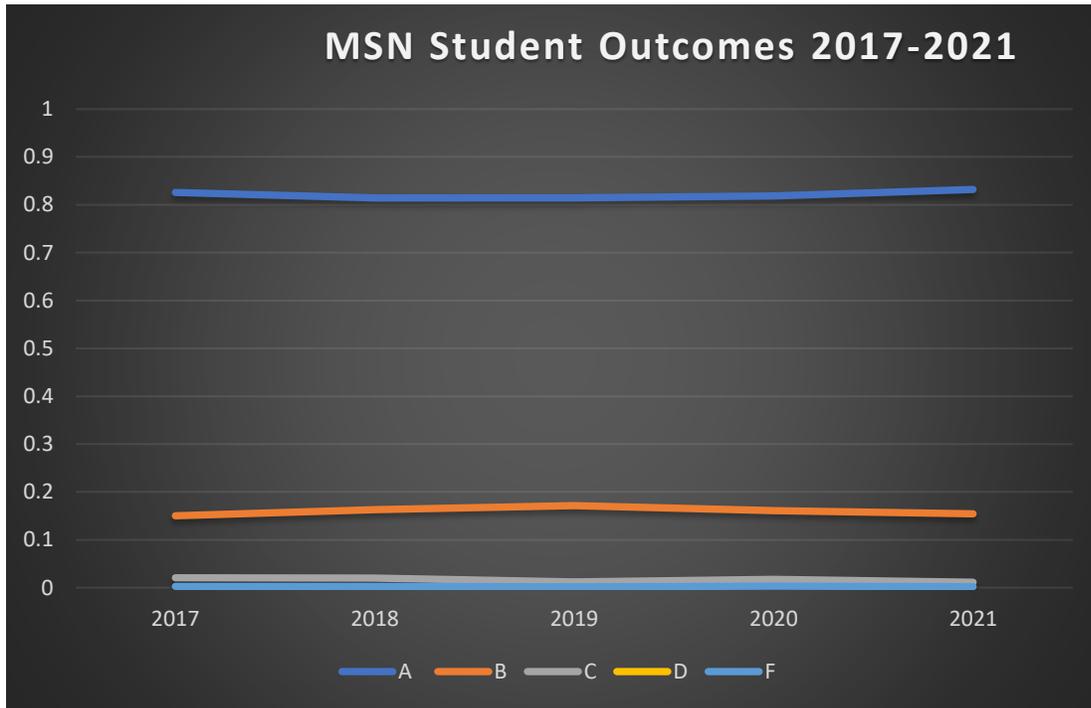
Figure D8: Phase One Study
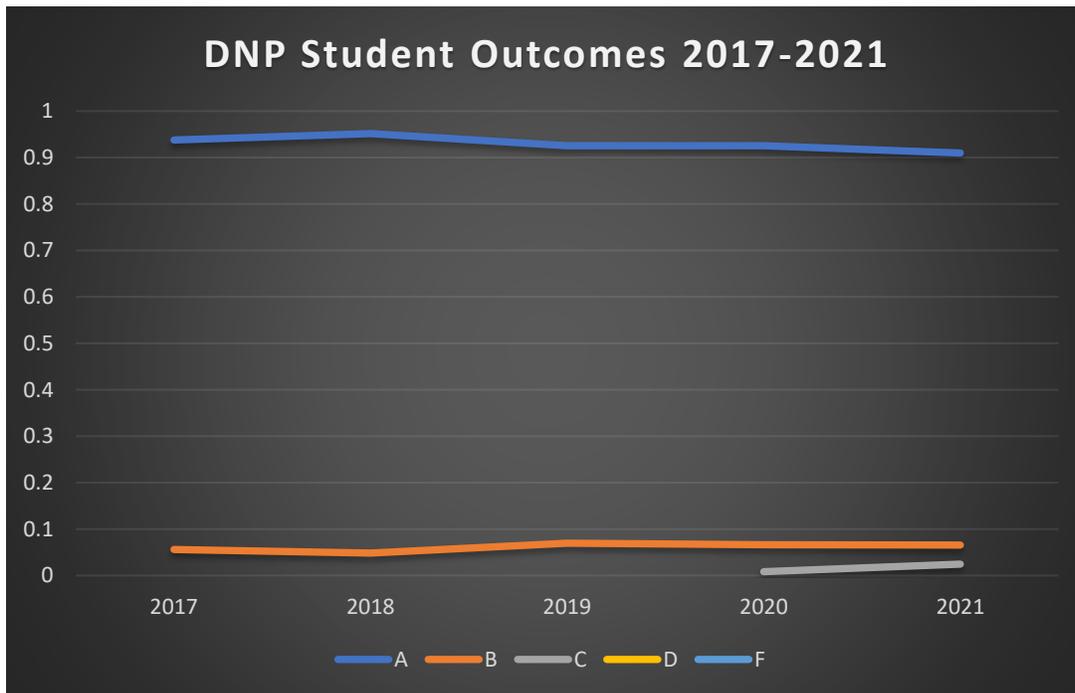
Figure D9: Phase One Study
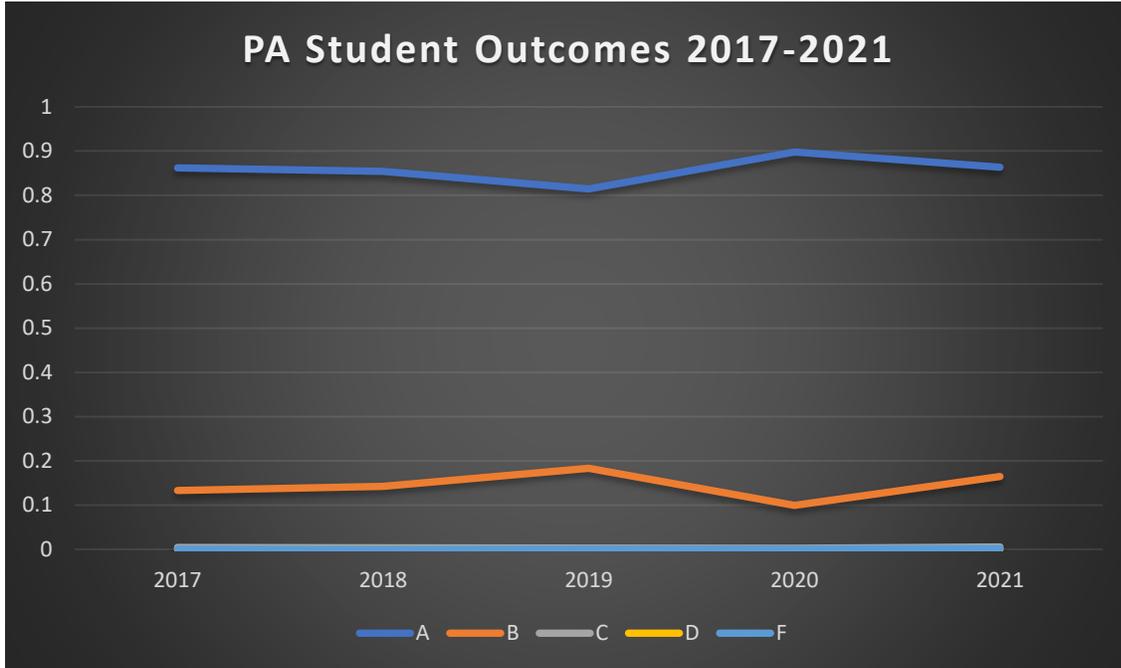
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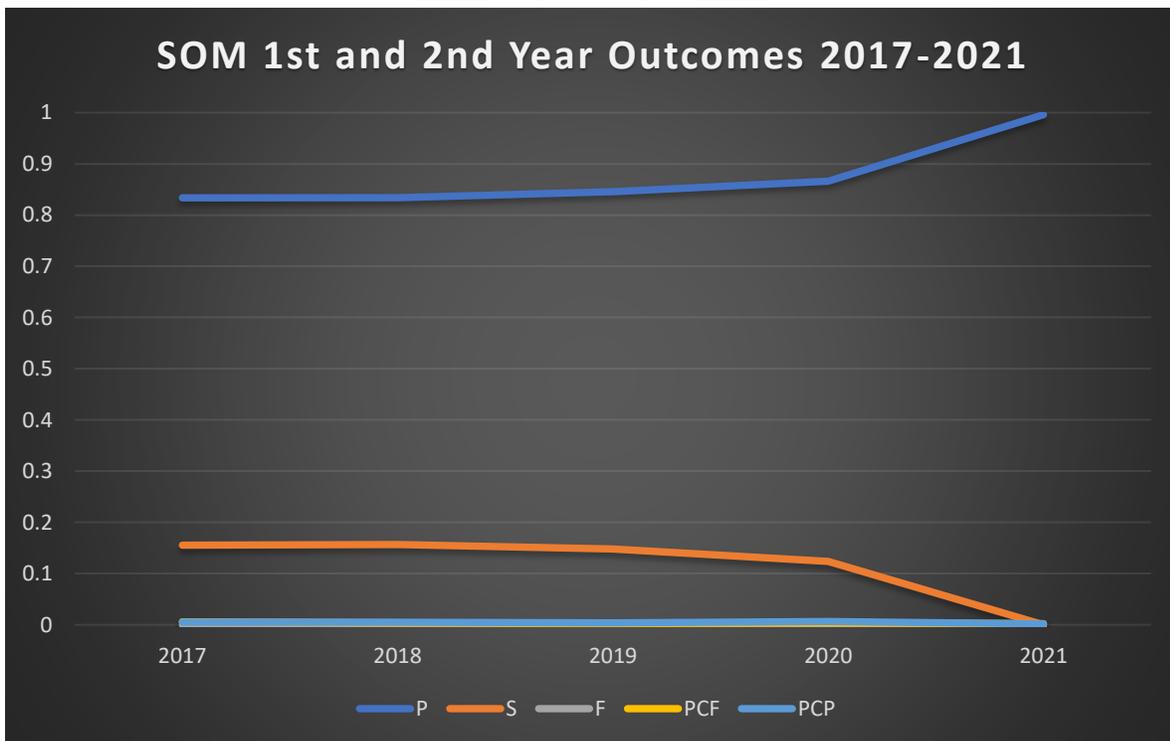
Figure D11: Phase One Study
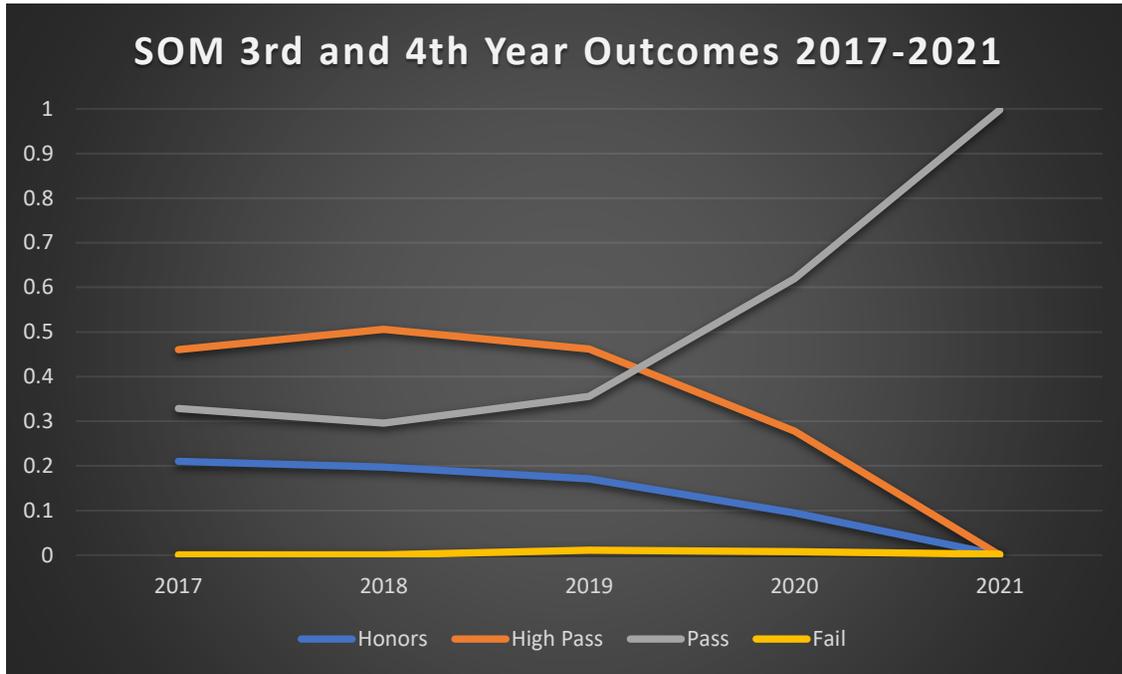
Figure D12: Phase One Study
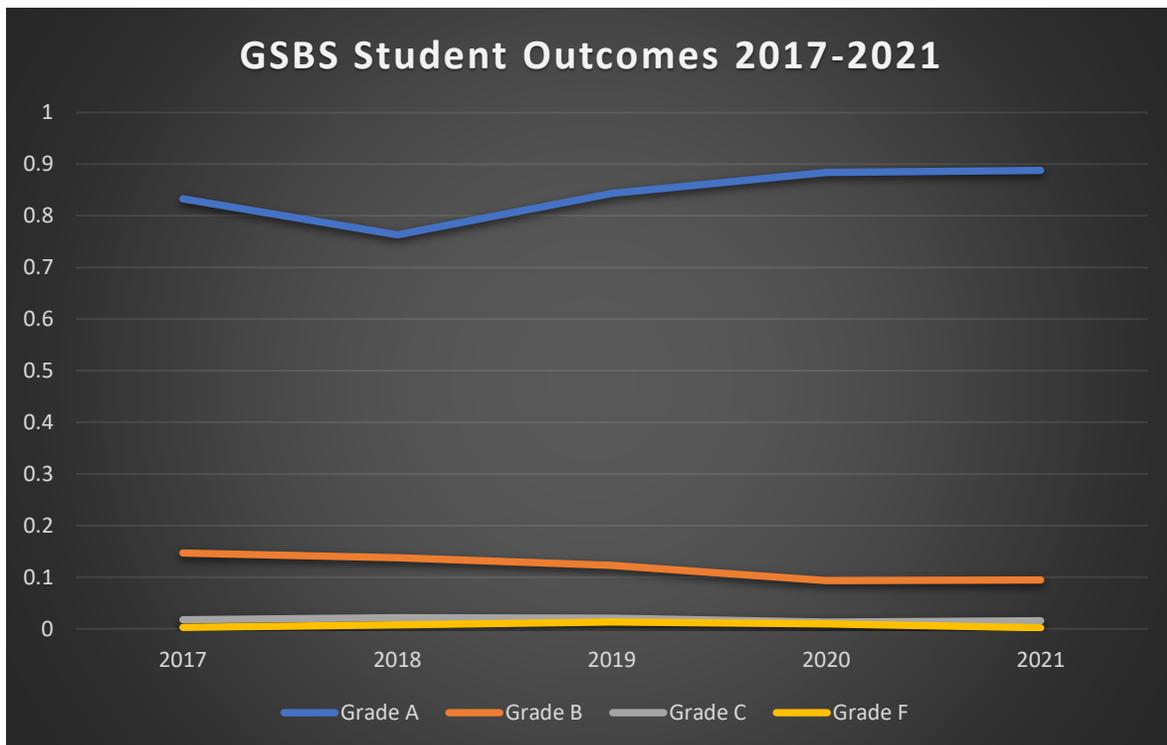
Appendix E

Figure E1: Phase Two Study
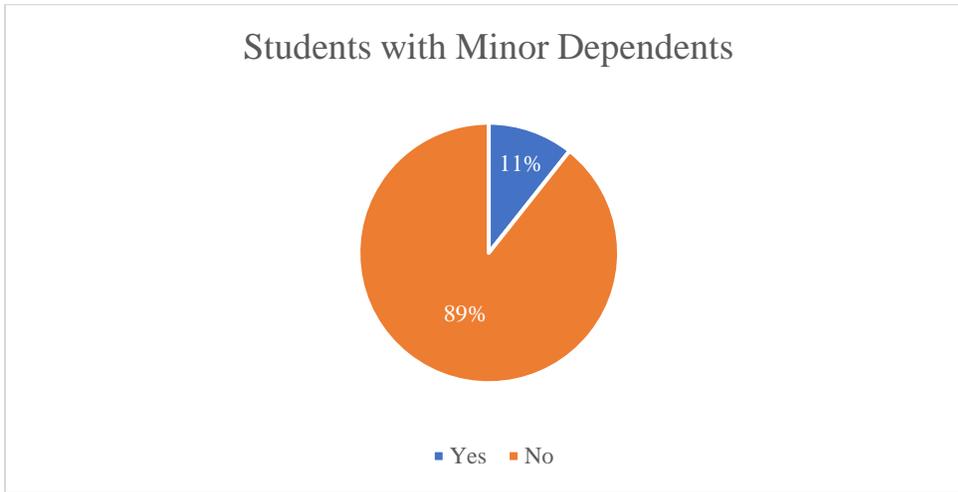
Students with Minor Dependents

Note: Percentage of Students Respondents to 2021 Annual Student Satisfaction Survey with Minor Dependents (18 years of age or younger).

Figure E2: Phase Two Study
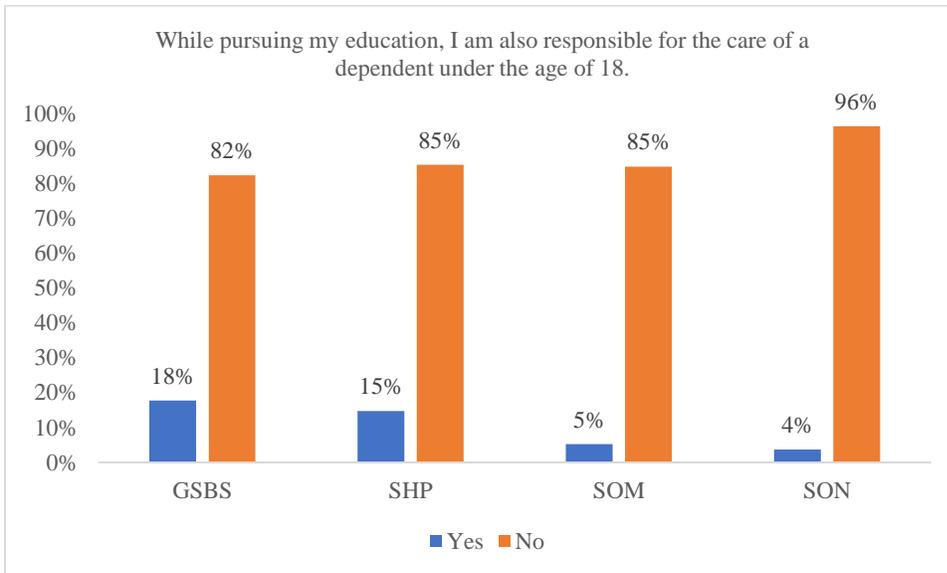
While pursuing my education, I am also responsible for the care of a dependent under the age of 18.

Note: Percentage of 2021 Annual Student Satisfaction Survey Student Respondents by School with Minor Dependents.

Figure E3: Phase Two Study

I am responsible for the following number of dependents under the age of 18:
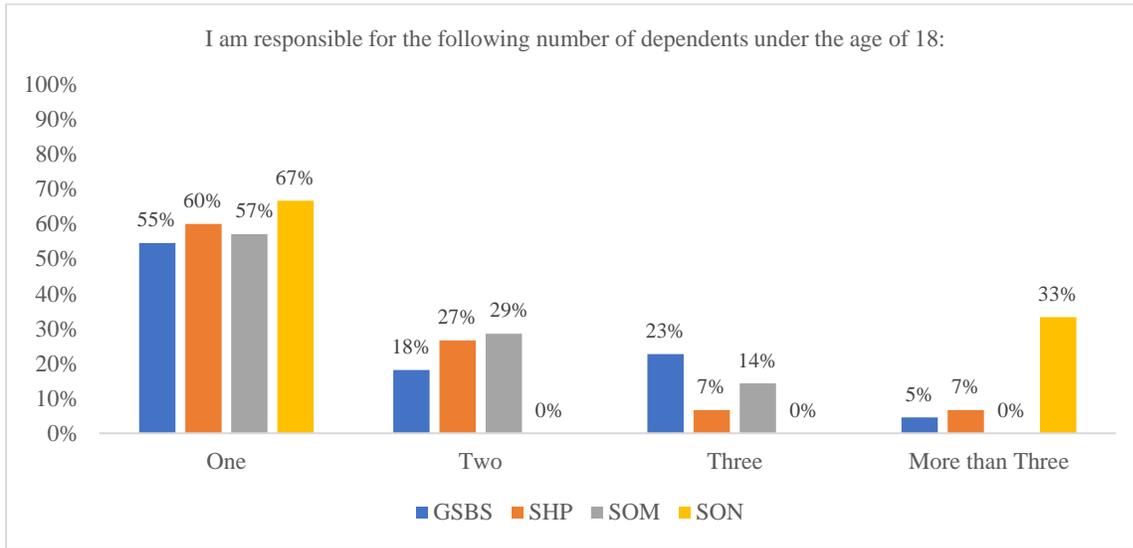
Note: Breakdown of total number of minor dependents for 2021 Annual Student Satisfaction Survey Respondents by School.

Figure E4: Phase Two Study
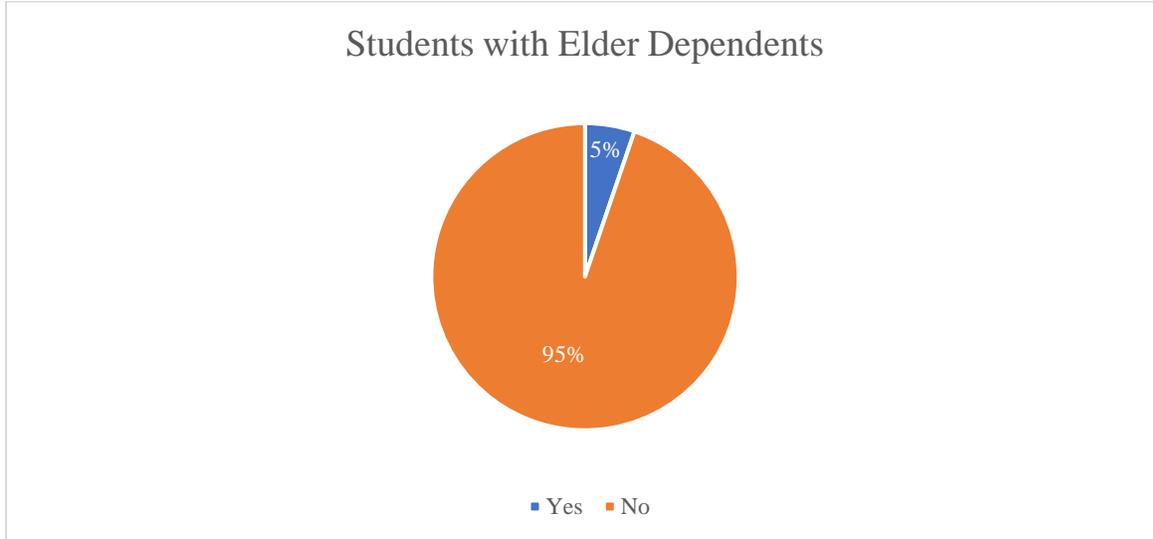
Students with Elder Dependents

Note: Percentage of Students Respondents to 2021 Annual Student Satisfaction Survey with Elder Dependents.

Figure E5: Phase Two Study
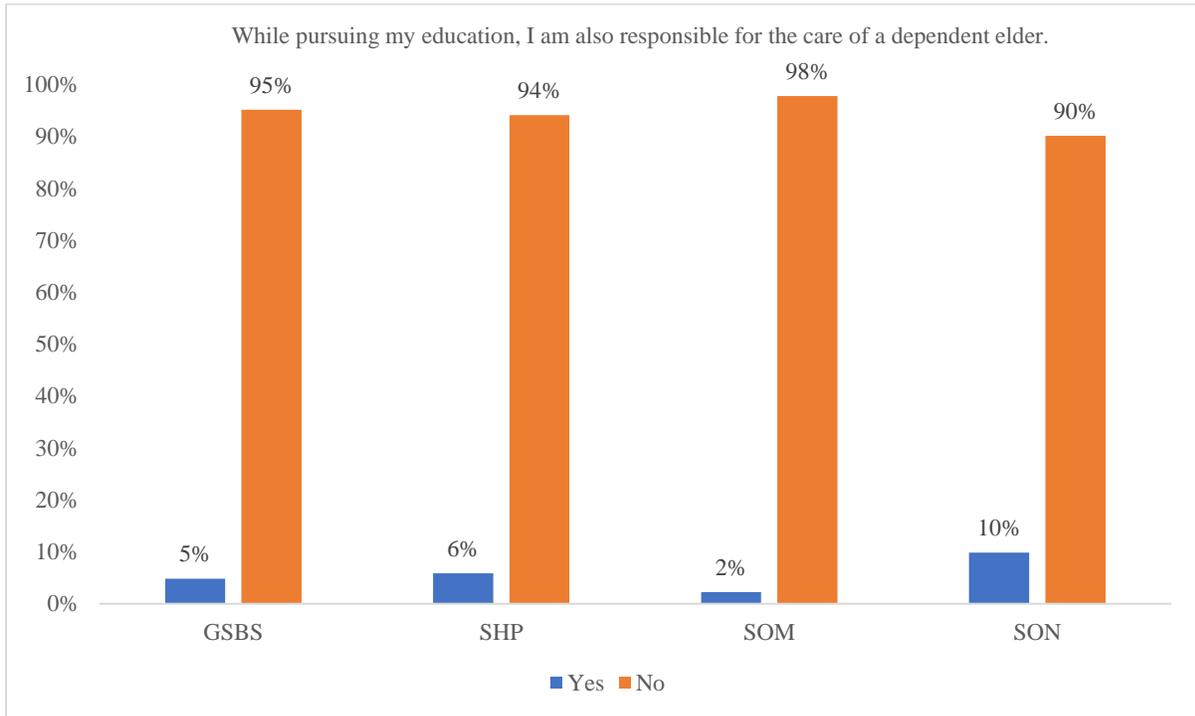
Note: Percentage of 2021 Annual Student Satisfaction Survey Student Respondents by School with Elder Dependents.

Figure E6: Phase Two Study
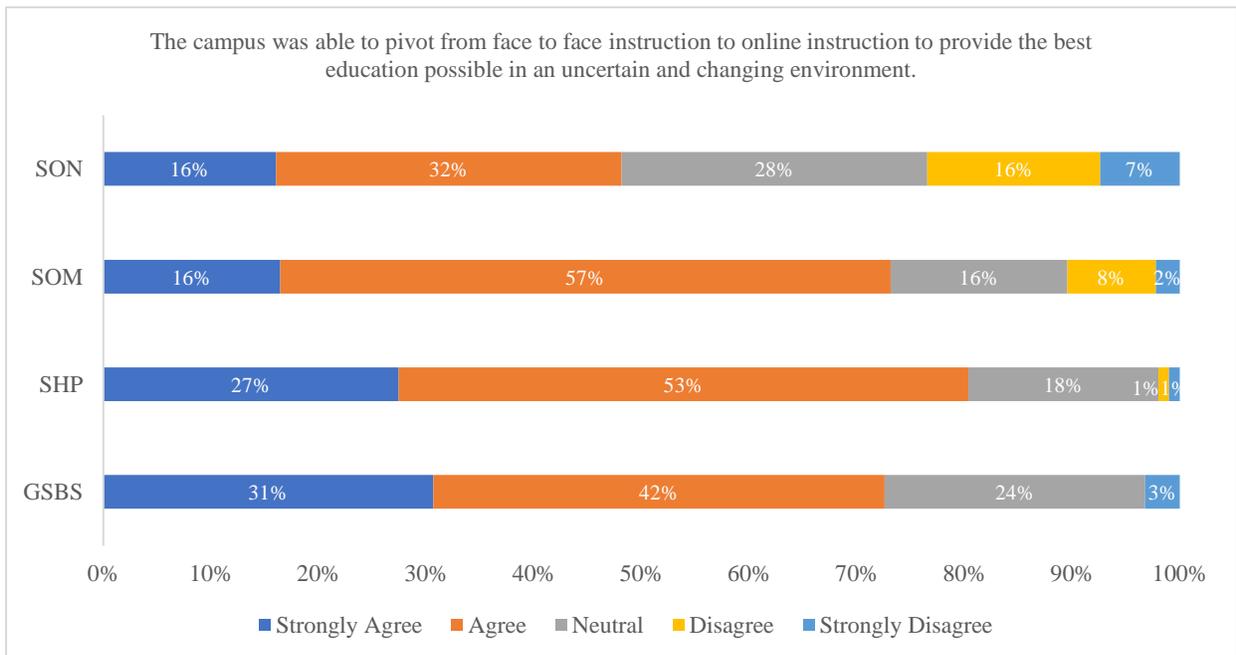
Note: 2021 Student Satisfaction Survey Respondent perception of Successful Campus Pivot to Online and Hybrid learning platforms.

Figure E7: Phase Two Study

The campus has communicated changes, policies, and expectations well through the pandemic.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
SON	19%	40%	20%	14%	9%
SOM	19%	43%	26%	7%	4%
SHP	34%	47%	10%	5%	4%
GSBS	37%	41%	13%	5%	4%
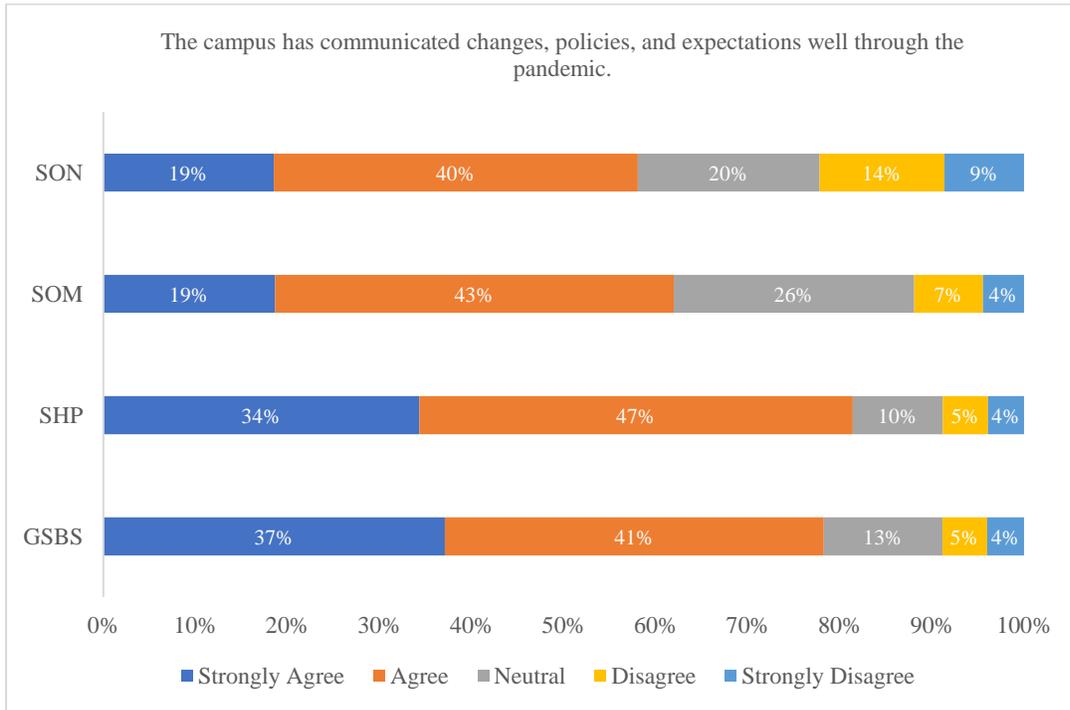
Note: 2021 Student Satisfaction Survey Respondent perception of Successful Campus Communications during the Pandemic.

Figure E8: Phase Two Study

My academic program has communicated changes, policies, and expectations well through the pandemic.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
SON	14%	36%	23%	22%	5%
SOM	19%	40%	25%	13%	4%
SHP	34%	41%	16%	7%	2%
GSBS	40%	40%	14%	4%	2%

Note: 2021 Student Satisfaction Survey Respondent perception of Successful Academic Program Communications during the Pandemic.

Figure E9: Phase Two Study

Campus employees and facilities reflect compliance with COVID-19 prevention precautions.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
SON	36%	43%	14%	6%	1%
SOM	31%	54%	12%	1%	1%
SHP	46%	44%	6%	2%	2%
GSBS	45%	44%	7%	2%	1%

Figure E10: Phase Two Study

Fellow students reflect compliance with COVID-19 prevention precautions.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
SON	32%	41%	19%	5%	4%
SOM	21%	56%	13%	7%	3%
SHP	38%	46%	14%	2%	
GSBS	42%	45%	10%	2%	

Figure E11: Phase Two Study

How confident are you that you could do the following social interaction task with your INSTRUCTOR in an ONLINE course: **Clearly ask my instructor questions?**

Legend: Almost Always, Often, Sometimes, Seldom, Almost Never

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	29%	25%	21%	17%	7%
SOM	38%	34%	19%	5%	4%
SHP	42%	25%	28%	5%	

Figure E12: Phase Two Study

How confident are you that you would do the following social interaction task with your CLASSMATES in an ONLINE course: **Develop friendships with my classmates?**

Legend: Almost Always, Often, Sometimes, Seldom, Almost Never

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	15%	24%	17%	28%	16%
SOM	7%	14%	34%	28%	17%
SHP	14%	23%	31%	20%	12%
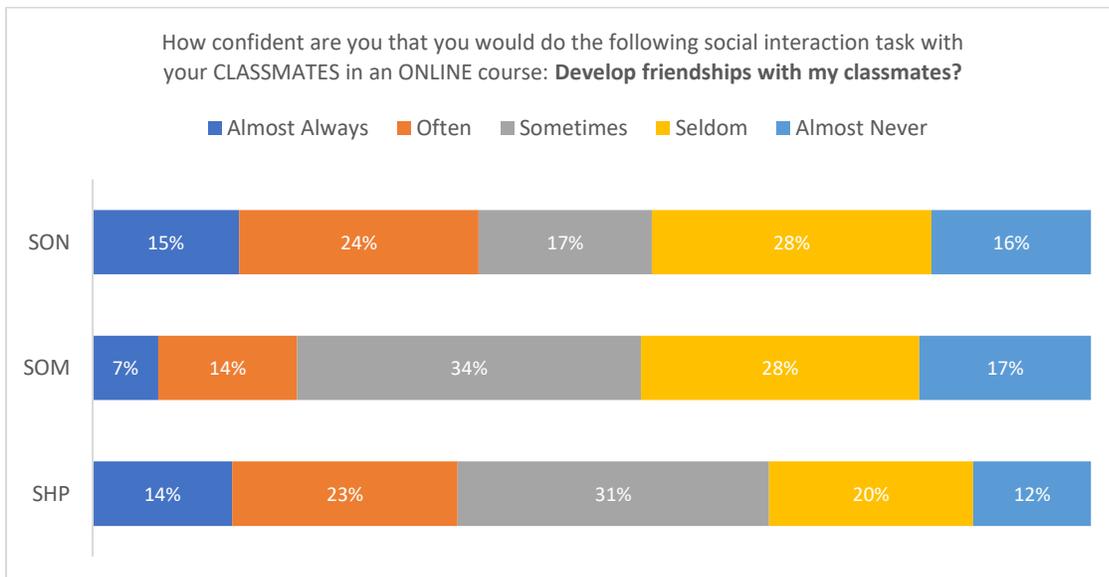
Figure E13: Phase Two Study

I have a **sense of self confidence** in using **computer technologies** for specific tasks.

Legend: Almost Always, Often, Sometimes, Seldom, Almost Never

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	32%	40%	23%	3%	3%
SOM	37%	43%	15%	3%	2%
SHP	38%	43%	15%	4%	
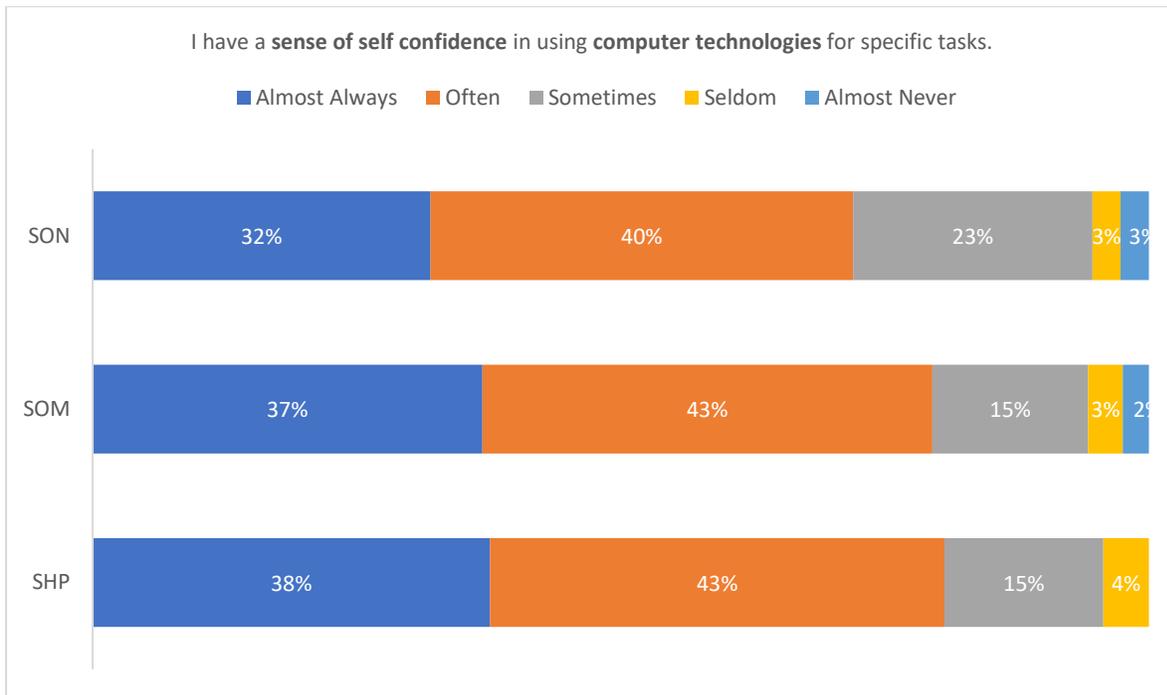
Figure E14: Phase Two Study

I am comfortable expressing my opinion in writing to others.

Legend: Almost Always, Often, Sometimes, Seldom, Almost Never

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	24%	31%	28%	13%	4%
SOM	33%	35%	22%	8%	2%
SHP	30%	35%	29%	3%	2%
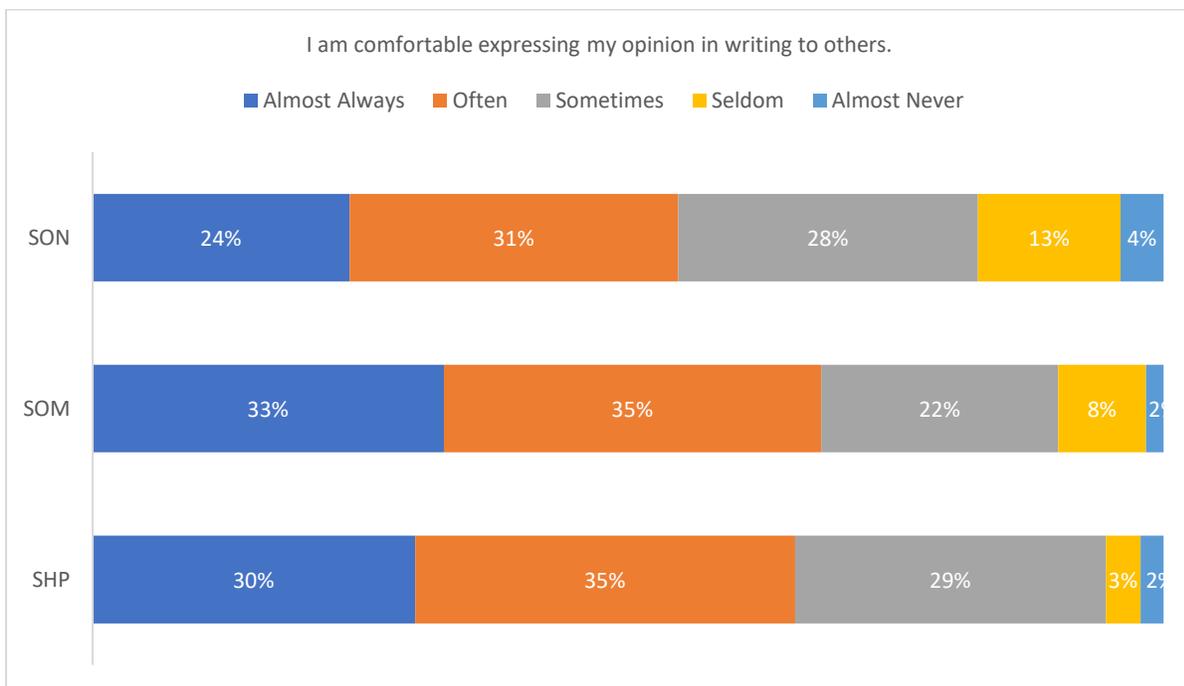
Figure E15: Phase Two Study

What I learned in healthcare simulation is important for my professional practice.

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	33%	29%	20%	13%	4%
SOM	28%	36%	23%	8%	4%
SHP	46%	40%	12%	2%	
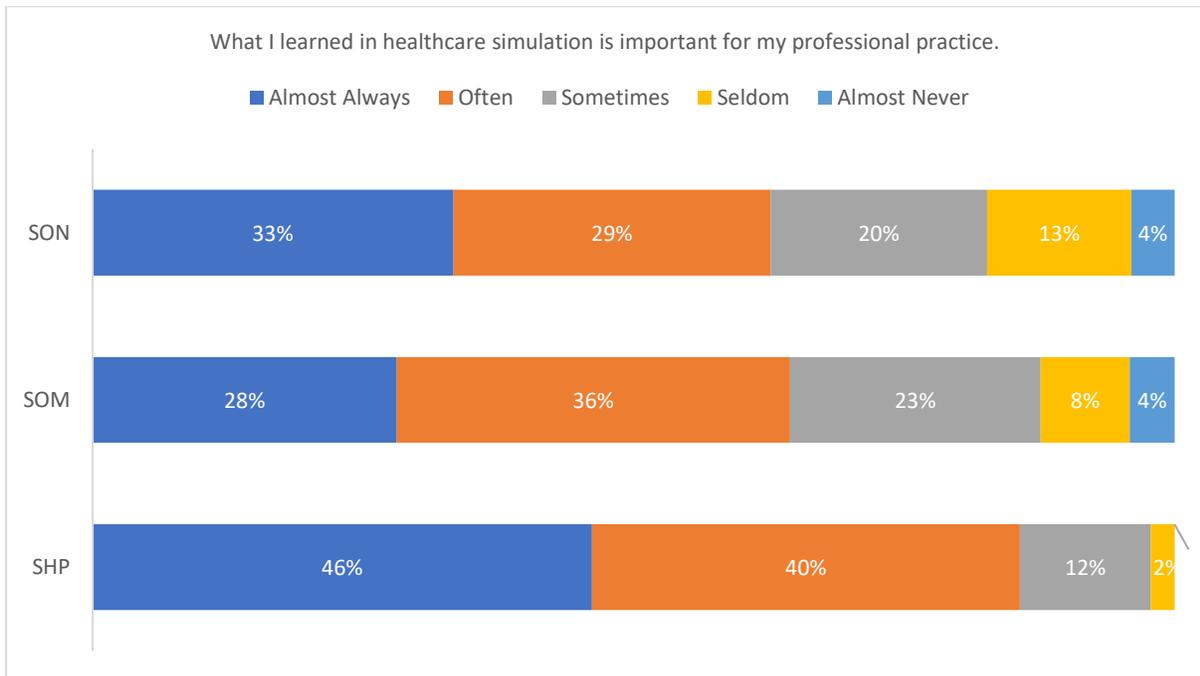
Figure E16: Phase Two Study

What I learned in simulation activities connects well with my professional program studies.

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	29%	37%	17%	15%	1%
SOM	28%	33%	23%	12%	3%
SHP	37%	41%	21%	1%	

Figure E17: Phase Two Study

Healthcare simulation activities stimulate my thinking.

■ Almost Always ■ Often ■ Sometimes ■ Seldom ■ Almost Never

SON: 35%, 32%, 19%, 12%, 1%
SOM: 30%, 34%, 21%, 10%, 6%
SHP: 38%, 36%, 22%, 3%

Figure E18: Phase Two Study

Healthcare simulation activities encourage me to participate.

■ Almost Always ■ Often ■ Sometimes ■ Seldom ■ Almost Never

SON: 29%, 36%, 21%, 9%, 4%
SOM: 31%, 33%, 20%, 10%, 7%
SHP: 33%, 43%, 16%, 7%, 1%

Figure E19: Phase Two Study

Healthcare simulation facilitators model good discourse.

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	29%	36%	25%	4%	5%
SOM	28%	37%	24%	7%	3%
SHP	34%	40%	23%	2%	

Figure E20: Phase Two Study

I make good sense of the simulation facilitator's lessons.

	Almost Always	Often	Sometimes	Seldom	Almost Never
SON	27%	43%	24%	5%	1%
SOM	25%	41%	22%	7%	4%
SHP	28%	49%	21%	2%	

Appendix F

Figure F1: UTTyler IRB Approval

UTTyler
THE UNIVERSITY OF TEXAS AT TYLER

DATE: 09/20/2023

TO: Maria Garcia, MS, MBA
        3900 University Blvd
        Tyler, TX 75799

SUBMISSION TYPE: **Exemption Submission**
PROTOCOL NUMBER: 2023-119
PROTOCOL TITLE: Evaluating Healthcare Student Learning Performance During the Initial Year of the COVID-19
                      Pandemic: A Case Study

IRB ACTION: **EXEMPT DETERMINATION**
APPROVAL DATE: 09/20/2023
EXPIRATION DATE: 09/19/2026
REVIEW TYPE: **Expedited Review**

Thank you for your protocol submission for the above-referenced study. The UT Tyler Institutional Review Board has GRANTED YOUR EXEMPTION REQUEST based on :

Exempt Category (4) Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:(i) The identifiable private information or identifiable biospecimens are publicly available; (ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects; (iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or (iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

*This determination is for a three year period beginning on **09/20/2023** and ending on **09/19/2026**. A progress report will be required prior to this end date if research is still ongoing.*

        Items Submitted for Review:
*   **IRB Exemption Request Submission Form**
        *   **Form26 with LOS and IRB exemption determination (Protocol)**

Institutional Review Board Office
1100 East Lake Street, Suite 330, Box-14
Phone: 903-877-7632
Email: irb@uthct.edu

- *Greg_Wang_CV2022 (Investigator/Research Team CV or Resume)*
- *IRB 21-0046 Exempt Determination (Determination Letter)*
- *LOS_Provost_Mouton (Other)*
- *Maria_Garcia-Villarreal_CV_Sept2023 (Investigator/Research Team CV or Resume)*
- *Student Achievements published online (Data Collection Tools)*
- *Student Outcomes Reports provided by IRB 21-0046 (Data Collection Tools)*
- *Student Survey Responses published online (Data Collection Tools)*

Research Team:
- Maria Garcia, MS, MBA - Investigator

Responsibilities of the Principal Investigator

Research that is determined to be Exempt from IRB review is not exempt from ensuring protection of human subjects. The Principal Investigator (PI) is responsible for the following throughout the life of the research study:

- Ensure that all research personnel complete and maintain all institutional required training.
- Disclose to subjects that the activities involve research and that participation is voluntary during the informed consent process, and provide subjects with pertinent information ensuring that subjects voluntarily consent, unless the requirement of consent has specifically been waived by the IRB.
- Assure that subjects will be selected equitably so that risks and benefits of the research are justly distributed. Assure that the privacy of the subjects and the confidentiality of the research data will be maintained appropriately to ensure minimal risks to subjects.
- Closure Request: Upon completion of the study, a Closure Request must be submitted to the IRB.
- Unanticipated Problems: Any unanticipated problems or complaints must be reported to the IRB immediately.
- Progress Report: A 3 year progress report must be submitted if the study will continue beyond the original determination period.
- Modifications: Modifications that affect the exempt category or the criteria for exempt determination must be submitted as a modification via IRBManager. All other changes to the research should be discussed with the IRB office prior to implementation for determination if a modification submission is required.

All research must be conducted in accordance with this approved submission. Any changes to the research must be reviewed and approved by the UT Tyler Institutional Review Board prior to implementation, except when necessary to eliminate an apparent immediate hazard to the subject.

The UT Tyler Institutional Review Board is organized, operates, and is registered with the United States Office for Human Research Protections according to the regulations codified in the United States Code of Federal Regulations at 45 CFR 46 and 21 CFR 56. The UT Tyler Institutional Review Board operates under Federal Wide Assurance Numbers: 00003494, 00006044, and 00009775.

Any complaints or issues of non-compliance must be immediately reported to this office. If you have any questions or comments about this correspondence, please contact the IRB Office at 903-877-7632 or irb@uthct.edu

Sincerely,

The Institutional Review Board

<div align="center">

Appendix G

</div>

Survey response example: SOM respondents

Please make any recommendations for improvement regarding your overall experience or the institutional environment at UTMB.

Administration is extremely resistant to feedback and requests from students during difficult situations like severe weather disasters. Administration is also convinced they "have always done it this way" and fail to consider how they must be more lenient to students during COVID with regards to deadlines, expectations but in the same turn/email demand that same leniency from students.

Faculty are far too concerned with students following attendance policy to a T and holding students immaculately accountable to every attendance quiz missed, any technical difficulties, all inconveniences and extenuating circumstances are burdens ultimately shouldered by the students at the admin's/coordinators/facultys' luxury. If students are exceptionally stressed due to study time reduced by severe weather, admin would rather students just deal with it and see if the exam results suffer enough to warrant a curve. Unfortunately, the mental toll has already taken effect on students' health by the time performance markers come in.

COVID/online instruction ultimately demanded more from students, I saw classmates attend PBL even though they were extremely sick, febrile, in pain, just got discharged from the ER, and many other valid reasons because they were afraid of how missing class would affect their performance. There needs to be a lot more emphasis on the permissibility and encouragement to take health days/mental health days for the wellbeing of the student body. In the end, we are students, not doctors, and taking a day off when we need it affects no one's health but ourselves. There is this pervasive idea that we need to ""suck it up"" now because we won't be able to afford these leniencies in the future which is only enforcing physician burnout/depression rates/suicide. Taking off days from mandatory class is more effective and rejuvenating than mandating wellness sessions and provides immense relief to students.

Above all, students deeply missed a sense of understanding from faculty/admin. There needs to be a lot more proactiveness from the administration/faculty in taking care of student wellbeing, being flexible, understanding, accommodating. The students that make it to med school are exceptionally responsible adults, time-efficient, are not looking to take advantage of the system, and deeply value their education. They do not need to be policed as much as they are regarding their attendance and performance. When they do have trouble, they often get more stressed trying to defend their extenuating circumstance to unsympathetic coordinators/faculty who are more interested in laying down the law to the letter. A few facilitators have demonstrated this

rapport/understanding, but they are an exception and not the norm/representative of the school culture.

Ultimately, this year has been difficult for students, and we have yet to catch a break. Please be kind to your worried, proactive, worn thin medical students. We've performed beyond all humanly reasonable expectations and are waiting for you to lower the bar just a little.

As a Houston-based UTMB medical student, I felt that UTMB did a terrible job of offering resources and study spaces in Houston.

Better and faster communication between admin and students, communication for MS1 is horrible and we had to learn info within days of exams this past year.

Bring back the ping pong tables. The school should have more interprofessional events to help students meet students in the other schools

Communication has always been an issue. Communication is either lacking, delayed, or incongruent with previous communication.

Decrease tuition

Extending WiFi acess to have a constant connection outside of the HEC and library so that students are encouraged to be outside to study. This could help wellness for sure.

Faculty communications could be more professional.

Faculty in SOM needs a do over. There are too many toxic people in positions of power and as long as they stay there, nothing will ever change no matter how many surveys you send out or how many professionalism seminars you hold. You need to get rid of everyone and start over fresh.

Given the COVID pandemic, I understand the restrictions but compared to other medical programs within the institution, the PA was extremely limited of what we could /could not do. I would have appreciated more hands on learning and help from faculty to prepare for clinicals.

Great educational experience.

HEC study rooms should be open!

I am a first-year student, so I am not sure how campus normally operates, but it appears to be lacking in relaxation/social spaces and areas to store personal belongings.

I don't know why the study rooms in the HEC are going to be rented out. That sucks

I enjoy the cleanliness and accessibility of the campus. Everything is well maintained

I have never seen the inside of a classroom.

I have seen non-UTMB affiliated people without ID badges in student buildings, so potentially brainstorming additional layers of security would be beneficial.

I marked disagree on #13, but I would contact a professor or Dr. Woods. I'm just not sure if that's the "best" approach. I marked disagree on #16 because the rec area in Old Red seems closed to socializing due to Covid.

I wish I could, but I haven't really gotten to see much of campus this year.

I wish PA students had access to simulation labs to practice clinical skills (i.e suturing, venipuncture, etc) like the medical students do since we are all in the School of Medicine.

I wish program/clinical/didactic directors listened to student feedback more. I wish I felt like I wasn't just a "class of students moving through the program" and more liek a student they cared about and wanted to help find success. Some professors do, but I don't feel that way from the school.

I would have preferred more areas available to study independently, but I believe the HEC provides more access to those areas than I had available during my MS1-MS3 years.

Increase spaces with comfortable chairs to study. Or couches with tables work too. It hurts my but from sitting for too long studying.

Just a reflection on this survey you didn't ask for-- question #8 is vague. What does "harmony" mean?

Keep making the pushes forward for improvement in all areas, whether diversity, educational goals, safety, etc.

Library should be open on the weekends.

more food options, a student lounge for every rotation or a dedicated student room in the hospital.

More secure environment. More places to study for students. More student engagement with food and snacks

One big issue I have is not knowing who to contact for certain issues or if I would like to give feedback about a department. For example, I really don't know who to contact if I am concerned for the mental well being of a student. I don't know who to contact to give feedback about student health and or who to tell that they have mistreated me and others in the past. I don't know who to contact about giving feedback about signing up for clerkship tracks (specifically about having no guidance about which tracks would be best if you're interested in a particular specialty) and about not getting a career advisor even though I was promised one multiple times in the past.

Open up the study rooms at the HEC and make it 24 hours for students!! I am tired of having to find random times to study and back ways to get in just so i can study. This is normal in UG institutions. At least 24 hours for 5-6 days

PA faculty need to listen to student input more 3specially before forcing third party paid services on us. Lecturio still feels like we were forced to burn over $200 on a service we barely used. Thwt money would have been better put towards a board prep resource. PA students need something like LSTAR to practice surgical techniques before rotations. We have no one to contact if we feel like we are having concerns or problems.

Please make more study rooms accessible! And at one point the library was barely open. That's as terrible.

Please open up the study rooms at HEC.

Some faculty couldn't be more exceptionally courteous to the students (Dr. Farr, Dr. Karnath, Dr. Self) but others have been surprisingly callous towards students in the past.

the homeless that come on campus make me very nervous. as someone who comes from austin, what happened to haruka weiser comes to mind. most homeless are good people, but there's always those who aren't. and that's what happened to haruka. i don't want that to happen to me on UTMB's campus, so I try to avoid the homeless walking and sitting around on campus. it makes me very uncomfortable to see them there.

The University of Texas Medical Branch is not called to be a "woke" institution. It is to teach medicine. IF there is any discrimination happening it's in the opposite direction of the the political spectrum than you are thinking...

There has been coyotes on campus.

Would like to have more access to study rooms

N/A (2)

Please make any recommendations for improvement regarding the UTMB academic experience.

"Teaching" mainly consists of reading powerpoint slides to the class during lecture.

Accessing UTMB Student services- every time I call student health they send me to voicemail. I have called 3 times and left a voicemail each time and they do not return my calls.

Both our POM and pre-clinical curriculum are outdated. They should be updated, shortened, and the arbitrary OSCE criterion designed for Step 2 CS should be removed/changed

Distance learning has made things difficult, so I don't think I got as good of an education as previous years. However, the faculty has tried their absolute best to make up for this. Unfortunately, some things just don't translate to distance education

Everything feels more up to the students rather than actual teaching. At this point, I don't need a medical school if I'm just using external resources to study. It's very frustrating

I am paying full tuition for online classes for the past year. I would like to be reimbursed for the resources I am not using due to COVID19

I believe that resources such as Sketchy, Boards and beyond, Pathoma, STEP1 First Aid, should be part of our materials provided similarly to how we are provided uworld for year 2 and year 3

I believe the adoption of using common outside sources (as done in NHB this year with utilizing Boards and Beyond) is a great idea. Boards and Beyond, Pathoma, Sketchy, and Amboss are all resources that I use almost exclusively in my education.

I don't even know what is meant by "program faculty" or by "UTMB student services" exactly. Who are these people and which departments are included in these groups? I think that the administration should be better outlined for us so that we know who we can go to for certain concerns/questions.

I don't feel that the curriculum is up to date with current medicine. I also dont feel that all faculty really want to be educators so our education suffers during rotations where the faculty treats us as in the way or relies solely on residents to teach. Residents often teach us but are overwhelmed with their own work.

I have been very underwhelmed by the mistakes that faculty make in teaching us medicine. There seem to be too many "let us get back to you with the correct answer".

I have reported several PBL cases that are insensitive. It seems like our curriculum reps, the diversity office, and the anti-racism task force take those concerns seriously, so I appreciate their willingness to investigate my concerns. I would like to see more questions about socioeconomic influences on patient care/outcomes built into the PBL cases.

I think the teaching experience has been poor and lecture material is not always related to testable material. I wish our program was not taught by just reading powerpoint slides and had more interactive lectures.

I wish we also had access to SmartyPance, RoshReview, and Sketchypharm/micro as resources instead of PAExcel which is poor quality. I also wish the PA program followed the same grading and remediation standards as the School of Medicine instead of its own even though we are part of the School of Medicine.

I wish that we would have more hands on instruction instead of having to teach ourselves the entire year, especially with physical exams and special tests maneuvers. I can only rely on YouTube and online resources so much.

If there are feasible things that could positively affect the experience of a few students, it would be nice if specific program administration members were more open to listening to those recommendations by student liasons or leaders.

Important outside resources that are required for passing exam/boards should be included within tuition. We have to access multiple different outside resources due to the lack of proper instruction/teaching and these resources are costly but necessary.

It would be helpful if UTMB considered and further supported the use of third-party subscriptions such as Boards and Beyond, Sketchy Micro/Pharm, Rx, and Amboss for their medical students. These programs are excellent study tools, for both STEP-specific studying and for course studying aimed at NBME exams. Further funding toward these subscriptions for their students would lift a burden and a potential for academic inequity in the long run, considering these services range in costs from $200 to $800 each. I understand they are outside the explicit realm of UTMB's organized curricula, but they are being used by some students to achieve

excellent results on exams in a very efficient, organized manner. Providing these services (or many of them) to all medical students would remove cost-related inequities with concern to access to such valuable study services.

More access needed for PAs to learning resources like LSTAR etc

Need more availability at the student health clinic. Appointments can be full for weeks in advance.

Offer study spaces and more mentors in Houston for Houston-based students.

Our program needs to shift to a 1.5 pre-clinical/1.5 clinical model similar to most other Texas medical schools, especially with the expected deemphasis on Step1 after it shifts to pass/fail.

Overall it has been an incredible experience. However, one thing would be expanding access to the faculty for more individual and small group advising meetings and mentors.

Please improve PBL facilitator training. And until then, stop making PBL so heavy on tests.

provide more proactive programming to equip students in building exceptional applications for residencies in light of step being P/F

SOM lectures are not relevant to board exams. UTMB involves a lot of wasted time at the hospital doing nothing then going home and studying online resources to pass

The curriculum covers a lot of information that isn't necessarily relevant to USMLE board exams. But I suppose that's not all that matters

The first two years of in classroom learning (lectures) is virtually no teaching

The HEC needs to be explained to medical students because there is this huge new building with tons of resources but we don't know anything about it. How do we access it? What can we use? What are the resources available there?

The professors in my program could do a much better job of organizing lectures and lecture times better. There were too many times where last-minute and unanticipated attendance was expected of students. Additionally, this may not be the fault of my program's faculty, but I noticed that medical students are afforded privileges (e.g. standardized patients) that PA students could equally benefit from. It would be awesome if the SOM treated their PA students with as much educational priority as the medical students.

There is only so much "flexibility" you can expect students to have, especially those who are unfortunate enough to have started school in the middle of a pandemic. Having online classes does not mean that we have more free time outside of class, as we are actually spending more time seeking information from outside resources in order to supplement what was lacking from our online lectures. Also posting several lectures covering testable material outside of designated class times and lectures that go longer than allotted hours only puts us further behind. Faculty should be as "flexible" as they expect their students to be and realize that piling on more information and expectations only adds more stress to the students lives and affects academic performance and the sought-after "good mental health and study/life balance" they keep touting us to find without giving us an opportunity to do so.

Too much paperwork in 3rd year, vague syllabi, surgeons can be rude to everyone but the patient

UTMB seems to be stuck in certain ways of learning that may be considered old or outdated by some (in-house lectures, PBL, etc.) and does not do a good job of emphasizing goal-directed learning- that is to say, directed towards excelling on the NBME board exams. Faculty often frown upon or make negative comments towards 3rd-party resources that most students rely heavily upon to prepare for the vast content requirements encompassed by the national boards. The content coverage provided by UTMBprovided learning resources amounts to roughly 50% of the content students are expected to have a grasp of for the national boards. With the preclinical years being as short as they are, it makes little sense why some curriculum/course directors emphasize learning for what lies beyond board exams (learning to be a real doctor) rather than facing the reality of a defunct system where so much of students' future profession as a physician rides on exam performance.

UTMB SOM courses need to be restructured and taught by MDs so we have relevant information going into board exams

We paid $25k this year to take our exams online and find our own study resources, risked our lives in clinicals because we were not given PPE even if we requested it, vaccine rollout was extremely disorganized for students, PA students have not had faculty hour since July 2020 because faculty is clearly disinterested in whatever we have to say, my only recommendation is to find new leadership and decrease the amount of faculty since half of them have not even been present anyways this past year

N/A

What has UTMB handled well with pivoting educational experiences because of the COVID-19 pandemic?

administering curriculum in online format

All

anatomy lab

At the beginning of the pandemic last year the town halls were really helpful in staying informed.

Clerkships progressed during Pandemic. We were able to complete requirements despite needing to work remotely.

creating online electives

Easy access to professors, keeping the BlackBoard pages updated, clear expectations of classes

Email updates

Everyone did a great job of coming up with ways to go virtual when it was needed.

Faculty have adapted MS2 courses generally well to be completely online

Getting us vaccinated

Giving options and waiting until more information is available before making decisions

It was handled very well and students' safety was priority.

Keeping Staff, faculty, and students as safe as possible.

Making PBL an online activity was by far the best pivot that could've been made. The next step is to make this event non-mandatory or re-vamp it in a way that focuses more on doing practice questions/working through clinical vignettes that I find far more helpful in terms of developing clinical reasoning skills.

Most of the faculty try to take advantage of interactive tools like Poll Everywhere.

Overall zoom lectures go smoothly.

Overall, a lot of our courses have been okay mainly because we are able to learn the material through Boards and Beyond. One good thing was stating which videos to watch for some of the classes since this was by far the easiest resource to access during the pandemic.

Provided education. Has been cautious with gatherings.

Providing study spaces, encouragement, and reminder of mental health resources.

Reorganizing courses for COVID

Scheduling zoom classes and having the calendar be updated frequently

Student Health has come up with some fun things (Bingo!) that are virtual

The ability to adapt all classes to an online platform is not easy, and ensuring we are still getting the same quality of education as in years past.

The quick adjustment to online as well as accommodating again when we had issues with exposures in December.

The relative speed at switching to a new unexpected platform

The transition from having to be strictly online in such a short amount of preparation.

They have provided wonderful modified programs, especially in regards to anatomy lab, to accommodate for the COVID-19 restrictions.

Transitioning to different platforms

Turning all learning to online has been an impressive success. CVP and RFE were the prime examples of this, with plenty of resources available for learning, all accessible online.

Use of townhalls are helpful and reassuring.

UTMB did everything they could to make our education work well despite the pandemic. They gave us online courses.

Vaccination programs

Very transparent with communication -- much appreciated

N/A, None (4)

Where could UTMB improve with the changes necessary for pivoting educational experiences because of the COVID-19 pandemic?

I wish we had had in person classroom instead of the whole year be online .

More online lectures would be nice

I am paying full tuition and feel like I am being economically robed. I should be reimbursed even a small amount.

Stop using Aquifer and go back to NBME exams

I think UTMB did an excellent job despite the fact that COVID-19 was unexpected for everyone.

Some student resources (like labs) are much less helpful for doing well in the curriculum and on STEP than resources that could be found, say, on online resources like Boards and Beyond or more online textbook resources through the library.

no comment

Communication and organization throughout the program has been pretty terrible throughout my experience. I expected it to improve as we progressed through the pandemic, but it has not.

More opportunities for in0lab clinical skill practice

please don't take away so much clinical time from us. We and our clinical education are suffering because we had so much clinical time taken away from us. I know that was unique to our situation, but please don't do that to future classes.

We haven't received an update about the vaccination status of our class in a while. The last one said about 2/3 were vaccinated, I'd like to know what's going on with the remaining 1/3. Are they abstaining and our class isn't quite at herd immunity level, or were they scheduled for appointments after that update was sent?

More regulation of the chat in zoom sessions. All of the side comments/ anecdotes are very distracting and disrespectful

More communication from the respective program directors

Allowing more safe/COVID restricted hands on instruction because learning through zoom only can go through so far. Especially in the medical fields that we are in.

We get date changes for things last minute and new expectations added last minute all the time. More communication about upcoming events/new expectations would be nice

The faculty could be better trained to use online modalities. I can't tell you how many times the faculty delayed lectures or were unable to use certain features because they couldn't figure out how to use Zoom. Additionally, many of our online quizzes were miskeyed on blackboard, so I never knew if my grades were accurate, and I stopped caring to ask the coordinators about that.

Allow students from all programs equality in experiencing campus resources and learning material. This goes for educational resource subscriptions and in-person learning activities. I understand it is out of UTMB's control in some sense but with a significant portion of the student population being vaccinated I would like to be able to do small group learning like PBL in person.

Continue online learning for as much as possible during preclinical years. Most beneficial learning from my standpoint comes from independent study- this is also a better way of developing adult learning (vs hand-holding activities like PBL that seem to be more of a learning distraction lacking in efficiency than anything)

Email communications were not always well written. Sometimes requirements were confusing or unclear.

It felt like our schooling was just cancelled for 6 months & we weren't a priority. We are one of the only schools in TX that cancelled for as long as we did & I am reminded everyday how this pandemic has negatively impacted my education.

Due to the transition, I feel as tho there are still knowledge gaps in our education and an increase in independent learning

A uniform response by all clerkship directors for COVID makeup days.

Less busywork courses that revolve around clicking through a program.

While UTMB has not done particularly badly with adapting to an online format, I think it is important to remind faculty in the SOM to not "lower standards" but to give students grace and be flexible with them. The pandemic has put a lot of students in vulnerable positions that affect our home life and added additional layers of stress. I understand that professionalism is paramount as a healthcare provider, but I personally feel like faculty expect students to perform and act the same as if there is not a deadly pandemic circulating the globe. Faculty should not make students feel like unprofessional failures for missing the deadline on a minor assignment by a few hours or by connecting to a Zoom lecture 1 minute late. Students frequently deal with the mistakes of professors; we should have the same grace extended to us.

When transitioned to virtual learning, a LOT more work was assigned with not much added value. The amount of work assigned (especially when the window of time to learn a subject is decreased) should not be more than before.

providing more spaces in HEC for students to use, booking individual rooms and allowing large classroom use.
Be more transparent, do not give us last minute notifications about things and blame the pandemic for your inadequacy, stop sending out performative emails about how we are heroes and utmb appreciates us

There should be a more streamlined virtual setup. There is an inconsistency with virtual setup which just leads to increased anxiety for your students. Everyone should be using Microsoft Teams and faculty should check in with their students more often since they don't see us every day. As a clinical student, I feel like I have been forgotten and that my faculty only cares about my test grade instead of me as a person.

There is a significant lack of empathy for students when dealing with online education. There is also a great need for in person interaction especially when it comes to physical exams.

Not charge in campus fees since we are not on campus

There was a lot of decisions up in the air in the fall which made it difficult to plan anything outside of class (doctors, dentist appts). I think we'd prefer just making a decision and sticking with it.

I wish clerkships in MS3 level had still been graded. It's hard to set ourselves apart with the current set up.

Using better software

Keeping students more accountable during Zoom lectures. Too many students are just letting required lectures play in the background or share attendance codes.

N/A (2)

Have you been directly affected by COVID-19?

My girlfriend got it but that's it.

I had COVID-19.

Yes

Yes

My spouse lost job due to Pandemic.

no

Yes, my wife had it, and I have been exposed greater than 5 times but never tested positive.

na

Yes

no

Luckily no.

Yes. The level of education I have received has been greatly impacted by COVID-19.

Hasn't everyone? Seriously, I don't know what you mean by this. Everyone who tried to follow the guidelines and be socially responsible had their lives were turned upside down.

no

No

I had Covid, and it sucked, but luckily I don't know of anyone who passed from it.

yes

Yes, my husband lost his job. Being online for graduate school has significantly affected my academic performance and ultimately has affected my learning experience overall. I feel very unprepared for clinicals and what's to come after graduation.

I'm not sure what this question is asking. I did not get the virus, but I had multiple family members who did. Everyone was affected in the sense that they were isolated for an extended period of time. I was mentally affected (as I'm sure many people were).

yes

I have not outside of changes to academics and my UTMB experience.

Yes

No

No

Yes, at this point everyone has

Yes

No

I have not known anyone personally with COVID19

yes

Not particularly.

My dad lost his job, and became severely depressed which was stressful to me. It has also been difficult on my grandmother and brother which is hard for me.

No

Yes

I have been vaccinated but never was sick/tested positives with COVID-19

I don't even get what the point of this question is. We all have...on some level. If you're meaning, have I personally gotten the virus...no. But we all have been affected and we all have been forced to adapt and we all will be just fine coming out the other end.

Yes

I've had COVID

Yes, my church pastor died of it. In addition, my board exams got pushed back several times from it.

yes?

No.

Yes, exposure resulted in me having to miss a day of clinic.

Yes

Yes. I am a clinical student and rotate from one frontline to the next trying to weigh getting as much out of my educational opportunities and not being exposed because I literally cannot afford to get sick and do well in my program.

Yes. My rotations were switched because they were not accepting students at the time

My dad cut down to working part time for about a year which hurt some financially.

No

Yes

No

I had a family member pass away due to covid.

I have had family members contract the illness. Social isolation at times was difficulty as well as juggling interviews during this difficult time.

Yes, it killed members of my family.

no

Appendix H

Figure H1: Word cloud generated by MAXQDA from word frequency analysis.

Note: Word cloud of word frequency analysis is inclusive of four grouped documents containing the cumulative responses from the SON, SOM, SHP, and GSBS

Appendix I

Figure I1: Survey example of Likert Scale questions regarding Online Education

37. Please consider simulation and online activities you have participated in during the pandemic when answering the following:	Almost always	Often	Sometimes	Seldom	Almost never
How confident are you that you could do the following social interaction task with your INSTRUCTOR in an ONLINE course: Clearly ask my instructor questions?	◯	◯	◯	◯	◯
How confident are you that you would do the following social interaction task with your CLASSMATES in an ONLINE course: Develop friendships with my classmates?	◯	◯	◯	◯	◯
I have a sense of self confidence in using computer technologies for specific tasks.	◯	◯	◯	◯	◯
I am comfortable expressing my opinion in writing to others.	◯	◯	◯	◯	◯
What I learned (in healthcare simulation) is important for my professional practice.	◯	◯	◯	◯	◯
What I learned in simulation activities connects well with my professional program studies.	◯	◯	◯	◯	◯
Healthcare simulation activities stimulate my thinking.	◯	◯	◯	◯	◯
Healthcare simulation activities encourage me to participate.	◯	◯	◯	◯	◯
Healthcare simulation facilitators model good discourse.	◯	◯	◯	◯	◯
I make good sense of the simulation facilitator's lessons.	◯	◯	◯	◯	◯

Note: Survey presentation of questions regarding student perceptions of online learning.

Appendix J

Table J1: Sample of Code Book

	pay insane fees
Directly Affected by Covid-19 > Yes: Financial Hardship	SON_SSS Results: 18 - 18 (0)
	extra fees for online education
	SON_SSS Results: 18 - 18 (0)
	pay all this money
	SON_SSS Results: 20 - 20 (0)
	Financially, yes
	SON_SSS Results: 102 - 102 (0)
	Decrease tuition
	SOM_SSS Results: 11 - 11 (0)
	forcing third party paid services on us
	SOM_SSS Results: 36 - 36 (0)

burn over $200

SOM_SSS Results: 36 - 36 (0)

Important outside resources that are required for passing exam/boards should be included within tuition.

SOM_SSS Results: 62 - 62 (0)

My spouse lost job due to Pandemic.

SOM_SSS Results: 160 - 160 (0)

My dad lost his job,

SOM_SSS Results: 186 - 186 (0)

My dad cut down to working part time

SOM_SSS Results: 200 - 200 (0)

hurt some financially.

SOM_SSS Results: 200 - 200 (0)

additional fees students incur while attending.

SHP_SSS Results: 7 - 7 (0)

which fees were distributed to students,

SHP_SSS Results: 7 - 7 (0)

Alumni Field House fees being distributed to all students

SHP_SSS Results: 9 - 9 (0)

Testing fees

SHP_SSS Results: 18 - 18 (0)

an ADDITIONAL fee for EVERY EXAM

SHP_SSS Results: 18 - 18 (0)

CHARGING US SO MUCH MONEY

SHP_SSS Results: 67 - 67 (0)

FINANCES.

SHP_SSS Results: 71 - 71 (0)

Yes, My job closed down

SHP_SSS Results: 103 - 103 (0)

financial loss

SHP_SSS Results: 103 - 103 (0)

Lower rent for the Student 2-bedroom apartments

GSBS_SSS Results: 15 - 15 (0)

d PhD students throughout the lifetime of the program instead of putting that burden on the PI.

GSBS_SSS Results: 21 - 21 (0)

Pricing and offering of courses

GSBS_SSS Results: 122 - 122 (0)

Directly Affected by Covid-19 > Yes: Financial Hardship > DataStrip_Finance	we pay SON_SSS Results: 16 - 16 (0) a lot of money SON_SSS Results: 16 - 16 (0)

pay insane fees

SON_SSS Results: 18 - 18 (0)

extra fees for online education

SON_SSS Results: 18 - 18 (0)

pay all this money

SON_SSS Results: 20 - 20 (0)

paid for an education that only allows us to learn from a screen,

SON_SSS Results: 20 - 20 (0)

I spend ~6k a semester

SON_SSS Results: 26 - 26 (0)

should be consistent access to supplemental resources that benefit students in their learning

SON_SSS Results: 40 - 40 (0)

Financially, yes

SON_SSS Results: 102 - 102 (0)

Yes, financially and psychologically

SON_SSS Results: 135 - 135 (0)

Decrease tuition

SOM_SSS Results: 11 - 11 (0)

forcing third party paid services on us

SOM_SSS Results: 36 - 36 (0)

burn over $200

SOM_SSS Results: 36 - 36 (0)

money would have been better put towards

SOM_SSS Results: 36 - 36 (0)

paying full tuition

SOM_SSS Results: 51 - 51 (0)

like to be reimbursed

SOM_SSS Results: 51 - 51 (0)

I believe that resources such as Sketchy, Boards and beyond, Pathoma, STEP1 First Aid, should be part of our materials provided similarly to how we are provided uworld for year 2 and year 3

SOM_SSS Results: 52 - 52 (0)

I believe the adoption of using common outside sources (as done in NHB this year with utilizing Boards and Beyond) is a great idea. Boards and Beyond, Pathoma, Sketchy, and Amboss are all resources that I use almost exclusively in my education.

SOM_SSS Results: 53 - 53 (0)

Important outside resources that are required for passing exam/boards should be included within tuition.

SOM_SSS Results: 62 - 62 (0)

It would be helpful if UTMB considered and further supported the use of third-party subscriptions such as Boards and Beyond, Sketchy Micro/Pharm, Rx, and Amboss for their medical students.

SOM_SSS Results: 63 - 63 (0)

Further funding toward these subscriptions

SOM_SSS Results: 63 - 63 (0)

lift a burden and a potential for academic inequity in the long run

SOM_SSS Results: 63 - 63 (0)

considering these services range in costs from $200 to $800 each

SOM_SSS Results: 63 - 63 (0)

would remove cost-related inequities

SOM_SSS Results: 63 - 63 (0)

learning resources like LSTAR etc

SOM_SSS Results: 64 - 64 (0)

but I noticed that medical students are afforded privileges

SOM_SSS Results: 75 - 75 (0)

3rd-party resources that most students rely heavily upon to prepare for the vast content requirements encompassed by the national boards.

SOM_SSS Results: 78 - 78 (0)

paid $25k this year

SOM_SSS Results: 80 - 80 (0)

take our exams online and find our own study resources

SOM_SSS Results: 80 - 80 (0)

paying full tuition

SOM_SSS Results: 122 - 122 (0)

economically robed.

SOM_SSS Results: 122 - 122 (0)

reimbursed even a small amount.

SOM_SSS Results: 122 - 122 (0)

resources that could be found, say, on online resources like Boards and Beyond or more online textbook resources through the library.

SOM_SSS Results: 125 - 125 (0)

for educational resource subscriptions

SOM_SSS Results: 136 - 136 (0)

Not charge in campus fees

SOM_SSS Results: 149 - 149 (0)

My spouse lost job due to Pandemic.

SOM_SSS Results: 160 - 160 (0)

Yes, my husband lost his job

SOM_SSS Results: 173 - 173 (0)

My dad lost his job,

SOM_SSS Results: 186 - 186 (0)

My dad cut down to working part time

SOM_SSS Results: 200 - 200 (0)

hurt some financially.

SOM_SSS Results: 200 - 200 (0)

additional fees students incur while attending.

SHP_SSS Results: 7 - 7 (0)

which fees were distributed to students,

SHP_SSS Results: 7 - 7 (0)

why the fees were required and not optional.

SHP_SSS Results: 7 - 7 (0)

understand all the ins and outs of the finances required to maintain certain buildings, etc.

SHP_SSS Results: 8 - 8 (0)

Alumni Field House fees being distributed to all students

SHP_SSS Results: 9 - 9 (0)

We are paying tuition and fees for services

SHP_SSS Results: 10 - 10 (0)

for example the HEC fee that is imposing

SHP_SSS Results: 12 - 12 (0)

not all fees are applicable to the various programs.

SHP_SSS Results: 18 - 18 (0)

Testing fees

SHP_SSS Results: 18 - 18 (0)

all students' tuition

SHP_SSS Results: 18 - 18 (0)

they must pay out of pocket

SHP_SSS Results: 18 - 18 (0)

an ADDITIONAL fee for EVERY EXAM

SHP_SSS Results: 18 - 18 (0)

the testing fees mandatory

SHP_SSS Results: 18 - 18 (0)

students are paying for because "tuition is standard for all students."

SHP_SSS Results: 18 - 18 (0)

student insurance throughout the program

SHP_SSS Results: 29 - 29 (0)

CHARGING US SO MUCH MONEY

SHP_SSS Results: 67 - 67 (0)

cover proctoring fees

SHP_SSS Results: 70 - 70 (0)

struggling with rent, tuition, gas, groceries.

SHP_SSS Results: 70 - 70 (0)

charged an additional, unexpected, and obligatory

SHP_SSS Results: 70 - 70 (0)

exam fees

SHP_SSS Results: 70 - 70 (0)

tuition/fees

SHP_SSS Results: 70 - 70 (0)

FINANCES.

SHP_SSS Results: 71 - 71 (0)

fully utilize the on-campus resources

SHP_SSS Results: 71 - 71 (0)

We pay

SHP_SSS Results: 71 - 71 (0)

tuition

SHP_SSS Results: 71 - 71 (0)

breakdown of costs

SHP_SSS Results: 71 - 71 (0)

charges.

SHP_SSS Results: 71 - 71 (0)

exam fees

SHP_SSS Results: 78 - 78 (0)

included in tuition.

SHP_SSS Results: 78 - 78 (0)

Not charging

SHP_SSS Results: 86 - 86 (0)

not charging students

SHP_SSS Results: 86 - 86 (0)

services that we are still charged for

SHP_SSS Results: 92 - 92 (0)

Yes, My job closed down

SHP_SSS Results: 103 - 103 (0)

financial loss

SHP_SSS Results: 103 - 103 (0)

Yes, my husband lost his job

SHP_SSS Results: 109 - 109 (0)

out of work for several weeks

SHP_SSS Results: 113 - 113 (0)

limited in work due to the virus.

SHP_SSS Results: 113 - 113 (0)

could be a great resource to help students

GSBS_SSS Results: 4 - 4 (0)

Lower rent for the Student 2-bedroom apartments

GSBS_SSS Results: 15 - 15 (0)

d PhD students throughout the lifetime of the program instead of putting that burden on the PI.

GSBS_SSS Results: 21 - 21 (0)

ving the PI fund a student creates a massive power imbalance a

GSBS_SSS Results: 21 - 21 (0)

Pricing and offering of courses

GSBS_SSS Results: 122 - 122 (0)