

MEETING THE STANDARDS DURING A GLOBAL
PANDEMIC: A MIXED METHODS STUDY OF FEPAC
ACCREDITED FORENSIC SCIENCE EDUCATIONAL
PROGRAMS

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December 2022

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ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my PhD advisor and Chair of my research committee, Dr. Jarrad Wagner. I am sincerely grateful for your encouragement to pursue my PhD. Thank you for your support throughout the process and your dedication to not only my success, but also my fellow students. I am also incredibly thankful for the opportunity to complete this research under the mentorship of Drs. Ron Thrasher, James Hess, and Bavette Miller. Thank you all for sharing your knowledge and expertise with me. I am grateful to all committee members for challenging me while providing incredible support and encouragement. I am incredibly honored that I had the opportunity to learn from each of you.

I would also like to express my immense gratitude to my parents, Michael and Theda Smith, whose support never waned throughout all my educational endeavors and their encouragement. The ability to complete this degree would not be possible without the support of my Husband, Dr. Bryan Jones, and our son Cullom Jones. Thank you for cheering me on, believing in me, and giving me the time and space to achieve my goals.

Finally, to all the mentors I have had in my career, I am grateful to each one of you. You have all played a part in getting to this point. Thank you for sharing your time and passion with me as well as the years of encouragement and friendship.

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Date of Degree: DECEMBER, 2022

Title of Study: MEETING THE STANDARDS DURING A GLOBAL PANDEMIC: A MIXED METHODS STUDY OF FEPAC ACCREDITED FORENSIC SCIENCE EDUCATIONAL PROGRAMS

Major Field: FORENSIC SCIENCE

Abstract: Introduction: Standardization is used to ensure consistency and reduce variability within a given field such as forensic education. Evaluating how Forensic Science Education Programs Accreditation Commission's (FEPAC) programs met select standards during a public health crisis may help us to understand its impact. To this end, an explanatory sequential mixed methods design employing Grounded Theory was utilized. The purpose of this study was to evaluate FEPAC accredited masters' programs and how accreditation standards were met with a focus on the effect of a global pandemic in four core areas. **Methods:** Twenty-one FEPAC masters' programs were identified. Qualtrics was used to collect data on core standards, followed by qualitative interviews to further expand on initial findings. Interview data was analyzed with ATLAS.ti to identify themes in responses to questions. Procedures and materials were approved by Oklahoma State University Institutional Review Board. **Results:** Of the 21 programs, 13 (~62%) of program directors completed the survey. Pre-pandemic, ~77% of programs offered traditional education (Core 1) with only 23% offering online courses. No programs offered online formats for more than 25% of courses. March 2020 through 2020-2021 academic year, there was variability in the number of courses offered online from 25-100% of program's coursework. Respondents indicated moving forward a decrease in in-person courses with 62% and increase in online courses at 31%. Prior to March 2020, 100% specified that all laboratory courses were offered in in-person settings. Following March 2020, 62% in-person, 31% hybrid, and 8% offered online laboratory courses. All (100%) responded that laboratory courses would return to be offered in-person after the pandemic. All (100%) of program directors responded that they did not lose faculty members directly due to the pandemic (Core 2). Professional involvement (Core 3) remained relatively unchanged with slight shifts after March 2020. Changes to institutional support (Core 4) were identified with 54% of budgets remaining the same, 31% decreased funding, and only 8% of programs experiencing an increase in support or were not sure (8%). Post- questionnaire interviews revealed overarching themes including: Impact of the Global Pandemic, Challenges, Faculty and Student Interaction, Professional Involvement, Perceptions of Online Learning, Learning, and Positive Effects. **Conclusion:** Overall, programs experienced impacts to their course offerings (lecture and laboratory) due to the global pandemic. However, most programs returned to pre-pandemic approaches (i.e., in-person coursework). Professional involvement for students and faculty was not significantly impacted; however, institutional support was reported to have increased or decreased for almost 39% of the programs. Themes identified focused on students receiving the training and education needed for degree completion (education, professionalism, available faculty, and resources) and the challenges the pandemic had on faculty and students.

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LIST OF ABBREVIATED TERMS

American Academy of Forensic Sciences (AAFS)
American Board of Criminalistics (ABC)
American Board of Forensic Toxicology (ABFT)
Academy Standards Board (ASB)
ASTM International (ASTM)
Bachelors of Arts (BA)
Bachelors of Science (BS)
Combined DNA Index System (CODIS)
Computer-Assisted Qualitative Data Analysis Software (CAQDAS)
Council of Forensic Science Educators (COFSE)
Council for Higher Education Accreditation (CHEA)
Corona Virus Disease 2019 (COVID-19)
Doctor of Osteopathic Medicine (DO)
Doctor of Philosophy (PhD)
Forensic Science Assessment Test (FSAT)
Forensic Science Education Programs Accreditation Commission (FEPAC)
International Association for Chemical Testing (IACT)
International Association of Forensic Sciences (IAFS)
International Association for Identification (IAI)
Medical Doctor (MD)
Masters of Science (MS)
National Association of Medical Examiners (NAME)
Science Technology Engineering and Mathematics (STEM)

Registered Nurse (RN)

Small, Mobile, Instruments for Laboratory Enhancement (SMILE)

Society of Forensic Toxicologists (SOFT)

The International Association of Forensic Toxicologists (TIAFT)

The Organization of Scientific Area Committees (OSAC)

U.S. Department of Education (USDE)

CHAPTER I

A REVIEW OF EXISTING FORENSIC LABORATORY EDUCATION RESEARCH AND NEEDS ASSESSMENT

Introduction

Forensic education is relatively new in comparison to other scientific disciplines as is content delivery via non-traditional, online or hybrid academic programs. Published research on forensic education effectiveness is limited, especially with regard to forensic laboratory education. Since 1977, several reviews of forensic educational programs have been published (3-7) that highlight the variability in academic programs, course work, faculty demographics, laboratory courses offered, as well as the perspectives on hiring decisions with regard to forensic science degrees. Further, with the creation of the Forensic Science Education Programs Accreditation Commission (FEPAC) there has been a shift from unaccredited to accredited forensic programs with the adoption and implementation of meeting accreditation standards (FEPAC, 2020) (8).

Forensic science is characterized as a hands-on career, with seven overarching disciplines: biology, digital multimedia, medicine, scene examination, physics/pattern interpretation, chemistry-trace evidence, chemistry-toxicology, and chemistry-seized drugs (11). Each of these forensic disciplines utilizes hands-on techniques whether in the field or in the laboratory.

Consequently, forensic analysts must acquire unique skills (via formal educational programs) prior to work force participation in addition to those learned on the job. Academic programs offering degrees focused on forensic science must offer laboratory and didactic courses which teach these relevant hands-on techniques. Those accredited by FEPAC, which must first meet regional accreditation, must demonstrate adherence to developed standards which include "...the financial resources available to the program in comparison to those available to other natural science programs at the institution [as well as] the physical facilities available to the program, including classrooms, laboratories, and any other facilities the program routinely uses..." which demonstrates the need for equipment and space to carry out laboratory courses (FEPAC, 2020) (8).

Therefore, this study sets out to identify current peer reviewed research in the area of forensic laboratory education regardless of pedagogy. To provide the reader an overview of the disciplines in which educational research has been conducted, a review of degree programs (e.g., undergraduate, graduate, or post-graduate/professional education), delivery (e.g., traditional, online, or hybrid), delivery style (e.g., synchronous, asynchronous, or hybrid), if academic standards were addressed, and educational level of faculty.

Methods

A literature search using PubMed (US National Library of Medicine, National Institutes of Health, Bethesda, MD, USA) was conducted to identify relevant peer-reviewed articles. The search terms "forensic", "laboratory", "education", and "standards" were used to identify research in this area. Using the terms "forensic laboratory education standards" resulted in 155 results, however after a closer examination, only 14 of the articles were relevant to forensic laboratory education (3,10-22). Each of the articles were assessed for target educational level (e.g., undergraduate, graduate, postgraduate/doctoral, medical, or continuing professional education),

forensic discipline, pedagogy, delivery style (synchronous, asynchronous, or hybrid), academic standards, and educational levels of faculty/authors.

Results

Educational research evaluating the curriculum, content, and/or effectiveness of forensic laboratory education has been conducted primarily over the past 20 years, with ~71% occurring within the last ten years (n=10 from 2011-2020 and n=4 from 2000-2010). With regard to forensic science academic programs, ~35% of articles were focused on undergraduate education, ~35% were focused on post graduate education, and ~28% were applicable to undergraduate, graduate and post graduate education with no specificity to educational level. The forensic discipline categories of the peer reviewed research are outlined in FIG 1 with ~64% focused on medicine (e.g., forensic pathology, forensic nursing, forensic anthropology, forensic entomology; n=9), ~7% were non-discipline specific (e.g., STEM v. Non-STEM educational backgrounds, n1), ~22% on biology disciplines (e.g., DNA; n=3), and ~7% were physics/pattern interpretation (e.g., physical evidence; n=1) related.

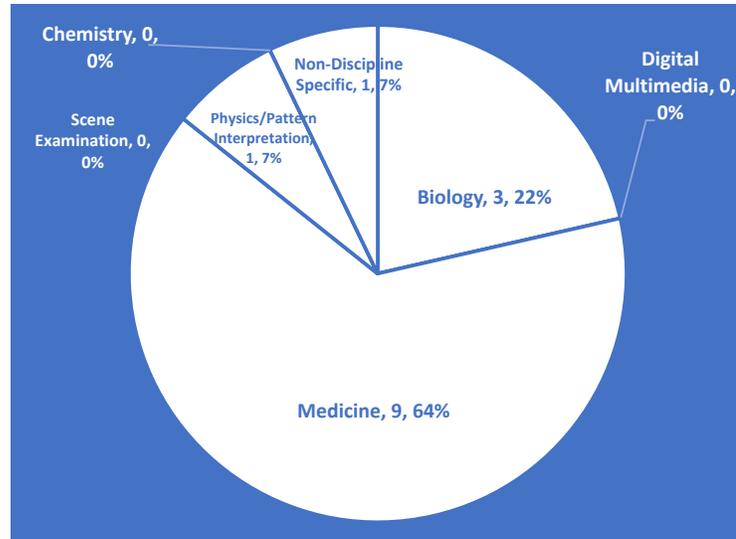


Figure 1: Forensic disciplines of peer reviewed research on laboratory education effectiveness. Medicine is most represented (9 of 14 articles). Notably, no review articles covering scene examination, chemistry, and digital multimedia were identified.

Biology

Of the three peer reviewed articles relating to forensic biology, all focused on traditional in-person synchronous education. Baranski et al. (2020) focused on a searchable forensic DNA database referred to as “FauxDIS” modeled after the Combined DNA Index System or CODIS and how faculty can utilize it as part of “experiential learning exercises in which students apply the scientific method to solve mock crimes” (16). The authors were also mindful of cost associated with commercial kits used to generate DNA profiles, noting that the use of FauxDIS is a cost-effective alternative. Feliciano et al. (2019) focused on biological evidence collection for touch DNA. In their work, the exercises were developed to serve as an example of experimental design and training on DNA contamination and touch DNA (10). The work of Zeller and Elkin (2020) titled “Simulation of population sampling and allele frequency, linkage equilibrium, and random match probability calculations” focused on hands-on learning of population database and

calculations (15). The authors used different types of candy in their forensic molecular biochemistry course to demonstrate the concepts of genetic loci and allelic variations.

Medicine

By far, the majority (n=9; 64%) of published research in forensic laboratory education focused on medical disciplines such as medico legal death investigation including pathology, nursing, anthropology, and entomology (11–13,17–22). The work of Stamper et al. (2020) titled “Towards understanding how to instruct students in dichotomous identification keys in a mixed STEM forensic science education environment” focused on academic backgrounds of students (STEM vs. non-STEM majors) and their abilities in decision confidence and accuracy in dichotomous key training (11). Identification keys are used in a number of forensic disciplines such as fingerprints, seized drugs, skeletal osteology, and entomology. In the article “Forensic Pathology Education in Pathology Residency: A Survey of Current practices, a Novel Curriculum, and Recommendations for the Future”, Spencer et al. (2017) draw attention to the inconsistency in medical programs which offer training in forensic pathology, and the authors provided recommendation for improvements including forensic pathology requirements such as the mandatory forensic pathology rotation with a minimum time of four weeks, the necessity of accredited programs, documented curriculum, and evaluations of effectiveness (19). Brooks et al. (2017) also highlighted the usefulness of the autopsy as a learning tool beyond forensic pathology training to clinical medicine, specifically they noted that autopsy training is critical to education on the pathogenesis of disease (20). Similarly, Horowitz and Naritoku (2007) concluded that the autopsy as an underutilized educational tool for the training of medical and pathology residents (13). It is noted that to utilize the autopsy as effectively as possible, that financial resources must be made available to do so. The authors suggested several possible solutions, including “incorporating autopsies into payment schedules, into clinical trials, and in pay-for-performance initiatives” (13).

Maeda et al.'s (2014) work focused on molecular pathology, its role in death investigation and the importance it plays in social risk management (22). The authors concluded that the application of forensic molecular pathology to investigate the genetic basis, as well as the cause and process of death at the biological molecular level in the context of forensic pathology is key to providing society information on what factors play a role in death. In McKenna's (2007) work, the author highlighted the use of in-training/in-service examinations and its role in graduate medical education (21). In-training/in-service examinations were developed by the American Board of Medical Specialists certifying board where forensic pathology is a component. The examination was used to assess the effectiveness of graduate medical education and can be a useful tool to assess a program as well as student competency. The in-training/in-service examinations could be compared to the American Board of Criminalistics Forensic Science Assessment Test (23). The FSAT is an optional examination that some academic programs offer to their students to assess general competency in 26 knowledge, skills and abilities areas (23). However, not all students take part in the FSAT examination even when it is offered by their academic program and therefore it may be an underutilized tool.

In the article "Using Mammalian Skulls to Enhance Undergraduate Research on Skeletal Trauma in a Forensic Anthropology Course", Henson described a traditional synchronous approach to training students using mammalian skeletons (e.g., deer) in place of human for the purpose of forensic anthropology education (12). Dadour et al.'s article focused on professional education in the use of forensic entomology and its use by pathologists, police, and the judiciary system (18). In "Criminalistics and the Forensic Nursing Process", Burgess et al. described an interdisciplinary laboratory course where criminalistics tools are applied to the field of forensic nursing (17). Unlike the previous articles, educational standards developed by the American Nurses Association and the International Association of Forensic Nurses were specifically addressed. Further, the course was developed to address a number of forensic topics which could be

encountered by forensic nurses. The authors went on to note that it was necessary to develop the laboratory course using cost effective measures (17).

Physics/Pattern Interpretation

Chohan et al.'s article "Construction and Characterization of an Inexpensive Electrostatic Lifter" focused on an alternative to high-cost, high-power requirements, and sheer bulk of the standard instrumentation used in forensic laboratories with the "SMILE initiative (small, mobile, instruments for laboratory enhancement)"(14). The authors noted that the SMILE project "incorporates an inquiry-based project" in an upper level undergraduate analytical chemistry course where students are tasked with research, design, construct, characterization, and troubleshooting small instruments (14). Further, the process included conveyance of this information to underclassman or visiting high school students. Although the authors categorized their work as a forensic chemistry due to the analytical component, the SMILE instrumentation was focused on pattern/impression evidence and interpretation with its creation of an electrostatic dust print lifter. The developed electrostatic lifter was described as on par with commercial instrumentation with the exception of software and specialized components (14).

Non-Discipline Specific

In 2010, Tregar and Proni provided a review of undergraduate or bachelor of science as well as graduate or master of science forensic science programs (3). In their work, the authors offered a snapshot of forensic education circa 2010 with a focus on standardization, specifically FEPAC. The authors found variability in the following areas: size of academic programs, subject areas, adherence to FEPAC standards, strong science curriculum, faculties with advanced degrees, and diverse forensic-oriented courses (3).

Further, the authors noted the variability in forensic programs, including the offered courses, internship requirements, as well as resources such as laboratories dedicated to forensic science

courses. Ultimately, the authors concluded that “mandatory accreditation would assist laboratory directors and other forensic personnel in their confidence that graduates of forensic higher education programs have the skills necessary to contribute to the field at large” (3).

Discussion

In this review of the over 150 original articles, some peer reviewed research focused on analogous scientific areas which were not specific to forensic science. One such case, Jones’s article “Creating a Longitudinal Environment of Awareness: Teaching Professionalism Outside the Anatomy Laboratory” highlighted an issue in human anatomy education that overlaps with forensic science which is professionalism in education and where it should fit in the overall academic process (Jones, 2013) (24). Jones highlighted that often in medical education, professionalism is emphasized in anatomy courses where students are faced with a “confrontation with mortality” with regard to dissection of human remains and how this is processed by the student (Jones, 2013) (24). Jones noted that these topics are often overlooked in other medical courses where it could also be discussed. Further, students may be exposed to traumatic conditions of the remains or specimens due to medical conditions or roughness of dissections and must practice the responsibility of confidentiality. Students training in forensic science, including laboratory courses, face similar issues. For example, some institutions make use of gross anatomy laboratories to process evidence retrieval on cadavers. Further, mock evidence is often presented that closely resembles actual cases a faculty member has encountered. Finally, instruction may be augmented by actual crime scene photos, reports, and documentation that has been redacted so that students are exposed to content from or similar to that in forensic laboratories. In these cases, forensic science students are faced with the same issues of professional behavior relating to dealing with not only human remains whose death may or may not have been the result of a tragic event, but to some of the most heinous criminal acts that one can imagine. This being so, students may experience vicarious trauma or relate the events to personal experiences. Per

FEPAC standards, “professional practice” or “professional responsibilities” is listed as required topics that must be covered in forensic curriculum, however it is not specified how a program must address it other than addressing the topics by “involve[ing] multiple class meetings and may involve multiple learning modalities, such as lectures, laboratories, and demonstrations” (FEPAC, 2020) (8).

Only one third (n=5; ~35%) of the articles referred to educational standards, with two (~14%) referencing FEPAC standards. Three (~21%) of the articles noted the need for standardization and eight (~64%) did not address educational standards. Of the authors, ~57% of the articles were written by faculty holding PhDs, ~35% held MD or DO, ~7% were RNs, ~35% held MS degrees and ~28% held BS or BA degrees. Of the educational styles, ~85% were delivered in traditional or in-person formats, ~14% were provided in a hybrid or both in-person and online formats, with two of the articles the delivery style was not specified. Similarly, ~85% were delivered in synchronous delivery, ~14% were not specified with no articles addressing asynchronous or hybrid approaches.

Forensic science and many of the tools necessary to carry out forensic analysis are often very expensive and/or require specialized space requirements. A topic that was addressed in multiple relevant articles was that of ways in which forensic tools such as autopsies, instrumentation/hardware or software could be recreated or used via more cost-effective approaches (13,14,16,17). For example, in both Chohan and Burgess et al.’s articles, the authors discuss the cost associated with development of the tools used to educate their students (14,17). Chohan notes that the Small, Mobile, Instruments for Laboratory Enhancement or SMILE initiative costs less than \$50.00 to construct. Burgess et al. note that the forensic laboratory course they developed for forensic nursing students was done so for less than \$200 for supplies for the entire 12 modules. Although these are two informative examples of creative alternatives, both student trainees and academic educators in forensic science need actual instrumentation and/or

tools used in forensic laboratories. Institutions with or hoping to develop a forensic science program must allocate the necessary funds to enable it to be done so appropriately.

Finally, there is no published research on laboratory education effectiveness for the following forensic disciplines: digital multimedia (e.g., digital evidence, facial identification, speaker recognition, video/imaging technology and analysis), scene examination (e.g., crime scene investigation and reconstruction, fire and explosion investigation, dogs and sensors), or chemistry (e.g., trace materials, ignitable liquids, explosives, gunshot residue, seized drugs, and forensic toxicology). Therefore, research in this area would benefit not only the educational programs in content and its delivery, but with the input of the forensic scientific community, has the potential to help ensure that future forensic scientists receive quality education, comprehensive of all forensic science sub-disciplines.

Conclusion

There is a significant lack of literature on effectiveness of forensic laboratory education as demonstrated by the mere ~9% (n=14) of the 155 articles. There is a need for laboratory education research in the areas of forensic chemistry, biology, physics/pattern interpretation, crime scene/death investigation, and digital multimedia. Connecting the effectiveness of laboratory education and educational standards is essential. Further, with research on effective laboratory education that is supported by educational standards the forensic education community would have objective evidence to consider with regard to how academic programs deliver content, the overall effectiveness of the courses they are offering, as well as assisting forensic organizations who hire graduates of forensic science programs.

CHAPTER II

A REVIEW OF GROUNDED THEORY-MIXED METHODS ANALYSIS AND POTENTIAL APPLICATION TO FORENSIC SCIENCE EDUCATION RESEARCH AND PRACTICE

Introduction

Educational research is essential to develop best practices, identify and further investigate deficiencies in current approaches, and ultimately improve student outcomes. Within STEM education, programs focused on forensic science may benefit from research that assesses the role educational standards play in program design and content delivery, student experiences, faculty demographics, allocated resources, and more. Historically, grounded theory, developed by Glaser and Strauss, has been used in qualitative research for over sixty years and in many subject areas(25). It has allowed researchers to “ground” their theory in data that is systematically gathered, sampled, coded, categorized, and analyzed. Further, Charmaz, Thornberg and other researchers have explored grounded theory and note that it can aid in the development of strategies for theoretical analyses, in the generation of new concepts, contribute to the larger body of scientific knowledge, as well as help to guide policy development and practices(26-29). In the work of Taber, who explored case studies of grounded theory and research in science education, they found “grounded theory approach claims to produce testable outcomes.....and is intended to lead to predictions which may be subject to traditional experimental and statistical testing”(30).

We noted in our previous work that forensic science education is relatively new in comparison to other STEM disciplines as is its content delivery via non-traditional, online or hybrid academic

programs(1). We found that published research on forensic science education effectiveness is limited(6-7,23,31). Forensic science has been characterized as a hands-on career, with various sub disciplines including seven overarching scientific areas: biology, digital multimedia, medicine, scene examination, physics/pattern interpretation, and chemistry(9). Each of these forensic disciplines utilizes hands-on techniques whether in the field or in the laboratory. Since 1977, several reviews of forensic educational programs have been published that highlight the variability in academic programs, course work, faculty demographics, laboratory courses offered, as well as the perspectives on hiring decisions regarding forensic science degrees(3-4,6-7,31). Further, with the creation of the Forensic Science Education Programs Accreditation Commission (FEPAC) there has been a shift from unaccredited to accredited forensic programs with the adoption and implementation of meeting accreditation standards(8).

Educational research utilizing grounded theory mixed methods analysis, whether focused on forensic science or not, could help guide future research on the effectiveness of forensic science education. Therefore, this study set out to identify and characterize current peer reviewed articles in grounded theory mixed methods research in STEM education regardless of pedagogy.

Methods

A literature search using PubMed (US National Library of Medicine, National Institutes of Health, Bethesda, MD, USA) and Google Scholar (Mountain View, CA, USA) was conducted to identify relevant peer-reviewed articles. The search terms "grounded theory", "research", "science", "technology", "engineering", "education", "mathematics", "graduate", "undergraduate", "educational standards", and "STEM" were used to identify research in this area. Research from the past decade (range 2011-2021) was targeted for both graduate and undergraduate education. Using these key terms and search parameters, 165 results in Google Scholar and 20 in PubMed were identified. However, after a closer examination, only 37 and 16

of the articles, respectively, were relevant to grounded theory mixed method analysis in higher education research (n=53). Each of the articles were assessed for targeted educational research related to general and STEM higher education research/practice. The selection, screening, eligibility, exclusion, and inclusion process can be viewed in Figure 2.

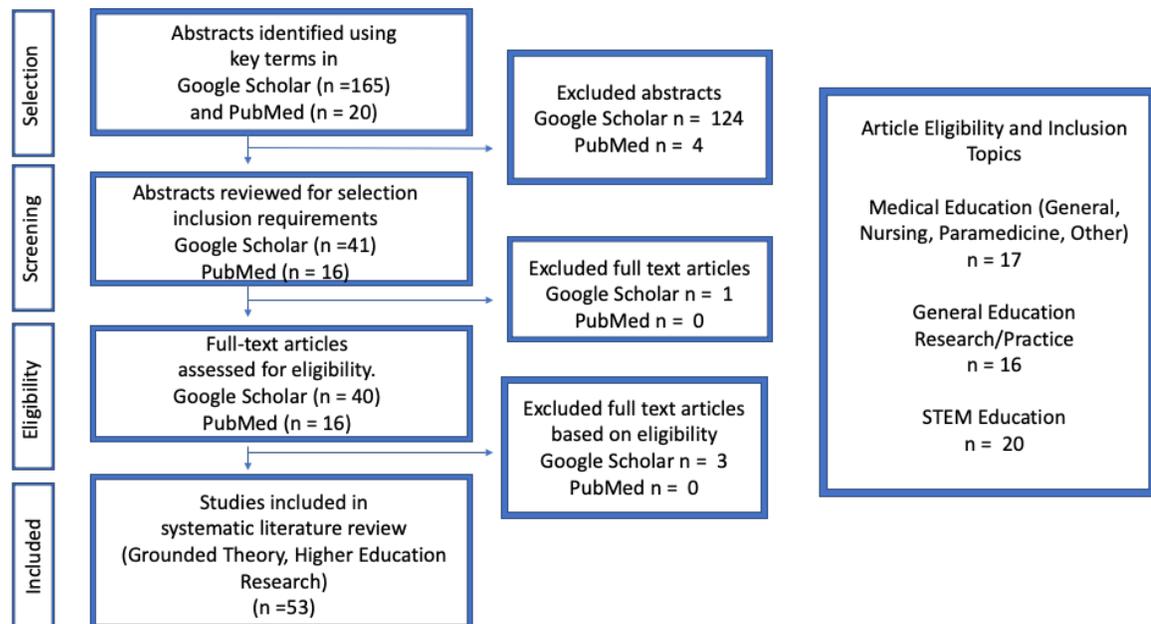


Figure 2. Peer-reviewed article selection, screening, eligibility, exclusion, and inclusion process(32).

Results and Discussion

Themes Identified

Using the published research on grounded theory mixed method analysis in educational research and practice revealed a total of 52 themes or thematic groups that occurred in at least two or more journal articles (Table 1). The most studied themes identified were “applied practice” (n18), “culture/environments/community/climate/socio-cognitive” (17 items), “communication/handoffs/interpersonal skills” (14 items), “pedagogy” (13 items), “knowledge building/acquisition/learning theory” (12 items), “resources (education and research)” (11 items),

and “innovation” (11 items). “Mixed methods” (n13) was also a theme that was specifically identified in the article selection process, in addition to qualitative and quantitative analyses which is often used interchangeably with mixed methods.

Table 1. Identified themes in grounded theory mixed-methods research.

Themes	Occurance	Themes	Occurance
Applied Practice	18	Modeling	6
Culture/Environments/ Community/Climate/Socio-Cognitive	17	Interdisciplinary	6
Communication/Handoffs/Interpersonal Skills	14	Evidence Based/Social Emotional Learning	5
Mixed Methods	13	Learners Interest	5
Pedagogy	13	Productivity	5
Knowledge Building/Acquisition/Learning Theory	12	Process Influence	4
Resources (Education and Research)	11	Ethical	4
Innovation	11	Resilience	4
Data/Frequency of Information/Information Processing	10	Preparedness/Transition	4
Academic/Curriculum	10	Collaboration	4
Peer-Peer Interaction/Tutoring	9	Professional	4
Competence	9	Gaps	4
Quality/Best Practices/Standards/Policy	9	Internship/Simulation/Scenario	4
Student Experience	9	Utility of Information	3
Assessment	9	Translational Science	3
Change Research	8	Variability	3
Motivation	8	Implementation	3
Development	8	Self Directed Learning	3
Challenges/Barriers/Corruption	8	Objectives	2
Perceptions	7	Decision Making	2
Adaptive Skills	7	Diversity	2
Evaluation	6	Post-training Work Experience	2
Engagement/Interactive	6	Mentoring/Student Faculty Interactions	2
Student Support	6	Acceptance	2
Interventions	6	Gender	2

In addition to those listed in Table 1, other themes identified but limited to one occurrence included “accountability”, “continuity”, “disengagement”, “faculty development”, “flexibility”, “immersive”, “indifference”, “problem-based learning”, “promote”, “relevance”, “structure”, and “service”. These topics may not have been studied using grounded theory and/or mixed methodologies extensively, but some, if not all, may warrant further exploration. Although there were over 50 identified themes, some were combined into thematic groups due to topic similarity (i.e., culture, environment, community, climate, data, resources, etc.) and/or targeted behavior (i.e., communication, interpersonal skills, learning/knowledge, etc.). Further, multiple themes or thematic groups may occur in a single article.

Applied Practice and Laboratory Based Instruction

Laboratory based instruction, applied practice, and hands-on skill acquisition, are key elements of scientific education, regardless of the discipline. Grounded theory and/or mixed methodologies have been used to evaluate effective themes in laboratory instruction(33-40). Communication has been found to be essential in learning and group collaboration. Peer to peer learning has been studied and found to be “crucial to students’ knowledge acquisition through lab work”(41-42). A theme that not only arises in grounded theory research on laboratory instruction, but other educational research, is culture and how it can influence individual productivity, affect motivations, and facilitate, as well as possibly impede, progress in full student participation(43-48). The application of forensic science theoretical knowledge in applied practice and/or laboratory settings is essential. Indeed, FEPAC standards state that “FEPAC acknowledges that laboratory-based instruction is integral to any science-based discipline such as forensic science”(8). Emphasis is placed on resource allocation to program laboratories, including equipment and supplies, and must demonstrate that the program is able to meet the standard for accreditation(8). The standard shows preference to faculty members with working experience in forensic organizations and the program must interact with local forensic science laboratories.

Culture/Environments/Community/Climate

As previously noted, culture/environments/community/climate can influence an individuals’ ability to become fully participating laboratory members. Organizational climate, culture, community, and environments were the second most common theme group identified (n17)(43-44,46-49). Researchers found that the structure of the laboratory and effective communication can “influence group collaboration and individual learning”(47). Peer to peer interaction and collaboration has been found to influence knowledge acquisition. Culture can influence individual motivation, productivity, communication, educational interventions, collaboration, applied

practice, and create as well as break down barriers(45-47). In 2009, the United States Department of Justice released the report “Strengthening Forensic Science in the United States: A Path Forward” and highlighted culture in several sections(50). The report stated that “It [forensic science] must have a culture that is strongly rooted in science, with strong ties to the national research and teaching communities, including federal laboratories” and that “This culture leads to continued reexamination of past research and hence increased knowledge”(50).

Communication, Handoffs, and Interpersonal Skills

As important as culture is communication, handoffs, and interpersonal skills (n14)(37,47,51-53). A handoff, in terms of medicine, is important for patient care, where key information is communicated from one practitioner to another that is essential for the quality of medical outcomes(54). Miscommunication due to ineffective handoffs may result in harm to patients. This review identified that communication influences group collaboration, self-directed learning, and facilitates collaboration(37,40,43,51,55-56). Communication can occur in innovative ways such as with the use of social media to facilitate peer interaction(57). Peer-peer interaction can be an important factor in education, especially knowledge acquisition through laboratory practice(47). Further, effective student faculty interaction can have “implications for achieving mastery of core competencies”(56). With regard to effective handoffs in medicine, students need to “learn key information, be open to guidance, apply clinical knowledge, be concise, incorporate delivery strategies, and be open to styles/preferences of handoff recipients”(58). Handoffs, although not often characterized as such, occur in other areas including forensic science. Ineffective communication both within and outside forensic organizations such as through expert testimony can have severe consequences on the outcome of a criminal case. Further, information that is “handed off” to a forensic analyst may result in cognitive bias(59). In forensic science, providing and reserving information that could influence forensic evidence analysis, also known as linear sequential unmasking, is an approach that attempts to reduce bias through withholding task-

irrelevant information (i.e., race, gender, etc.) from the forensic scientist until the analysis of evidence is complete(60-61).

Pedagogy, Knowledge Building/Acquisition, Innovation and Learning Theory

The method and practice of teaching, or pedagogy (n13), is a theme intertwined with knowledge building/acquisition and learning theory (n12). Further, it is important to understand the effectiveness of innovation (n11) in knowledge acquisition and transfer through other themes such as assessment (n9), development (n8), challenges/barriers/corruption (n8), students' adaptive skills (n7), and evaluation (n6) and their effects on acquiring new knowledge and techniques.

This literature review revealed several studies on innovative approaches such as machine learning, augmented/virtual reality, modeling, social media, gamification, simulation-based medical education, maker movement, and massive open online courses(52,62). Several learning theories have been developed and studied including evidenced-based, self-directed, and problem-based learning (57, 63-65). In general, learning theories describe how students receive, process, and retain knowledge through the learning process (48,52,66). Further, intertwined in these topics is the connection with inter/multidisciplinary research (n6) (33,55,63,65,67-68). Forensic and STEM disciplines are characterized by the numerous scientific disciplines, some of which are multidisciplinary, as well as the variability in pedagogies used to transfer knowledge from faculty to student. To strengthen "education outcomes" and the applied practice of STEM disciplines, including forensic science, laboratory courses should be the focus of additional research (67).

Resources (Education and Research)

As with the other most studied themes, educational and research resources (n11) was repeatedly identified in the grounded theory mixed methods research. For example, in simulation based medical education, resources (educational and research) are needed for translational science (52). McGaghie et al. found that "national research priorities are served from translational educational research [and that] national funding priorities should endorse the contribution and value of translational education research"(52). In research evaluating self-directed learning in internal medicine residency, resources were identified as a needed component for progression through an academic program (48). Resources were also cited as necessary for other higher education initiatives including incorporating innovative approaches such as the "Maker Movement", "Active Learning", and "Social-Emotional Learning" approaches (62, 69-70). Forensic science education and training involve faculty with specialized knowledge and skills, expensive analytical equipment, laboratory space, and additional resources to provide the required information and expertise to enable students to enter a career as a forensic scientist. FEPAC acknowledge in their standards that forensic academic programs must demonstrate that they have "Institutional Support" which must be sufficient to allow the program to achieve its mission, goals, and objectives (71). These resources should provide classrooms, laboratories/facilities, equipment and supplies appropriate for the size and scope of the program.

Quality, Standards, Best Practices, and Policy

Standardization, as well as academic accreditation, which can demonstrate that an institution meets a set of minimum standards, helps to ensure that the education students receive provide a base level of experience and instruction to prepare them for entry into a career in a STEM field such as forensic science. As previously mentioned, FEPAC was created to provide minimum standards for forensic science education. It is essential that future forensic scientists obtain a level

of academic/technical competence, communication/interpersonal skills, protective mechanisms, adaptive skills, professional attitudes, and ethical judgment (54-55,51,53,56,62,70,72-73). These are all themes identified in this review. With the use of grounded theory and mixed method analysis, the identified themes in this review may provide useful information that applies to forensic science and help to identify key areas that should be focused on for future research.

Other Theories

Socio-cognitive, critical, and spatial skills theories were also explored. In the work by Atit et al., “Spatial skills enable us to manipulate, organize, reason about, and make sense of spatial relationships in real and imagined spaces [and] STEM professionals often employ spatial skills when completing tasks within their domain” (74). As with STEM professionals, forensic scientists need spatial skills to perform their analyses. Atit et al., further found that “...discipline-based education researchers specializing in STEM domains have focused much of their research on understanding how to bolster students’ skills in completing domain-specific spatial tasks” (74). Research on problem-based learning, through the understanding of socio-cognitive nature of learning, can help us understand how “conceptions, judgment, and motivation” affects cognitive processes and how environments influence learners and the acquisition of knowledge (66,75). Critical theory and modeling were also explored in the articles reviewed (49,58,63,77). Modeling allows us to create visual representations of data (through experimentation) to better understand it. Critical theory is an approach that utilizes reflective assessment of society and culture criticism to reveal and challenge power structures (76). Forensic scientists often work in publicly funded law enforcement organizations, such as local and state police departments, which may be operated in a para-military formation with a distinct chain of command or power structure. Forensic scientists are tasked with examining evidence and making conclusions that could potentially influence the outcome of a case. The information that is gathered through the

investigative process on victims and suspects may influence the forensic scientists, due to preconceptions they may hold on criminal acts and those that may be involved in them (77).

Conclusion

This review highlights numerous educational research themes that may help us understand and improve educational outcomes in STEM higher education, including forensic science. It was found that a theme may be identified as a topic of study but may also influence other themes and/or thematic groups. Although grounded theory mixed method approaches have not been used in forensic science education research, the identified themes and conclusions in this review may be of benefit to forensic science training. Brown noted that grounded theory methodologies allow for “innovative synthesis” to “organize, analyze and combine concepts from an intermixed selection of quantitative and qualitative research [and] inferring an emerging theory or thesis of new knowledge" (78). It is essential that future forensic scientists obtain a level of academic/technical competence, communication/interpersonal skills, protective mechanisms, adaptive skills, professional attitudes, and ethical judgment. These themes should be evaluated with a focus on forensic science to enhance the education students receive and the skills they start out with in their careers.

CHAPTER III

MEETING THE STANDARDS DURING A GLOBAL PANDEMIC: A MIXED METHODS STUDY OF FEPAC ACCREDITED FORENSIC SCIENCE EDUCATIONAL PROGRAMS

Introduction

Standardization is used to ensure consistency or uniformity and reduce variability within a given field. Published research on forensic education effectiveness and the role standardization plays is limited (3-4,6-7,31-32). When academic programs choose to meet educational standards and be subject to oversight through accreditation, it helps to ensure that students receive a minimum level of education to reach competency within a given degree program. Evaluating how forensic programs met select Forensic Science Education Programs Accreditation Commission's (FEPAC) standards while impacted by a public health crisis may help to understand its impact, both negative and positive, to pedagogies used by these forensic programs (71).

To evaluate how the targeted accredited programs met FEPAC standards before, during and, where applicable, after a global pandemic, an explanatory sequential mixed methods design was used (79). This design employs two distinct phases, starting with collection and analysis of quantitative data, followed by collection and analysis of data which is qualitative in nature to further expand/explain the results of the quantitative analysis (79). Explanatory sequential mixed methods design has been employed in educational research (80-86). This work utilized grounded theory, which is a data driven approach to guide information collection and analysis. Grounded theory has been used in qualitative research for over sixty years and in many subject areas. It has

allowed researchers to “ground” their theory in data that is systematically gathered, sampled, coded, categorized, and analyzed. Within STEM education, programs focused on forensic science may benefit from grounded theory mixed methods research that assesses program design, content delivery, student experiences, faculty demographics, and allocated resources. With Glaser and Strauss’s grounded theory, the focus of analysis is determined through the research process (25). Charmaz, Thornberg and other researchers have explored grounded theory and note that it can aid in the development of strategies for theoretical analyses; in the generation of new concepts; contribute to the larger body of scientific knowledge; as well as help to guide policy development and practices (26-29).

The purpose of this study was to evaluate FEPAC accredited masters’ programs and how accreditation standards were met with a focus on the effect of a global pandemic in four core areas: 1) providing in-person/traditional, distance learning/online/alternative delivery, or hybrid lecture and/or laboratory coursework (Core 1), 2) composition of forensic faculty (Core 2), 3) professional involvement (Core 3), and 4) institutional support (Core 4). These areas were chosen to assess the impact of a global pandemic on how forensic programs may have adapted to meet the select FEPAC educational standards.

Research Questions

Employing both a grounded theory and mixed methods approach, a questionnaire of targeted FEPAC accredited masters’ programs was used to collect data on how programs met the select core areas identified in the standards, followed by qualitative post-questionnaire interviews to further expand on the findings of the first phase of the research project.

As previously noted, the core areas to be assessed include: 1) providing in-person/traditional, distance learning/online/alternative delivery, or hybrid lecture and/or laboratory coursework (Core 1), 2) composition of forensic faculty (Core 2), 3) professional involvement (Core 3), and

4) institutional support (Core 4). It is hypothesized that there will be variability in how programs met each of the select standards. Utilizing a mixed-methods sequential explanatory design a questionnaire targets the previously mentioned core areas to gather data and identify variables on meeting educational standards (79). Post-questionnaire interviews were conducted to expand on the findings.

The second hypothesis is that there will be greater variability in select core areas and specifically those related to shifts in how content is delivered to students pre-, during, and post-pandemic. Further, as forensic academic programs reside in both public and privately funded institutions, there may be a variable shift in institutional support which would affect programs and potentially their ability to meet educational standards.

Methods

Utilizing the FEPAC website (<https://www.fepac-edu.org/accredited-universities>), accredited universities (n43) were identified (71). Of these, 32 universities had accredited bachelor's program, 21 accredited masters' programs, with 12 having either both a bachelors/masters, more than one bachelor's, or more than one masters programs at the time of publication. For the purposes of this study, the 21 accredited masters' programs were targeted. Qualtrics (Qualtrics, Provo, UT, USA) was used to collect data on how FEPAC masters' programs met the core areas identified in the standards, followed by qualitative post-survey interviews to further expand on the findings of the first phase of the research project.

Post Questionnaire Interviews Data Analysis

Data collected from the qualitative post-questionnaire interviews were coded and analyzed. Utilizing ATLAS.ti (ATLAS.ti version 22.2.0, Berlin, Germany), which is a computer-assisted qualitative data analysis software (CAQDAS), themes or patterns were identified based on responses to the instrument questions and post-questionnaire interviews. Using CAQDAS,

qualitative research can be evaluated using transcription analysis, coding, text interpretation, content analysis, grounded theory methodology and more (87-89). To further explore the data, descriptive statistics were identified to evaluate sample characteristics.

Institutional Review Board Approval

All procedures and materials were approved by Oklahoma State University Institutional Review Board (Stillwater, OK). The solicitation process lasted from April 4th through June 6th, 2022, and included in-person solicitations, email, and phone/video calls to generate interest from the 21 FEPAC accredited masters' programs.

Ethical Considerations

Respondent anonymity was ensured both with the instrument design and in the post-questionnaire interviews. Oklahoma State University, Center for Health Sciences Forensic Sciences master's program, although FEPAC accredited, was not included in this study due to the authors affiliation to the university.

Results and Discussion

Of the 21 FEPAC-accredited forensic science master's programs in which the instrument was sent, 13 (~62%) program directors completed the survey.

Questions for Instrument

1. Prior to March 2020, did the academic program routinely/typically offer distance learning/online/alternative delivery options for required lecture coursework (Core 1)?

- a. No, all course work was offered in a traditional/in-person classroom.
- b. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.

c. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.

d. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.

e. Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.

2. After March 2020, through the 2020-2021 academic year, did the academic program offer distance learning/online/alternative delivery options for required lecture coursework (Core 1)?

a. No, all course work was offered in a traditional/in-person classroom.

b. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.

c. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.

d. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.

e. Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.

3. Does the academic program plan to continue offering distance learning/online/alternative delivery options for lecture coursework going forward (Core 1)?

a. No, all course work will be offered in a traditional/in-person classroom.

b. Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of course work.

c. Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of course work.

d. Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of course work.

e. Yes, online courses/distance learning/alternative delivery will be offered for 100% of course work.

4. Prior to March 2020, did the academic program routinely/typically offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?

a. No, all course work was offered in a traditional/in-person laboratory setting.

b. No or Not applicable (laboratory courses were not offered)

c. Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.

d. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.

e. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.

f. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.

g. Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.

5. After March 2020 through the 2020-2021 academic year, did the academic program offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?

a. No, all course work was offered in a traditional/in-person laboratory setting.

b. No or Not applicable (laboratory courses are not offered)

c. Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.

d. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.

e. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.

f. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.

g. Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.

h. Normally offered laboratory coursework was not offered during this time period.

6. Does the academic program plan to continuing to offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?

a. No, all course work will be offered in a traditional/in-person laboratory setting.

b. No or Not applicable (laboratory courses are not offered)

c. Yes, a hybrid approach will be utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.

d. Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of laboratory course work.

e. Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of laboratory course work.

f. Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of laboratory course work.

g. Yes, online courses/distance learning/alternative delivery will be offered for 100% of laboratory course work.

7. Did the composition of faculty members of the forensic program change due to the global pandemic (Core 2)? (Select all options that apply)

a. Yes, faculty members of the forensic program voluntarily left their positions.

b. Yes, faculty members of the forensic program non-voluntarily (i.e., reduction in staff, lack of students, etc.) left their positions.

c. No, no change to the composition of the faculty members in the forensic program.

8. Prior to March 2020, how did the program meet the FEPAC requirement for professional involvement during to the global pandemic (Core 3)? (multiple option responses, respondent asked to select all options that apply):

a. Members of local forensic organizations interact directly with the academic program
(select all options that apply):

i. provide internships

ii. serve on graduate research committees

iii. teach as adjunct faculty

iv. serve in an advisory role to the program(s)

v. other (text box for open response)

b. Full-time faculty serve on state, city, county, or federal forensic oversight boards.

c. Full-time faculty recruit research committee members/advisors or collaborators from local/national/international forensic laboratories/organizations

d. Full-time faculty serve within professional organizations directly related to forensic science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional Professional Forensic Organizations, etc.)

e. Full-time faculty serve on standards development organizations directly related to forensic science (i.e., OSAC, ASB, ASTM, etc.)

f. Full-time faculty serve on forensic certification or accreditation boards, committees or as assessors (ABC, ABFT, FEPAC, etc.)

9. After March 2020 through the 2020-2021 academic year, how did the program meet the FEPAC requirement for professional involvement during to the global pandemic (Core 3)?
(multiple option responses, respondent asked to select all options that apply):

a. Members of local forensic organizations interact directly with the academic program
(select all options that apply):

i. provide internships

ii. serve on graduate research committees

iii. teach as adjunct faculty

iv. serve in an advisory role to the program(s)

v. other (text box for open response)

b. Full-time faculty serve on state, city, county, or federal forensic oversight boards.

c. Full-time faculty recruit research committee members/advisors or collaborators from
local/national/international forensic laboratories/organizations

d. Full-time faculty serve within professional organizations directly related to forensic
science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional
Professional Forensic Organizations, etc.)

e. Full-time faculty serve on standards development organizations directly related to
forensic science (i.e., OSAC, ASB, ASTM, etc.)

f. Full-time faculty serve on forensic certification or accreditation boards, committees or
as assessors (ABC, ABFT, FEPAC, etc.)

g. Other (text box for open response)

10. Was the institutional support provided to the program changed due to the global pandemic
(Core 4)? (multiple option responses, respondent asked to select all options that apply):

- a. Yes, the program budget increased, or supplemental funds were provided by the institution, due to the global pandemic (i.e., increased due to required supplies, social distancing, or other needs of the program to carry out the required course work, etc.).
- b. Yes, the program budget decreased, or typical funds provided by the institution was not allocated, due to the global pandemic (i.e., loss of students and associated tuition, loss of grant funding, etc.).
- c. Yes, additional space was provided to the program to help carry out course work with a consideration to public health concerns and social distancing.
- d. No, the program budget, funding, or space was unchanged.
- e. Not Sure

Core 1-Instument Results

In evaluating how accreditation standards were met with a focus on the effect of a global pandemic in four core areas, as previously noted, Core 1 focused on how educational content was provided to students. This included in-person/traditional, distance learning/online/alternative delivery, or hybrid lecture and/or laboratory coursework (Core 1). Prior to March 2020, of the programs that responded to the survey, labeled as Question (Q) 1, Core 1, ~77% of programs offered traditional/in-person classroom-based education with only 23% offering online courses/distance learning/alternative delivery were offered for up to 25% of course work (Figure 3). No program offered non-traditional coursework for more than 25% of their program coursework.

After March 2020, through the 2020-2021 academic year, which was at the height of the global pandemic, only one program (~8%) offered all lecture course work in-person. Figure 3 shows the responses for what percentages of courses were offered online or another alternative delivery

formats as well as a comparison with pre-pandemic offerings (Qs.1-2, Core 1).

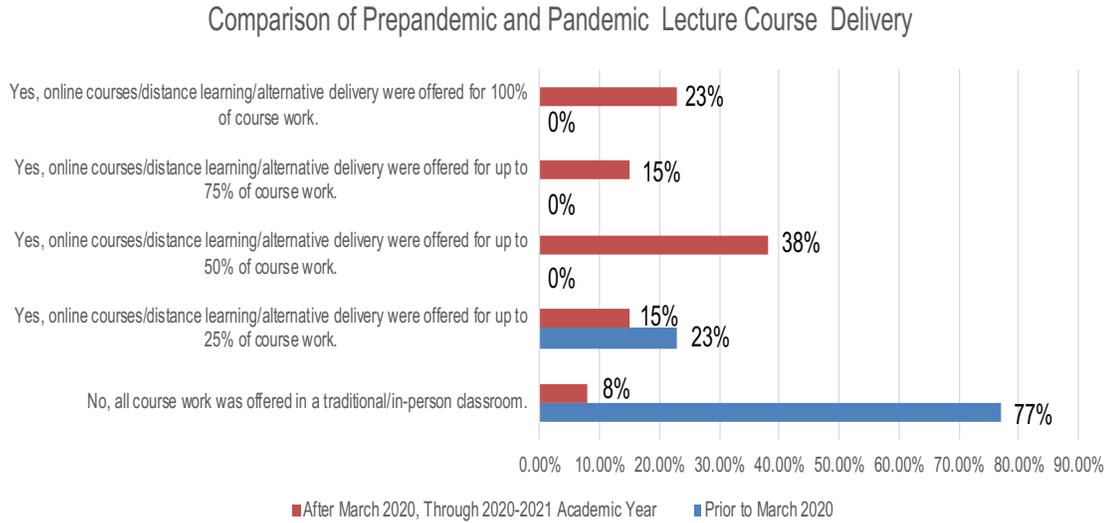


Figure 3. FEPAC program responses for what percentages of lecture courses were offered online or another alternative delivery formats after March 2020, through the 2020-2021 academic year as well as comparison from pre-pandemic delivery (Qs.1-2, Core 1)

Program directors were asked to determine if the academic program plan to continue offering distance learning/online/alternative delivery options for lecture coursework. The results can be viewed in Figure 4.

Online Lecture Course Offerings After the 2020-2021 Academic Year

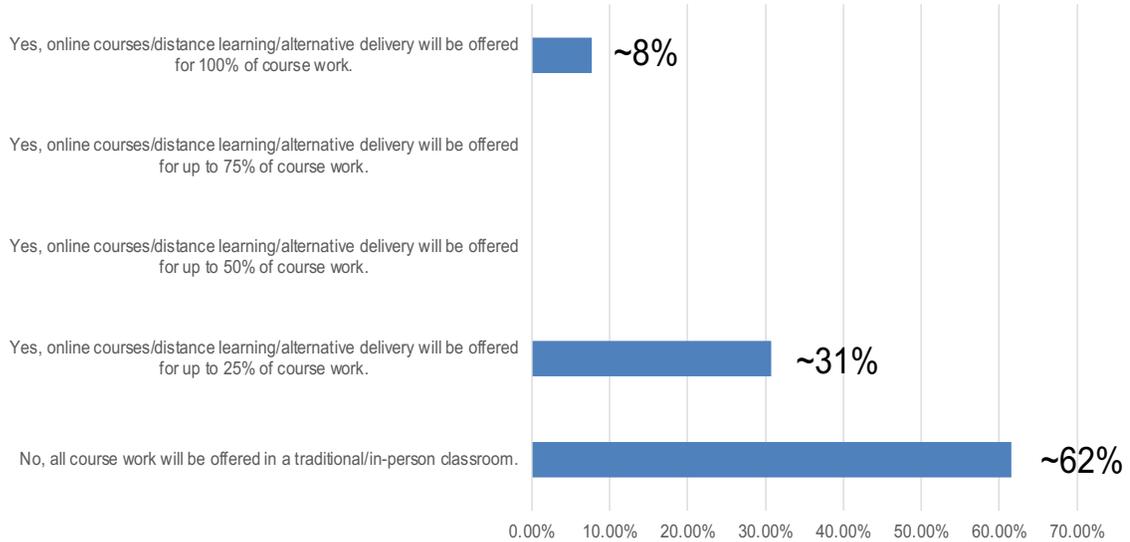


Figure 4. FEPAC program responses for what percentages of lecture courses will continue to be offered online or another alternative delivery formats after the 2020-2021 academic year (Q.3, Core 1)

Forensic science and its sub disciplines are characterized as hands-on careers, therefore academic programs offer laboratory courses focused on providing the knowledge, skills, and abilities needed to perform these roles. Program directors were asked if prior to March 2020 if the FEPAC accredited academic program routinely offered distance learning/online/alternative delivery options for laboratory coursework (Q. 4, Core 1). All program directors (100%) specified that all laboratory courses were offered in a traditional/in-person laboratory setting.

To prevent the spread of disease, universities and colleges were faced with determining how many individuals could safely be in one confined space and reduce the risk of exposure.

Laboratory courses which require adequate space to perform hands-on activities while still maintaining safe distances can be very challenging to hold at the needed enrollment capacities to accommodate the students and ensure they meet the program as well as FEPAC requirements.

Therefore, program directors were asked if after March 2020 through the 2020-2021 academic

year, if the academic program offered distance learning/online/alternative delivery options for laboratory coursework (Q.5, Core 1). The results can be viewed in Figure 5.

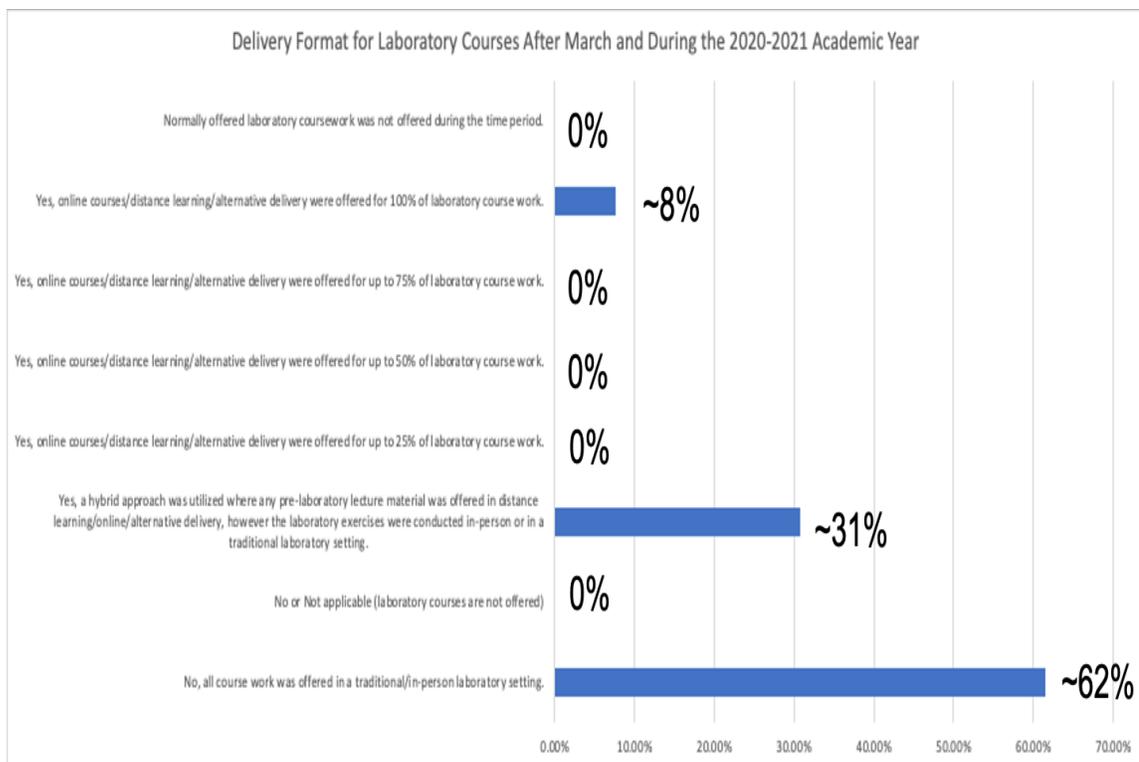


Figure 5. FEPAC program responses for what percentages of laboratory courses were offered in-person, online/alternative delivery, or in a hybrid format after March 2022 and during the 2020-2021 academic year (Q.5, Core 1)

Program directors were asked if their academic program plan to continuing to offer distance learning/online/alternative delivery options for laboratory coursework (Q. 6, Core 1). All (100%) responded that their programs would only offer traditional/in-person laboratory courses.

Core 2-Instument Results

To better understand the impact of the global pandemic had on staffing, Core 2 evaluated the composition of forensic faculty and if those programs lost faculty members (Q7, Core 2). All

(100%) of program directors responded that they did not lose faculty members directly due to the pandemic.

Core 3-Instument Results

To understand how academic programs, faculty, and students, achieved the FEPAC standard for professional involvement, program directors were provided a list of activities that faculty members and students may have been involved in (Q.8, Core 3, Figure 6). Respondents were also provided an option to share other activities. It was noted that faculty were engaged in professional initiatives including grant reviewers, journal editorial boards, and with the Innocence Project.

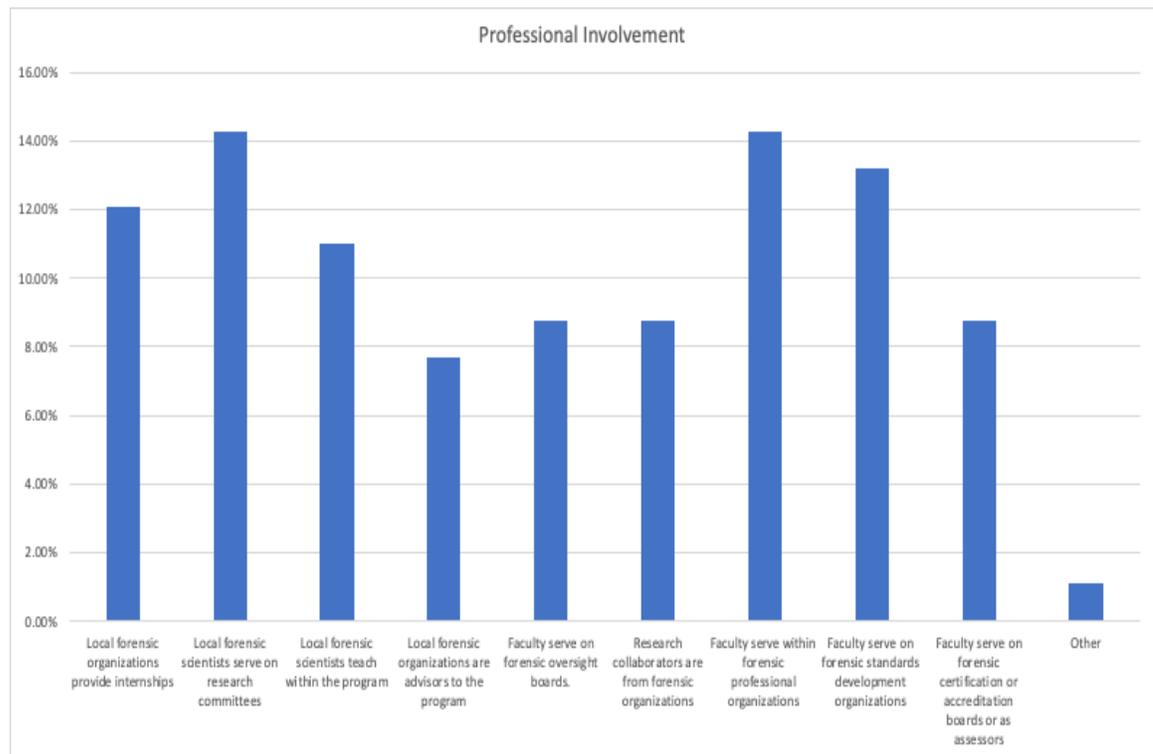


Figure 6. FEPAC program responses to how faculty within the program and students met the FEPAC standard for professional involvement (Q.8, Core 3)

At the height of the pandemic and through the following school year (March 2020 through 2020-2021 academic year) with the limitations in travel and in-person meetings, program directors

were asked about their program’s professional involvement (Q.9, Core 3), questions on how the global pandemic affected the program and their student’s ability for professional engagement, if at all, were asked (Figure 7).

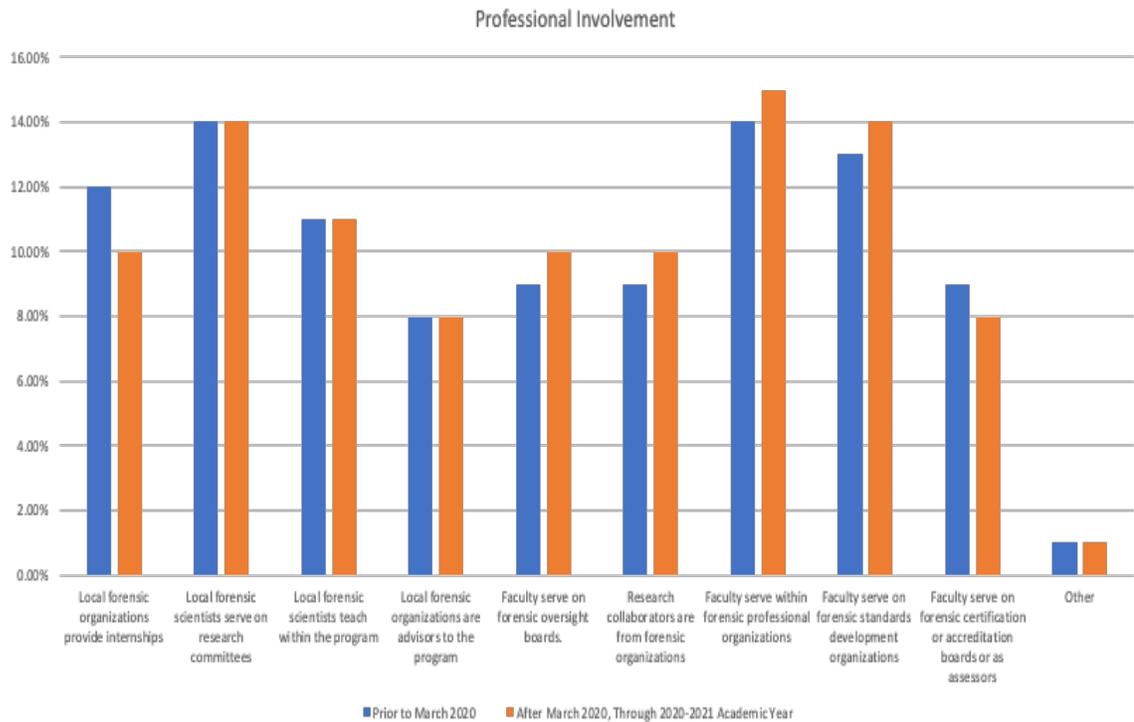


Figure 7. FEPAC program responses how the global pandemic affected the program and their student’s ability for professional engagement after March 2020 through 2020-2021 academic year (Q.9, Core 3) as well as comparison from pre-pandemic involvement

Core 4-Instument Results

The economic effects of the global pandemic are not fully understood, and it may be some years before we fully appreciate the short- and long-term effects, therefore program directors were asked if the program’s budgets were altered due to the pandemic (Figure 8, Q.10, Core 4)

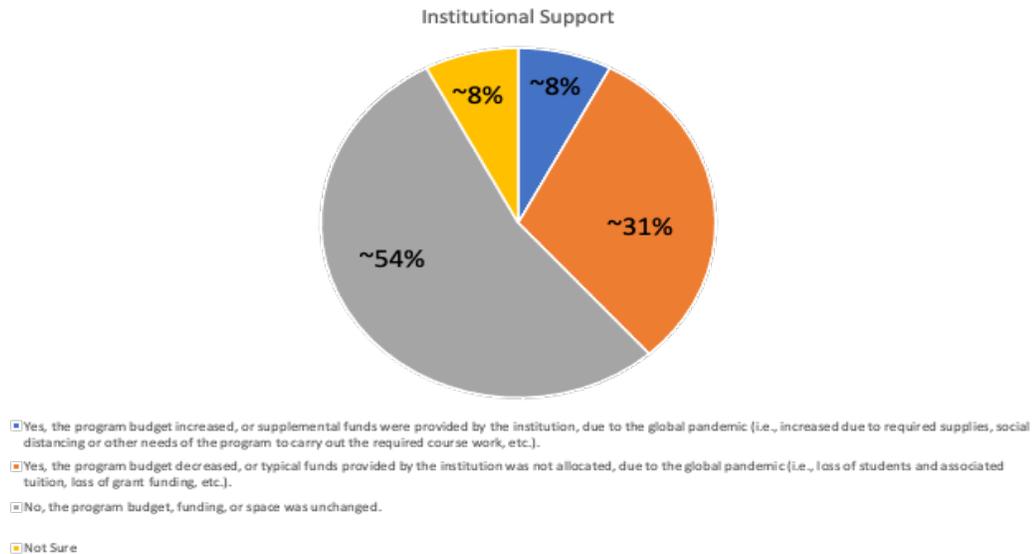


Figure 8. FEPAC program responses how the global pandemic affected the program institutional support (Q.10, Core 4)

Forensic academic programs reside in both public and privately funded institutions. Institutional support, either directly or indirectly, may affect programs differently, with some being fully tuition funded and others dependent on grant funding to support student and faculty research. Funding variability and institutional support may also relate to other select core areas assessed such as the composition of forensic program faculty members as well as the ability to meet the standards regarding professional involvement.

Post-Questionnaire Interviews

Following the administration of the instrument to collect the before mentioned data, each response was evaluated for completeness, and post- questionnaire interviews were conducted. These interviews were conducted with program directors. Of the 21 FEPAC accredited forensic science masters programs, 7 (33%) program directors took part in the one-on-one interviews. Conducting this qualitative data collection helped in the interpretation of participant responses to

the instrument, as well as explain or describe variations in responses to the same question. The qualitative post-questionnaire interviews were evaluated, transcribed, and then coded.

Follow-Up Questions and Associated Core Areas

Core 1

1. Can you provide additional details as to why core courses were not offered by distance learning prior to March 2020?
2. Are courses outside the program offered by distance learning/online/alternative delivery options?
3. Does the program or university have the technology to support distance learning/online/alternative delivery options?
3. Is distance learning/online/alternative delivery options as effective as in-person teaching?
4. Did students find distance learning/online/alternative delivery options as effective as in-person teaching?
5. Did the program consider offering distance learning/online/alternative delivery options for laboratory courses? If so, what were some of the barriers to offering distance learning/online/alternative delivery options for laboratory courses?

Core 2

1. If faculty members left voluntarily, did they do so to continue teaching at another institution or take on a position in a forensic organization?
2. If faculty member(s) left non-voluntarily, did they do so due to faculty cuts or lack of funding?

3. If faculty members left voluntarily, did they do so due to medical issues related to the global pandemic?

Core 3

1. Did program requirements change to meet the FEPAC professional involvement requirement?

2. Did any students take part in an online or remote internship program?

3. Was there any change to how local forensic organizations interacted with the forensic program during the global pandemic?

4. Were there any benefits seen during or due to the global pandemic? For example, were members of forensic organizations in more of a position to interact with the academic program as they had more available time to do so? Or did faculty members have an opportunity to work with collaborators they normally would not have the opportunity to do so, such as those outside of the United States?

Core 4

1. If you answered yes to a program budget increase or decrease can you elaborate on why this occurred?

2. If additional space was offered to carry out teaching and/or research objectives due to the global pandemic, did this additional space remain with the program after capacity restrictions were removed-if they have been lifted?

3. If the program budget was not affected, do you believe that the academic program suffered due to the global pandemic and meeting the FEPAC standard for institutional support?

Post Questionnaire Interviews Results and Discussion

Codes Identified

Upon transcribing the interviews, these were imported into ATLAS.ti along with the video recordings. Transcripts were reviewed for accuracy. After completion of coding, the frequency of each code was evaluated. If a code was not used, it was deleted. Codes with only one or two occurrences were evaluated and merged, if possible, with a similar code resulting in an initial 40 codes (n40). All codes were further evaluated to ensure uniqueness, merged, if necessary, with a result of 33 (n33) final codes for data analysis as can be seen in Figure 9.

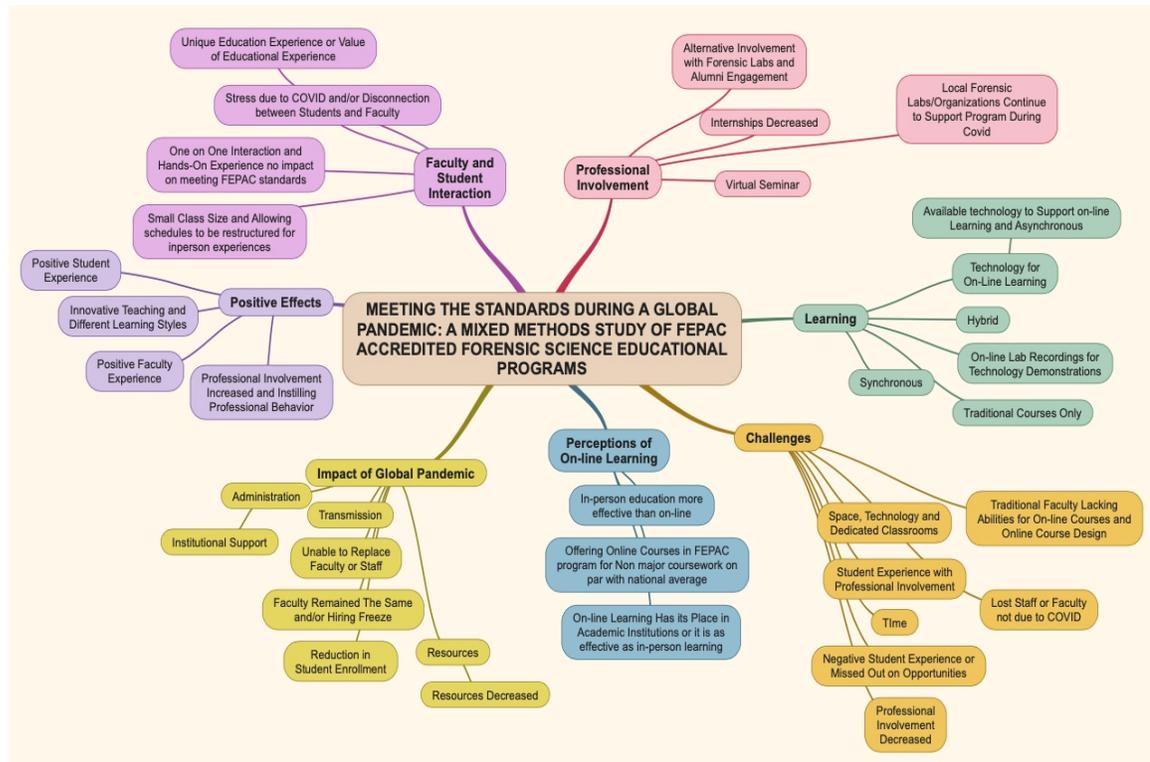


Figure 9. Finalized codes for data analysis. (Created using SimpleMind, Version 1.32.0)

Codes were evaluated for overarching themes and included: Impact of the Global Pandemic, Challenges, Faculty and Student Interaction, Professional Involvement, Learning, Perceptions of OnLine Learning, and Positive Effects. Subcategoring within these themes are described and

surprising that the topic would be discussed during the interview process. There was a total of 38 occurrences on the impact of the global pandemic, with transmission of COVID-19 and steps taken to prevent the spread of the virus communicated five (15%) times. There were six (18%) instances regarding that the faculty remained the same or that a hiring freeze was put in place. Three (9%) instances where the reduction in student enrollment occurred. University administration and institutional support was discussed in seven (21%) occurrences, with resources, including reduction in resources, discussed 17 (52%) times, by far the most often noted within the impact of the global pandemic theme.

Challenges

There were 77 occurrences where codes involving challenges were discussed. It is not surprising that challenges with space, technology, and dedicated classrooms for the academic programs were noted and occurred 11 (33%) times. Traditional faculty lacking abilities to carry out online courses and online course design-10 (30%), student experience with professional involvement-6 (18%), lost staff or faculty not due to COVID-6 (18%), available time-17 (52%), professional involvement decreased-8 (24%), and the most often occurring topics being negative student experience or missed opportunities with 19 (58%) instances.

Faculty and Student Interaction

A key component of successful graduate education is faculty and student interaction. There were 56 instances where codes involving these interactions were discussed. The occurrences included the programs' ability to provide unique education experiences or value of educational experience 9 (27%), stress due to COVID and/or disconnection between students and faculty 15 (45%), as well as importance of small class size to allow schedules to be restructured for in person experiences 10 (30%). There were 22 (67%) occurrences that included topics regarding one-on-

one interactions, hands-on experience, as well as how these factors had no impact on meeting FEPAC standards.

Professional Involvement

As previously noted, to understand how academic programs, faculty, and students achieved the FEPAC standard for professional involvement, program directors were provided a list of activities that faculty members and students may have been involved in. There were 34 occurrences of codes involving professional involvement. During the interview process, topics were identified including alternative involvement with forensic labs and alumni engagement 15 (45%), decrease in internships 7 (21%), local forensic labs/organizations continue to support programs during a global pandemic 7 (21%), and virtual seminars 5 (15%).

Learning

As the topic of this research is education, specifically educational standards, it is expected that codes related to learning (51 occurrences) and how courses were offered would be identified including synchronous 7 (21%), traditional/in-person courses only offered 8 (24%), and hybrid 12 (36%) approaches. Offering online laboratory recordings for technology demonstrations had 7 (21%) occurrences. When asked if the programs had technology for online learning (available technology to support online learning or provide asynchronous education) there were 17 (52%) instances that the programs did feel they had it available.

Perceptions of Online Learning

To gather more details on perceptions of online learning (43 occurrences) and if those may have impacted the approach taken to deliver course content prior to, during and after the height of the global pandemic questions were asked to derive more details. It was noted in 18 (55%) occurrences that program directors of FEPAC accredited master's programs that in-person

education is more effective than online courses. When asked, offering online courses in FEPAC program occurred for non-major coursework and when noted, that they felt their institutions were on par with national average 11 (33%) for online learning. Finally, in 14 (42%) occurrences, program directors felt that online learning had a place in academic institutions, or it was viewed as effective as in-person learning for certain coursework or academic disciplines.

In addition to available technology or faculty trained in online pedagogies, there are other possible reasons for not offering courses in non-traditional formats. As noted, the beliefs that in-person education is more effective or reluctance for institutions to adopt online learning due to loss of funding that comes with traditional programs (i.e., housing/food/tuition dollars) may also be reasons to consider.

Positive Effects

Challenges, stress, disconnection between students and faculty, and other negative effects were experienced during and continue to be felt after the height of the global pandemic, however there were unanticipated positive effects (57 occurrences) including 25 (76%) instances of positive student experiences, 11 (33%) of innovative teaching and accommodating different learning styles, 10 (30%) of positive faculty experience, and 11 (33%) of professional involvement increases and instilling professional behavior.

Conferences, seminars and/or other forms of virtual continuing education were noted in professional involvement and behavior where students and faculty could attend and/or participate without the burden of travel costs. Virtual seminars and engaging alumni were another added benefit where programs began to recruit seminar presenters from outside their geographical location and invite graduates of the program to these events.

Limitations

As previously mentioned there may be variability in how accredited forensic programs meet the FEPAC standards. Currently, there is only one accreditation program that is specific to forensic science education in the United States with only 32 accredited forensic programs, and only 21 accredited masters' programs. Per the National Center for Education Statistics (2019) there are approximately 3,000 four-year colleges in the United States (50). Therefore, the number of accredited forensic education programs is an extremely small number (~1%) relative to the number of total programs. Further, although forensic organizations may require that applicants' degrees are obtained from accredited universities/colleges, they may not specify that they are FEPAC accredited. Through the Council of Forensic Science Educators (COFSE), committee members have captured forensic science programs in the United States (as of February 2019) and provided this to COFSE members. This list includes over 350 bachelors and masters' programs related to forensic science education (90). Therefore, FEPAC accredited programs only account for ~9% of all forensic related educational programs.

Disclosure

It is disclosed that of the 21 FEPAC accredited masters' programs the authors are or were associated with two of the programs in which this research is being conducted.

Conclusion

Overall FEPAC accredited programs experienced impacts to their course offerings (lecture and laboratory) due to the global pandemic. For lecture-based courses, there was a shift from traditional to online courses, even following the height of the pandemic. However, all programs returned to pre-pandemic approaches such as offering traditional in-person laboratory-based courses. Professional involvement for students and faculty was not significantly impacted and in some cases were positively affected. However, institutional support was reported to have

increased or decreased for almost 39% of the programs. Themes identified focused on students receiving the training and education needed for degree completion (education, professionalism, available faculty, and resources) and the challenges, such as missed opportunities, the pandemic had on faculty and students.

CHAPTER IV

DISCUSSION

Phase I Instrument

As previously noted, a shift in the delivery format for lecture based courses occurred during the height of the global pandemic (Core 1). Prior to March 2020, 77% of lecture-based courses were offered in a traditional in-person classroom setting with only up to one quarter of lecture course work offered in a non-traditional or online format for 23% of the programs. Programs varied in the amount of lecture course work offered online after March 2020 and through the 2020-2021 academic year. The percentage of course work offered online ranged from 15-38% (Figure 11) with only 8% offering in person education for all coursework.

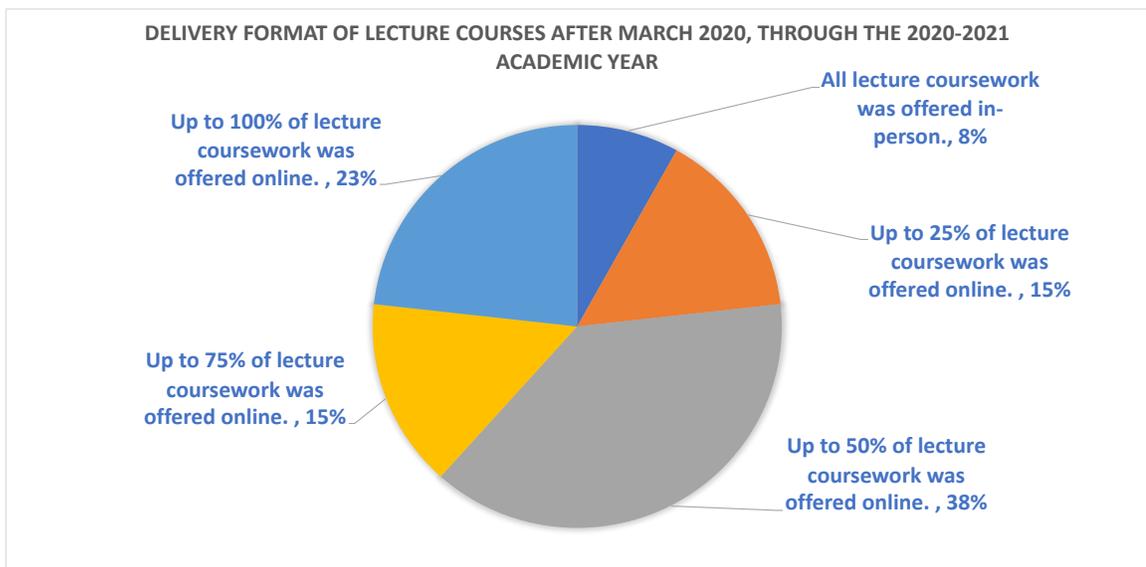


Figure 11. Delivery format of lecture courses after March 2020, through the 2020-2021 academic year

Although 62% of programs responded that they would return to in-person for lecture courses, what may be more insightful is the shift in the use of online learning for lecture based forensic course work. With 8% (from 0% prior to the pandemic) of respondents offering 100% of their lecture coursework and an increase from 23% (prior to the pandemic) to 31% offering a quarter of their courses in online formats. For laboratory-based courses these returned to pre-pandemic approaches with traditional in-person training.

Professional involvement (Core 2) for students and faculty was not significantly impacted by the global pandemic. Although there were events and activities that could not take place in person, there were many virtual options for meetings of professional organizations that students and faculty participated in. Although many reported that there was a reduction in internships, the programs that took part in this research found no impact to their student's ability to complete the degree requirements. There were increases in some areas of professional involvement such as serving on forensic oversight boards, research collaboration, service in professional organizations, and forensic standards development. In addition to internships, service on certification or accreditation boards as assessors did decrease after March 2020 and through the 2020-2021 academic year.

Faculty composition (Core 3) was not influenced directly by the global pandemic, however there were changes in staff and faculty due to normal transition to new roles or retirements. Although we may consider faculty to be integral to forensic programs, we should not overlook the importance of staff members and the roles they play in the program administration and student interaction. Hiring freezes were utilized by universities and colleges as a reaction to the drop in enrollment or anticipated loss in revenue due to the global pandemic. When staff or faculty

changed, for some programs they were not able to replace them for extended periods of time. This may have added to stress experienced by faculty where they may have had to take on additional duties such as teaching, student advising, program administration, and more.

As previously noted, program budgets (Core 4) may be based on a several factors including student enrollment/tuition dollars, grant funding, or other forms of program resources. Over half (54%) of the programs indicated that there was no change to their program budgets. However, 39% reported that institutional support changed, with 31% reporting a decrease and only 8% experiencing an increase in funding.

Phase II Interviews

The interview process took place over Zoom (San Jose, USA) where representatives of the FEPAC masters programs were provided an overview of the research project and then were asked specific questions for each of the core areas of the FEPAC standards. As previously noted, these questions were designed to gather additional details on the provided instrument during Phase I. Following the interview, they were provided the next steps in the research process (i.e., transcription of the recordings, data analysis, etc.). In all instances, Program Directors took part in the interview process. The transcriptions were coded and the data was evaluated to identify themes. Although seven overarching themes were identified, in some instances there were overlaps from one main theme to another.

Impact of the Global Pandemic

Through the interview process, several themes related to the impact of the global pandemic (Figure 12) were discussed including resources (increase and decrease), transmission of the virus and steps taken to reduce the risk, composition of the program's faculty, student enrollment and the effect of the pandemic on it, as well as administration and institutional support. There was variability in program budgets with some program directors noting that their resources were

increased, some decreased, or for more than half it remained the same. They reported that budgets were cut from anywhere from 5 to 15%. Directors reported they saw a drop in student enrollment which may have directly affected the resources allocated to their programs. For those who reported additional resources, the funding was COVID relief funds intended to provide tutoring and/or workshops to ensure students were able to get hands-on activities that were not able to be carried out due to the shutdown or for students who were not able to complete those during the typical semester.

For some, programs were provided additional space, or their space was altered to accommodate more students and/or more appropriate social distancing. One program director noted that the impact of COVID continued to affect their research and laboratory courses due to supply chain issues. This included the ability for the program to have enough personal protective equipment and receive supplies in a timely manner.

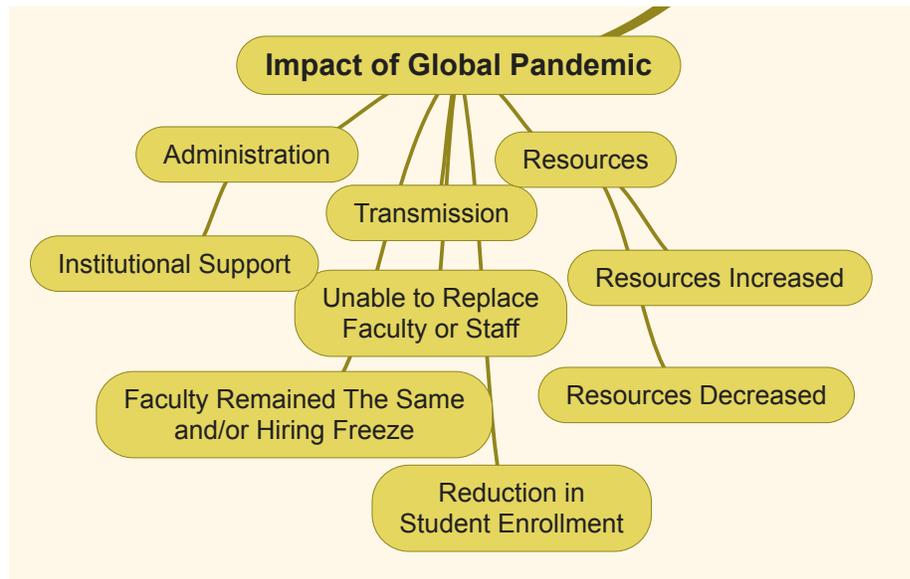


Figure 12. Impact of global pandemic themes. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Challenges

There are numerous challenges (Figure 13) that were discussed during the interview process. These included ensuring student professional involvement; students feeling as if they may have missed out on opportunities or faculty feeling that students did not get the same experiences as in previous academic years. With restrictions in room capacities, faculty reported having to alter and reduce the number of students inside laboratory spaces and either offering more laboratory sessions or restructuring the course to ensure they did not violate those limits. They reported that regardless of the approach taken, students and faculty were impacted negatively. For faculty, they were required to offer more sessions of their laboratory courses which added an additional strain to their already busy schedules. If the course was restructured to split the students into two or more cohorts where one group were in-person one week and remote the second, then students may have had a reduction in the amount of time with hands-on activities. In both instances there was stress and/or a feeling of having missed out on opportunities.

To ensure that students met the degree requirements, the program directors noted the importance of having dedicated space and technology in classrooms or laboratories to carry out in person activities. Although the program directors reported they did not lose any faculty due to COVID, faculty members and staff did change due to other factors such as retirement or moving to different positions. During the height of the global pandemic some institutions implemented hiring freezes whereby these open positions could not be replaced. Directors interviewed reported that their programs returned to some type of in person activity (research or laboratory courses) as early as May of 2020 and sooner than other programs at their colleges or universities.

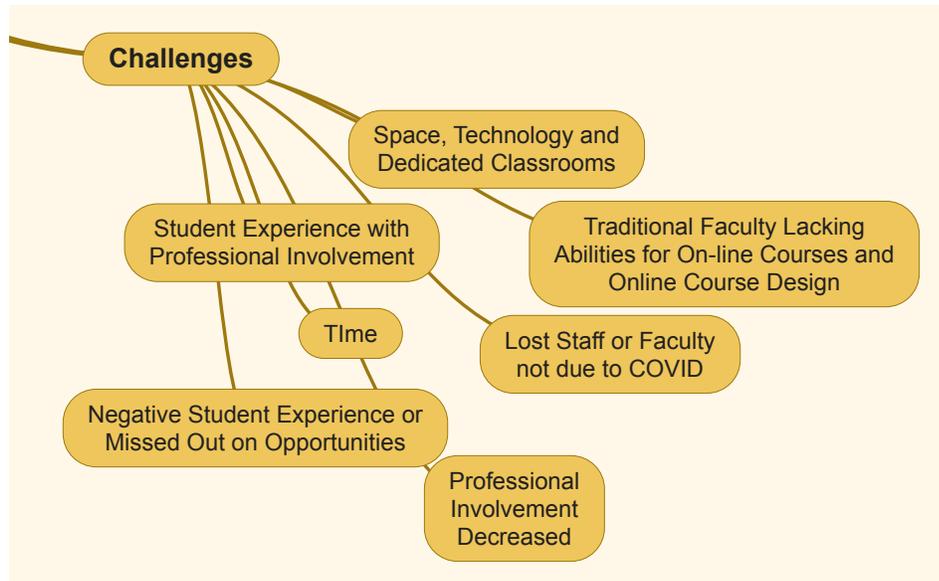


Figure 13. Themes related to challenges. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Faculty and Student Interaction

The themes identified regarding faculty and student interaction (Figure 14), included unique education or “value” of the educational experience; stress due to COVID and/or disconnection between students and faculty; one on one interaction; hands-on experiences; no impact to meeting FEPAC standards; and importance of small class size on allowing programs to restructure course work for in-person experiences. Regarding faculty student interactions, directors noted that the inability to see a student’s face had an impact on communication and their teaching. Faculty rely on facial cues that help them gauge student understanding. The inability to see a student’s face was mentioned by faculty and that they felt that online synchronous education and the inability to see facial expressions well in-person (with masks), had a great impact on their ability to teach effectively as expressions were either “masked” or in online formats, the ability to see all students in a glance was not feasible.

A strength noted by the program directors interviewed was small class sizes. Unique educational experience or “value” of educational experience and the ability to pivot easily due small class size was seen as strengths of their programs. Further, the ability to restructure courses when the shutdown occurred or prior to so that course schedules were “front loaded” during the Spring 2020 semester for hands-on activities was noted. In addition, time was allocated to make-up missed laboratory classes once it was safe to return to in-person activities.

There are formal and informal ways that faculty can develop relationships with their students. For example, one on one advising session could be classified as a formal mechanism built into the program to interact with the students, establish their future goals (i.e. research focus, career path, etc.) and check in with how students are doing within and possibly outside of the program. There are in-formal opportunities that although are not easily quantitative, provide faculty opportunities to get to know students better and learn about issues that may not be raised during a scheduled advising session which often only occur once or twice a semester. Noted was the time during a laboratory course in which a faculty member has the opportunity to speak informally with students, possibly while waiting for instrument time or for an experiment to be carried out. These opportunities can allow time for students and faculty to get to know one another, and for faculty to informally check in with students and find out how they are doing. During the shutdown there was no clear mechanism to carry out these types of informal conversations and program directors responded to the interview stating that they realized that many of their students were not doing well. They adjusted their communication and made time during lecture courses or other opportunities to check in with how the students were feeling. Students and faculty were both dealing with his stress related to COVID, whether that be from direct illness in contracting the virus, fears concerning the well beings of friends and family members, and in some cases dealing with grief related to the loss of family and friends due to the virus. Due to the specialized nature

of forensic science, program directors noted that the bonds formed during the educational process are extremely important and that with remote learning, those bonds are not formed or not as strongly.

Program directors noted that their institutions had effective approaches to managing transmission to reduce risk, testing strategies and effective quarantine procedures. Overall, these programs reported that they were able to restructure the courses once students returned to in-person campus activities. They were able to ensure that laboratory course content could be made-up with laboratory time or additional opportunities to train on the instrumentation.

Program directors reported that although they may have had to alter the delivery of specific course content, however, it did not impact their ability to meet FEPAC standards. Program directors also noted that students may specifically choose an academic program based on the interaction and/or anticipated experience they may have with the faculty. They reported that by continuing to offer online learning for core course work that it would detract from those aspects of their programs and would result in lower student enrollment. Program directors responded that they if they could not carry out an in-person activity due to the shutdown or reductions in room capacity that they would postpone and reschedule it once they were able to do those activities in-person.

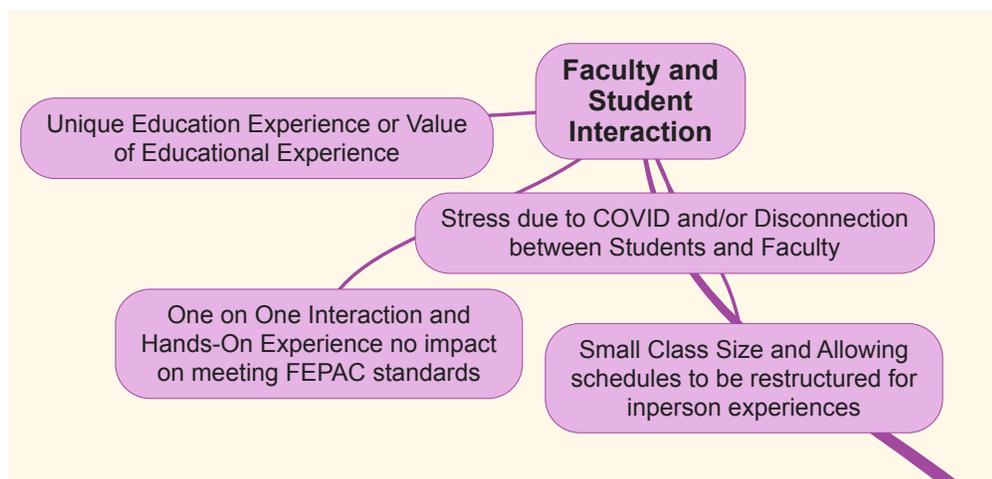


Figure 14. Faculty and student interaction themes. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Professional Involvement

The themes identified for professional involvement (Figure 15) included interaction with local forensic laboratories/organization; continued support from local forensic laboratories/organizations during COVID; internships; virtual seminars; and alternative involvement with forensic laboratories and alumni engagement. During the summer of 2020, some students would have typically taken part in internships with local forensic laboratories. However, to reduce the risk of spreading the virus, many forensic organizations could not allow students to intern, either in the summer or into the fall of 2020.

Program directors reported their interaction with local forensic laboratories and organizations continued, but in different ways. They continued to serve as adjunct professors, on research committees or collaborations, and advisory boards to the programs. A benefit that most program directors reported, and would continue to utilize, was offering virtual seminars. During the shutdown and after, they were able to recruit seminar speakers from around the world. They were also able to offer attendance to virtual seminars to their alumni and found it to be another mechanism to engage not only their students, but also local forensic laboratories and past graduates. Most program directors reported that research committees were comprised of individuals from outside of their academic institutions. With the use of technology like Zoom and other online meeting platforms, research committees were able to participate more fully throughout the student's research project. They reported that their strong relationships with their local forensic organizations were an added benefit not only to themselves and their programs, but also to students.

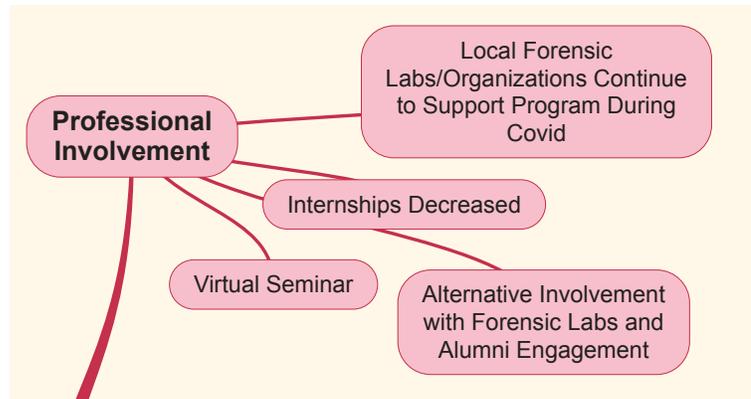


Figure 15. Professional involvement themes. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Learning

The themes identified for learning (Figure 16) included technology for online learning; hybrid; synchronous; online laboratory recordings for technology demonstrations; available technology to support online learning; asynchronous; and traditional courses only. Overall, program directors reported that they felt that their academic institutions had the technology to offer online learning. Many provided that a hybrid format was used once the shutdown was lifted and students were able return to in person activities. The hybrid format was most often described as allowing students to synchronously join online to a lecture-based course and/or offer a certain number of seats in the lecture room on campus. The program directors also noted that once able to go fully in person they chose to go back to a more traditional delivery of course content. They also reported that the ability to record lectures and post them for future viewing was found to be a benefit that would be continued once programs returned fully to pre-pandemic formats. They noted that their students benefited from the ability to re-watch recordings of lectures to reinforce the information. Some program directors noted that it also was helpful to those with different learning styles, such as those individuals who learn more effectively through audio and visual learning.

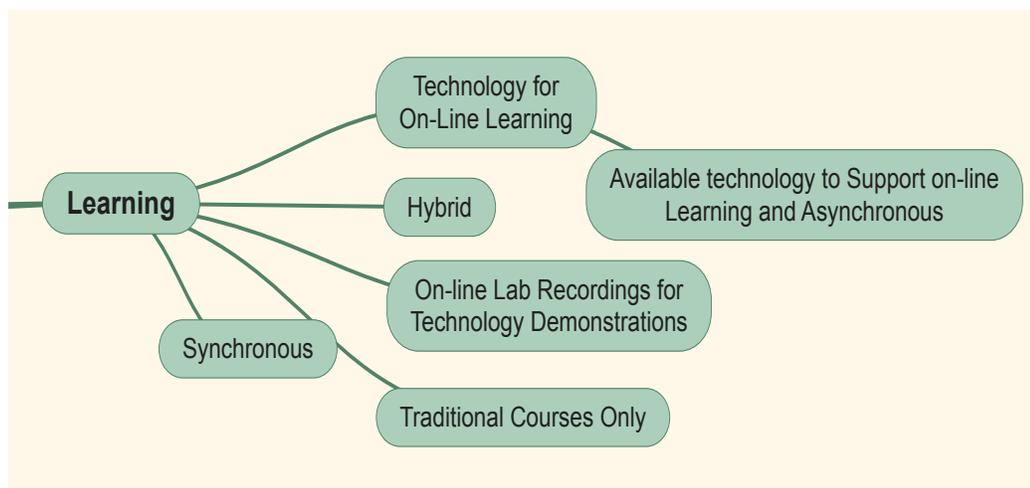


Figure 16. Learning themes. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Perceptions of Online Learning

The themes identified for perceptions of online learning (Figure 17) included in-person education was more effective than online; offering online courses in FEPAC programs for non-major coursework was “on par” with the national average; and online learning has its place in academic institutions or it is as effective as in-person learning. When interviewed, the program directors responded that they felt that their institutions offered online programs at a similar level as other programs across the United States. When asked specifically about their perceptions of online learning related to forensic science, most responded that in person education was more effective than online education. They did feel that online courses had a place within academic institutions. Such as for non-major coursework, specific academic programs, or lower-level coursework. Due to the hands-on nature a forensic science, most responded that online learning cannot replace the skills acquired with the hands-on interaction with instrumentation or equipment in the laboratory. Program directors felt that watching a demonstration did not replace the time spent physically touching the laboratory equipment. Some program directors related their student’s feedback which varied with some reporting that they did not enjoy the online format. Specifically noting that they felt that it was less engaging, that they may be missing out on activities that other

students are experiencing, as well as difficulty in staying engaged when online. Overall, the hands-on aspect of forensic science was most often mentioned when considering the effectiveness of online education for forensic disciplines.

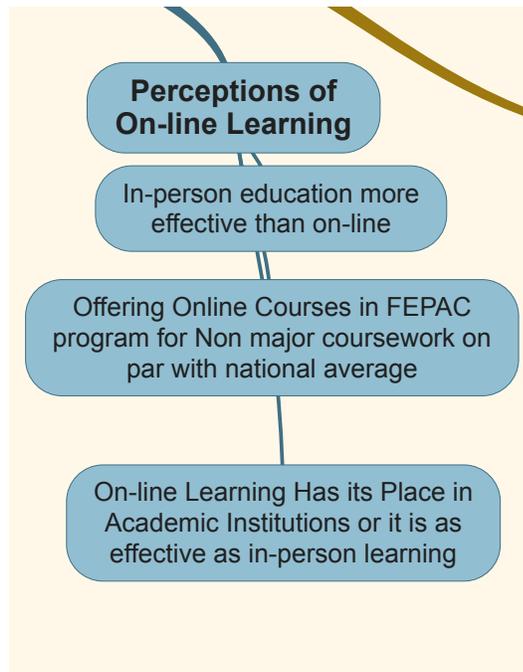


Figure 17. Perceptions of online learning themes. (Created using Simple Mind Lite Version 1.288.3 Build 2166)

Positive Effects

The themes identified for positive effects (Figure 18) included positive student experience; innovative teaching and different learning styles; positive faculty experience; and professional involvement increase and instilling professional behavior. In some instances, program directors reported that faculty members developed online laboratories where kits were sent out to the student and online demonstrations were provided. During the 2020 and 2021 academic year, many of the professional organizations that would typically host in-person meetings were able to provide the scientific content in an online format. This allowed students and faculty to participate

in these meetings at times in which they may not have been able to due to the cost related to travel. Program directors also responded that students were able to attend and participate in international conferences which may not have been feasible without the virtual format. A benefit that was reported was the large number of continuing education and/or webinars that were offered completely free of charge. This provided another opportunity for students to engage in professional development. Many program directors reported that their academic institutions had already installed technology such as monitors, web cameras and other tools that could support online learning and/or a hybrid approach. In some instances, faculty reported that the pandemic and related constraints placed on in-person activities, forced them to reevaluate their coursework and restructure, reorganize and ultimately improve the effectiveness. Program directors also noted that there were aspects of the laboratory courses that they could do online, and it resulted in a more positive experience for the students as the available time in the laboratory was more effectively utilized.

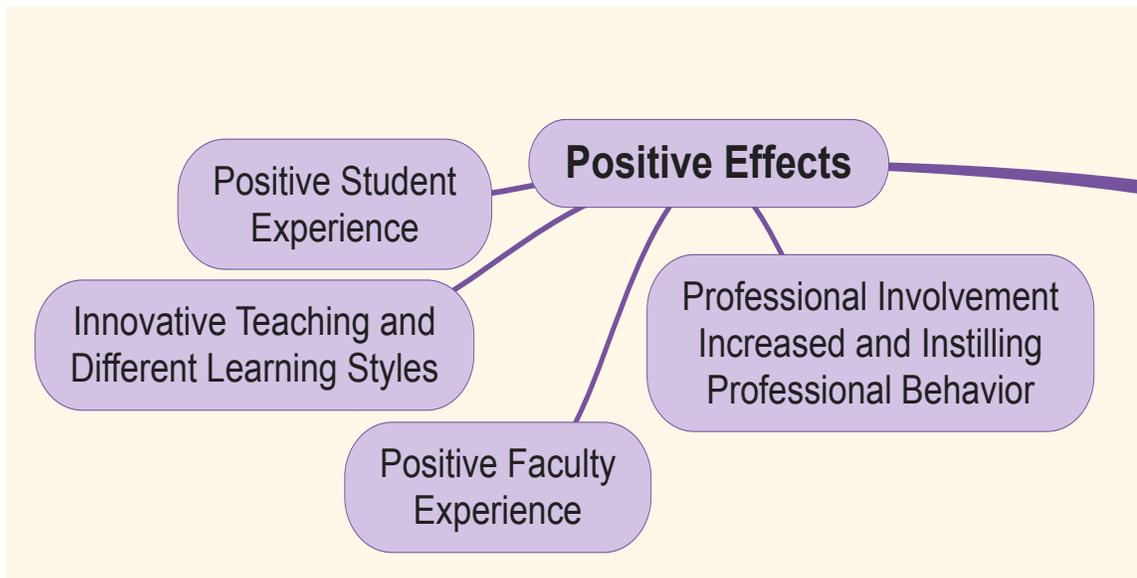


Figure 18. Positive effects themes (Created using Simple Mind Lite Version 1.288.3 Build 2166)

CHAPTER V

CONCLUSIONS

Phase I Instrument

Understanding the ability of forensic education programs to meet specific educational standards can help us better understand impacts of a global impact and learn from the choices and changes that were made during the height of the pandemic as well as influence programs moving forward. For lecture-based courses, there was a shift from traditional delivery to online courses, even following the height of the pandemic (Core 1). Program directors also shared their perspectives on the importance of hands-on skills acquisition by indicating that laboratory-based courses would return to pre-pandemic approaches and be offered in traditional in-person formats.

Professional involvement for students and faculty was not significantly impacted by the pandemic (Core 2). Some areas of were impacted after March 2020 and during the 2020-2021 school year, such as internships or the ability to conduct research at forensic laboratories, however these did not impact the ability for students to meet the degree requirements. There were positive effects such as virtual meetings and training opportunities which significantly increased due to the inability to attend in-person events. Finally, faculty reported increases in certain professional activities such as the ability to serve on oversight boards, research collaborations, service within professional organizations, and forensic standards development.

Overall, the composition of program faculty was not influenced directly by the pandemic (Core 3). Respondents noted that programs lost faculty and staff, however it was not directly due to COVID-19. There were faculty members that retired and staff that changed jobs and programs were unable to replace them due to hiring freezes in place at their institutions.

Institutional support (Core 4) was impacted for 39% of the programs (increase and decrease), with more than half of the respondents noting that their budgets were not affected. For those programs that experienced increases (8%), it was reported to be due to COVID relief funding. A reduction in student enrollment and/or tuition dollars was noted as factors in decreases in program budgets.

Phase II Interview

There were several themes identified during the interview process which were impact of the global pandemic, challenges, faculty and student interaction, professional involvement, learning, perceptions of online learning, and positive effects. Overall, students were able to receive the training and education needed for degree completion although the process may have changed due to the pandemic. Programs reported that traditional in-person approaches would be taken for laboratory courses, however some aspects used during the height of the pandemic such as recording lectures or laboratory demonstrations and providing those to students would continue as it was found to better support different learning styles. Programs reported that they had online courses available for non-major courses and/or that their institutions offered online programs for specific academic disciplines, however it was perceived to be not as effective for forensic courses, especially laboratory coursework.

Programs noted that they would continue to utilize technology to engage with the national and international forensic science community. They also noted that faculty utilized innovative teaching approaches, and some were “forced” to reevaluate courses during the pandemic with

noted improvements based on course evaluations. There were challenges for faculty and students including missed opportunities such as reduction in hands-on skill acquisition, stress, available time, and faculty/student interactions suffering due to the global pandemic. Although programs did not lose faculty or staff directly due to the pandemic, hiring freezes prevented them from replacing retired faculty or staff that transitioned to new positions. Professional involvement was not significantly impacted and there were increases in specific activities such as ability to attend national/international conferences and service in forensic science initiatives (i.e., standards development, professional organizations, and more).

Faculty and student interactions were discussed in detail, with forensic programs offering unique educational experience, due to small class sizes, one on one interactions, ability to provide hands-on interaction with dedicated instrumentation, and opportunities for students and faculty to form career long bonds. The global pandemic greatly impacted many of these areas, however overall program directors reported that they were still able to meet the FEPAC standards.

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APPENDICES

APPENDIX I

Informed Consent to Participate in a Research Study

Study Title: Meeting the Standards During a Global Pandemic: A Mixed Methods Study of FEPAC Accredited Forensic Science Educational Programs

Principal Investigator: Sabra Jones, M.S., M.A., D-ABFT-FT

Email: sbotch@ostatemail.okstate.edu

You are being invited to participate in a research study. This consent form will provide you with information on the research project, what you will need to do, and the associated risks and benefits of the research. Your participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research to make an informed decision.

Purpose: The purpose of this study is to evaluate FEPAC accredited masters' programs and how accreditation standards were met with a focus on the effect of a global pandemic in four core areas: 1) providing in-person/traditional, distance learning/online/alternative delivery, or hybrid, lecture and/or laboratory coursework, 2) composition of forensic faculty, 3) professional involvement, and 4) institutional support.

Procedures: To gather data on these four core areas, I would like for your participation in a questionnaire that includes 10 questions. These questions will be provided using Qualtrics. You will be contacted to take part in an interview via a platform such as Zoom or Teams and the information collected during the interview will be transcribed, coded, and analyzed.

Audio and Video Recording: Any audio or video recordings that may be made will only be used for preparing a transcription of the interviews. Any identifiable information will be removed and not retained. Once the study is complete, the recordings will not be retained or used for any other purposes.

The interview will be audio and video recorded to collect a transcript. Recordings will be destroyed once the study is complete. You have the right to refuse to be recorded.

I agree to be (audio/video/photography) recorded: YES ____ NO ____

Benefits: This research may not benefit you directly. However, your participation in this study will help us to better understand how FEPAC accredited programs met select educational standards during a global pandemic.

Risks and Discomforts:

There are no anticipated risks beyond those encountered in everyday life.

Privacy and Confidentiality: Your study related information will be kept confidential. Any identifying information will be kept in a secure location and only the researchers will have access to the data. Identifying information will be removed from the data following the interview transcription. Research participants will not be identified in any publication or presentation of research results; only aggregate data will be used. The researcher works to ensure confidentiality to the degree permitted by technology. It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. However, your participation in this online survey involves risks similar to a person's everyday use of the internet. If you have concerns, you should consult the survey provider privacy policy at <https://www.qualtrics.com/privacy-statement/>.

Time Commitment: The questionnaire should take approximately 15 to 30 minutes to complete. The interviews should take approximately 30 minutes.

Compensation: There is no compensation associated with taking part in this research study.

Future Research: Your de-identified information will not be used or shared with other researchers.

Voluntary Participation: Taking part in this research study is entirely up to you. You may choose not to participate, or you may discontinue your participation at any time.

If you have any questions or concerns about this research, you may contact Sabra Jones at 405-822-3123 or sbotch@ostatemail.okstate.edu or my research advisor Dr. Ron Thrasher at r.thrasher@okstate.edu. This project has been approved by the Oklahoma State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may contact the IRB at irb@okstate.edu.

To participate click the link below. If you do not want to participate, no further action is required.

APPENDIX II

FEPAC Programs Survey

Questions for Instrument

1. Prior to March 2020, did the academic program routinely/typically offer distance learning/online/alternative delivery options for required lecture coursework (Core 1)?
 - a. No, all course work was offered in a traditional/in-person classroom.
 - b. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.
 - c. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.
 - d. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.
 - e. Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.

2. After March 2020, through the 2020-2021 academic year, did the academic program offer distance learning/online/alternative delivery options for required lecture coursework (Core 1)?
 - a. No, all course work was offered in a traditional/in-person classroom.
 - b. Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.
 - c. Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.
 - d. Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.
 - e. Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.

3. Does the academic program plan to continue offering distance learning/online/alternative delivery options for lecture coursework going forward (Core 1)?
 - a. No, all course work will be offered in a traditional/in-person classroom.
 - b. Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of course work.
 - c. Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of course work.
 - d. Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of course work.
 - e. Yes, online courses/distance learning/alternative delivery will be offered for 100% of course work.

4. Prior to March 2020, did the academic program routinely/typically offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?
- No, all course work was offered in a traditional/in-person laboratory setting.
 - No or Not applicable (laboratory courses were not offered)
 - Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.
5. After March 2020 through the 2020-2021 academic year, did the academic program offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?
- No, all course work was offered in a traditional/in-person laboratory setting.
 - No or Not applicable (laboratory courses are not offered)
 - Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.
 - Normally offered laboratory coursework was not offered during the time period.
6. Does the academic program plan to continuing to offer distance learning/online/alternative delivery options for laboratory coursework (Core 1)?
- No, all course work will be offered in a traditional/in-person laboratory setting.
 - No or Not applicable (laboratory courses are not offered)
 - Yes, a hybrid approach will be utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.
 - Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of laboratory course work.
 - Yes, online courses/distance learning/alternative delivery will be offered for 100% of laboratory course work.

7. Did the composition of faculty members of the forensic program change due to the global pandemic (Core 2)? (Select all options that apply)
- a. Yes, faculty members of the forensic program voluntarily left their positions.
 - b. Yes, faculty members of the forensic program non-voluntarily (i.e., reduction in staff, lack of students, etc.) left their positions.
 - c. No, no change to the composition of the faculty members in the forensic program.

8. Prior to March 2020, how did the program meet the FEPAC requirement for professional involvement during to the global pandemic (Core 3)? (multiple option responses, respondent will be asked to select all options that apply):

- a. Members of local forensic organizations interact directly with the academic program (select all options that apply):
- i. provide internships
 - ii. serve on graduate research committees
 - iii. teach as adjunct faculty
 - iv. serve in an advisory role to the program(s)
 - v. other (text box for open response)
- b. Full-time faculty serve on state, city, county, or federal forensic oversight boards.
- c. Full-time faculty recruit research committee members/advisors or collaborators from local/national/international forensic laboratories/organizations
- d. Full-time faculty serve within professional organizations directly related to forensic science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional Professional Forensic Organizations, etc.)
- e. Full-time faculty serve on standards development organizations directly related to forensic science (i.e., OSAC, ASB, ASTM, etc.)
- f. Full-time faculty serve on forensic certification or accreditation boards, committees or as assessors (ABC, ABFT, FEPAC, etc.)
- g. Other (text box for open response)

9. After March 2020 through the 2020-2021 academic year, how did the program meet the FEPAC requirement for professional involvement during to the global pandemic (Core 3)? (multiple option responses, respondent will be asked to select all options that apply):

- a. Members of local forensic organizations interact directly with the academic program (select all options that apply):
- i. provide internships
 - ii. serve on graduate research committees
 - iii. teach as adjunct faculty
 - iv. serve in an advisory role to the program(s)
 - v. other (text box for open response)
- b. Full-time faculty serve on state, city, county, or federal forensic oversight boards.
- c. Full-time faculty recruit research committee members/advisors or collaborators from local/national/international forensic laboratories/organizations
- d. Full-time faculty serve within professional organizations directly related to forensic science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional Professional Forensic Organizations, etc.)
- e. Full-time faculty serve on standards development organizations directly related to

forensic science (i.e., OSAC, ASB, ASTM, etc.)

f. Full-time faculty serve on forensic certification or accreditation boards, committees or as assessors (ABC, ABFT, FEPAC, etc.)

g. Other (text box for open response)

10. Was the institutional support provided to the program changed due to the global pandemic (Core 4)? (multiple option responses, respondent will be asked to select all options that apply):

a. Yes, the program budget increased, or supplemental funds were provided by the institution, due to the global pandemic (i.e., increased due to required supplies, social distancing or other needs of the program to carry out the required course work, etc.).

b. Yes, the program budget decreased, or typical funds provided by the institution was not allocated, due to the global pandemic (i.e., loss of students and associated tuition, loss of grant funding, etc.).

c. Yes, additional space was provided to the program to help carry out course work with a consideration to public health concerns and social distancing.

d. No, the program budget, funding, or space was unchanged.

e. Not Sure

Post Questionnaire Interviews

Following the administration of the instrument to collect the before mentioned data, each response will be evaluated for completeness, and post- questionnaire interviews conducted. The qualitative post-questionnaire interviews will be evaluated, transcribed, and then coded.

Follow-Up Questions and Associated Core Areas

Core 1

1. Can you provide additional details as to why core courses were not offered by distance learning prior to March 2020?

2. Are courses outside the program offered by distance learning/online/alternative delivery options?

3. Does the program or university have the technology to support distance learning/online/alternative delivery options?

3. Is distance learning/online/alternative delivery options as effective as in-person teaching?

4. Did students find distance learning/online/alternative delivery options as effective as in-person teaching?

5. Did the program consider offering distance learning/online/alternative delivery options for laboratory courses? If so, what were some of the barriers to offering distance learning/online/alternative delivery options for laboratory courses?

Core 2

1. If faculty members left voluntarily, did they do so to continue teaching at another institution or take on a position in a forensic organization?

2. If faculty member(s) left non-voluntarily, did they do so due to faculty cuts or lack of funding?

3. If faculty members left either voluntarily or not, did they do so due to medical issues related to the global pandemic?

Core 3

1. Did program requirements change to meet the FEPAC professional involvement requirement?
2. Did any students take part in an online or remote internship program?
3. Was there any change to how local forensic organizations interacted with the forensic program during the global pandemic?
4. Were there any benefits seen during or due to the global pandemic? For example, were members of forensic organizations in more of a position to interact with the academic program as they had more available time to do so? Or did faculty members have an opportunity to work with collaborators they normally would not have the opportunity to do so, such as those outside of the United States?

Core 4

1. If you answered yes to a program budget increase or decrease can you elaborate on why this occurred?
2. If additional space was offered to carry out teaching and/or research objectives due to the global pandemic, did this additional space remain with the program after capacity restrictions were removed-if they have been lifted?
3. If the program budget was not affected, do you believe that the academic program suffered due to the global pandemic and meeting the FEPAC standard for institutional support?

APPENDIX III

FEPAC Programs Recruitment Email

Principal Investigator: Sabra Jones, M.S., M.A., D-ABFT-FT

Sending Email: sbotch@ostatemail.okstate.edu

Subject Line: Research Study on how FEPAC accredited graduate programs met select standards

Dear Program Director/Assistant Director,

My name is Sabra Jones, and I am a PhD student at Oklahoma State University. I am writing to let you know about an opportunity to participate in a voluntary research study “Meeting the Standards During a Global Pandemic: A Mixed Methods Study of FEPAC Accredited Forensic Science Educational Programs”. The purpose of this study is to evaluate FEPAC accredited masters’ programs and how accreditation standards were met with a focus on the effect(s) of a global pandemic in four core areas: 1) providing in-person/traditional, distance learning/online/alternative delivery, or hybrid, lecture and/or laboratory coursework, 2) composition of forensic faculty, 3) professional involvement, and 4) institutional support. To gather data on these four core areas, I would like for your participation in a questionnaire that includes 10 questions. These questions will be provided using Qualtrics by following the provided link and should take approximately 15-30 minutes to complete. Following the analysis of the responses, you will be contacted for a follow-up interview which take approximately 30 minutes.

Link: https://bostonu.qualtrics.com/jfe/form/SV_8wdyX4nKTeEVzEy

If you have any questions about this research, you may contact Sabra Jones at 617-358-2286 or sbotch@ostatemail.okstate.edu or my research advisor Dr. Ron Thrasher at r.thrasher@okstate.edu. Thank you for your consideration, and once again, please do not hesitate to contact us if you are interested in learning more about this Institutional Review Board approved project.

Sabra Botch-Jones, M.S., M.A., D-ABFT-FT
School of Forensic Sciences, Graduate Student-PhD Program

Oklahoma State University Center for Health Sciences

APPENDIX IV

IRB Form



Oklahoma State University Institutional Review Board

Date: 10/15/2021
Application Number: IRB-21-443
Proposal Title: Meeting the Standards During a Global Pandemic: A Mixed Methods Study of FEPAC Accredited Forensic Science Educational Programs

Principal Investigator: Sabra Jones
Co-Investigator(s):
Faculty Adviser: Ron Thrasher
Project Coordinator:
Research Assistant(s):

Processed as: Exempt
Exempt Category:

Status Recommended by Reviewer(s): Approved

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in 45CFR46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

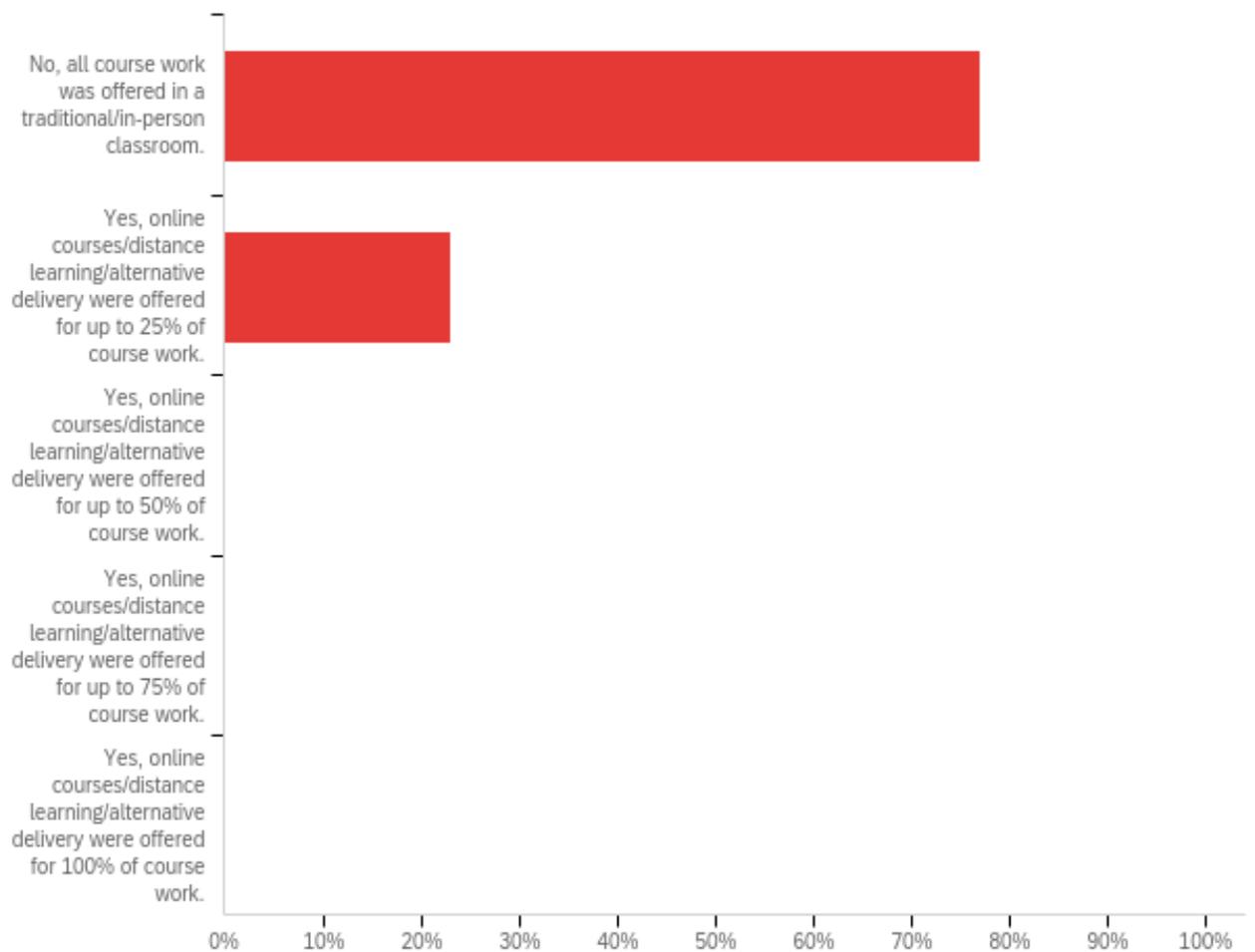
Sincerely,
Oklahoma State University IRB

APPENDIX V

Qualtrics Data FEPAC Accredited Masters Programs

QID1 - Core 1

Core 1, Question 1

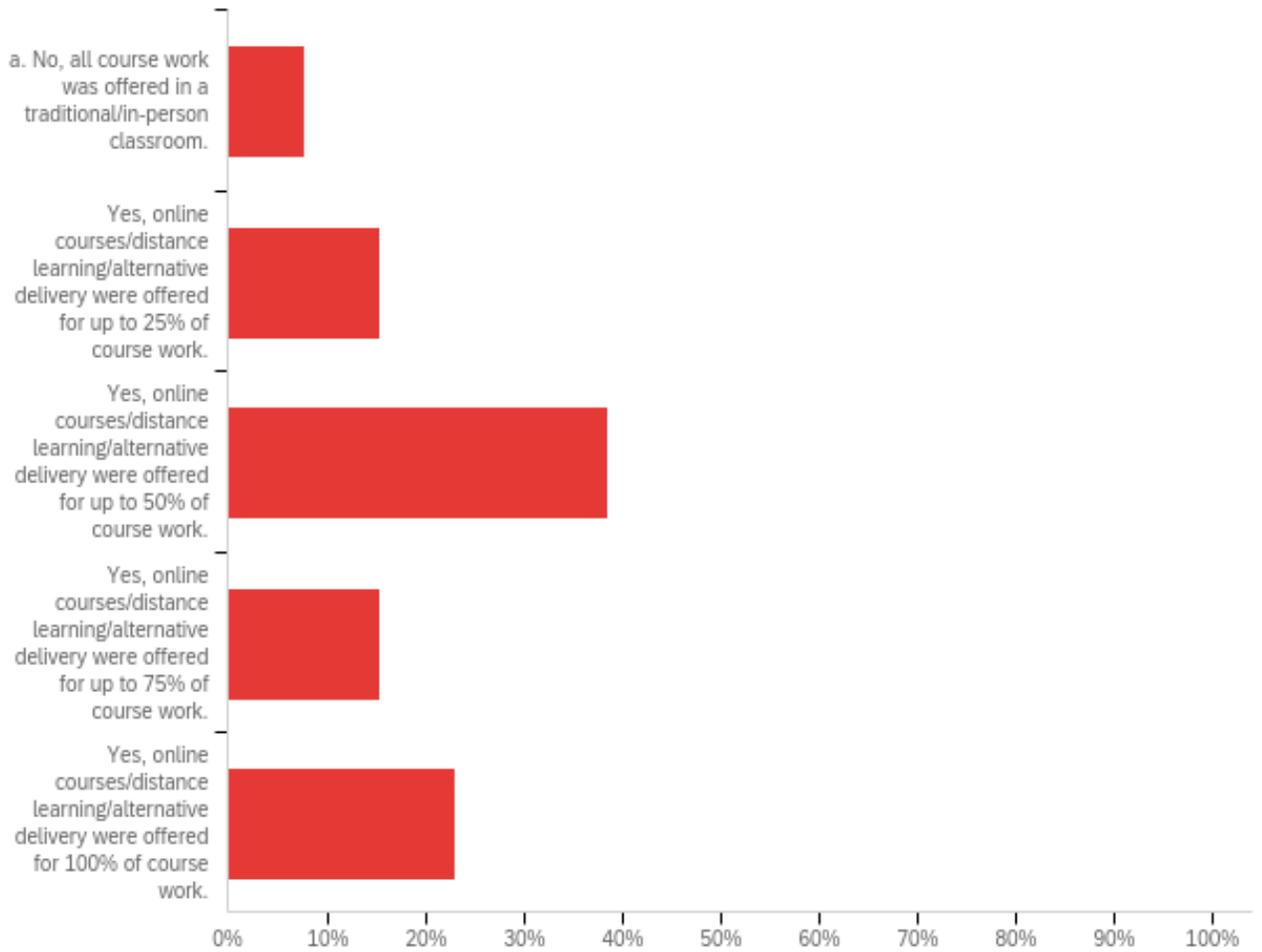


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 1	1.00	2.00	1.23	0.42	0.18	13

#	Answer	%	Count
1	No, all course work was offered in a traditional/in-person classroom.	76.92%	10
2	Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.	23.08%	3
3	Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.	0.00%	0
4	Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.	0.00%	0
5	Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.	0.00%	0
	Total	100%	13

Q2 - Core 1

Core 1, Question 2



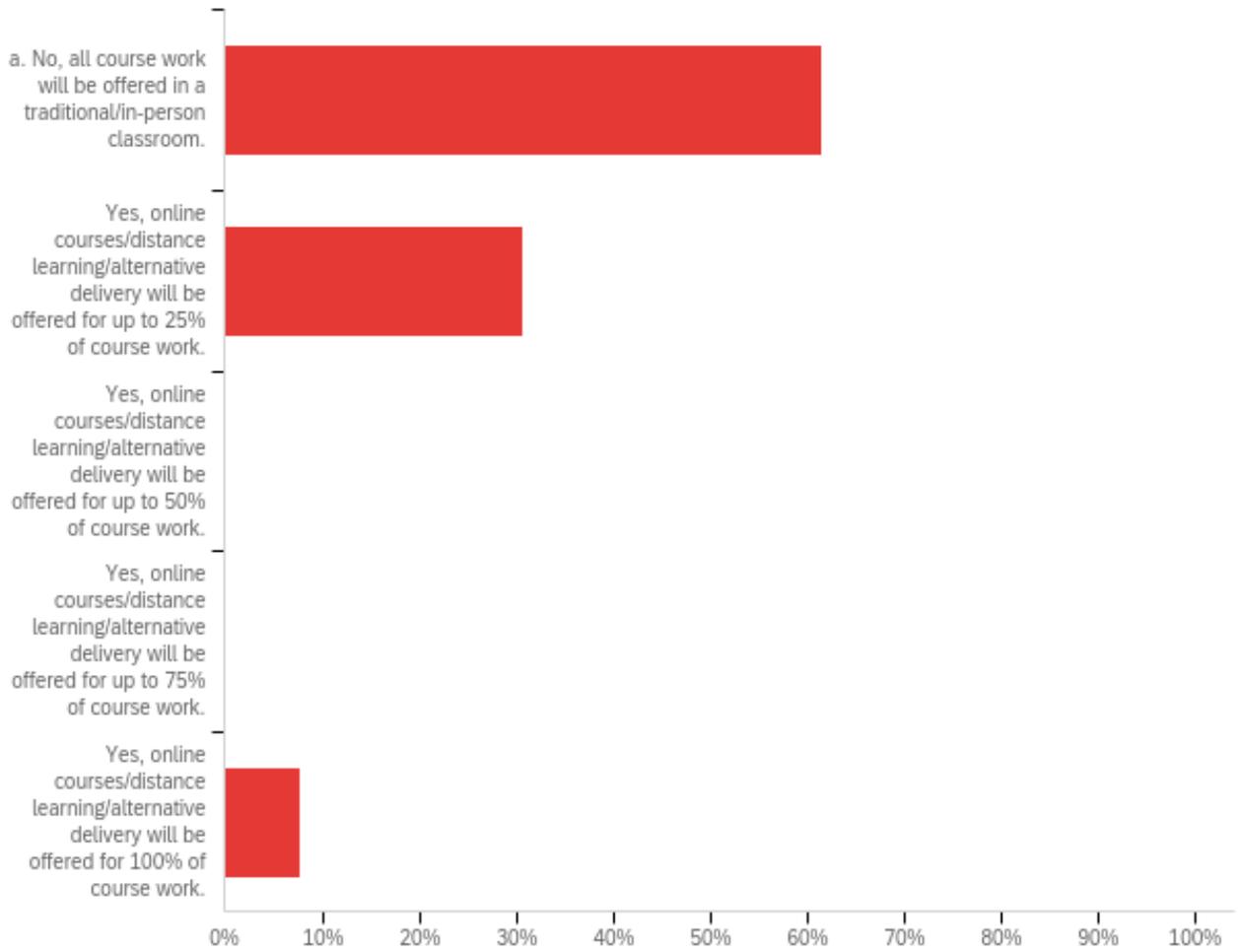
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
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1	Core 1	1.00	5.00	3.31	1.20	1.44	13
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#	Answer	%	Count
1	a. No, all course work was offered in a traditional/in-person classroom.	7.69%	1
2	Yes, online courses/distance learning/alternative delivery were offered for up to 25% of course work.	15.38%	2
3	Yes, online courses/distance learning/alternative delivery were offered for up to 50% of course work.	38.46%	5
4	Yes, online courses/distance learning/alternative delivery were offered for up to 75% of course work.	15.38%	2
5	Yes, online courses/distance learning/alternative delivery were offered for 100% of course work.	23.08%	3
	Total	100%	13

Q3 - Core 1

Core 1, Question 3

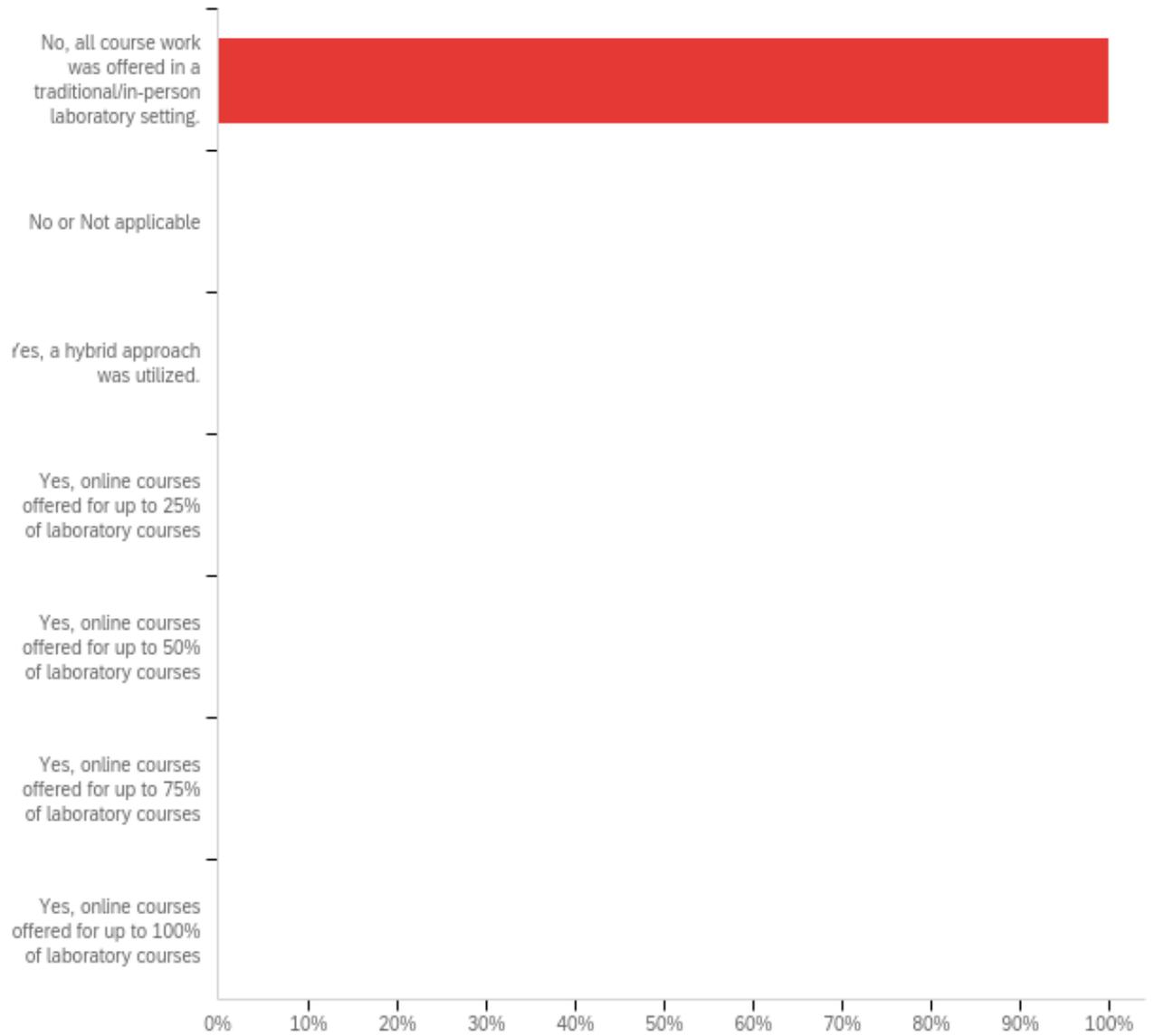


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 1	1.00	5.00	1.62	1.08	1.16	13

#	Answer	%	Count
1	a. No, all course work will be offered in a traditional/in-person classroom.	61.54%	8
2	Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of course work.	30.77%	4
5	Yes, online courses/distance learning/alternative delivery will be offered for 100% of course work.	7.69%	1
3	Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of course work.	0.00%	0
4	Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of course work.	0.00%	0
	Total	100%	13

Q4 - Core 1

Core 1, Question 4

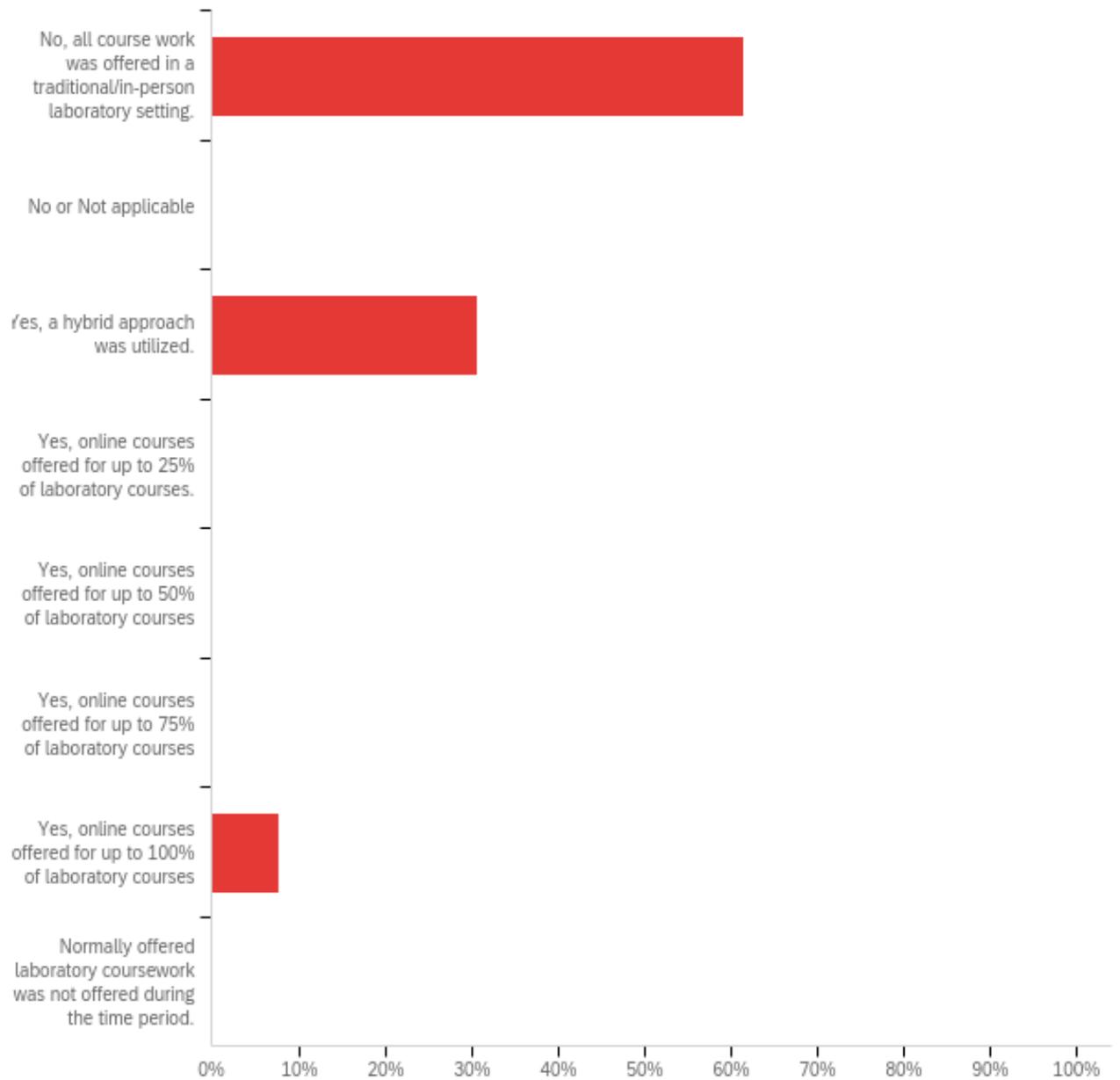


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 1	1.00	1.00	1.00	0.00	0.00	13

#	Answer	%	Count
1	No, all course work was offered in a traditional/in-person laboratory setting.	100.00%	13
2	No or Not applicable (laboratory courses were not offered)	0.00%	0
3	Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.	0.00%	0
4	Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.	0.00%	0
5	Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.	0.00%	0
6	Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.	0.00%	0
7	Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.	0.00%	0
	Total	100%	13

Q5 - Core 1

Core 1, Question 5

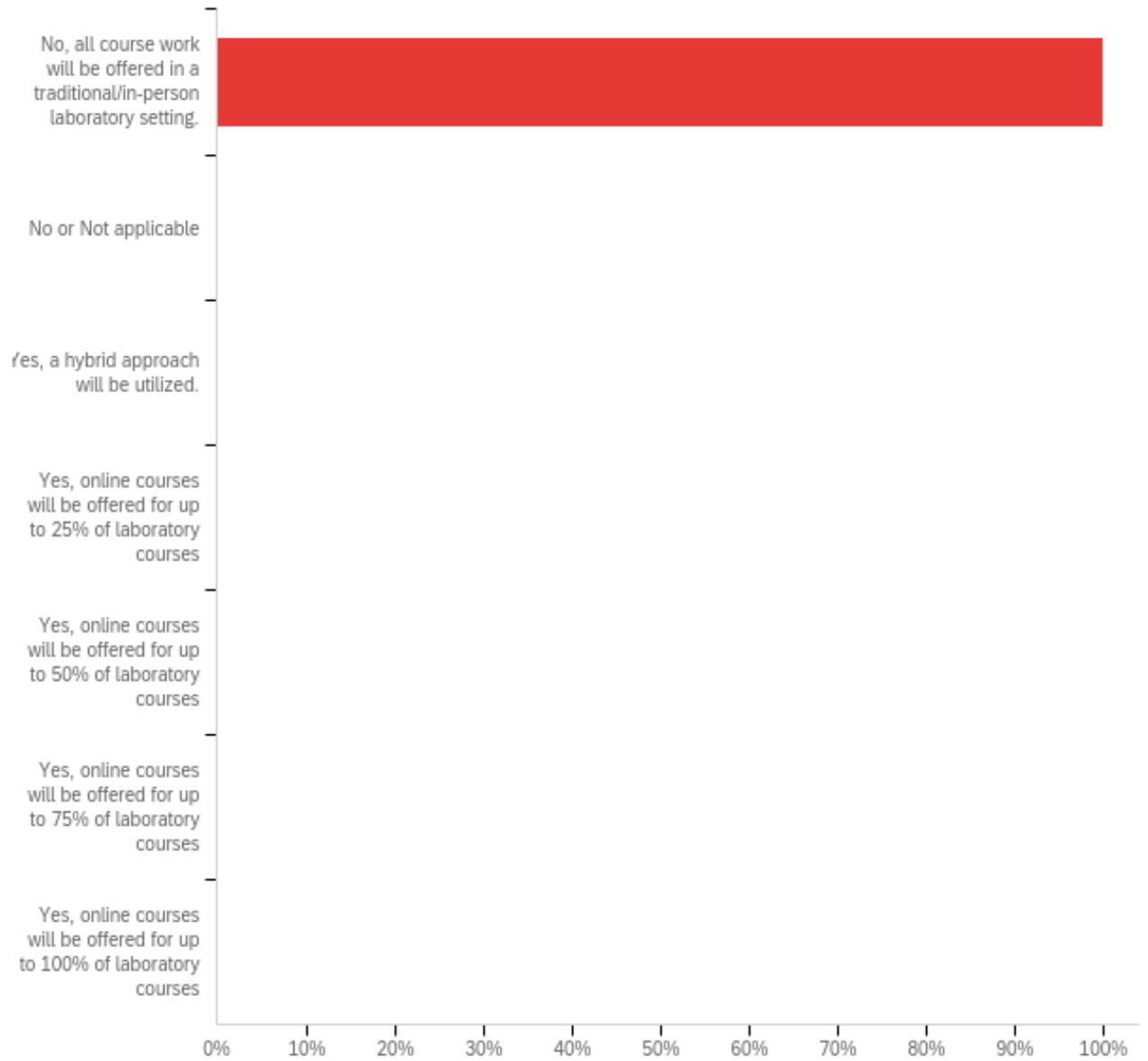


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 1	1.00	7.00	2.08	1.69	2.84	13

#	Answer	%	Count
1	No, all course work was offered in a traditional/in-person laboratory setting.	61.54%	8
2	No or Not applicable (laboratory courses are not offered)	0.00%	0
3	Yes, a hybrid approach was utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.	30.77%	4
4	Yes, online courses/distance learning/alternative delivery were offered for up to 25% of laboratory course work.	0.00%	0
5	Yes, online courses/distance learning/alternative delivery were offered for up to 50% of laboratory course work.	0.00%	0
6	Yes, online courses/distance learning/alternative delivery were offered for up to 75% of laboratory course work.	0.00%	0
7	Yes, online courses/distance learning/alternative delivery were offered for 100% of laboratory course work.	7.69%	1
8	Normally offered laboratory coursework was not offered during the time period.	0.00%	0
	Total	100%	13

Q6 - Core 1

Core 1, Question 6

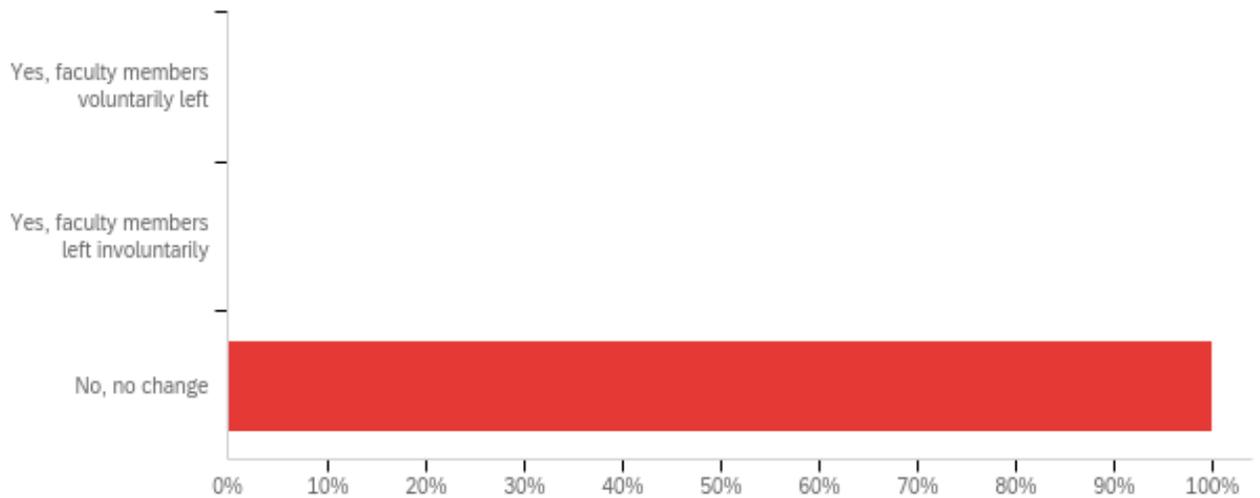


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 1	1.00	1.00	1.00	0.00	0.00	13

#	Answer	%	Count
1	No, all course work will be offered in a traditional/in-person laboratory setting.	100.00%	13
2	No or Not applicable (laboratory courses are not offered)	0.00%	0
3	Yes, a hybrid approach will be utilized where any pre-laboratory lecture material was offered in distance learning/online/alternative delivery, however the laboratory exercises were conducted in-person or in a traditional laboratory setting.	0.00%	0
4	Yes, online courses/distance learning/alternative delivery will be offered for up to 25% of laboratory course work.	0.00%	0
5	Yes, online courses/distance learning/alternative delivery will be offered for up to 50% of laboratory course work.	0.00%	0
6	Yes, online courses/distance learning/alternative delivery will be offered for up to 75% of laboratory course work.	0.00%	0
7	Yes, online courses/distance learning/alternative delivery will be offered for 100% of laboratory course work.	0.00%	0
	Total	100%	13

Q7 - Core 2

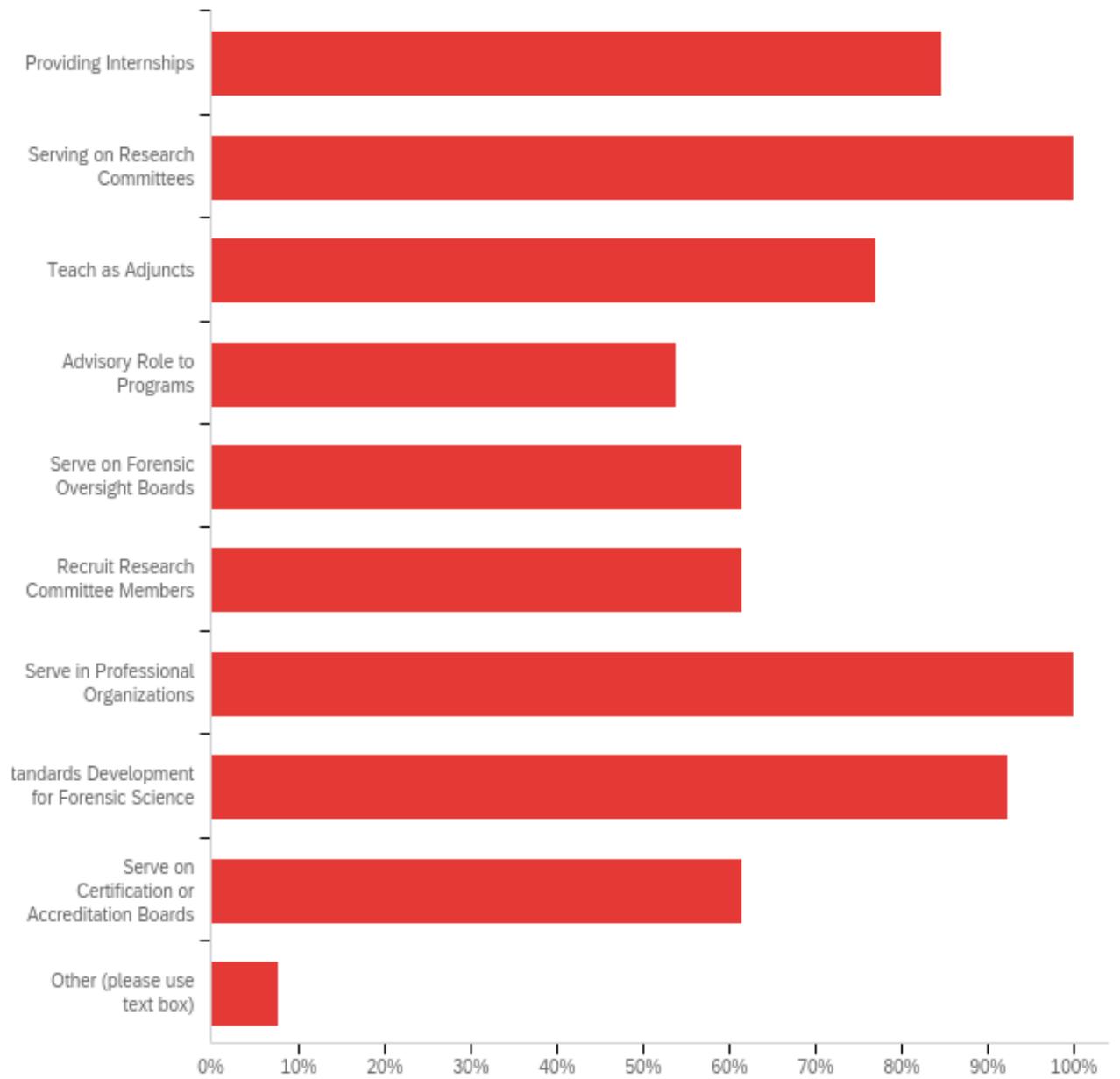
Core 2, Question 7



#	Answer	%	Count
1	Yes, faculty members of the forensic program voluntarily left their positions.	0.00%	0
2	Yes, faculty members of the forensic program non-voluntarily (i.e., reduction in staff, lack of students, etc.) left their positions.	0.00%	0
3	No, no change to the composition of the faculty members in the forensic program.	100.00%	13
	Total	100%	13

Q8 - Core 3

Core 3, Question 8



#	Answer	%	Count
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1	Members of local forensic organizations interact directly with the academic program by providing internships for the students	12.09%	11
2	Members of local forensic organizations interact directly with the academic program by serving on graduate research committees	14.29%	13
3	Members of local forensic organizations interact directly with the academic program by teaching as Adjunct Faculty for the program	10.99%	10
4	Members of local forensic organizations interact directly with the academic program by serving in an advisory role to the program	7.69%	7
5	Full-time faculty serve on state, city, county, or federal forensic oversight boards.	8.79%	8
6	Full-time faculty recruit research committee members/advisors or collaborators from local/national/international forensic laboratories/organizations.	8.79%	8
7	Full-time faculty serve within professional organizations directly related to forensic science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional Professional Forensic Organizations, etc.)	14.29%	13
8	Full-time faculty serve on standards development organizations directly related to forensic science (i.e., OSAC, ASB, ASTM, etc.)	13.19%	12
9	Full-time faculty serve on forensic certification or accreditation boards, committees or as assessors (ABC, ABFT, FEPAC, etc.)	8.79%	8
10	Other (please use text box)	1.10%	1
	Total	100%	91

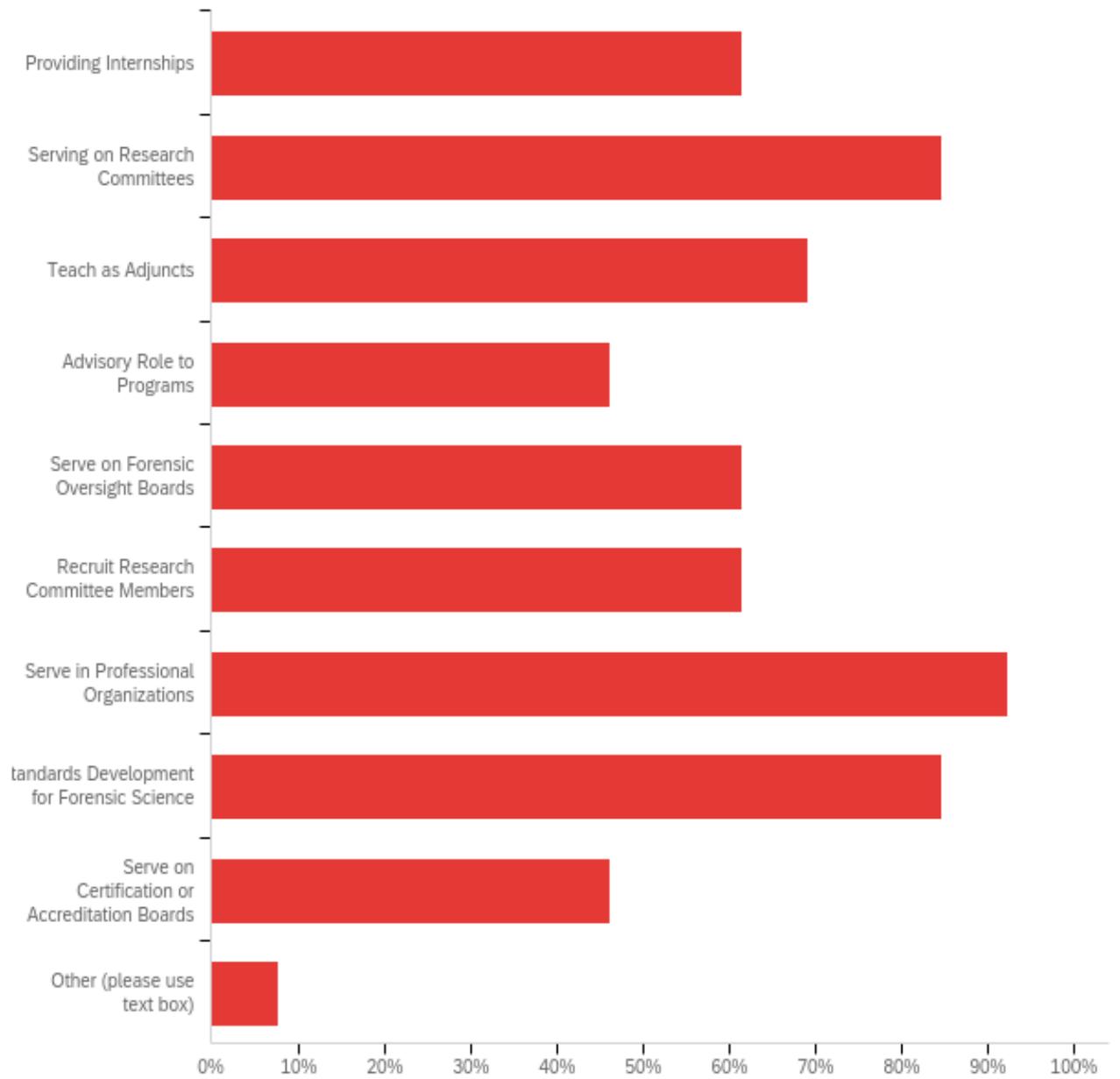
Q8_10_TEXT - Other (please use text box)

Other (please use text box) - Text

Grant Reviewers, Journal Editor Boards, Innocence Project

Q9 - Core 3

Core 3, Question 9



#	Answer	%	Count
1	Members of local forensic organizations interact directly with the academic program by providing internships for the students	10.00%	8
2	Members of local forensic organizations interact directly with the academic program by serving on graduate research committees	13.75%	11
3	Members of local forensic organizations interact directly with the academic program by teaching as Adjunct Faculty for the program	11.25%	9
4	Members of local forensic organizations interact directly with the academic program by serving in an advisory role to the program	7.50%	6
5	Full-time faculty serve on state, city, county, or federal forensic oversight boards.	10.00%	8
6	Full-time faculty recruit research committee members/advisors or collaborators from local/national/international forensic laboratories/organizations.	10.00%	8
7	Full-time faculty serve within professional organizations directly related to forensic science (i.e., AAFS, NAME, SOFT, IAI, IACT, TIAFT, IAFS, COFSE, Regional Professional Forensic Organizations, etc.)	15.00%	12
8	Full-time faculty serve on standards development organizations directly related to forensic science (i.e., OSAC, ASB, ASTM, etc.)	13.75%	11
9	Full-time faculty serve on forensic certification or accreditation boards, committees or as assessors (ABC, ABFT, FEPAC, etc.)	7.50%	6
10	Other (please use text box)	1.25%	1
	Total	100%	80

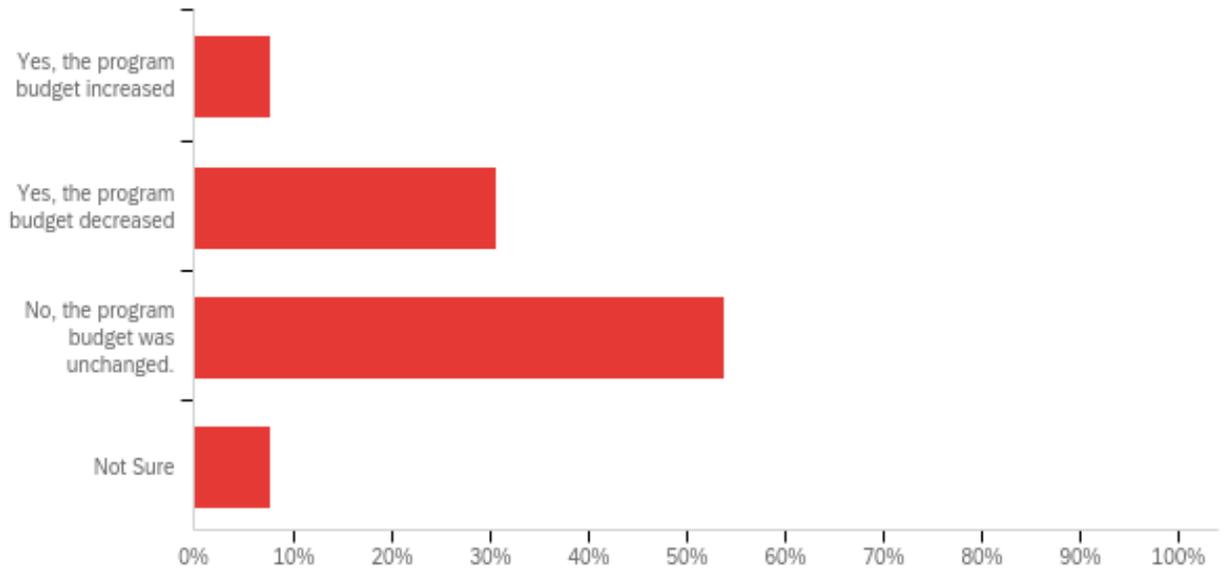
Q9_10_TEXT - Other (please use text box)

Other (please use text box) - Text

No change from pre-pandemic

Q10 - Core 4

Core 4, Question 10



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Core 4	1.00	4.00	2.62	0.74	0.54	13

#	Answer	%	Count
1	Yes, the program budget increased, or supplemental funds were provided by the institution, due to the global pandemic (i.e., increased due to required supplies, social distancing or other needs of the program to carry out the required course work, etc.).	7.69%	1
2	Yes, the program budget decreased, or typical funds provided by the institution was not allocated, due to the global pandemic (i.e., loss of students and associated tuition, loss of grant funding, etc.).	30.77%	4
3	No, the program budget, funding, or space was unchanged.	53.85%	7
4	Not Sure	7.69%	1
	Total	100%	13

VITA

Sabra R. Jones

Candidate for the Degree of

Doctor of Philosophy

Dissertation: MEETING THE STANDARDS DURING A GLOBAL PANDEMIC: A MIXED METHODS STUDY OF FEPAC ACCREDITED FORENSIC SCIENCE EDUCATIONAL PROGRAMS

Major Field: Forensic Science

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Forensic Science at Oklahoma State University, Center for Health Sciences, Tulsa, Oklahoma in December, 2022.

Completed the requirements for the Master of Science in Veterinary Medical Sciences at University of Florida, Gainesville, FL in 2009.

Completed the requirements for the Master of Science in Pharmacy at University of Florida, Gainesville, FL in 2007.

Completed the requirements for the Master of Arts in Criminal Justice Management and Administration at University of Central Oklahoma, Edmond, OK in 2004

Completed the requirements for the Bachelor Arts in Criminal Justice at University of Central Oklahoma, Edmond, OK in 2002

Publications:

Jones, S., Thrasher, R., Miller, B., Hess, J., Wagner, J. A Review of Existing Forensic Laboratory Education Research and Needs Assessment. The Journal of Forensic Science Education. 2021

Jones, S., Thrasher, R., Miller, B., Hess, J., Wagner, J. Review of Grounded Theory-Mixed Methods Analysis and Potential Application to Forensic Science Education, Accepted for Publication