Examining Online International Health Professions Education: A Mixed Methods Review of Barriers, Facilitators, and Early Outcomes

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Abstract

**Background:** Access to quality healthcare education across the world is disproportionate. This study explores the potential for Cardiovascular Perfusion education to be delivered online to reach international students.

**Methods:** Exploratory mixed methods were used to identify the barriers, facilitators, and early outcomes of online international health professions education.

**Results:** Qualitative analysis yielded four primary and nine subthemes. Multiple interventions were implemented in the planning of a novel online international Extracorporeal Science (ECS) program based on these themes. Quantitative data from the first semester of the new ECS program was collected along with data from the traditional entry-level program and historic data from previous entry-level cohorts. No significant correlations or differences were found between students. Student satisfaction surveys were determined to be equivalent for each group. Mixed data analysis revealed exceptional student satisfaction in areas where qualitative feedback was incorporated in the program design.

**Conclusions:** Online international education may be a viable option in the health professions. Barriers and facilitators to this mode of education were identified and utilized in designing one such program. Early outcomes from the novel ECS program reveal that the student performance and satisfaction are equivalent to those of a traditional in-person training program.
Introduction

Public health research has estimated that 93% of those in need of cardiac care in developing nations do not have access and will go untreated (1). The challenges to healthcare access are multifactorial but one contributor is a lack of trained personnel (2). The field of Cardiovascular Perfusion (CVP) is a specialty within cardiac surgery whose professionals operate the heart-lung bypass machine (HLM) to make surgical operation on the heart possible. In the nearly 70 years since its first use, HLM technology has advanced and the field of CVP has increased in complexity necessitating more robust training, education, and knowledge from the clinicians in this field (3).

Although it is difficult to accurately estimate the number of perfusionists worldwide or the actual need for new graduate perfusionists, the literature suggests that the availability of academic perfusion training across the globe is limited. A literature search revealed that only 19 of the 194 countries in the world have perfusion education programs or published literature. Further research shows that the availability of trained professionals, medical resources, and access to cardiac care globally are highly disproportionate, irrespective of population (2).

In a review of perfusion education programs, Stammers identified the primary reason for program closure was due to financial viability (4). With the niche nature of the field and the very small numbers of trainees, the financial impact is even greater in small programs or low-income nations. Tuition is the major source of income for academic programs (5) and with very few students, costs cannot be balanced (4, 6). Universities are unable to support perfusion education programs in regions where professional vacancies are infrequent and therefore class sizes are very small due to limited demand. For these reasons, the primary mechanism of perfusion training in many countries around the world is on-the-job training.
While on-the-job training may provide the clinical and technical skills that a perfusionist requires, the didactic education and theoretical foundation is not available to clinicians trained in this manner. In some regions “self-study” materials are provided to trainees for independent exploration (6, 7). In other regions no such academic guidance is provided. As research in medicine has shown, with increased levels of education, patient outcomes also increase (8).

It is for these reasons that the pursuit of an alternative educational strategy is necessary. At the Medical University of South Carolina (MUSC) a novel Extracorporeal Science (ECS) program was proposed to educate perfusionists around the world. The program faculty saw the need expressed through international colleagues and an opportunity to take their resident curriculum to a broader audience. The program is structured to deliver the didactic education of a traditional Perfusion Education program with the expectation that it will supplement the on-the-job clinical training that students will receive in their global regions. This program was structured to be delivered in English and English fluency was a prerequisite for entry. All courses were taught asynchronously and remotely by the Cardiovascular Perfusion faculty at MUSC in the United States.

As the first to develop such a program, we investigated the challenges that may be involved. This research study sought to determine how identified barriers and facilitators to online international health professions education impact the effectiveness of a novel cardiovascular perfusion education program.

**Materials & Methods**

This study involved exploratory, sequential mixed methods research in which the qualitative phase preceded the quantitative. This style of mixed methods research is appropriate for topics that have little or no previous research data available (9). The authors approached each research
phase with separate paradigms. The qualitative phase was approached through a constructivist framework to understand experiences of interviewees. The quantitative phase was approached through a post-positivist framework to objectively collect outcomes data.

The topic of online international health professions education has little to no published literature. For this reason, an open exploration to understand the experiences of health professions educators who have taught international or online students was pursued. Institutional review board (IRB) approval was received from the MUSC IRB prior to recruitment and interviews (Pro00118039). Semi-structured interviews were conducted over video conferencing technology with electronic recordings and transcripts being gathered after verbal consent from interviewees.

Transcripts were deidentified and subjects were given identification (ID) numbers by the primary investigator (PI) who conducted all the interviews to maintain consistency. Interviews continued until saturation was achieved and no new information was discovered. Deidentified data was shared with a co-investigator and both PI and co-investigator used thematic analysis to independently analyze the interviews for recurring or profound themes. Triangulation was used to compile the identified themes and investigators continued review until consensus on relevant themes was achieved.

Quantitative analysis centered on the Resident 2022, Online 2022, and Resident 2021 cohorts. The Resident 2021 cohort received content in the traditional in-person lecture-based format in Charleston, South Carolina at MUSC. The Resident 2022 and Online 2022 cohorts participated in a hybrid format with a flipped classroom style (10) of content delivery which introduces pre-class teaching materials for independent review and reserves classroom time for discussion surrounding application of the material (11). Resident 2022 students were physically
present for the conversation and Online 2022 students viewed the recorded activities and participated asynchronously where applicable.

Course outcomes were measured through course grades as well as academic progress from a baseline written examination to the final written examination in two separate courses each with a separate instructor. Instructors were consistent for all three student cohorts. Student satisfaction was measured by a university administered survey which included eight Likert-scale questions rated from 1 to 5 on an agree/disagree scale (Table 1). All data were checked for errors and outliers. Descriptive statistics were run for all variables, including assumptions for parametric testing. Alpha level was set at 0.05 for all tests of statistical significance and analysis was completed in SPSS software, version 28 (Armonk NY: IBM).

Statistical analysis compared the two Resident cohorts to determine if the change in curriculum and delivery impacted course outcomes. Comparison of final course grades between the 2021 and 2022 Resident cohorts was performed using independent t-tests. Then, a comparison was done between the 2022 cohorts to determine if resident versus non-resident status impacted course outcomes. Due to the imbalance in cohort sizes, a Mann-Whitney U test was used to compare final course grades between these two groups.

The qualitative interviews with experienced educators had suggested associations between demographic data and course outcomes, so correlational analysis was used to examine this possibility. Associations included gender to course grade (Point Biserial); age to course grade (Pearson’s r); years in healthcare to course grade (Pearson’s r); and highest degree earned prior to matriculation to course grade (Spearman’s Rho).
Differences between the baseline and final written examinations were investigated using a 2x2 mixed model ANOVA. The two time points were baseline written examination and final written examination, and the two groups were the Online 2022 and the Resident 2022 cohorts.

Finally, student satisfaction surveys from all three cohorts were compared and analyzed to determine trends in student satisfaction. Mann-Whitney U tests were utilized to make this comparison.

The final step in analysis was to strengthen the findings by combining the qualitative and quantitative results. The themes that were identified during the qualitative interviews were merged with the quantitative outcomes and survey questions to identify if the discussed barriers and facilitators were reflected in the curriculum implementation. These analyses helped to determine program effectiveness and if program changes adequately accounted for, or capitalized on, the identified themes.

Results

Cohort demographics are described in Table 2. Although open to all international students, the initial Online cohort was recruited from the regions of Australia and New Zealand. There were more females enrolled in both the Online 2022 and Resident 2022 cohorts, while the Resident 2021 cohort included slightly more males. The average age was similar between groups. Years of previous healthcare experience was lowest in the Resident 2021 cohort at a mean±SD of 2.7±4.7 years and highest for the Online 2022 cohort at 4.5±5.7 years. Finally, there was one student in each of the Online 2022 and Resident 2021 cohorts with a graduate degree prior to matriculation. The Resident 2022 cohort included four students with previous graduate degrees.

Qualitative results
Saturation was achieved with 17 interviews after which triangulation ensued. Four primary and nine subthemes were agreed upon and can be found in Table 3.

Culture

Several educators emphasized the impact of culture on the learning environment with international cohorts. Differences in cultural upbringing and respect were seen to impact the exchange of conversation and knowledge within the classroom. Some educators noticed that “respect cultures”, prevalent in certain regions of the world, cause students to hesitate to ask questions or admit confusion for fear of disrespecting the overseeing educator. Representative quotes include:

‘Culturally they’re very respectful…nobody hardly ever questions me in those countries.’

‘I’m a fallible human being… but you have to keep reinforcing that… “we were stronger because you didn’t defer to my age or experience… we did this together”.’

However, once educators felt that there was sufficient trust and exchange of information, the opportunity for mutual learning from educator-to-student, student-to-student, and student-to-educator was enhanced by the diverse group. Many educators recounted specific examples of times that they gained new knowledge while teaching an international cohort of students.

Time

Another recurring theme was the time commitment that is required to educate students online and internationally. Several educators mentioned that more preparation than what is common in traditional classrooms is necessary to successfully conduct an online international program. For example:
‘...it took us three years to... get it all created and recorded... We go to a studio. They have people that do makeup. They have a whole setup where they have you record your lectures. It’s very professionally done.’

With students in various time zones and a variety of life and work dynamics, the impact on educators can be intrusive to normal working hours which caused several educators to emphasize the importance of setting boundaries and recognizing when flexibility was necessary.

**Relationships**

Relationships were important to educators when considering the experience for students and encouraging retention within the program. Educators felt that relationship building was more difficult online but can be enhanced with purposeful communication through advisor-advisee pairings and occasional synchronous meetings for personal connection. One educator noted:

‘It actually helps us give honest feedback because we know the students so well.’

Finally, several characteristics of both students and educators were believed to contribute to facilitating success with online international education.

**Practical Considerations**

Several practical considerations were identified as critical to identifying barriers and facilitators to online international education. Amongst the recurring topics were time zones and languages. Time zones were considered a manageable barrier with the primary suggestion being establishment of a programmatic operating time zone. Language barriers require further consideration and exploration. In many countries English is considered the language of medicine. However, many educators emphasized the need to ensure students fully understand the technical terminology, particularly when it is taught in a non-native language. Educators shared that it is
important to avoid idioms, slangs, and jokes that may not translate to other languages well. One educator said:

‘My students do speak English but their comprehension in English is not going to be as good as their comprehension in their native tongue.’

Other practical considerations included access in various forms. For students, the flexibility of online asynchronous learning allows them to continue working and mitigate the financial strain of returning to school. Additionally, taking the education to the student and allowing them to remain in their region will encourage them to practice in that area, dissuading the “brain drain” phenomenon (12). However, access in certain regions of the world to reliable connectivity and technology at a cost that students can afford may still be of concern. For educators and universities, this educational model improves the ability to integrate work and life and improves access to expert educators across the globe as opposed to being restricted to a particular geographic region. One educator had this experience to share:

‘You can invite an expert... on a particular topic... into the [virtual] classroom... It’s amazing- the technology. You can bring these thought leaders right to these people.’

**Quantitative results**

Final course grades were compared between the three groups for two separate courses, CVP-700 and CVP-702. Independent t-tests used to compare the Resident 2021 and 2022 cohorts revealed no significant difference ($t = 0.45, p=0.66$). Likewise, Mann-Whitney U tests between the Resident 2022 and Online 2022 cohorts revealed no significant difference ($U = 50.5, p=0.29$).

Demographic data and course grade associations were investigated. No significant correlations were found to exist between gender, age, years of healthcare experience, or highest degree earned and final course grade. Correlations data can be found in Table 4.
ANOVA comparison of the pre and post examination scores between the Resident 2022 and Online 2022 cohorts revealed no interaction effect for CVP-700 ($F=2.43$, $p=0.13$). The main effects were then examined and found to be significant for both time ($F=172.38$, $p<0.001$) and cohort ($F=6.13$, $p=0.02$). For CVP-702, there was a significant ordinal interaction effect ($F=4.17$, $p=0.05$). Therefore, we interpreted the significant main effects for both time ($F=80.42$, $p<0.001$), with the post-test always being higher, and cohort ($F=11.66$, $p=0.002$) with the Online cohort always being higher.

Student satisfaction as measured through Likert-scale questions revealed statistically significant differences for questions 3 ($p=0.48$), 4 ($p=0.032$), 5 ($p=0.029$), and 7 ($p=0.026$) between the Resident 2021 and Resident 2022 cohorts. Descriptive statistics were analyzed to determine the relevance of this difference. Median and mode satisfaction scores for these questions were 5.0 for both groups, suggesting there is no practical difference in satisfaction scores. Additionally, if the agree and strongly agree categories are collapsed together to indicate “satisfaction” then 96% and 100% of students were satisfied in the Resident 2022 and Resident 2021 cohorts, respectively (Figure 1). Additionally, there were no significant differences in satisfaction between the Resident 2022 and Online 2022 cohorts.

**Combined results**

The qualitative themes, corresponding interventions, and corresponding quantitative outcome data indicators are displayed in Table 5. Each theme was considered independently, and program interventions were designed to account for the barriers and facilitators within the theme. These interventions are available in column 2 of Table 5. Table 6 displays qualitative themes, interventions, and quantitative student satisfaction results. Certain questions from the university administered student satisfaction survey were identified as being related to the qualitative themes.
and interventions. The data reported in Tables 5 and 6 show that after incorporation of the interventions into the program planning, there were no significant differences between cohorts in course outcomes or student satisfaction.

**Discussion**

Distance education is a novel possibility for expansion to areas of the globe and populations without access to advanced education. The literature is sparse concerning online international health professions education and mostly inferred from the adaptation of traditional to online education in response to the COVID-19 pandemic (13). A systematic review found reports that spanned from overall positive student perception to overall negative student perception with variances across access, course design, and skills attainment (13). However, none of these articles look at programs designed from the start for the online environment, or educators and learners in different geographies and cultures.

Studies looking at cultural influences in the classroom such as classroom behaviors (14), learning preferences (15, 16) and feedback preferences of students from different cultures (17) are available. However, these publications do not address health professions specifically, and therefore our study helps fill a gap in the literature. We found that educators experienced in relevant areas were able to identify perceived facilitators and barriers to online international education and felt that it was a viable option for expanding access to healthcare education across the globe. The most relevant themes were shared with the Extracorporeal Science (ECS) program faculty.

The recurring themes that were most pertinent to the research question were incorporated into the planning phases of the online ECS program. Several changes were made in the proposed program ranging from practical and organizational to curricular. Specifically, consideration of
the theme of preparation led the faculty to pursue Quality Matters certification (18). This is a nationally recognized certification which provides guidance for formatting and delivery of online learning. Within the same theme, the time, effort, and energy required to maintain student engagement in the online setting was a primary concern. To address this area, faculty reformed one of two hybrid courses to a flipped classroom model as several interviewees agreed that it encourages engagement. One participant described the flipped classroom online interaction like this:

‘You’ve learned it. You’ve read the materials, you watched the webcast, you’ve taken the quiz, and you’ve gotten feedback from that. Now let’s dig deeper. Let’s discuss this topic.’

Mutual Learning was incorporated through efforts to include geographic or culturally relevant information into the curriculum and courses. Practical considerations led to the decision that the designated program time zone would be U.S Eastern Standard Time (EST) and that there would be periodic synchronous meetings between the faculty and ECS students which would require flexibility from the educator. Finally, faculty advisors were assigned to each ECS student to promote relationship building and synchronous meetings were required at least once per semester.

When considering prospective students for the first ECS cohort, academic record, previous accomplishments, and healthcare experience served as selection criteria and were consistent with those that educators identified as potential indicators for success. Additionally, diversity amongst the ECS group was desired and allowed consideration of gender and age correlations with course grades.
Analysis of early outcomes of the ECS program revealed that incorporating educator experiences in the planning phases of an online international program may be key to successful implementation. Our experience revealed that content delivery and education are possible and can be as effective as traditional in-person education. Specific student characteristics identified by educators as being potential predictors of success were not found to correlate with outcomes as previously indicated (Table 2). Overall, our students were equally satisfied with in-person traditional content delivery, flipped classroom resident content delivery, and flipped classroom online asynchronous content delivery.

While early outcomes from this experience are promising, the data represent one specialty graduate program in one institution with a small cohort. Additionally, this report includes only one semester worth of course grade outcome data.

Other limitations within the study are related to Likert-scale measurements. Analysis and interpretation of Likert-scale data is challenging when determining a practically significant difference in ratings. Additionally, the pre-constructed university templated questions limited specificity to the unique themes revealed in the qualitative phase.

Finally, the researchers elected to remove an outlier data point that was five standard deviations above the mean and determined to be non-representative of the group. A sensitivity analysis demonstrated that the removal of this data point impacted the correlation of age and course grade, changing the result from significant to non-significant.

**Conclusion**

Ultimately, the potential implications of success in this novel program could be of benefit to the health professions education community. Expanding health professions education through online international programs could positively impact the availability of high-quality didactic
curriculum, and knowledgeable clinicians and educators, to areas of the world where this is currently not feasible. To strengthen these findings, it will be important to track and report long term outcomes of students and graduates from the ECS cohort as well as continued research into other indicators of success.

https://chp.musc.edu/academics/cvp/extracorporeal-science

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- Data Availability: Interview guide is available online DOI: 10.5281/zenodo.8253300
- Ethics: IRB approval Pro00118039
- Author Contributions: All authors contributed in part in the study design, data collection, data analysis, and manuscript authorship.
References


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Table 1. Student Satisfaction Survey

<table>
<thead>
<tr>
<th>Questions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Learning objectives were clearly defined.</td>
</tr>
<tr>
<td>Q2</td>
<td>The syllabus adequately explained how assignments were graded and how course grades were earned.</td>
</tr>
<tr>
<td>Q3</td>
<td>Course activities contributed significantly to learning the course material.</td>
</tr>
<tr>
<td>Q4</td>
<td>The educator encouraged appreciation of other healthcare professionals.</td>
</tr>
<tr>
<td>Q5</td>
<td>The educator was an effective teacher.</td>
</tr>
<tr>
<td>Q6</td>
<td>The educator was well prepared.</td>
</tr>
<tr>
<td>Q7</td>
<td>The educator was responsive to students’ questions and concerns.</td>
</tr>
<tr>
<td>Q8</td>
<td>The educator facilitated an interactive learning environment.</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Resident 2021 (N=28)</td>
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<td>-----------------------</td>
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</tr>
<tr>
<td>Male- no. (%)</td>
<td>16 (57.1)</td>
</tr>
<tr>
<td>Age- years ± SD</td>
<td>27.9±5.2</td>
</tr>
<tr>
<td>Healthcare Experience- years ± SD</td>
<td>2.7±4.7</td>
</tr>
<tr>
<td>Graduate Degree- no. (%)</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td>Themes</td>
<td>Codes</td>
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<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>Culture</td>
<td>CUL</td>
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<tr>
<td>Mutual Learning</td>
<td>MUT</td>
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<tr>
<td>System Differences</td>
<td>SD</td>
</tr>
<tr>
<td>Time Commitment</td>
<td>TIME</td>
</tr>
<tr>
<td>Preparation</td>
<td>PREP</td>
</tr>
<tr>
<td>Boundaries &amp; Flexibility</td>
<td>B&amp;F</td>
</tr>
<tr>
<td><strong>Relationship</strong></td>
<td>REL</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----</td>
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<tr>
<td><strong>Selecting Participants</strong></td>
<td>SEL</td>
</tr>
<tr>
<td><strong>Student Characteristics</strong></td>
<td>STU</td>
</tr>
<tr>
<td><strong>Faculty Characteristics</strong></td>
<td>FAC</td>
</tr>
<tr>
<td><strong>Practical Considerations</strong></td>
<td>PRA</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td>LAN</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>ACC</td>
</tr>
<tr>
<td>Correlations to course grade</td>
<td>Resident 2021 CVP-700</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Gender</td>
<td>P=0.475</td>
</tr>
<tr>
<td>Age</td>
<td>P=0.318</td>
</tr>
<tr>
<td>Years in Healthcare</td>
<td>P=0.822</td>
</tr>
<tr>
<td>Highest Degree Earned</td>
<td>P=0.161</td>
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<tr>
<td>Theme</td>
<td>Integration into Curriculum</td>
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<td>-------</td>
<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CUL</td>
<td>Incorporate international healthcare systems and standards</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>Development of activities that engage online cohorts (flipped classroom)</td>
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<td></td>
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</tr>
<tr>
<td>PREP</td>
<td>Planning meetings prior to implementation</td>
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<tr>
<td>B&amp;F</td>
<td>Asynchronous interactions between students &amp; teachers, periodic synchronous group meetings</td>
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<td></td>
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<tr>
<td>REL</td>
<td>Synchronous meetings between assigned advisor-advisee pairs</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SEL</td>
<td>Student selection based on healthcare experience and proven academic record</td>
</tr>
</tbody>
</table>
A diverse and representative cohort was sought  

<table>
<thead>
<tr>
<th>STU</th>
<th>A diverse and representative cohort was sought</th>
<th>Correlations; Point biserial; Pearson’s R</th>
<th>No significant correlation between gender or age and final course grade was found (p&gt;0.05).</th>
</tr>
</thead>
</table>

Set time zone standards (EST), periodic synchronous meetings  

<table>
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<tr>
<th>PRA</th>
<th>Set time zone standards (EST), periodic synchronous meetings</th>
<th>Pre-post test difference; 2x2 ANOVA</th>
<th>The ECS cohort consistently scored higher on the pre and post test written examinations. There was significant improvement over time in both cohorts.</th>
<th>There was no significant difference between cohorts in final course grades (p&gt;0.05)</th>
</tr>
</thead>
</table>

|     |                                                            | Final course grade comparisons; independent t-test & Mann-Whitney U |                                                                                                                                               |                                                                                                                                               |
|     |                                                            |                                                                    |                                                                                                                                               |                                                                                                                                               |
### Table 6. Qualitative Themes and Student Satisfaction

<table>
<thead>
<tr>
<th>Theme</th>
<th>Integration into Curriculum</th>
<th>Survey Question</th>
<th>Student Satisfaction Resident 2022</th>
<th>Student Satisfaction Online 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUT</td>
<td>Incorporate international healthcare systems and standards</td>
<td>Appreciating Other Professionals (Q4)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>TIME</td>
<td>Development of activities that engage online cohorts (flipped classroom)</td>
<td>Course Activities (Q3)</td>
<td>96.6%</td>
<td>100%</td>
</tr>
<tr>
<td>TIME</td>
<td>Additional assignments designed to engage online learners and test knowledge</td>
<td>Interactive Learning (Q8)</td>
<td>100%</td>
<td>80%</td>
</tr>
<tr>
<td>PREP</td>
<td>Quality Matters certification</td>
<td>Learning Objectives (Q1)</td>
<td>96.6%</td>
<td>100%</td>
</tr>
<tr>
<td>PREP</td>
<td>Quality Matters certification</td>
<td>Course Syllabus (Q2)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>PREP</td>
<td>Planning meetings prior to implementation</td>
<td>Preparation (Q6)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>B&amp;F</td>
<td>Asynchronous interactions between students &amp; teachers, periodic synchronous group meetings</td>
<td>Interactive Learning (Q8)</td>
<td>100%</td>
<td>80%</td>
</tr>
<tr>
<td>REL</td>
<td>Synchronous advisor-advisee meetings</td>
<td>Responsiveness (Q7)</td>
<td>96.6%</td>
<td>100%</td>
</tr>
<tr>
<td>PRA</td>
<td>Set time zone standards, periodic synchronous meetings</td>
<td>Responsiveness (Q7)</td>
<td>96.6%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Legends:
- **Table 1:** Student satisfaction evaluated by Likert-scale from 1= strongly disagree to 5=strongly agree
- **Table 2:** SD: Standard Deviation
- **Table 3:** Identified themes from educator interviews. Primary themes are shaded, subthemes are in white.
- **Table 4:** CVP-700: course code; CVP-702: course code
- **Table 5:** Theme codes, implementations into the program, and quantitative outcome items used as correlate measures. Primary themes are shaded, subthemes are in white. B&F: Boundaries & Flexibility; CUL: Culture; ECS: Extracorporeal Science; PRA: Practical Considerations; PREP: Preparation; REL: Relationship; SEL: Selecting Participants; STU: Student Characteristics.
- **Table 6:** Theme codes, implementations into the program, and student satisfaction items were used as correlate measures. Primary themes are shaded, subthemes are in white. Student satisfaction is percent of respondents that chose an affirmative response. B&F: Boundaries & Flexibility; MUT: Mutual Learning; PRA: Practical Considerations; PREP: Preparation; REL: Relationship
Legends: Questions with statistical significance were analyzed for positive responses. Positive responses are reported as a percent of total responses.
Appendices

Appendix 1. Interview Guide

Demographics
1) Please describe for me your current occupation and role.

2) What experience do you have, if any, in educating (international/domestic, online/resident) students?

Student selection
3) Are you involved in the selection process for this program?
   a. If yes: What has your experience been in the selection process of these students?
      i. What is the selection process like?
      ii. What is challenging about the selection process?
      iii. What do you enjoy about the selection process?

4) How do you evaluate the preparedness of the applicants to this program?

5) What qualities do you look for in a student to be successful in your program?

6) To the best of your knowledge how does the selection process for these students compare/contrast with the selection process for a (resident/domestic) program?

7) Overall, what is your evaluation of the selection process for this program?

Didactic Education

8) What, in your experience, has been the level of knowledge of students coming into this program?
   a. How does it compare/contrast with (resident/domestic)?

9) In your experience, have entry-level students been properly prepared and equipped to take on the didactic course load?
   a. Can you identify qualities that distinguish between those who are prepared and equipped and those who are not?

10) What do you find most challenging about delivering didactic education to (online/ international) students?
    a. Have you experienced any challenges that you feel are unique to this cohort?
    b. What, if any, technologic difficulties have you experienced during this process?
    c. What, if any, cultural difficulties have you experienced during this process?
d. What if any, discipline specific difficulties have you experienced during this process?

11) What were some benefits to educating (online/ international) students in this way?

12) For international educators:
   a. Have you found that there are regional differences in clinical practice?
      i. If yes: have you addressed these in your didactic education? How so?
   b. Have you found that there are regional differences in scientific and pharmacologic terminology?
      i. If yes: have you addressed these in your didactic education? How so?
   c. Do you adapt your didactic curriculum to discuss local disease patterns for the regions that your students currently live or intend to practice?

Clinical Education

13) Do you have any type of clinical education, lab, or hands on component in your current program?
   a. If yes: please describe.
   b. If yes: What do you find most challenging about delivering clinical or lab education to (online/ international) students?
   c. If yes: In your experience, have entry-level students been properly prepared and equipped to take on the clinical or lab workload?
      i. Can you identify qualities that distinguish between those who are prepared and equipped and those who are not?
   d. If no: do you feel there would be any benefit to adding one? How might this be accomplished?
   e. For online educators: How do you accomplish this considering the distance and diminished interaction?

14) Do you currently leverage any modern technologies, such as virtual reality, to conduct “hands-on”, “lab”, or “clinical education” objectives?

Evaluation

15) In your own words, what is your philosophy and approach to providing students feedback?
16) In your experience, have students been receptive to your methods of feedback and evaluation?
   a. Have you witnessed any differences in the reception of feedback between the cohort in question and others that you have taught?

17) Have you adapted any of your methods of feedback to fit the (online/ international) students that you currently teach?
   a. If yes, how so?

General

18) What was most unexpected to you about this type of teaching when you first participated?

19) Have you experienced any disruptive behavior or actions that required correction while educating these students?
   a. If yes, please describe.

20) What do you enjoy the most about educating (online/ international) students?

21) What advice might you give to instructors who are about to begin educating (online/ international) students in this format?

22) Do you feel that educating international students in an online format is a good option? Why or why not?