

Experiential learning: transformation and discovery through travel study programs

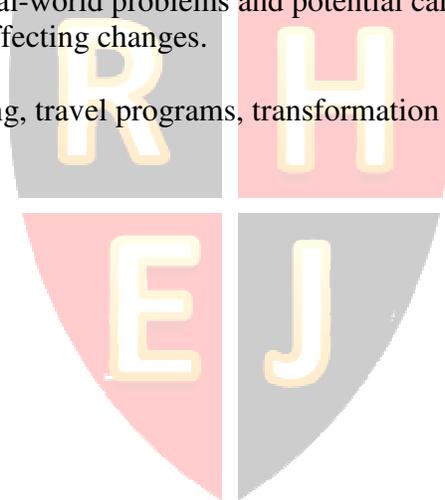
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ABSTRACT

Students involved in two separate travel study programs consented to participate in a mixed-methods research approach examining the effects of an experiential learning course offered to criminal justice and forensic science students. The course exposed students to hands-on criminal investigations involving human body decomposition and osteology. Results indicate positive findings of transformation and discovery by students after analyzing reflective journals, interviews and pre- and post-tests scores. Students were able to apply their new knowledge and conceptual understanding to real-world problems and potential career opportunities. This transformation produced life affecting changes.

Keywords: Experiential learning, travel programs, transformation



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INTRODUCTION

Experiential Learning is any learning that supports students in applying their knowledge and conceptual understanding to real-world problems or situation where the teacher directs and facilitates learning. The classroom or laboratory can serve as a setting for experiential learning through embedded activities such as case and problem-based studies, guided inquiry, simulations or experiments. (Wurdinger & Carlson, 2010). Kolb's Cycle of Experiential Learning includes four phases; concrete experience, reflective observation, abstract conceptualization and active experimentation. Because life presents change, the human condition may best be understood as a continuous effort to negotiate through experiential meanings. It is important for students to reflect critically on assumptions they may have coming into a course and validate those meaning by assessing reason to the new knowledge and experiences. Transformative learning offers a theory of learning that is uniquely adult, abstract, idealized, and grounded in the nature of human communication. It is a theory that is partly a developmental process; students understand that examining prior assumptions or interpretations can contribute to a revision of original meanings of one's experience in order to guide future action (Mezirow 1996). During two separate travel courses titled *Human Identification in Criminal Investigations* students majoring in Criminal Justice, Forensic Criminal Investigations and Biology participated in experiential learning through direct exposure to field case work with donated human bodies. Students reflected in daily journals their experiences and how the experiences transformed their lives.

Factors Influencing Travel Study Program

Study abroad programs are critical components to higher education directly entwined with the mission of many universities; which is to offer academic distinction to a diverse population and engage students intellectually, become ethically grounded, socially responsible and globally connected. To advance our mission, faculty are encouraged to develop and promote distinctive learning experiences by increasing experiential and participatory learning. By offering a unique and creative learning community; teaching and learning can extend beyond the classroom promoting a culture of inquiry from supportive faculty.

Study abroad programs have been regarded as a positive method to impact a student's global learning experience. Literature evaluating study abroad experiences is prevalent, however shorter travel studies (1-2 weeks in length) have not been thoroughly addressed in the literature. The literature indicates "study abroad has the power to transform the lives of college students who are given the opportunity to participate and broaden their education" (Smith & Mrozek, 2016 p.9). Creating an effective learning environment is critical in developing and fostering transformative learning where new experiences and perspectives can grow (Smith & Mrozek, 2016) (Smith, P.J. & Mrozek, L. J.,2016). Previous studies on study abroad programs have shown an increase in student's motivation to conduct research (Engel & Keeley, 2015), become more globally aware (Grigorescu, 2015) (Stathem, 2015), the ability to work with others (Olson & Lalley, 2012) and become self-reliant (Cubillos & Ilvento, 2012). A study conducted by Burkholder indicates "students exhibited better coping mechanisms for stress compared to students in other domestic classes who were more likely to use substance to cope" (2015, para 5). In addition, students report a desire to enhance their resume for career opportunities and marketability. For this study a partnership was developed between another university and the travel study faculty to advance learning and career opportunities independent of the traditional

classroom environment. The learning outcomes are associated with course material assessment tools to enhance the exploration of experiential and transformational learning. This study attempts to address whether a travel study program (1-2 weeks) can influence a student's learning and offer a real-world career application similar to a study abroad program. Unfortunately, with a travel study, global awareness is not a potential outcome; however, interpersonal skills and community awareness is a viable outcome. Measuring the effectiveness in a travel study is not an easy task. Students may acknowledge the travel study was a profound life changing experience, however they find it difficult to articulate how they changed as a result of the experience. Therefore, the assessment tool(s) used to evaluate the course are important to understand the impact in concrete terms. The approach was to utilize two instruments for assessment; quantifiable pre- and post-test along with a qualitative approach using reflective journals, and post interviews. The daily journals help students process the experience. Faculty must be cognizant that exposure to human remains during the field work has the potential to cause emotional duress to students, so close observation and wellness checks was necessary. Journals are a valuable method to improve reflective and critical thinking skills.

Human Identification in Criminal Investigations

This hands on undergraduate degree course was designed to provide an in-depth study of human vs. non-human osteology, bone biology, and pathology. The travel study course is held at the University of Tennessee's Forensic Anthropology Center founded by renowned anthropologist Dr. William Bass. The learning outcomes included an understanding of the history of anthropology, human and non-human osteology, bone biology and histology, how osteology can be used to determine an individual's sex, age, stature, race and ancestry, how skeletal trauma; whether caused by pathology, accident or homicide can be used in criminal investigations. The course included lectures, quizzes, reflective journals, field work, and a final case study reconstruction practical to assess student learning.

Experiential Learning

Experiential learning is a pedagogical theory explained by Kolb that reflects on how student knowledge can be transformed through experience, observation, and reflection (Kolb 1984; George, Lim, Lucas & Meadows, 2015). Educators in numerous disciplines have adopted this student centered 'hands on' approach to replace or supplement the traditional lecture centered formats in the classroom. These disciplines include nursing education (Warnke & Thirwell, 2014), medical education (Gugliucci, & Weiner, 2013) engineering. (Durkin & Verma, 2016) business (Winsett, Foster & Dearing, 2016) and criminal justice programs (George 2015; Cromwell & Birzer, 2012; Sims, 2006; Stichman & Farkas 2005; Sgroi & Ryniker 2002.).

Criminal justice educators face many challenges in preparing their students for careers in law enforcement, corrections, probation, and a host of other positions. Traditionally, this is accomplished using lectures that cover a wide range of topics including history, policies, procedures, and laws. However, this type of approach in criminal justice programs does not provide real world scenarios and challenges that are gained solely through experience (Cromwell & Birzer, 2012; Sim, 2006; Stichman & Farkas, 2005; George, Lim, et al. 2015). To remedy this shortcoming, numerous criminal justice programs have implemented experience-based activities into their programs. These include: internships (Fichter, 1987; Stone & McLaren 1999, George,

Lim et al. 2015), the ride along (Cromwell & Birzer, 2012), service (experiential) learning (Sims, 2006; George, Lim et al.), field trips & research projects (George, Lim et al. 2015). Notably, there is scarce literature on experiential travel programs within collegiate criminal justice degree programs.

Stichman & Farkas (2005) conducted a nationwide survey of 99 programs that adopted an experiential approach by including internships in their criminal justice programs. Their comparative analysis examined the “organization, application, implementation, and evaluation of internships in criminal justice” (p.45). Their data reflected similarities among respondents about both strengths and weaknesses. The major strength recorded was “the ability to integrate theory and practice” (p.160); and the greatest weakness “appeared to be organizational” (p. 161). The authors conclude that internships could be improved by including reflection, analysis, discussion and journal writing (Stichman & Farkas (2005).

Cromwell & Birzer (2012) examined the usefulness of using a ride-along program, in which participants spent 12 hours with a police officer. Their data reflects that students who participated in the ride-along program were able to apply knowledge learned in the classroom and gain a new perspective on the numerous situations faced by Police Officers on a day-to-day basis.

More recently Molly, Lim, et al. (2015) implemented and examined four experiential learning opportunities (ELO's) provided to their students. The ELO's included internships, field trips, service learning and research projects. Each underlying ELO (preparation, active engagement, critical reflection, and creative application” (p.472) was a consistent component among all experiences. To evaluate the effectiveness of these components they gathered assessment data from a survey administered to senior and alumni. Their research results show a systematic approach using a combination of learning opportunities (ELO's) can benefit students “both professionally and academically” (p 487). In addition, data from respondents reflected they found “internships most useful in terms of *professional* influence (p. 484) and field trips most useful in terms of “*academic* influence” (p.484).

Transformational Learning

Students enter college with perceptions formed and developed by family, society, friends and social media, which influence their individual assumptions guiding their decisions on degree programs and potential career opportunities. The mission of a university is often centered on the development of building a whole-person in the pursuit of knowledge, wisdom, justice and fidelity along with a spirit of association fostering a community in their teaching, learning and service. According to Mezirow “learning is understood as the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience in order to guide future action”(1996, p. 162). Transformational learning is often associated with adults who have gone through a significant event in their life causing an interruption of new meaning toward potential change. Entering college is a life altering event whereupon students become “critically aware of how and why our presuppositions have come to constrain the way we perceive, understand, and feel about our world; of reforming these assumptions to permit a more inclusive, discriminating, permeable, and integrative perspectives; and of making decisions or otherwise acting upon these new understandings” (Mezirow and Associates, 1990, p.14).

Experiential, service learning or travel abroad courses continue to gain popularity in higher education. These methodologies and learning environments provide a setting to challenge

individual's assumptions and offers a conduit for safe critical reflective discourse examining alternative views and perspectives (Mezirow, 1997) (Stover, 2016). For this study, students were exposed to new experiences and perceptions outside of the norm. Therefore, students' daily reflections were a key component in the experiential travel study course; a key element of transformative learning theory. Students were required to write daily journals expressing their personal feelings and test their beliefs about death and the human body. The internal dialogue allows the learner to promote clarity in light of new information. Relationships developed through a travel course stimulate important reflective discourse with others exposed to the same experiences. Students entering into a travel course often find camaraderie with other students helpful and stimulating since they hold similar interests in the field of study. They can be encouraging, supportive and offer a trusting learning environment which is imperative for discourse (Piercy, 2013). Students are able to share their feelings with one another where they create an environment of compassion and trust enabling them to share different perspectives on topics of interest. These discussions "provide opportunities for the student learner to examine the strengths and weaknesses of their personal" (p 33) beliefs and those of others in the travel group (Piercy, 2013). Students participating in the travel course are exposed to material associated with death, therefore creating an environment in which instructor and student build a relationship of "compassion and empathy for one another can be a catalyst for transformative learning" (Piercy, 2013 p.34). Learners need to feel they can make a mistake or feel uncomfortable in unfamiliar surroundings and know the goal is for their success (Wickett, 2000).

The combination of implementing experiential learning into a travel course offers experiences which can provide a new or refined learning process directed toward social and environmental transformative potential (Breunig, 2014, Breunig, 2008a, Warren, 2002). An instructor cannot guarantee transformation in a single course, however it is the responsibility for the instructor to provide an environment in which transformation can exist (Stover, 2016). The learning environment needs to be a setting where the student's preconceived assumptions can be challenged and feel safe to express or disclose their reflections of alternative views based on their new perspectives. "Transformation is aimed at engaging the individual beyond the status quo" (Stover, 2016. 27). When students are placed in an environment that can "challenge their prejudices, prior experiences and assumptions" (p.17) they learn about themselves and can develop relationships within any community (Eyler & Giles 1999).

METHOD

Purpose statement

The purpose of this study was to assess the scope of a hands-on experiential learning travel study experience has on transforming students' personal and career expectations.

Hypothesis

1. Students participating in a Human Identification in Criminal Investigation course will experience life affecting changes in their career choices after the completion of the course.
2. Students will demonstrate acquired new knowledge demonstrated by increased scores assessed from a pre and posttest due to the usage of experiential learning techniques.

Research Questions

1. To what degree does exposure to the human body in decomposition affect the participating travel course students?
2. How does transformational learning manifest itself in students selected to participate in the travel study offered at a premier forensic anthropology facility?
3. To what extent and in what ways does the exposure to experiential learning pedagogy offered at the forensic anthropology facility precipitate life-affecting transformations in students participating in the travel study course?

Setting

Two groups of students participated in a travel course consisting of 40 hours of instruction provided by experts in the field of forensic anthropology. The facility site is located in a wooded area approximately 3 square miles in size off the main university campus. The first group of students (sixteen) attended the course in May 2016 and shared residency in campus apartments. The second group of students (twelve) attended the course in October 2017 and shared off campus hotel rooms. Since experiential field work was conducted by the students, weather was a consideration in selecting the dates for travel. The weather did not impede the instruction of either session. Housing conditions differed due to the university calendar of events. On campus apartment housing was not available during the October course. The adult students were responsible for their own travel arrangements.

Instruments

A mixed methods approach was utilized. A qualitative survey and a quantitative pre- and post-test were developed and approved by the University Internal Review Board (IRB). The qualitative survey consisted of eighteen questions; five demographic questions and thirteen topic related questions to assess the students' views on their learning experience. Also included in the qualitative analysis are the students' daily reflective journals. All respondents were voluntary and signed an Informed Consent to participate in the study. There was no risk to the respondents and no monetary benefit to participate in the study. The interviews were conducted in a private office or a specified location per the respondents' request. The interviews were recorded for accuracy and transcribed verbatim. All interviews were recorded in such a way as to not reveal the identity of the respondents to anyone but the person conducting the interview by linking an identifier to the respondent. This was accomplished by assigning a letter indicator to the interview rather than a respondent's name. Respondents are identified as Respondent A, B, C etc. A total of 30 students were considered possible respondents for the qualitative interviews.

The quantitative instrument consisted of a pre- and post-test to assess learning prior and after the hands-on experiential travel study course concluded. The pretest was distributed and collected from the 2017 respondents during a mandatory 8 hour travel study prep course containing material on anatomy and physiology and criminal investigations. The posttest was distributed and collected on the final day of the travel study course at the forensic facility. The pre- and post-tests are the same measuring instrument with identical questions. There were fourteen 2017 students eligible for the quantitative study since the pre- and post-test was not

utilized in the first offering of the travel course. The travel course consisted of daily quizzes for academic grades, however they were not included in the quantitative analysis.

Participants

A total of thirty students (6 males and 24 females) were selected to attend two separate travel study learning opportunities. Adult learners from several majors participated; Criminal Justice, Forensic Criminal Investigations and Biology. To be accepted students were required to submit an application consisting of an official transcript with a minimum GPA of 2.75, 500-word essay describing their expectations for the course and two letters of recommendation from faculty. The submissions were reviewed by the attending instructors who had final approval. Students who did not meet the qualifications were not allowed to participate in the travel course.

QUALITATIVE FINDINGS

Qualitative coding

The constant comparative method was utilized to analyze the interviews and journals of the students. After transcribing all interviews and journals into units, they were then coded into categories which were significant to the project's focus of inquiry encompassing the theories of experiential and transformative learning from a college travel program. The process of constant comparison resulted in emerging categories that were constantly compared with other categories. As the categories and their properties emerged reflection was necessary to reduce multiple categories to logical themes. Since the data collected was integrated with the theories of experiential and transformative learning characteristics, it was more likely themes may emerge from these theories. Therefore, it was important to constantly question the data to not fill in gaps to extend the theories.

After continuously comparing categories three major themes emerged from the qualitative data analyzes: expectations of learning, impact on perspective careers, and experience and comfort in traveling. Within each category common language emerged in relationship to how students learned best and how they were transformed as a result of their participation in the course.

Expectations of Learning

Prior to departure to the travel program students were required to participate in a preparation session which included a quick overview of osteology and criminal investigation techniques. The actual field work exposed students to human donors in various stages of decomposition. Most students' expectations were consistent with feelings of apprehension, nervousness, anxiety and excitement.

- F/W coming into this week, I had an abundance of emotions. I was anxious, excited, and nervous not knowing what was in store for us. I was beyond ready to get started today! I already learned so much the first day, I am no longer nervous and excited about tomorrow. Now it is the anticipation of what to come.
- M/W On the first day, I did not know what to expect. I felt I was learning things left and right. I was a bit nervous to see the field in person. I did not know what to expect if it was going to be easy to get used to the smell, but I managed and it got better.

- F/H I was really excited about it on Sunday night that I couldn't fall asleep.

The course work contained classroom lectures, hands-on field work, lab work, and the application of all new knowledge to a case study project. Students were broken into teams of four. The week began with each team demonstrating their ability to reconstruct skeletal remains. During the afternoon session of the first day students went to the facility and were exposed to different human donors in decomposition. The following day each team was responsible for mapping, excavating and reconstructing a crime scene involving skeletal remains. An essential aspect to the course was exposing students to hands-on experiential field work replicating an actual crime scene recovery. Kolb's experiential learning cycle was clearly evident through the students' journals.

- F/W My favorite part of the whole day was being in the field. I was so intrigued I didn't want to leave. I love hands on learning and the best way, to learn is to get out there and interact.
- M/W after the lecture on bugs...I love bugs even more. I am having the time of my life. My group was great, my roommate and I looked for an hour and half for one bone we couldn't find.
- F/H Today was fascinating!! I honestly wish that every day was like today, where half the day was in class learning about things and then applying it in the field.
- F/W being in the field –hands on is what intrigues me most about this course. I love getting up close and personal and fully participating in the activities we were given.
- F/W I don't want to leave. I did not want to ask for help right away, I wanted to try my hardest to figure it out on my own and teach myself.
- F/W the labs definitely made things easier because I am a visual learner. I felt like I learned the most by doing so more time in the field would be better.

Impact on Perspective Careers

The travel program presented students the opportunity to learn in a completely different environment outside of the standard college classroom. The learning setting offered a safe environment challenging their pre-existing assumptions on working in the field of a criminal investigation recovery. Trust was established quickly amongst the students and instructors as well as among the teams. Open dialogue and journals allowed for reflection on their new perspectives of career opportunities related to the new knowledge gained. Students were engaged beyond their comfort zone, challenging their prior experiences, learning more about themselves and developing relationships. Not all students maintained their original viewpoint on careers. Students who experienced unexpected challenges to their preconceived notion of a career now felt empowered to move into a direction more suited to their abilities. Knowing what you don't want to do is just as important as knowing what you do want to do.

- M/W This broke a barrier for me that I can handle dead bodies and work in the field.
- F/W being able to experience decomposition up close and hands-on was a really rewarding experience. I'm 100% positive that this trip will be very beneficial for my career.
- F/W today was absolutely amazing!! Being out in the facility was way better than I expected. I cannot even put into words how I am feeling because it was so reassuring that this is what I was meant to do. I have also now been considering, strongly, applying to do my masters. I am feeling even more ready to graduate and begin my career.

- F/W Today flew by, and may have just helped me decide on idea for my future career.
- F/W this week has opened my eyes to all the possibilities as far as my career. I feel like I have a better overall understanding of the human body after death and that maybe one day I will specialized in pathology or trauma. I feel as though I have taken a huge step in my college career and that I have mentally matured in a few days.
- F/W This opportunity has helped me fully decide that this is what I want to do with the rest of my life which is exactly what I hoped coming on this trip would do for me.
- F/W After lunch we went out in the field to start our recovery. The process was very tedious and time consuming and definitely tested my patience. I honestly do not think I could be a forensic anthropologist. It was a unique experience and I feel very lucky and grateful to have been chosen to come on this trip.
- F/W hands on learning is my favorite way to learn so I loved not being in lecture all day. I know for sure I couldn't be an anthropologist. It is a little tedious and I think I enjoy the more morbid stuff.

Experience and Comfort in Traveling

The benefits of a travel study program can be life changing for students; whether it is abroad or in country can provide a competitive edge for employment opportunities, advance degree college admissions, and new friendships. Students' expand their horizons and change the way they see the world. During their experiences they are able to grow as individuals and receive outstanding education that is increasingly becoming more important in our changing world (Liberty, 2017). Traveling and living with almost perfect strangers offer students a multitude of new experiences. While learning new course content they must learn to navigate traveling and living together while developing relationships with the hope of few personality conflicts. Travel studies help to demonstrate to potential employers the individual is independent, seeking broader experiences to learn and initiative to explore beyond contentment. Respondents were different ages with various backgrounds and life experiences, however, overwhelming they felt the travel and living arrangements benefited their learning experience. They worked together in teams during the day, tutored each other to prepare for quizzes, explored new surroundings and have fun outside of the classroom.

- F/W I was so worried and nervous about this trip because I didn't know anyone going into it. The group of friends I have made are very helpful.
- M/W It was a lot of fun! I had never done it before and I know I can be responsible, and take care of myself as well as the people that were with us. I think it gave a whole different feel to the experience. I really liked it. The rooms were really nice and I guess it was just nice in a way ...just to get out in a different environment.
- M/W everyone in the group participated and everyone adds their own flavor to the group. Being with my roommate I have learned a lot about the body and bones in general...he helps me study after class.
- F/W I am enjoying this trip more than I initially thought I would. My car pool friend have been so helpful and teaching me new things. I have gotten comfortable with them and we are becoming good friends that is how you get through the hard stuff.
- F/W My car pool group has become close friends or a little family this week. I was worried at first, but now I am sad to be leaving but happy to go home. It's not really hard

being away from home, but I was able to talk to my significant other and mom, so it has helped.

- F/W We found ways to go out to dinner together. We had a lot of fun together and we included everyone.
- M/H It was great, everybody got along great. We went over certain sections for our quizzes. Everyone was cooperative, considerate, I had no issues living away from home.

QUANTITATIVE FINDINGS

Quantitative analysis

To assess students' knowledge a multiple choice examination was administered one week prior to a one week travel study course at University of Tennessee Forensic Anthropology Center (FAC). The pretest included 20 questions about comparative osteology, pathology, forensic anthropology field methods, and methods in ancestry estimation. The same examination was used as the posttest, and was administered to students the last day at the FAC. The sample consisted of 14 participants.

Item analysis and learning gain calculations were used to analyze the pretest and posttest data for the 20-item examination. The item analysis provided data specific to each question on the pretest, and posttest. The pretest class average was 56.5%, and the posttest average was 81%. The item analysis revealed the following: improvement from pretest to posttest on 15 questions, 2 questions no change, and 3 questions with scores below pretest scores (Table 1 Appendix).

Learning gain calculations were also completed to determine the difference between content knowledge prior to the travel study and immediately following the travel study (Table 2 Appendix). According to Colletta & Phillips "normalized gain G is defined as the change in score divided by the maximum possible increase" (2005, p.1172). To calculate the learning gain the pretest score percentage is subtracted from the posttest score percentage.

Quantitative data gathered from the pre and posttest suggests that experiential learning as a pedagogical tool can enhance student knowledge. Item analysis and learning gain data show a significant increase in knowledge about comparative osteology, pathology, forensic anthropology field methods, and methods in ancestry estimation.

CONCLUSION

Kolb's experiential learning theory includes a four stage cycle; Concrete Experience, Reflective Observation, Abstract Conceptualization and Active Experimentation (McLoed, 2017). Across the reflective journal students' demonstrated their individual paths through Kolb's cycle of learning. They all encounter new experiences whether it was exposure to a decomposing donor body to residing with new people in an apartment or hotel room for a week. As the week progressed students utilized the journals as a means to reflect on their new understanding which allowed for the modification or solidification of existing career options and how new options fit into their world views.

Travel abroad programs will continue to be popular because of the documented benefits for students. College degree programs need to consider alternative programs beyond the traditional semester abroad. This research study examined the impact of learning from a time-limited experiential travel course conducted in the United States. An unexpected outcome

revealed, prior to the travel study, the majority of the participants desired a career in criminal forensics; however, after working in the field and in the lab, several participants no longer have an interest in pursuing a career associated with forensics. These students maintain the experience was life-altering because they learned more about themselves, which is invaluable towards directing future career choices. Since this particular travel experience exposed students to hands-on field work typically taught to law enforcement agencies, it was critical to continuously assess the students' affect to human bodies in decomposition. Journals offered an abundance of data in response to the research questions. Overall, the students performed extremely well in the field and became comfortable with their surroundings. Most affirm their career aspirations and enhanced their desire to work in the field or pursue an advanced degree. As a result of the education gained at the Forensic Anthropology Center, two students are working as death investigators in a coroner's office, three students are pursuing master's degrees and numerous others continue to seek jobs in the criminal justice field. One student's comment encompasses the experience, "I felt like this week was going to be a long one, but it ended up going by really fast. Not only was this a great experience but it was also a good way to make friends. I am happy to say I got the opportunity to participate in this program. I cannot wait to show my family the certificate and tell them about my experiences".

RECOMMENDATIONS

With every learning experience comes new knowledge encouraging further development of either programs or courses. As a result of the travel experiences and research lessons were learned covering areas concerning logistic to course content.

- A comprehensive application process including a GPA requirement, essay and letters of recommendation can assist with the selection process. Student selection can determine the success of the experience.
- Only students willing to actively engage and participate should be considered for the exceptional learning opportunity.
- Some form of a preparation course prior to departure is recommended (face to face or online modules). This will ensure the student recognizes the rigor and expectations of material covered during the actual course.
- Pair students' together based on their academic ability to encourage tutoring.
- University conduct policy applies while traveling.
- Include journaling during the travel course to ensure the student's well-being throughout the experience. Journals need to be reviewed and graded by instructors each day.
- Encourage students to have fun!

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APPENDIX

Table 1: Item Analysis

Incorrect responses per test question

<u>Question #</u>	<u>Pre-Test Results</u>	<u>Post-Test Results</u>
1	2	6
2	2	0*
3	10	12
4	7	4*
5	2	0*
6	6	2*
7	4	1*
8	9	11
9	11	2*
10	3	1*
11	7	1*
12	3	0*
13	2	1*
14	11	4*
15	4	0*
16	0	0
17	14	0*
18	14	2*
19	2	2
20	9	4*

14 Participants Pretest Class Avg. 11.3 Posttest Avg. 16.2

20 Items Pretest Class Avg. 56.5% Posttest Avg. 81%

*- Improvement from pretest to post-test.

Table 2: Learning Gain Scores

Student #	Pretest Score	Posttest Score	Student Gain Score
1	60%	80%	50
2	30%	75%	64
3	40%	80%	67
4	50%	60%	20
5	60%	80%	50
6	50%	80%	50
7	70%	100%	100
8	60%	90%	75
9	50%	80%	60
10	65%	90%	71
11	70%	85%	50
12	45%	80%	64
13	70%	70%	0
14	70%	85%	50

***55% (Learning gain for entire class average)**

Total Avg. Gain Scores .55*

