Student learning venture overseas in the transnational research partnership – a Taiwan and US PIRE case study

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Abstract

Purpose – Transnational learning has become a mainstream issue in recent years due to the rise of global education. There are many kinds of overseas learning, including degree-seeking, joint/double degree, student exchange, internship, service learning and so on. The scope of learning may involve research, teaching/learning and community service. The purpose of the case study is to investigate how the Taiwanese students participating in an international internship project of the US–Taiwan Partnerships for International Research and Education (PIRE) acquire professional knowledge and soft skills, including cross-cultural awareness, interdisciplinary communication, skill development and social networking. It also explores how a joint research project contributes into a collaborative educational program.

Design/methodology/approach – To better understand participants' experiences in the PRIE, this study held three focus groups and seven in-depth interviews on the students, faculty members and project managers for data collection.

Findings – Three major findings are shown in the study. First, participants agreed that the overall learning experiences in knowledge acquisition or skill development have been positive. Second, participants obviously expressed their greater interests in intercultural interaction with the locals, which did not happen quite often during the internship. Third, the extent of interest in applying for the PIRE deg ree program after the internship program is escalating year by year.

Research limitations/implications – More investigation into participants' social and cultural engagement in similar project will be needed for future research.

Practical implications – The results will be implicated into other cross-border education project evaluation.

Originality/value – This study manages to investigate the cross-border research initiative from different participants' perspectives and received comprehensive feedbacks.

Keywords PIRE project, Transnational partnership, Cross-cultural experiences, DMIS

Paper type Research paper

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1. Introduction

Over decades, higher education systems, talent mobility as well as educational delivery and learning mode were changed and facilitated rapidly in the globalization era. Transnational learning, which has been one of the manifestations in cross-border higher education, not only becomes the national agenda but also is embraced by universities. Through joint ventures or collaborative programs by host and sending institutions provided, transnational learning would occur. According to Knight and McNamara (2017), the collaborative academic programs offered between host and sending "are jointly designed, delivered and quality assured through collaboration between host and sending country partners" (p. 16). There are a variety of transnational learning programs, including long-term degree-seeking program, joint degree program, student exchange program, internship program, service leaning program and so on.

It is believed that participating students in the collaborative programs would greatly be benefited with knowledge and skills acquisition. Busby (2003) identified some advantages for students undertaking internships include experiencing the responsibility for the tasks, obtaining management methods, growing maturity, involving in the solution of problems and developing appropriate career aspirations. In addition, students would benefit from widening access to education and improve their opportunities of joining in the global economy (Stronkhorst, 2005; Van't Klooster *et.al.*, 2008; Smith, 2010; Busby and Gibson, 2010). Through the student mobility, students can acquire diverse key competences. They will be able to expand international perspective, build intercultural capacity, deepen professional knowledge, acquire language proficiency, enhance transnational network/linkage and, last but not least, be a "global citizen" who requires knowledge, values and skill (Stearns, 2009). As Mok *et al.* (2017) also indicated that "the international and transnational learning experience could enhance graduates' hard knowledge, as well as soft skills and cross-cultural understanding" (p. 5). As one of the popular ventures, internship program can better form a bridge between academic curriculum and industry and create an opportunity to develop a joint/dual program afterward (Carpenter, 2003; Aerden; Reczulska, 2012). In general, the short-term work experience allows participants to apply theoretical knowledge in a real-world setting and gain a better understanding of a given field in a global context (Jackson, 2008; Nolting *et al.*, 2013).

Based on 1979 Taiwan Relations Act, Taiwan and US government "enjoy a robust unofficial relationship and close cooperation on a wide range of issues" (American Institute in Taiwan, 2019, p. 1) particularly educational cooperation and academic exchange programs. According to American Institute in Taiwan (AIT), Taiwan has become the seventh largest source of international students in United States for a fourth consecutive year. The numbers of US students in Taiwan also slowly increased for the last three years and reached about 1,000 students in 2016–2017 academic year (Chao, 2004; American Council on Education, 2019; AIESEC, 2019). In addition to exchange student programs developed between universities in both countries, a variety of partnership programs have been promoted with the joint governmental funding, such as Fulbright Program for Scholarly Exchange, Taiwan–United States Sister Relations Alliance, TUSA, Taiwan Research Visiting Program and Bilateral Research Collaborations. (Ministry of Foreign Affair, 2007; Ministry of Science and Technology, 2019).

The case study is based on one five-year MOST-NSF Partnerships for International Research and Education (PIRE) titled "Building Extreme Weather Resiliency and Global Community Resiliency Through Improved Weather and Climate Prediction and Emergency Response Strategies" that began in 2015 with the financial support of the National Science Foundation in the United States and the Ministry of Science and Technology in Taiwan jointly (Ministry of Science and Technology, 2019). It involves more than 11 universities and research institutes from Taiwan and the United States with around 30 American and

Taiwanese scholars to investigate extreme weather resiliency through improved weather prediction and emergency response strategies. There are two major aims of the project: one is to enhance high-level research connection between Taiwan and US scholars; the other one is to develop a joint and dual degree program between participating institutions after the end of the research project. It is expected to leverage "international and cross-disciplinary experiences to prepare a diverse cohort of next generation experts" (Joseph, 2019, p. 3) Students in the participating institutions are selected to take part in the summer internship programs since 2017 (Zhang, 2016).

Based on the aforementioned, this study would like to explore how the selected Taiwanese students in case PIRE internship program were developed intellectually by applying Model of Intercultural Sensitivity (DMIS) mode (Holmes and O'Neill, 2012; Holmes *et al.*, 2015; Youtie *et al.*, 2017). Two research questions are presented as follows:

(1) How would the PIRE project and summer internship program facilitate students' knowledge acquisition, interdisciplinary competences, communication skills and cross-cultural understanding according to DMIS?

(2) How much would the PIRE project and summer internship program encourage students to attend a collaborative degree program?

2. Literature review

2.1 Development and delivery modes of transnational programs in higher education

In order to enhance international competitiveness as well as nurture local talents, various types of transnational cooperative initiatives and mobility programs by higher education institutions have been provided rapidly during the 1980s, including long-term degree-seeking programs and short-term visit programs. Transnational education (TNE) is defined as "all types of higher education study programs, or sets of courses of study, or educational services (including those of distance education) in which the learners are located in a country different from the one where the awarding institution is based" (Council of Europe, 2001, p. 1). In other words, TNE should be operating in the country that is different from its origin independently with an involvement of two or more countries in cooperation. Much literature highlights that TNE would not only accelerate the frequency of mobility of the talents, which would lead to positive multilateral impacts on economic, cultural and social developments in a nation, but also facilitate on the research and teaching/learning cooperation among higher education institutions (Stearns, 2009; Smith, 2010; Knight and McNamara, 2017).

According to the report of British Council and German Academic Exchange Service (DAAD) (2017), international programs and provider mobility (IPPM) with a qualification awarded are mainly classified into six modes, including franchise programs, partnership programs, international branch campus, joint universities/colleges, self-study distance education and distance education with local academic partner to the extent of autonomy and collaboration. Traditionally, students who choose to study aboard were seeking a formal qualification in specific field for a period of time. Therefore, international student mobility as major source of high-end workers by developed countries would cause brain drain in developing and underdeveloped countries, vice versa (Chan, 2012).

Currently, short-term partnership programs, which are gaining popularity among students, have rapidly become the fastest-growing segment of the study abroad landscape without sacrificing on-campus life or jeopardizing rigorous academic schedule (Open Doors, 2013). Due to time flexibility and low cost, students would also have opportunities to enjoy new cultures, pursue academic credits and experiential learning abroad. The form of short-term program varies and becomes diverse, ranging from international conferences, meetings

and contests in few days, joint research projects, overseas internships, service learning, summer schools with more than a month or semester (Chan, 2012).

2.2 Developmental model of intercultural sensitivity (DMIS): student learning experiences

With the growing attention to transnational learning in recent years, assessing and evaluating the effect of transnational learning cases has become more necessary than ever (Paige *et .al.*, 2003). In this study, *developmental model of intercultural sensitivity (DMIS)* was adopted as the theoretical framework for exploring students' experience in an intercultural encounter. DMIS is a model developed to explained individuals' experience in intercultural situations (Bennett and Bennett, 2004). There are two major worldviews in DMIS, ethnocentrism and ethnorelativism. According to Bennett (2004), the major change for people to become interculturally competent would be having the transition from ethnocentrism to ethnorelativism. Here, being ethnocentric refers to experiencing one's own culture as central to reality in some way. In this belief, people would be more likely to avoid cultural difference by neglecting or having negative evaluation on other cultures. On the other hand, ethnorelativism means one's own culture is experienced in the context of other cultures. With this worldview, people are more likely to communicate effectively and relate appropriately in cross-cultural situations and build up intercultural competence. (Bennett and Bennett, 2004; Stephan and Stephan, 2013)

There are six distinct stages of experience spread across the continuum from ethnocentrism and ethnorelativism (See Figure 1.) Starting with the most ethnocentric stage, denial of cultural difference is the first one in the continuum, followed by defense against cultural difference and then minimization of cultural difference. Moving to the three ethnorelative stages, the sequence would be acceptance of cultural difference, adaptation to cultural difference and at last integration of cultural difference into identity (Bennett, 2004). To see more details of DMIS, we categorize the key concepts of each stage of experiences in Table 1.

2.3 US and Taiwan PIRE project: context, objective and outcomes

In order to support high and advanced science and engineering research, which depends on international collaboration, US National Science Foundation launched so-called "Partnerships for International Research and Education (PIRE)" since 2005. It is expected that PIRE would be able to "catalyze a higher level of international engagement in the US science and engineering community" (NSF, 2019, p. 1). Throughout global engagement, US scientists can respond to the urgent issues worldwide from a comprehensive perspective.

Until now, the number of the PIRE projects awarded from 2005 to 2017 is 87 with a total amount of US$6.6 million funding. It has a threefold increase over past ten years (Figure 2). In the year of 2007, the number of awarded projects reached the peak about 20 and then dropped a little bit slowly.

In contrast, it was found that the funding has grown gradually as shown in Figure 3 in spite of a drop in number of the awarded projects.

When it comes to the participating countries, PIRE projects engaged more than 60 countries (See Figure 4). German, France and China are the top three countries taking part in

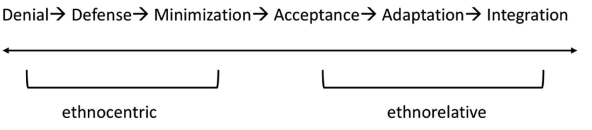
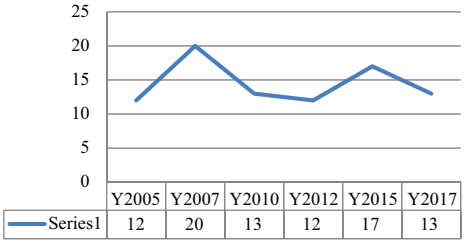


Figure 1.
The DMIS continuum

Stages of experience	Key concepts
(1) Denial of cultural difference	"One's own culture is experienced as the only real one in this stage" (Bennett and Bennett, 2004) People would either intentionally neglect or be incapable of noticing the culture differences. Therefore, culture differences are not experienced during this stage
(2) Defense against cultural difference	People become more adept and start to recognize the difference of other cultures. However, feeling threatened by it, they degrade other culture and consider their own culture the most "evolved" one
(3) Minimization of cultural difference	In this stage, culture differences seem to be less significant compared with the view of physical universalism such as human's biological nature, needs or motivation and also transcendent universalism in certain religious, political or spiritual belief
(4) Acceptance of cultural difference	It is a stage where people not only see cultural differences but also start to appreciate them. In addition, one may be in the belief of cultural relativism, which means one culture is not better or worse than another Paige *et al.* (2003)
(5) Adaptation to cultural difference	People are able to experience a culture from the worldview of that culture. As suggested by Paige *et al.* (2003), there are two dimensions in the stage, empathy and pluralism. Empathy means being able to experiences certain feelings and behaviors from other cultures' perspectives, but meanwhile not losing one's primary cultural identity due to pluralism
(6) Integration of cultural difference into identity	It is a stage where people internalize more than one cultural worldview into their own. They construe their identity from the margin of many cultures, which is named as "Cultural marginality." They will be able to accept the identity based on more than one culture and employ different culture frames in different contexts

Source(s): Bennett and Bennett (2004)

Table 1.
Key concepts of each stage in DMIS

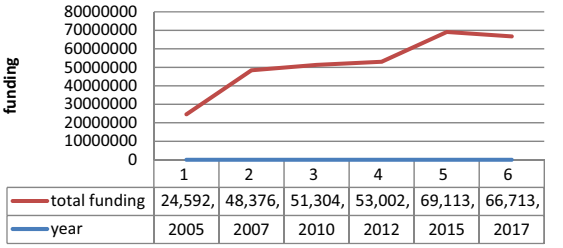


Source(s): National Science Foundation (2019). Partnerships for International Research and Education (PIRE). Retrieved from https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505038

Figure 2.
Number of PIRE from 2005 to 2017

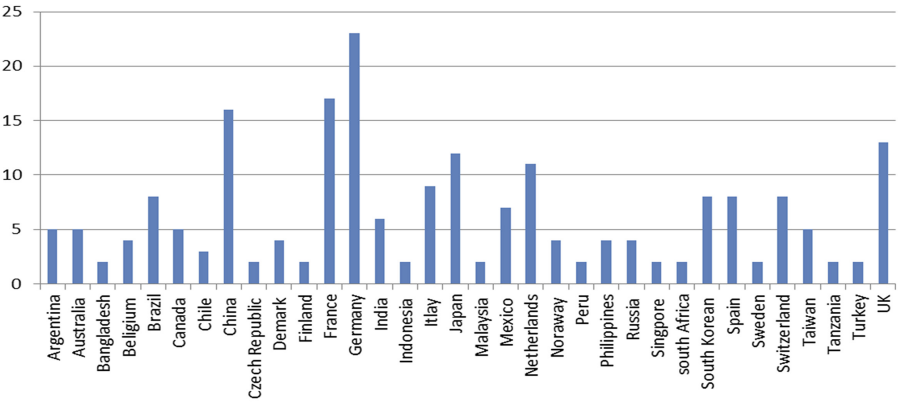
the programs, with 23, 17 and 16, respectively. Taiwan participated in five PIRE projects, including two in 2017, two in 2015 and one in 2007 (NSF, 2019).

This case PIRE project, which was led by Professor Everette Joseph of SUNY at Albany starting in 2015, has four specific objectives. The first three ones focus on the research cooperation in the fields of climate models, weather prediction and decision-making during extreme weather; the fourth one is related to education of students and young scientists "who



Source(s): National Science Foundation (2019). Partnerships for International Research and Education (PIRE). Retrieved from https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505038

Figure 3.
US PIRE funding from 2005 to 2017 in US$



Source(s): National Science Foundation (2019). Partnerships for International Research and Education (PIRE). Retrieved from https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505038

Figure 4.
Participating countries in PIRE from 2005 to 2017

can work effectively on international teams" (PIRE, 2015). In addition, the case PIRE also provides international research and educational experiences for US and Taiwan students and faculty members throughout a variety of educational activities collaboratively. Basically, a centrally coordinated team was composed of Professor Everette Joseph of SUNY and Professor Pay-LiamLin, National Central University, Taiwan. There are four major scientific subteams under this project including ensemble team, microphysics team, climate and regional climate team and social science team (PIRE, 2015).

3. Research method and design

There are a total of 33 participants in this study, including 26 students, 5 faculty members from two national Taiwanese universities and 2 project managers. The students went to the United States in 2017, 2018 and 2019, respectively for 45 days (from July to August) with financial support from either the PIRE or university as an internship package. All participating universities are allowed to send their students joining this transnational learning. Both sides are responsible for the basic needs of students during their overseas

internship. Each student was assigned to different mentor/faculty member, either working at a lab or joining a research team after arrival. The frequency and approaches that students discussed with their advisors varied. In general, American faculty members (who had Chinese, Taiwanese, English and American backgrounds) provided sufficient academic feedback for students' progress on certain topics or issues. Tutorials were provided according to faculty's discretion and students' needs.

To better understand participating students' experiences in the PRIE project and internship programs, this study held focus groups and in-depth interview for data collection. Three focus groups with participating students were conducted respectively in August 2017, November 2018 and August 2019, exploring their perceptions, ideas and reflections on this internship experience. Five Taiwanese faculty members and two US project managers were interviewed in order to realize the actual implementation and impacts of the PRIE project. Based on DMIS and the objectives of PIRE, interview questions were categorized into four parts, including knowledge acquisition, cross-cultural sensitiveness/awareness, interdisciplinary communication, challenges and impacts. The field reports presented at annual PIRE meetings, PowerPoints and video files of their daily life and social encounters during the internship were collected, too. Finally, PIRE's official documents were also used to analyze the structural design and learning arrangements provided by this major international research project in a triangular approach.

Each focus group lasted 90–120 min, while each in-depth interview lasted 30–60 min. All interviews were transcribed verbatim and the transcripts were used as one of the major sources of data analysis. To facilitate data analysis, and avoid preconceived ideas or bias, all respondents were given a shortened code in terms of type of affiliation and level of education (Bazeley and Jackson, 2013) (Table 2 and Table 3). In addition, in compliance with academic ethics code, all interviewees signed consent forms before the interviews took place.

Table 2. Participants in the focus groups

Year 2017			Year 2018			Year 2019		
Coding	Sex	Education	Coding	Sex	Education	Coding	Sex	Education
NCUI1	M	Graduate	NCUII1	F	Undergraduate	NCUIII1	M	Graduate
NCUI2	F	Graduate	NCUII2	M	Graduate	NTUIII2	M	Undergraduate
NCUI3	M	Graduate	NCUII3	F	Undergraduate	NCUIII3	F	Undergraduate
NTUI4	F	Undergraduate	NCUII4	F	Undergraduate	NCUIII4	M	Undergraduate
NTUI5	M	Undergraduate	NCUII5	M	Graduate	NCUIII5	M	Undergraduate
NTUI6	M	Undergraduate	NTUII6	F	Undergraduate	NCUIII6	M	Undergraduate
NTUI7	M	Undergraduate	NTUII7	M	Undergraduate	NCUIII7	F	Graduate
NTUI8	M	Undergraduate	NTUII8	F	Undergraduate	NCUIII8	F	Undergraduate
			NTUII9	M	Undergraduate	NTUIII9	F	Undergraduate

Table 3. Faculty members and project managers in the in-depth interview

Coding	Sex	University
F1	M	NTU
F2	M	NTU
F3	M	NCU
F4	F	NCU
F5	F	NTNU
F6	F	Albany
F7	F	Albany

4. Major findings

4.1 Students' perspectives in the three consecutive years

4.1.1 Students learned knowledge, new skills and language proficiency and were provided with sufficient learning resources. The students in the three focus groups responded that their learning experience were quite positive, including developing research skills and knowledge on programming language, having sufficient learning resources and equipment.

> I think the most valuable thing I learned during the internship is to learn how to conduct research in such a short time (Interviewee NTUII6).

> I think the experience is really helpful because I learned how to do the data analysist there. In Taiwan, we learned the old program language, but in US, we learned the new one (Interviewee NCUII2).

> Simply I think I can go to America and learn something new in research and want to have such experiences. (Interviewee NCUI1 and NCUI 2).

> Actually the motivation for me is American culture and going abroad (Interviewee NCUIII 3).

In comparison, the students thought that the American advisors tended to guide them in a liberal and respectful way in order to develop critical thinking as an independent researcher. They were expected to explore more issues related to their research and even research areas they were not familiar with.

> I remembered my first meeting with the advisor in Albany. My professor asked me to think of a research topic, and that would be the topic for next six weeks. This is so different from my professor in Taiwan. In Taiwan, most professors just give me some data, and teach me how to do it. But in US, advisors will ask me what I want to do, which made me feel respected and encouraged (Interviewee NTUII10).

> My advisor was very busy at first, so most of the time I just did the research by myself. But when he came back, we started to have regular meeting, and I asked him many things about the research, which is really helpful for me. I also tried to asked some other professors for some advice and audited other classes (Interviewee NTUII7).

> My advisor was willing to listen to my thoughts completely. They would not reject your idea instead they encouraged you to do what you would like to do (Interviewee NCUIII7).

In addition to the academic professional acquisition, the students agreed that they were encouraged to speak English more confidently and were able to communicate with foreigners frequently. However, some students in the first and third year indicated that it was still hard to overcome language barrier.

> For me the biggest issue is language. With good language proficiency, we cannot do anything (Interviewee NCUIII8).

> I think the most different thing is that I will not be so afraid to speak English anymore. Although I still have a limited vocabulary, I would try to express what I want to say. And I even delivered a presentation in English in the end of internship, which is a whole new experience for me (Interviewee NTUII9).

> At first I might not be able to understand when someone speaks too quick or with strong accent. But I think I improved in the end, and found more ways for communication, such as using body languages or drawing. (Interviewee NTUII6).

> I still suffer from the language barrier hoping to have more opportunity to practice. At the same time, I do not think I was trained by either professional courses or social-cultural lessons before I left (Interviewee NTUI 7).

4.1.2 Although the participants expressed their greater interests in interaction with local communities, cultural exposure seemed to be limited. The students clearly expressed their greater interests in interacting with local faculty members, students and even communities. However, such needs were not met adequately. One of the causes is that they were assigned into different research teams or labs, which resulted in less chance to meet other local students. Besides, there were not many local students staying on campus. Instead, most students took part in the events or activities organized by Taiwanese Student Association.

> It was summer when we went there, so there were not many people for us to have interaction with. I think it was a pity that I did not have chance to meet other students, because it was summer, the campus was so empty (Interviewee NTUII6; Interviewee NCUII3).

> I hope there can be more chances for us to have interaction with the local students. Like I said before, I searched for many events by myself. It would be great if there are more official events and activities so that all people can participate in (Interviewee NTUII8).

> Taiwanese Student Association has many activities, but there can be more activities held by Taiwan and US together (Interviewee NCUII3).

In addition, some students responded that they did not have much chance to get along with their American colleagues and staff in the lab or office because they usually went home after work.

> I rarely met American on the weekend. It feels like they value their personal time so much (Interviewee NCUII2).

> American is really punctual about work. So if I stayed a little bit longer after work, there would be no people in the office. Also most people have their own family, so I did not have many chances to interact with them (Interviewee NTUII6).

In spite of rare local encounters, the students became more open-minded to accept different culture. As one student mentioned that she was more willing to talk with foreigners and was not afraid to express herself after the internship.

> I think after this internship, I am more willing to talk with foreigners, and less afraid to say something inappropriate. After I came back to Taiwan, I also found that I am more willing to interact with some foreign students in our school. I would sit near them in the school cafeteria, and try to listen to what they are talking about (Interviewee NTUII6).

4.1.3 Lack of interdisciplinary skill generation and insufficient financial support are the two main challenges. Developing interdisciplinary knowledge and skill is one of the project's objectives. There are four major subteams in this major collaborative project including ensemble team, microphysics team, climate and regional climate team and social science team. On one hand, many students indicated that they did not have chances to build this capacity. On the other hand, the interaction between different research teams continued to grow.

> Yes, I have some interaction with that ensemble team. I actually just joined a student's thesis defense together. And we have some collaboration on their research topic because I am from the micro physics team, and she is from the ensemble team so there is some joint discussion between us. But I did not have much interaction with the other research team in US (Interviewee F1).

> This is my first to explore the field of research through the program. It also helps me to develop interdisciplinary knowledge (Interviewee NTUIII9).

Financial support is another issue. Participating students were funded with limited financial support around US$1,400, which could only cover air ticket. Similarly, faculty members

needed to rely on the other research funding from Ministry of Science and Research in order to conduct the PIRE project.

> Last year I think we have seven students visit Albany but because of limited funding we can only at most support 50,000 NT dollars for each student to stay and visit. Basically I think their parents need to pay. So every time when we interview the students who are interested in the PIRE project, we always ask them if there are no financial support, can you come by yourself? (Interviewee F1).

> I think most of the researchers in Taiwan we will have the project with MOST and I think my cases is lucky because I have a big project with MOST. But I think there is a need for students if they really have a good collaboration working. So if there is a really positive feedback I think that will be very important for students to continue two or three months later and then they can bring their works from US. That's what I hope but so far I am not sure how we can really continue this visit (Interviewee F4).

> First of all, I think the funding. Originally, they plan a lot of things for students. But some of them cannot be done because lack of funding. If I have more money, for instance, we can start more solid experiment, but this year PIRE project is lucky that another project call TASA they do summer storm experiment also supported by MOST but in different project (Interviewee F2).

4.1.4 The deviation of interest in applying for the PIRE joint/double degree program between groups of the students appeared. There is a slight difference between two groups of students in terms of applying for the PIRE degree program. Students in focus group I (Year 2017) expressed low interest in applying for the PIRE programs due to incomplete information (Interviewee NTUI 5, 6, 7, 8). On the contrary, students in the focus groups II and III were willing to apply for the PRIE joint/dual degree program after more information was provided by the programs and faculty members. Although many students did not decide if they would continue advanced study, they felt that the PRIE's joint/dual degree was one of the alternatives.

> While we were leaving, people there told us about the program and how to apply for it. After hearing that, I felt really interested and I think I might join it if I had the chance (Interviewee NCUII3).

> In my opinion, after I came back from US, I really want to go back there for study again. So if I decide to study for master degree, I will apply for the program (Interviewee NTUII7).

> If I am going to study for a master degree, I would like to apply for this double degree program. I had a teacher in NCU before I went US, and he always let me do what I am interested in the lab. After I went US, the professor there also let me dig into something I like. He would also give me helpful advice, which made me learn a lot. So if I would continue my study, I would apply for the program (Interviewee NTUII1).

Due to their short stay, there was no significant impact on their career pursuit, particularly in the students of focus group I (Interviewee NTUI 5, 6, 7, 8). One student was also worried if he could continue his research area in the PRIE collaborative program and he did not know how joint advising system would work.

> How do the different research areas link with each other? I mean for example if I already find an advisor in one school, and then I want to apply for the double degree program. Will it be possible for me to find another advisor in other school with the same research area? What is the cooperation mode of different advisor and laboratory? (Interviewee NTUII9).

4.2 Faculty members and staff's perspectives

Administrative support from home and host universities was sufficient, and Taiwan and US faculty members worked closely on guiding students' research. The program heads and staff at participating universities fully supported the project from faculty's perspectives.

Universities not only promoted the project but also held annual meetings for students and faculty members. As faculty members indicated,

> I think last year, PIRE visited us, and we have the second annual meeting here. So all the organizations and all the plans are needed to be supportive by departments. So I think our chair tried to show his best support, . . . so he particularly talks to me and hope that this is something we can establish a good collaboration and relationship with the US side (Interviewee F4).

> On the department level when the PIRE students first came to our department, the chairman also have an orientation program for them to explain our program and introduce our campus and to help them know our environment and also the computer system in our department. There are also schedules for them to know what they should do. Like sometimes in the morning they need to go to the lab and in the afternoon they can go to some cultural activities (Interviewee F1).

The internship program also facilitated the academic linkage between Taiwan and US faculty members. Due to frequent communication between faculty members on both sides, they advised students together from different points of view. As a matter of fact, both students and faculty members were benefited via the internship program.

> So mainly for example my part, I think that I have a strong collaboration or interaction with Professor Ryan in SUNY. (. . .) So we're sort of looking at the same problem but from a slightly different point of view. Through the collaboration, we are able to put our ideas together (Interviewee F4).

> We have regular meeting, almost monthly scientist meeting, and PIRE student group meeting. Those are the regular group meeting. We invited all PI to participate the meeting. Sometime due to some schedule conflict, some people might be not able to participate that meeting, but most of time I think all people invited to participate the meeting will participate (Interviewee F3).

Yet, mutual communication between administrative units in Taiwan and US universities in program promotion and student selection is not timely according to the project managers and faculty members' perspectives.

> Taiwan project leader does not have a full time staff as a coordinator among US and Taiwan universities. Things would be delayed often (Interviewee F5).

> Although we started earlier to prepare the content of the program and the selection process since Feb in US, Taiwan participating institutions often determine list of the attendees until last minute. We here feel frustrated. Usually, Taiwan partners' would respond that it is because the students' quality is not good enough (Interviewee F6 and F7).

In general, faculty members felt that students made great progress in research capacity building and confidence on language over past three years.

> I am so amazed at students' presentations and excellent performance. They did much better than the students over past two years (Interviewee F6 and F7).

5. Discussions

5.1 Transition path of cultural awareness

The study shows that participants obviously expressed their greater interests in intercultural interaction with local faculty members, students and even communities. As Chang and Chan (2020) has indicated, short-term mobility can be beneficial to social/cultural immersion. In addition, research capacity developing and cultural exploration are two major reasons for taking part in the PIRE project. One of the challenges for students is to express themselves with professional terminology and hard to explain their thoughts successfully. However,

some students admitted that professional communication is not that challenging than daily conversation. As reported, most of them did not have opportunities or access to engage in American cultural, traditional and social activities or events. They expected to attend university teaching courses, engage in local social life and activities and have greater cross-cultural experiences.

It was found that prior to the internship, participating students realized that they needed to adopt themselves into different culture, which presented them to be in between defense stage and minimization stage according to the DMIS theory. By the end of the internship program, the students who could *share and appreciate the differenced in both cultures* tended to be moving into the acceptance stage (See Figure 5). It seems that the students become more cross-culturally competent with a transition from ethnocentrism to ethnorelativism. However, the transition path also demonstrated that the deeper immersion of social and cultural life into American society did not occur in this short-term overseas learning venture (Bennett and Bennett, 2004). Our conclusion confirmed there remained the greater needs for social and cultural engagement of Taiwanese interns in the United States. Such soft knowledge and local adaptation became the major pities that they faced.

5.2 Would participation in a short-term internship program turn into increasing interests in long-term degree seeking?

Despite the fact that participating students of four universities from the United States and Taiwan will be able to take core courses in the fields of atmospheric sciences and emergency management during the internship, one of the expected consequences of the PIRE project is to develop dual degree programs at graduate and undergraduate levels. As the proposal stated that, "the US-Taiwan PIRE will build educational pathways and a sustainable academic infrastructure by leveraging and integrating the partners' undergraduate and graduate academic programs" (PIRE, 2015, p. 17), University at Albany, State University of New York and National Central University signed an agreement on dual diploma program. NCU and UAlbany will each award its respective degree to the students graduating from this dual diploma program, NCU in Atmospheric Science and UAlbany in Atmospheric Science (University at Albany, SUNY, 2019). The MOU stated that "The degrees shall be awarded in accordance with graduation policies and customs of each respective institution" (p. 2).

Over past three years, there are only a limited number of students enrolled in the dual degree program. It was found that a half of the participants in the year 2 and the year 3 expressed their interests in applying for the PIRE dual degree program due to the positive experiences they earned during the internship program. However, they still regard it as a

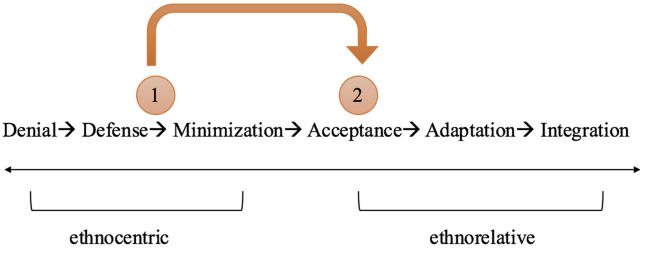


Figure 5.
Students' transition in the DMIS continuum

Note(s): Phase 1: Before the internship, students were in between Defense stage and Minimization stage; Phase 2: After the internship, students moved into the Acceptance stage

second choice because they would prefer to pursue an advanced degree in the other top notched universities. Therefore, it is quite interesting to further research on how an exploration from a short-term transnational program would turn into an inspiration of seeking a long-term dual degree program. To put it simply, how and why such transition might take place and in what condition? These are the fundamental questions for rising short-term programs.

6. Conclusion

The study found that a short-term internship still benefited students' professional and skill development significantly. They were arranged to meet advisor(s) discussing projects, visiting weather stations or even engaging local labs. American learning environments provided generous stimulus to these Taiwanese students. However, they also frankly expressed that they were not mainly motivated to have a prospective career development through the internship program at the PIRE project. Yet, the professional/academic training of the program (in atmospheric sciences) was not strongly associated with their long-term career planning in this wider area. Besides, the internship program would not strongly encourage them to apply for the joint or dual degree program offered by the PIRE project. This gap/mismatch occurred probably due to a shorter length of internship, lack of research experiences (most of them are undergraduates) and ill-organized learning package and so on. Such experiences were not regarded as a serious basis for future career plan. It might just act as an "experiment" or "exploration" for one of their personal learning processes.

All in all, as a professional, cultural and social venture for one's learning processes, PIRE project has received both positive and negative feedbacks. Students' professional knowledge and language proficiency have improved significantly. Moreover, cultural awareness has been uplifted into the acceptance stage in a transnational research partnership. Yet, there remained a greater need for social and cultural engagement in the future plan. Further investigation into such detailed impacts upon interns' social network and career development was still required. Moreover, it is believed that the results from the specific US and Taiwan research partnership, which provided student engagement and learning outcomes by participating in a well-structured international internship, will likely be implicated into other cross-border education or research project evaluation.

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