Tomodachi STEM @ Rice University for Female Students

2017 – 2019 Assessment Report

Description

This report summarizes the results of three years data collected to assess student learning outcomes for students participating in the Tomodachi STEM @ Rice University for Female Students, between 2017-2019. This assessment was completed by Dr. Cheryl Matherly, Vice President and Vice Provost for International Affairs at Lehigh University, and Junchi Zheng and Mary Beth Grove, graduate students enrolled in the College of Education at Lehigh University.

Student Outcomes

Student learning was assessed on the following dimensions:

➢Host country language development;

➢Students' comfort level when interacting with people from other cultures;

➢Student knowledge, skills, and understandings relevant to being effective researchers;
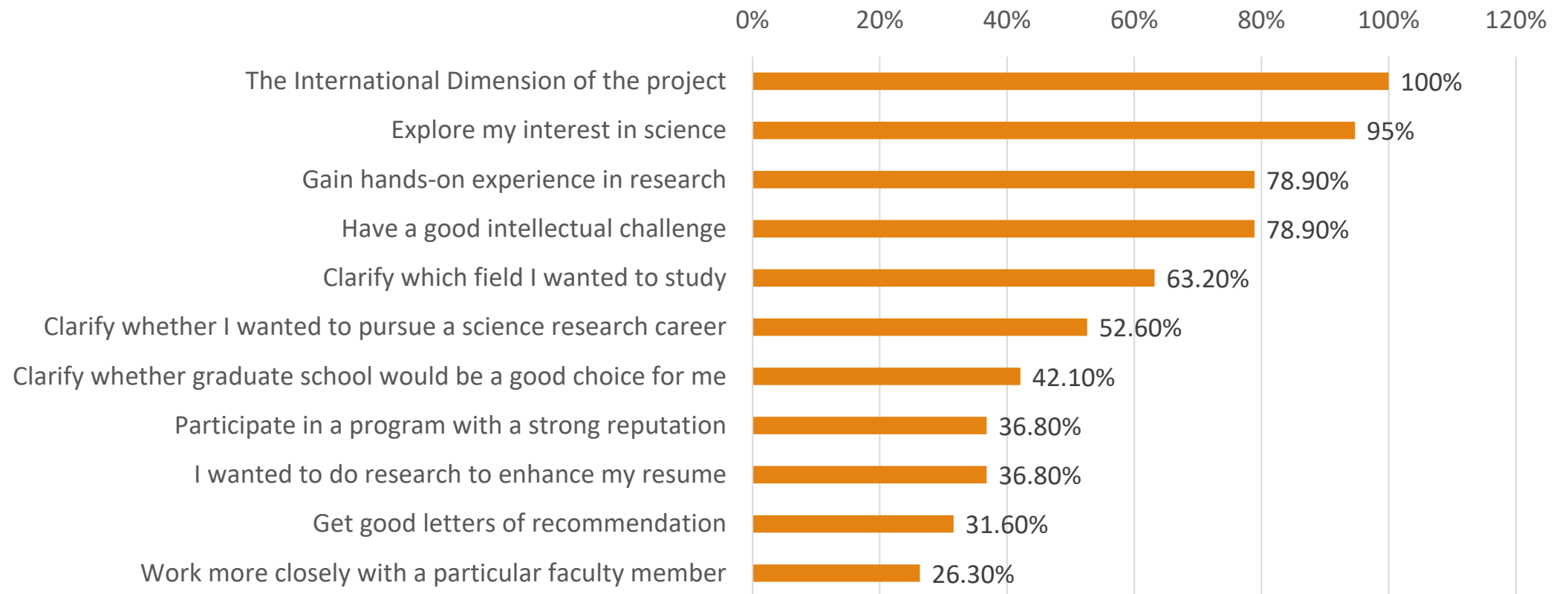
➢Students' career decision making and planning

Assessment Plan

Five instruments were used to assess student learning. Students were asked to complete each of the assessments at the start and conclusion of their research internships. Student participation in the assessments was voluntary. When possible, the assessments were made available in Japanese and students were invited to respond to open ended questions in Japanese.

➢ *Host country language development:* Attitudes of EFL Secondary Students towards Learning English Language (AtLE)

➢ *Students' comfort level when interacting with people from other cultures*: Intercultural Effectiveness Scale (IES)

➢ *Student knowledge, skills, confidence, and understandings relevant to being effective researchers*;

  ➢ Undergraduate Scientists – Measuring Outcomes of Research Experiences (USMORE)

  ➢ General Self-Efficacy Scale (GSE)

➢ *Students' career decision making and planning*: Collaboratively developed questionnaire and open ended questions

Reasons for Participation (n=19)

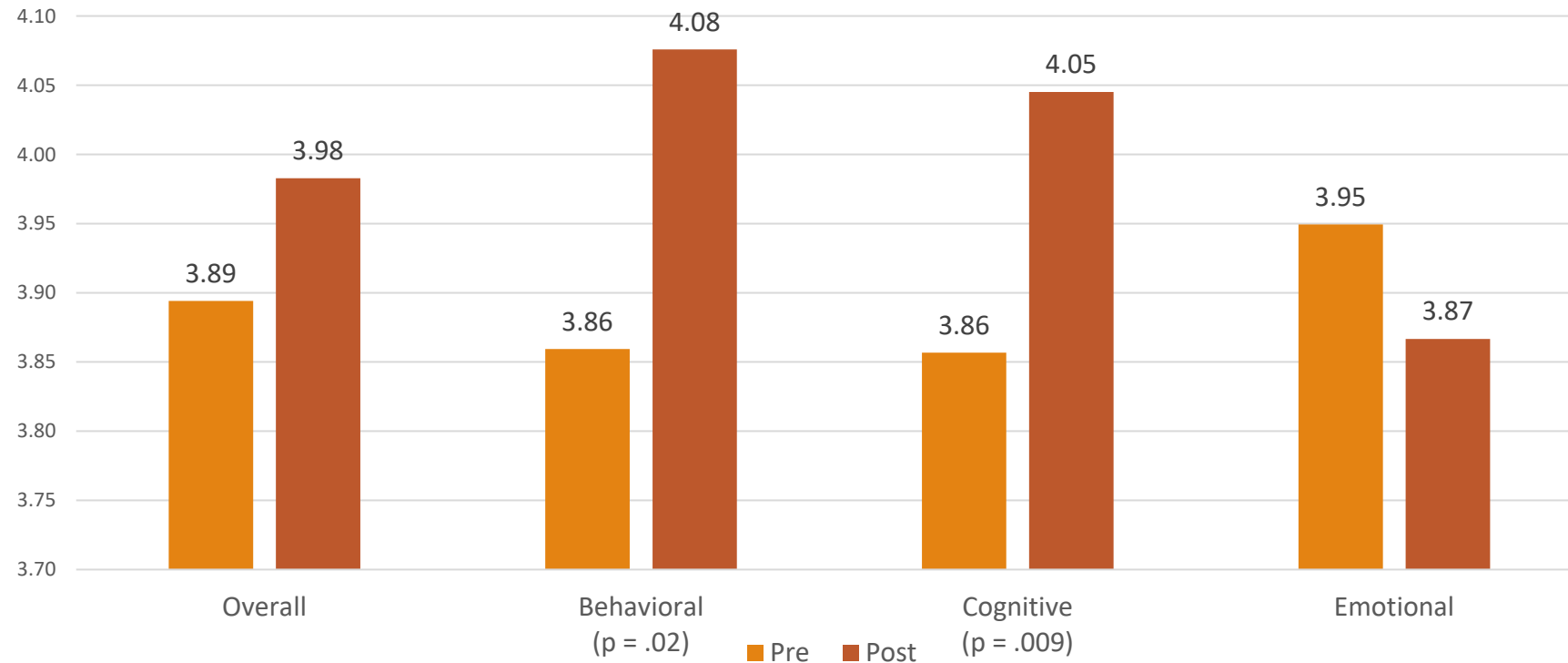| Reason	Percentage
The International Dimension of the project	100%
Explore my interest in science	95%
Gain hands-on experience in research	78.90%
Have a good intellectual challenge	78.90%
Clarify which field I wanted to study	63.20%
Clarify whether I wanted to pursue a science research career	52.60%
Clarify whether graduate school would be a good choice for me	42.10%
Participate in a program with a strong reputation	36.80%
I wanted to do research to enhance my resume	36.80%
Get good letters of recommendation	31.60%
Work more closely with a particular faculty member	26.30%

Attitudes toward speaking and learning English

Attitudes Towards Learning English (AtLE)

➢The AtLE survey (Jafre Zainol Abidin, Pour-Mohammadi, & Alzwari, 2011) includes 38 items that measure individuals' overall perceptions about the value, challenges, and skills related to English language learning; items are rated on a scale from (1) "strongly disagree" to (5) "strongly agree".

➢The AtLE items include three subscales:

1.   **Behavioral** aspect of attitude
   ◦ E.g. "I like to give my opinions when speaking English"

2.   **Cognitive** aspect of attitude
   ◦ E.g. "I am not satisfied with the way in which I speak English"

3.   **Emotional** aspect of attitude
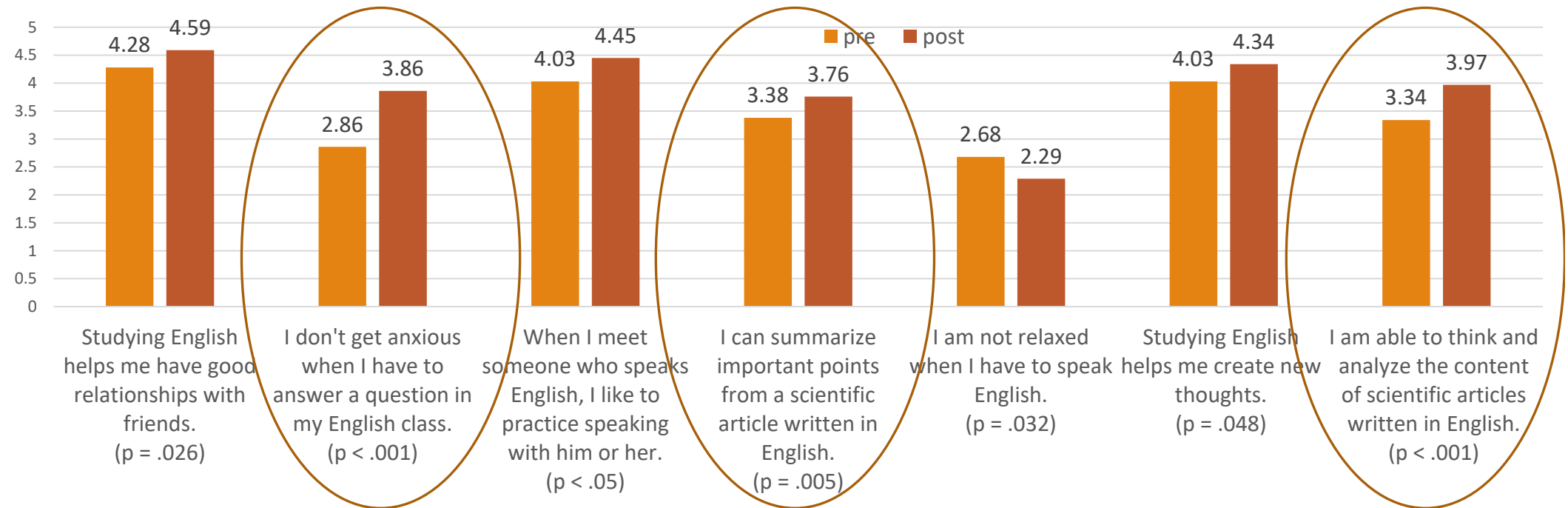   ◦ E.g. "I feel excited when I communicate in English with others."

Attitudes Towards Learning English (n=29) Individual Items

Summary: AtLE Results

➢ The scores of **Behavioral** and **Cognitive** aspects of attitudes increased significantly, suggesting that students demonstrated gains in their confidence in the use of English in personal and academic situations.
  ➢ Students use of English for scientific purposes showed marked improvement over the course of the program.
➢ Students reported a decline in the **Emotional** dimension. This suggests that by the end of the program, students demonstrated a less positive attitude about speaking English. This assessment was completed at the end of the internship, and may reflect that students were simply tired of speaking English intensively as non-native speakers.

Intercultural Learning

Intercultural Effectiveness Scale (IES)*

➢ The IES (Mendenhall, Stevens, Bird, Oddou, & Osland, 2011) is a statistically valid and reliable self-assessment to evaluate intercultural competences between pre- and post-experience. It includes an "Overall Intercultural Effectiveness Score," and scores on three dimensions and six subscales:

➢**Continuous Learning** — Perception of and willingness to engage intercultural interactions and knowledge

- ➢ **Self-Awareness -** It assesses how aware the respondent is of personal strengths and how much she reflects on this knowledge in order to pursue personal development and healthy relationships with various kinds of people.

- ➢ **Exploration -** Fundamental desire to learn new things and strategically seek out new experiences that can cause learning or a change in the respondent's perspective and behavior.

* The IES was only administered in 2018 and 2019.

Intercultural Effectiveness Scale (IES); cont.

➤**Interpersonal Engagement** — Level of dedication to, and interest in, developing positive cross-cultural knowledge and intercultural relationships

- ➤ **World Orientation -** The degree to which the respondent is interested in other cultures and the people who live in them
- ➤ **Relationship Development -** Initiating and maintaining relationships with people from other cultures

➤**Hardiness** – Level of, and willingness to engage, patience and understanding when engaging in potentially stressful intercultural interactions

- ➤ **Positive Regard -** The degree to which the respondent naturally assumes people are trustworthy, hardworking and generally good.
- ➤ **Emotional Resilience –** It measures the respondent's level of emotional strength and her ability to cope with challenging emotional experiences. It also assesses her capacity to recover quickly from psychologically and emotionally stressful situations and setbacks. How she manages these kinds of experiences influences her tendency to remain open, develop relationships, and interact effectively with others.

IES Pre & Post results (n=19)
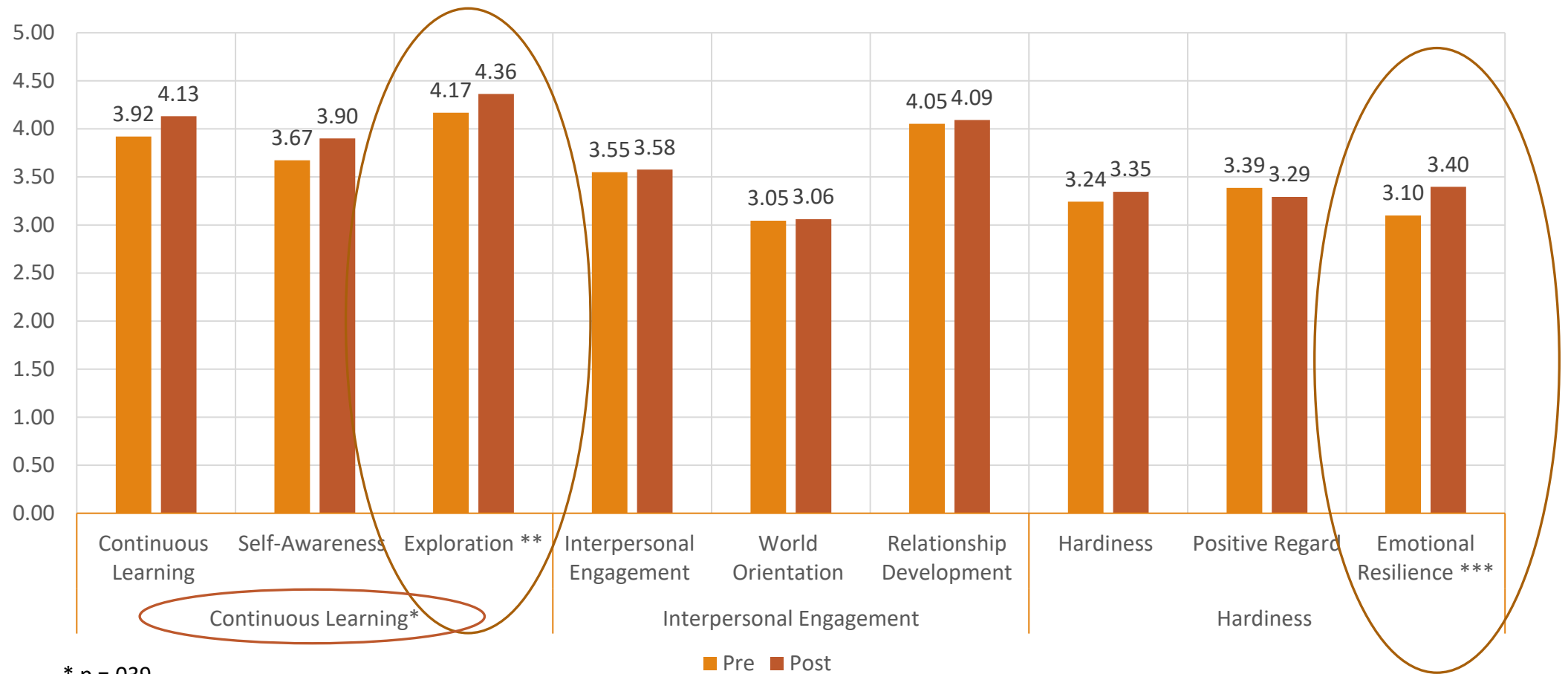
IES Results, Summary

- Gain on the **Continuous Learning** dimension is statistically significant,

  - *"People who consistently strive to learn new things are more successful working across cultures or demographic differences."*

  - Suggests that students developed greater confidence in their ability to learn about other countries and engage intercultural interactions.

- Gain on the sub-dimension **Exploration** is statistically significant.

  - *"Being open to ideas, values, norms, situations, and behaviors that are different from your own."*

  - Suggests that students perceived that they became more inquisitive, curious, and open to new ideas and experiences.

- Gain on the sub-dimension **Emotional Resilience** is statistically significant,

  - *"Level of emotional strength and ability to cope with challenging emotional experiences."*

  - Suggests that students perceived that they coped better with challenging emotional situations and had more energy to continue learning about the foreign culture or diverse groups and develop and maintain effective relationships with them.

Research Skills

Undergraduate Scientists- Measuring Outcomes of Research Experiences Student Survey (USMORE-ss)

The USMORE–ss (Maltese, Harsh, & Jung, 2017) is composed of seven constructs to assess students' levels of experience, knowledge, and skills directly related to being a researcher:
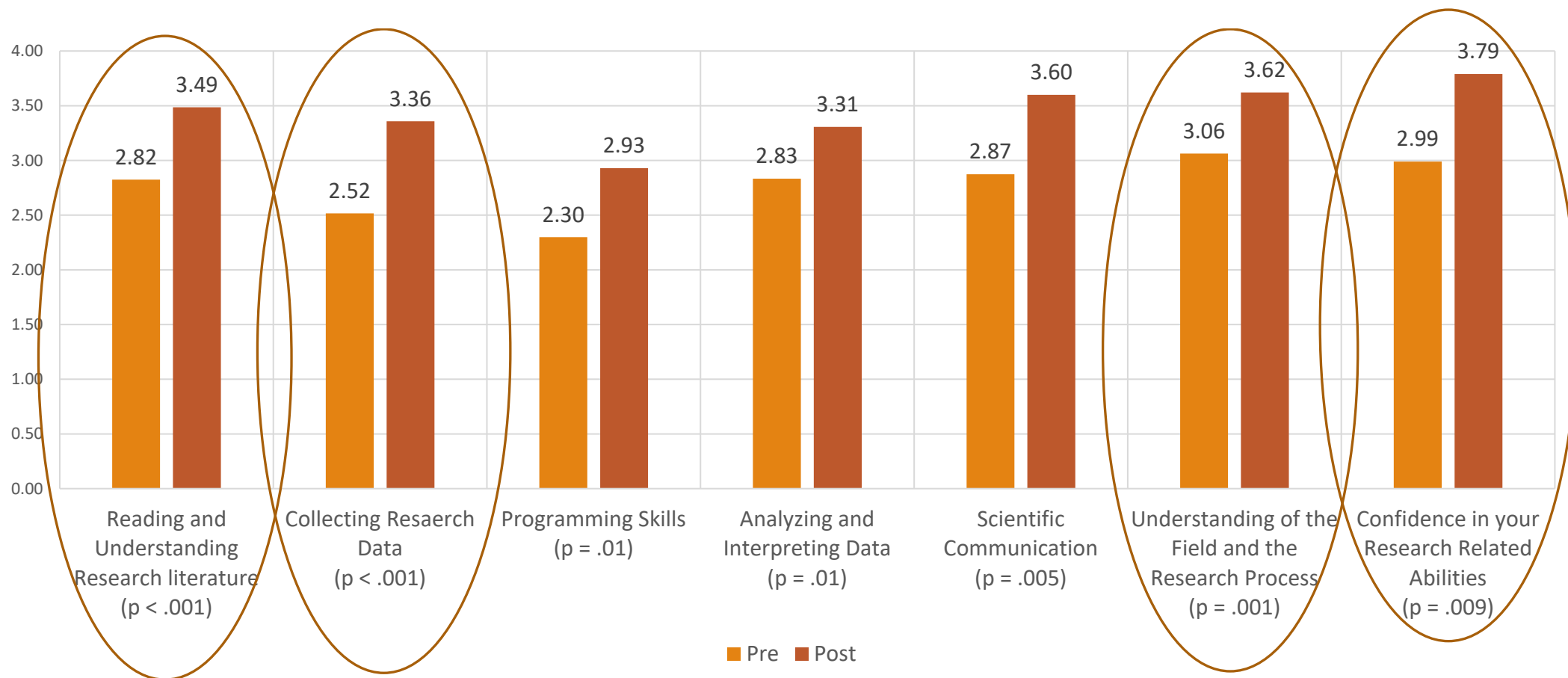
1. Reading and understanding research literature (9 items)
   - Interpreting and critiquing the results presented in literature
2. Collecting research data (5 items)
   - Troubleshooting theoretical errors in research during data collection
3. Programming skills (3 items)
   - Computer programming for statistical analysis/modeling of numerical data
4. Analyzing and interpreting research data (6 items)
   - Interpreting statistical analysis of research in the field

USMORE (Cont.)

5. Scientific communication (5 items)
   - Writing up research methods

6. Understanding of the field and the research process (5 items)
   - Understanding the social or cultural practices of your field

7. Confidence in your research related abilities (5 items).
   - Working independently to complete "basic" research tasks (e.g., data entry, weighing of samples.)

USMORE-Subscales (n=29)

USMORE Results, Summary

- Students reported **statistically significant gains on all the subscales,** in particular in student confidence/understanding of:
  - *Reading and Understanding the Research Literature*
  - *Collecting Research Data*
  - *Understanding of the Field & Research Process*
  - *Confidence in Your Research Related Abilities*
- Suggests that they perceived **greater confidence and enhanced skills in conducting research**.
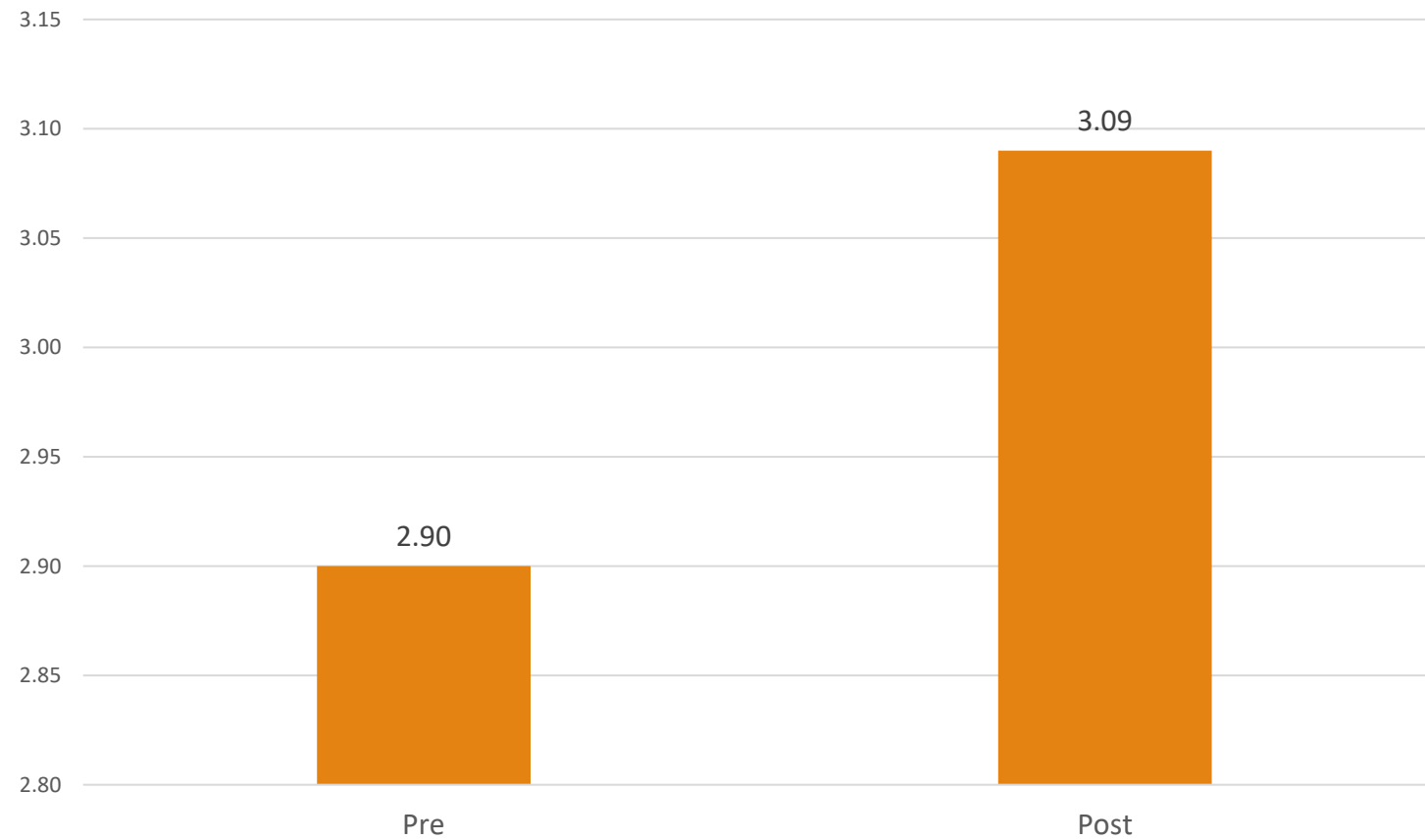
Self Efficacy

General Self-Efficacy Scale

- ➢ Beliefs about own ability to effectively cope with and successfully navigate novel, stressful, and/or difficult life events (Schwarzer & Jerusalem, 1995)
- ➢ General Self-Efficacy is positively correlated with many other important constructs, such as Optimism and Internal Control Beliefs, as well as positive attitudes toward productive activities such as learning a new language
- ➢ The instrument consists of 10 items, rated on the scale of 1 = Not at all true; 4 = Exactly true
- ➢ Sample items:
  "I can always manage to solve difficult problems if I try hard enough"
  "I can solve most problems if I invest the necessary effort"
  "I can remain calm when facing difficulties because I can rely on my coping abilities"
  "If I am in a bind, I can usually think of something to do"

Generalized Self-Efficacy Scale (n=29)

# Generalized Self-Efficacy Scale, Items (n=29)
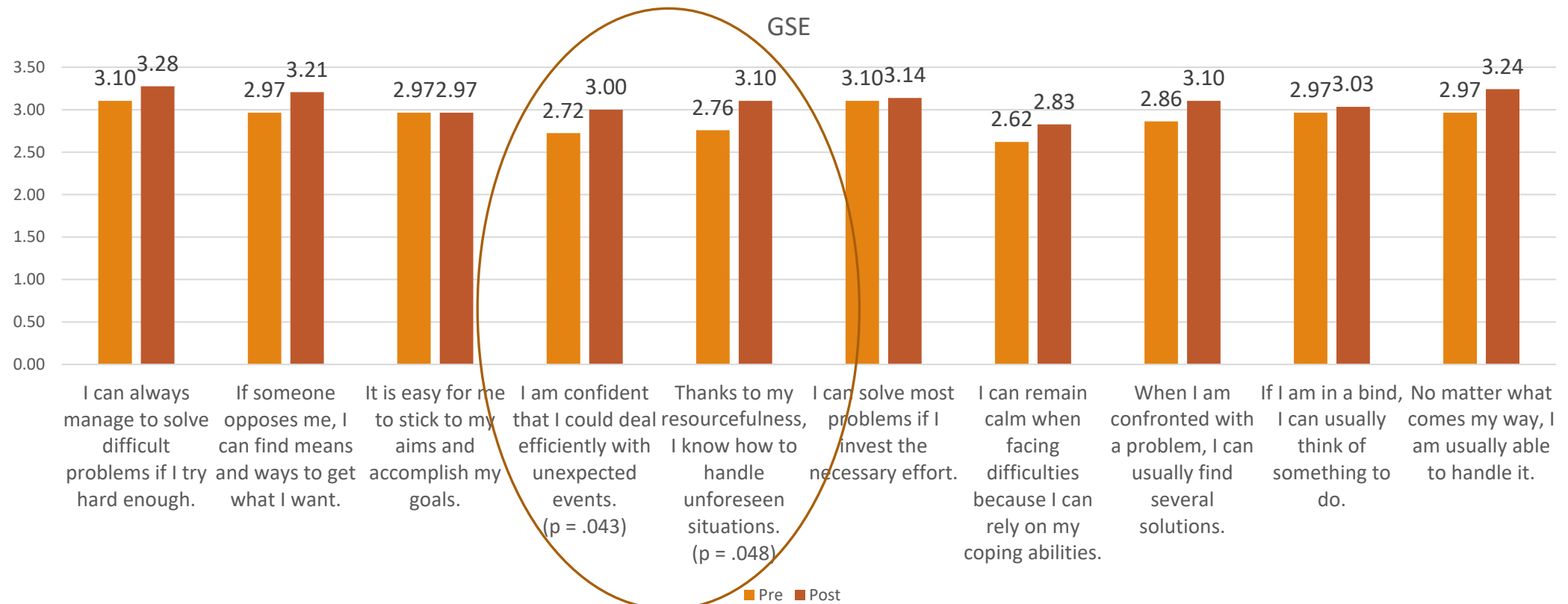
GSES Results, Summary

➢ Students showed **gains on all the 10 items; 2 were statistically significant**:

  ➢ I am confident that I could deal efficiently with unexpected events.

  ➢ Thanks to my resourcefulness, I know how to handle unforeseen situations.

➢ The gains with these items were consistent with the scores on the **IES Emotional Resilience** sub-dimension, suggesting that student could deal with tough situations with greater confidence.

Career decision making and planning

Overall Gains (n = 19)

I am confident that I can be a valuable part of an international research collaboration.
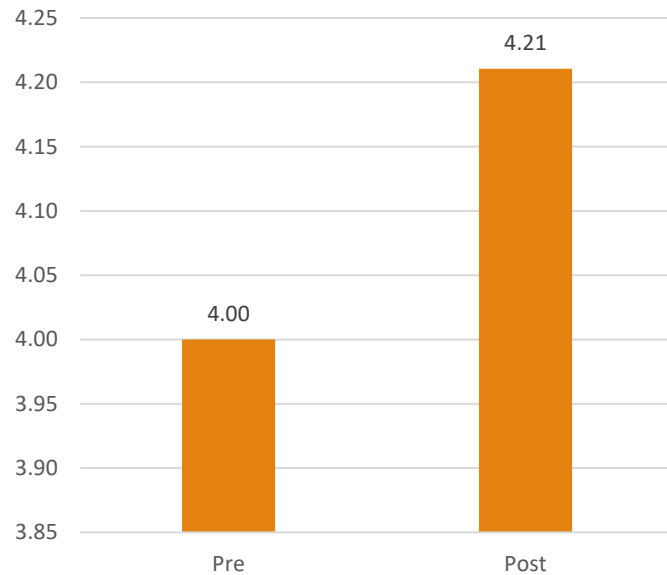
- ➢ 100% of students had a positive experience with research.
  - ➢ Excellent: 79%
  - ➢ Good: 21%

- ➢ 100% of students reported the research experience prepared them for graduate school.
  - ➢ Strongly agree : 53%
  - ➢ Agree: 47%

- ➢ 100% of students reported research experiences which field of study they wanted to pursue.
  - ➢ Strongly Agree: 26%
  - ➢ Agree: 74%

- ➢ 100% of students reported research experience prepared them for advanced coursework or thesis work.
  - ➢ Strongly Agree: 47%
  - ➢ Agree: 53%

Changes in Future Plans (n=19)
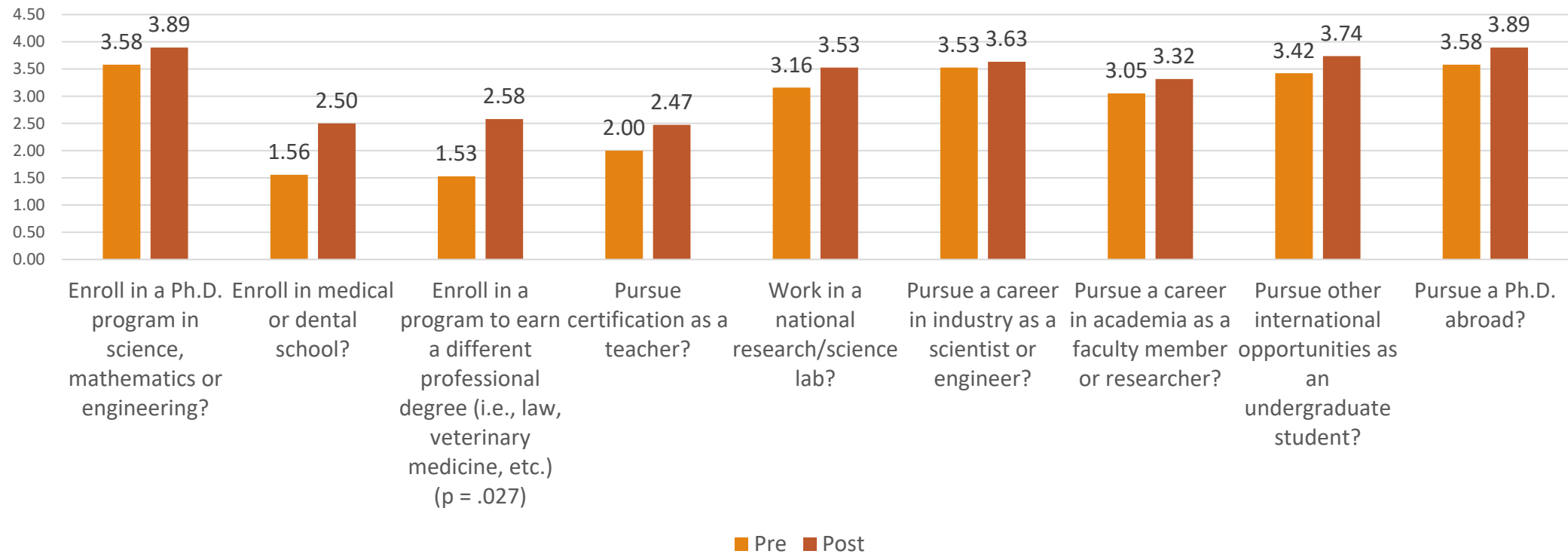
Career decision making and planning Results, Summary

➢ The students indicated **increased confidence in plans to attend graduate school**, as a result of participation in this program.

➢ Students also reported high **satisfaction with this program** in the post-surveys.

Open-ended Questions & Free Responses

Students provided free responses when asked about their experiences and future plan such as their gains in the program and post-graduation plans. Pre and post responses are organized by theme.

Pre-survey responses (n=29)

➢ Students' indicated the following goals for participation in the program:
  ➢ **Conducting research** (n = 18)
    ➢ "I wanted to experience scientific research."
  ➢ **Improve English** (n = 14)
    ➢ "I hope to gain English skills(especially speaking and listening)"
  ➢ **Make connections/Collaborate** with researchers from different backgrounds (n = 11)
    ➢ "I would like to acquire scientific knowledge, improve my English skills and build up network connections."

➢ Students reported **less confidence in their decisions about career and research** before the program started(n = 13)
  ➢ "I am not sure if I have enough knowledge on my research field."
  ➢ "I have thought about it (post graduation plan) but I am still uncertain."

➢ Students expressed their **lack of confidence** in conducting research (n = 7)
  ➢ "I'm not confident to conduct research well."
  ➢ "I want to go to U.S. PhD program after I graduate, but I do not have enough confidence for reaching my dream."

Post-Survey Responses (n=29)

➢ Students' reported the following outcomes from participation in the program

  ➢ Increased confidence in conducting **research** (n = 15): "It made me more clear what it was like to do research in the lab"

  ➢ **Network** with other students and researchers (n = 10):

    ➢ "Got a strong connection with TOMODACHI stem participants and host professors"

  ➢ Improved **English** (n = 8): "I enjoyed talking in English"

➢ Students reported **greater self confidence** (n = 10)

  ➢ "Simply I am really confident about English, cultural, specialized skills. I realized I can be an influencer in the future!! and I want to try tons of things/experiences even after TOMODACHI program ended."

➢ Students reported **greater self-awareness** (n = 7)

  ➢ "Exposed to other culture, new places, new people and new experiences, what I learned most was about myself: my interest, my bias, my tendency of behavior, my strength, my weakness, my way of thinking. "

  ➢ "This program motivated me a lot not in a temporary way but in a long-lasting way. Through this program, I come to think about my future goals in more detail and larger picture and they encourage me to move forward"

Conclusions

➤ Assessments suggest that the program was successful with achieving the stated learning objectives.

➤ Students reported more positive attitudes toward speaking and learning English.

➤ Students reported a greater interest and confidence in their ability to engage interculturally

➤ Students reported a greater confidence in their understanding of various components essential to being effective and knowledgeable researchers.

➤ Students indicated greater confidence in their adaptability and their ability to respond to unexpected events and unforeseen situations.

➤ Students indicated that participation in the program positively affected their decisions about future graduate education and/or career plans.

Limitations

➢All assessment data is based on student self-reports of perceived gains.

➢Research lab hosts did not provide complete post-program student evaluations, so program was not assessed on direct measures.

➢Some instruments were not provided in Japanese, and may have affected student understanding.

Future Assessment

➢ Consider conducting post program interviews (individual or focus groups) to seek more information about programs aspects that most directly impacted student learning.

➢ Add evaluations of student research to be conducted by US lab hosts to obtain direct measures of student lab performance.

➢ Track data of students' post-program plans to determine student likelihood to pursue stated graduate school and academic plans.

References

Mendenhall, M. E., Stevens, M. J., Bird, A. L. L. A. N., Oddou, G. R., & Osland, J. S. (2011). Intercultural effectiveness scale: technical report. *Chesterfield: The Kozai Group Inc*.

Maltese, A., Harsh, J., & Jung, E. (2017). Evaluating Undergraduate Research Experiences— Development of a Self-Report Tool. *Education Sciences*, *7*(4), 87.

Abidin, M. J. Z., Pour-Mohammadi, M., & Alzwari, H. (2012). EFL students' attitudes towards learning English language: The case of Libyan secondary school students. *Asian social science*, *8*(2), 119.

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. *Measures in health psychology: A user's portfolio. Causal and control beliefs*, *1*(1), 35-37.