

Presentation

Beyond the Classroom: Exploring Global Competence Development in a US-Norway STEM Exchange Program

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Abstract: International exchange programs play a pivotal role in fostering global competence among students. This study examines the experiences of students participating in a three-year Science, Technology, Engineering, and Mathematics (STEM) exchange program between a Norwegian and a United States institution. Using the Organization for Economic Co-operation and Development's (OECD) framework of global competence, we investigate how STEM exchange students articulate their experiences and how these experiences reflect their cultural competency. Through a qualitative photovoice methodology, participants captured and discussed their exchange experiences, revealing key themes across OECD's four dimensions of global competence. We identified three key themes to developing global competence through thematic analysis: Awareness of Global Challenges & Advocacy for Sustainability, Building Empathy Through Shared Experiences, and Navigating Cultural and Academic Differences. Our results suggest that immersive, experiential learning environments significantly enhance students' intercultural competence beyond formal coursework. The study highlights the importance of incorporating social engagement, place-based problem-based learning, and institutional support to maximize the impact of exchange

programs. By adopting a more deliberate approach to integrating these elements into higher education, educators can better prepare students to address the complex global challenges.

Keywords:

Exchange program, global competence, STEM education

1 Introduction

As part of the call for increasing international partnerships and overall internationalization within the Norwegian education system, universities are asked to utilize existing relationships with other institutions to develop exchange programs (Ministry of Education and Research, 2020). The following study is housed in a three-year exchange program between institutions in Norway and the United States (US) funded through the Norwegian Directorate for Higher Education and Skills (UTF-2021/10111). The exchange program emphasizes the importance of cultural competence while engaging students in real world Science, Technology, Engineering, and Mathematics (STEM) education challenges focused on place-based, problem-based learning (Bolick et al., 2024) and peer mentorship within STEM disciplines. We seek to answer the following questions:

- a. How do STEM students discuss their experiences in an international exchange program?
- b. How do their experiences reflect their cultural competency?

2 Theoretical Framing

We have decided to align our study with the Organization for Economic Co-operation and Development's (OECD) definition of global competence due to its international applicability. The OECD defines global competence as a multi-dimensional characteristic that includes an individual's ability to: 1) examine local, global, and cultural issues, 2) acknowledge and value a variety of perspectives and world views, 3) build respectful relationships with others, and 4) recognize individual responsibility toward sustainability and collective well-being (OECD, 2018). The first dimension discusses the ability to examine issues of local, global, and cultural significance by combining content knowledge and critical thinking skills to question, analyze, and develop a position based on data (Boix Mansilla and Jackson, 2011 as cited in OECD, 2018). Dimension two elaborates on valuing a variety of perspectives which are rooted in individuals' experiencing, learning, and engaging with differing perspectives, traditions, beliefs, values, and behaviors (Hanvey, 1975 as cited in OECD, 2018). Dimension three emphasizes the ability to utilize cross-cultural differences to engage in respectful dialogue, approach interactions with cultural sensitivity, and a "willingness to engage with others" (OECD, 2018). The final dimension expands on dimension one by acknowledging the influence individuals have on taking action in response to the local, global, and cultural issues (OECD, 2018).

3 Context of the Universities

The Norwegian institution is a publicly funded higher education institution that serves around 14,000 undergraduate, graduate, and doctoral students across a multitude of

disciplines. The institution has approximately 450 incoming and outgoing exchange students each year which highlights the importance of cultural exchange (University of Adger, n.d.). The US institution is also a publicly funded higher education institution in the Southeastern US that serves about 31,000 students. On average, 1,300 students from the US institution study abroad each year (Clemson University, 2025).

4 Context of the Participants

Over the past two years of the program, ten participants (five from each university) have exchanged. The participants are enrolled in a wide variety of programs (Bachelors, Masters, and PhD) that cover a multitude of STEM fields: Civil Engineering, Industrial Economy and Technology Management, Computer Science, Engineering and Science Education, Artificial Intelligence, and Mathematics Education. More specific information about the participants, including self-selected pseudonyms, can be found in Figure 1.

Name	Description
Maria	An undergraduate Civil Engineering student from Norway who participated in the exchange program in Fall 2024.
Red	A graduate Civil Engineering student from Norway who participated in the exchange program in Fall 2024.
Sophia	A graduate student in Civil Engineering and Industrial Economy and Technology Management from Norway who participated in the exchange program in Fall 2024.
Florence	An undergraduate Civil Engineering student from the United States who participated in the exchange program in Spring 2024.
Gigi	A graduate student and graduate instructor of the exchange course in Engineering and Science Education from the United States who participated in the exchange program in Spring 2024.
Michael	An undergraduate Artificial Intelligence student from Norway who participated in the exchange program in Fall 2024.
Superman	An undergraduate student in Mathematics Education from Norway who participated in the exchange program in Fall 2024.
Avery	A graduate student and graduate instructor of the exchange course in Engineering and Science Education from the United States who is currently on exchange this semester (Spring 2025).

Figure 1. Participant pseudonyms and descriptions.

5 Methods

The interviews were conducted using a photovoice methodology (Sutton-Brown, 2014) that was aimed at capturing participants' experiences and worldviews. Participants were tasked with selecting 10 photographs that captured their experiences from the most recent semester. The photographs were printed as artifacts for the interview and participants were asked to select five of the printed photographs. The protocol included the following questions: "Why did you take or select a picture of this?", "What does this picture tell us about your life?", and "How can this picture provide

opportunities for us to improve life and society?” Interviews lasted from 30 minutes to an hour, were recorded using Zoom, and transcribed using Microsoft Word. The authors reviewed the transcripts to familiarize themselves with the data and proceeded to use the temporary chat function in ChatGPT (due to privacy protections) to extract themes across the anonymized transcripts. Author One and Author Two reviewed the transcripts for the themes and discovered additional examples which we summarize in the results section below.

6 Results

Our analysis revealed that dimension one and dimension four were indistinguishable within this context. When participants identified and analyzed issues, they also addressed actions they took to develop solutions or recognized avenues in which they could promote advocacy. This suggests that examining local, global, and intercultural issues is inherently linked to taking action for universal well-being and sustainable development. Given this overlap, we consolidated these dimensions into a single overarching theme. In the following section, we provide rich descriptions of our findings.

6.1 Awareness of Global Challenges & Advocacy for Sustainability

Due to the STEM focus of the exchange program, participants largely discussed examining local and global problems connected to STEM. Previously, Red had not deeply thought about the issues of water contamination and sustainability in the US or in Norway. She recognized that she “doesn’t collect water back home,” but expressed how people could benefit from “a hands-on experience” to better understand local issues of water pollution. Florence wished courses “had more focus on global challenges” and engaged in the exchange program to broaden her perspective of local, global, and cultural issues. The exchange program and education-based course supplemented other activities she engaged in, including Engineers for Developing Communities, and aligned with her aspirations of solving water sanitation problems.

While in Norway, Florence expanded her volunteerism to work with the Student Academic International Help Fund, an organization that runs “a different campaign every semester or year depending on what’s happening in the world.” The most recent campaign focused on access to education; Florence noted that “Norway had just instituted fees for international students and it was prohibiting a lot of students, particularly people who live in places where they can’t receive an education, from immigrating to Norway.” Florence was able to dive deeply into the world of “for profit vs. non-profit” higher education in Norway and the US. She expanded her volunteerism through “Democracy Week,” a week hosted by the city “for students from all over Europe to talk about the future of democracy and human rights.” Florence thought she was just volunteering to help organize the conference; however, she ended up moderating a conversation on stage between the Rector of the university and the former European Union Affairs Minister for Sweden. She advocated for the conference attendees to stay politically active and seek out opportunities to support human rights.

6.2 Building Empathy Through Shared Experiences

Participants' experiences involved forming bonds through collaborative settings, including academic and social activities, helped deepen their empathy for diverse perspectives. Before her exchange semester, Sophia had never expressed interest in attending a sporting event and described herself as "not a sports person." During her time in the US, she saw "sports [as] such a big thing" across the country. Sophia attended sporting events (e.g., football games, soccer matches) and realized that sports had the ability to foster inclusion and a sense of community; "you don't need to be a sports fan to go to sports events because sports events are more like social events... that's how I see it while I've been here." Similarly, Red found sports to be an inclusive environment as an exchange student. She found that it was "hard to get to know" peers in her classes, but noted that "it's easier when you do a sport because then you [are] kind of forced together." Michael and Superman also used ultimate frisbee as a way to make friends; a local student invited them to partake in a "true authentic Thanksgiving dinner" where Michael "felt like one of the brothers" and "appreciated the time [he] spent with them because [the family was] really nice." Yet, Michael found it easier befriending exchange students "because they don't [previously] know each other" and was able to travel with them to different cities around the US.

Avery discussed how she fostered collaboration and dissolved cultural barriers within the exchange class she instructed. She leveraged active learning techniques, including Kahoot, sticky notes, and whiteboards to promote "interacting with other students, socially, building community within the class." Avery created a space that supported an exchange of ideas between both students from Norway and the US. She reflected on the benefits of going on exchange, "your view or outlook on the world is a little bit different just from life experiences in other cultures." Through these shared social and academic experiences, participants developed a deeper appreciation for their host countries.

6.3 Navigating Cultural and Academic Differences

Multiple participants discussed the cultural differences between their exchange and home countries. Gigi mentioned Norwegian's reserved nature when interacting with strangers, noting that "[Norwegians] don't necessarily talk to you [as a non-Norwegian]." She also identified Norwegian's affinity for nature and how it influenced her own curiosity for the outdoors: "the culture of Norway is very much like you spend time outside and they have this law in place where you can go anywhere, even if it's someone's property." Before coming to the US, Michael had "heard some things about [southern hospitality]" but he didn't expect to experience it. One of his most impactful examples was starting a conversation at a hockey game in Chicago with a random person who by chance was an alumna at his exchange university. The person invited Michael to "[his] mom's tailgate" and "sent a message from [Michael's] phone to her." Michael described attending the tailgate as feeling "like we were going to [meet] family."

Maria and Sophia both spoke about the difference in academic systems between the US and Norway. Maria noted the difference in the amount of work between the two structures. She described the Norwegian structure as students "usually just work[ing] a lot during the last month or two of the semester" while in the US, she noticed that students "work continuously." Maria was quick to express that she "liked [the US'] structure better" due to the multiple assignments each week that contribute to her grade and the feedback on her

progress to understanding. Sophia was surprised about the size of the workload in each course and found the weekly assignments overwhelming but also recognized that “it was really easy to get good grades.” Sophia struggled in finding courses that were compatible to her major in Norway due to her major “not directly translating to a major here at [the US institution].”

7 Discussion

This study highlights how international exchange programs foster global competence through experiential learning, building empathy through social interactions, and navigating cultural and academic differences. The findings reinforce prior research emphasizing the transformative impact of exchange programs on intercultural awareness (Jaiswal & Sapkota, 2024; Samira & Abderrahim, 2024; Gita, 2018). Through their global competence, students gained a deeper understanding of the complexities of sustainability, cultural diversity, and the social dynamics of different academic environments.

Participants’ engagement in real-world STEM challenges demonstrated the importance of contextual learning for understanding global issues. While formal coursework was part of the students’ exchange experiences, social and experiential learning environments emerged as more impactful facilitators of cultural competence development. Social integration was essential for developing empathy and cultural understanding. Collaborative environments, including sports and academic activities, helped participants form meaningful connections and gain diverse perspectives. The cultural and academic differences also shaped participants’ experiences. Some participants reflected on social norms and highlighted the need for cultural adaptability, while others provided insights into academic structures that may enhance learning outcomes.

These findings have important implications for educators. Deliberate integration of experiential learning, social engagement, and support for cultural adaptation can better equip students to navigate global challenges. For instance, open discussions about local events can reveal cultural values and social dynamics. These discussions can be linked to course topics such as global communications while building on students’ lived experiences. We pose the following questions: What specific strategies and practices can you implement to effectively foster global competence in your classroom? How can you support the academic, social, and emotional growth of exchange students?

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