

Understanding How Resettled Refugee Youth Bridge Funds of Knowledge With Science Learning

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Abstract: Refugees' knowledge and experiences are often rendered invisible. Building on an asset-based view, our study investigates the practices of resettled refugee youth bridging funds of knowledge with science learning in an afterschool STEM program. We present findings of how the youth bridged funds of knowledge with science learning about weather, climate, and climate change and how bridging practices mediated their engagement with the science topics.

Introduction

Learning is not limited to school but is expanded across multiple contexts of people's everyday lives (National Research Council, 2015). School learners naturally connect their knowledge and skills developed from diverse contexts outside school to those learned in school. However, students' everyday knowledge and experiences are often either viewed as non-scientific and therefore are not at all utilized or are only superficially referred to (Gutiérrez et al., 1999). These issues are even more salient for learners who come from non-dominant backgrounds. Only dominant (European, White, middle-class) ways of knowing are centered in classrooms, while others are ignored and rendered marginal (Calabrese Barton & Tan, 2020). An alternative view has been suggested to consider diverse ways of knowing as assets (Gutiérrez et al., 1999). Building on this view, we examine learners' participation, engagement, and STEM learning in contexts where non-dominant experiences and knowledge are leveraged. In this study, we focus on science learning of refugee youth who resettled in the United States. Narratives about resettled refugees overwhelmingly focus on their interrupted schooling experiences, trauma, and limited proficiency in the languages of their resettled country (Ryu & Tuvilla, 2018). While providing support for these challenges is an important task of our education system, our work intends to leverage refugee background learners' unique knowledge and experiences from their transnational experiences.

Theoretical framework

We aim to understand what cultural assets the resettled refugee youth brought to science learning space and how doing so mediated their science learning. *Funds of knowledge* and *bridging practices* guided our investigation.

Funds of knowledge

Moll et al. (1992) define *funds of knowledge* as "historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being" (p.133). Originally funds of knowledge refer to knowledge from households, including family members' employment, occupation, or household activities (Moll et al., 1992). More recent research has extended funds of knowledge to include knowledge and skills developed in communities, from media, and with peers (Calabrese Barton & Tan, 2009; Moje et al., 2004). As this study specifically focuses on Chin (an ethnic group in Burma) refugee youth's participation in science learning, we pay extra attention to their funds of knowledge linked to their lived experiences in the countries they had lived.

Bridging practices

We are interested in understanding not only what funds of knowledge the refugee youth brought into science learning, but also how they connected the funds of knowledge with science learning. We use *bridging practices* as a metaphor to emphasize that connecting funds of knowledge with science learning is more than bringing the two in contact but also making them integrated. Like building a bridge, making two pieces of construction in contact is not complete; they must be riveted together to become a whole bridge. Using *bridging practices*, we emphasize our focus on understanding how the youth integrated funds of knowledge with science learning in the current, situated learning context. We analyzed to what degrees, in what ways, and for what outcomes, the youth participants bridged funds of knowledge and science learning. We also examined how bridging practices mediated the youths' engagement with science topics. We paid close attention to the youths' sensemaking of the topics and their affects shown in the learning processes. Previous studies found that students drew on everyday knowledge and experiences to make sense of science concepts and populated science understanding onto familiar everyday phenomena (Rosebery et al., 2010). When these processes happened, new understandings were generated (Moje

et al., 2004). Other than helping with conceptual understanding, drawing on everyday knowledge and experiences also resulted in emotionally engaged participation (Rosebery et al., 2010). For example, nondominant participants positioned themselves as experts when they could connect everyday knowledge to academic learning (Calabrese Barton & Tan, 2009).

Study context

This study analyzed data from Project RESET. The project was part of a community-based afterschool program offered for resettled Burmese refugee youths in a Midwest city (1) in the United States. Project facilitators collected a rich set of data, including video recordings of weekly sessions, audio recordings of small group discussions, student artifacts, and interviews. The project has yielded publications focusing on the youths' self-narratives (Ryu & Tuvilla, 2018), design principles for engaging the youths in critical STEM literacy practices (Ryu et al., 2019), and how the youths negotiated their identity work (Ryu & Daniel, 2020). In the current study, we revisited part of the data (session video, audio recordings, and learner-generated artifacts) to answer two research questions: 1) What funds of knowledge did the resettled refugee youth bridge with science learning? 2) How did bridging funds of knowledge and science learning mediate the youth's engagement with science topics?

Curriculum

Project RESET consisted of 24 weekly sessions (90 minutes each) during the school year of 2016-2017. 10-20 youths participated in each session. The project addressed weather, climate, and climate change. The topics were chosen because of their high relevance to the youths' lived experiences. In the first 18 sessions, the participants learned about the topics through videos, pictures, personal stories, and maps. Learning activities included lab work, drawing, presentation, small group discussions, online research, and creating stories. Facilitators encouraged the participants to apply multimodal and multilingual literacy practices when making sense of the topics. In the last 6 sessions, the participants created videos in small groups to share their learning.

The youths left Chin State, Burma, at the ages of 5- to 11-year-old. They moved to a first asylum country, most of them to Malaysia and others to Thailand, Singapore, or India. They then resettled in the United States. At the time of participation, the youths were sophomores or juniors at local high schools and had lived in the United States for varying periods from 3 years to 9 years. Most of the youths spoke English, Burmese (the official language of Myanmar), and Hakha-Chin (a lingua franca in most parts of the Chin State), with different degrees of proficiency. A few students speak other Chin languages (e.g., Hakha, Falam, Zophei).

Data analysis

We analyzed data from the first 18 sessions because no adequate data were collected in the last 6 sessions. Our data analysis methods were inspired by the grounded theory approach (Strauss & Corbin, 1990). We primarily analyzed the video recordings and referred to the audio recordings and student artifacts to zoom in on interactions and discourses. In initial open coding, we identified episodes where the youth brought in their lived experiences of weather, climate, and climate change in the places where they had lived. Through the comparison of these episodes, we identified nuanced categories of family and community funds of knowledge. We then moved to axial coding, watching the episodes repeatedly to surface the themes of how the youth bridged funds of knowledge with science learning and how bridging practices mediated their engagement with the science topics. Throughout the process, we discussed the codes and reached agreements on interpretations.

Findings

The resettled refugee youth brought into science learning family and community funds of knowledge. Family funds of knowledge are linked to their life in Myanmar and their family's migration history. Community funds of knowledge include their childhood experiences and Chin farming and cultural practices. The youth demonstrated bridging practices in the following ways. They drew on funds of knowledge to concretize scientific concepts. They also applied newly developed scientific understanding to reinterpret funds of knowledge and began to see what was familiar in new ways. While these findings align with those of existing studies (Moje et al., 2004; Rosebery et al., 2010), our findings revealed more nuanced ways of how the resettled refugee youth bridged family and community funds of knowledge with science learning and how bridging practices mediated their engagement with the science topics. We explained our findings in the following three episodes.

Episode 1: Surprising climate differences between countries

When learning about climate, each group received a set of pictures of flora, fauna, natural landscape, and architecture. The youths were asked to identify the country in which their set of pictures was taken. The facilitators

marked six countries on the world map as options. After providing some time to discuss in small groups, Facilitator 1 revealed the correct answers and gave them climate data (temperature, precipitation, and wind speed) graphs of each country. The two groups who had pictures of Sri Lanka and Spain were surprised to find out that the patterns of monthly mean wind speed were distinctly different between the two countries. In Sri Lanka, the monthly mean wind speeds stayed pretty much constant throughout the year, whereas in Spain they were higher in January and May through September than in the other months. Pointing at the world map, Joe talked out loud that both Spain and Sri Lanka are surrounded by oceans. The other group members echoed, “Yeah! They are!” Talia said, “Didn’t we discuss earlier that places near oceans usually have similar climates and are usually windy?” She continued, “Remember when we were sharing our experiences of weather in Yangon, Kuala Lumpur, and Singapore? These places have very similar climates – windy, rainy, and hot.” The participants were expecting that Sri Lanka and Spain, both close to oceans, should have similar climates, based on their experience of similar climates in the multiple coastal cities and countries they had lived in. The data graphs of Sri Lanka and Spain contradicted their expectations. The disparity led them to discuss other factors that could shape a place’s climate.

In another group, the youths started to examine Australia’s climate data graphs. To their surprise, they noticed that the coldest months they experience in the U.S. are Australia’s warmest months, and vice versa. The group members started to talk to the group that had the U.S. weather data. A youth described, “They are inverted from each other.” Other youths commented, “Interesting,” “Weird,” and “Why?!” They suggested that maybe this pattern is due to time zone differences. They moved from Southeast Asia to the U.S. and experienced both time and climate differences. They searched online and learned that Australia and the U.S. have time differences as well. Hence, they reasoned that the time zone differences might be the reason why the two countries have climate differences. Facilitator 1 shared that though her home country and the U.S. are in different time zones, they have overlapping months of the four seasons. The facilitator suggested the youths locate the U.S. and Australia on a globe. They identified on the globe that the two countries are on the northern and southern sides of the equator. Facilitator 1 explained to them why the U.S. and Australia have opposite seasons.

As this episode demonstrated, the youths tried to make sense of an unfamiliar country’s climate based on their experiences of climates in regions they had lived in. When their predictions turned out to be far from reality, they were surprised, confused, and intrigued to find out why. The contradictions made them aware that climates are influenced by more factors than they had thought.

Episode 2: Commander Leo’s adventure story

After learning about climates in several different countries, the participants created their climate stories tied to their experiences of climate in one or more regions. Leo built his storyline along several places he and his family went through when they were migrating from their hometown to the United States. He produced a mini storybook telling an adventure story of a troop marching from Myanmar to the United States. He made himself the commander of the army. After leaving Chin State, the army first arrived at Mandalay and then marched all the way south until they reached a coastal city near Rangoon in June. There they seized all the supplies they needed. Because the army’s target was to capture Rangoon, it kept marching despite the non-stop rain and resulting muddy roads. When the army finally reached Rangoon in August, the weather turned sunny - as Leo described, “The sun was all over.” Then it took the army less than one month to capture Rangoon. Leo exclaimed, “Think about that! In less than one month! How spectacular it was!” Putting a range of stickers representing a castle and people in his storybook, Leo explained, “Here is the Commander’s castle. Everyone is happy because they just captured the capital Rangoon.” However, the army did not stay in Rangoon for very long but continued their adventure toward the United States. After a long journey, the army eventually reached America in December. “It was very cold and snowy there as you can see the snowmen and cookie houses,” said Leo while he was adding different stickers.

Leo turned his family’s migration route from Myanmar to the United States into the journey of his army’s adventure. He kneaded into the climate story his experiences and knowledge of climates in different cities of Myanmar and in the United States. Bringing in his lived experiences of family migration and of weather and climates in multiple cities along the migration journey, Leo was engaged in personally meaningful and emotionally rich climate storytelling. He provided rich details of what the weather was like in those places at those times of the year. With the knowledge, he made strategic planning and decisions for his army as they moved along from place to place. Creating and sharing the climate story made it explicit to himself and other participants how weather and climate are different in different places at different times of the year.

Episode 3: Myanmar farmers’ farming practices

In the reading materials on extreme weather events including drought, the word “desertification” was mentioned.

Facilitator 1 approached one of the groups and asked the youths to explain “desertification”. Simon jumped in, “It means that the land turns into a desert.” The facilitator further asked why that could happen.

Pointing at the words “poor farming methods” in the text, Leo explained, “If you grow corn every single year, then you know for sure that your ground is going to be messed up. The Great Plains used to be rich in minerals. But since farmers know nothing about farming methods, they just grow the same crops every single year. That is how it turned into a desert.” Leo continued, “You must change crops every season. Potatoes, for example, are good for the soil.” Later in another group, Rosa, who had overheard Leo’s talk, explained how poor farming methods could result in desertification. Tom in the same group exclaimed, “That [crop rotation] is what farmers in Myanmar do! When it rains a lot, farmers plant rice. In summer when it does not have a lot of rain, they grow peas.”

When making sense of desertification and drought, Leo brought in his understanding of how different farming practices impact lands. Tom shared his knowledge of Myanmar farmers’ farming practices. Leo and Tom made the science concept concrete by relating it to their knowledge and experiences of farming practices. They were emotionally charged when explaining the knowledge to others. A sense of pride was evident in Tom’s emphasizing tone when claiming Myanmar farmers’ farming practices as an example of “good farming practices”. He enthusiastically described how farmers change crops based on weather and climates in different seasons.

Conclusion

In this study, we identified that the resettled refugee youth bridged family and community funds of knowledge with science learning. Bridging practices helped the youth both make sense of the science topics and develop new interpretations of the funds of knowledge. What is more, bridging practices mediated the youth’s engagement with the science topics in emotionally charged ways. The youth positioned themselves as experts who were contributing relevant knowledge and experiences to the science learning community. They merged family stories and community practices into learning tasks and discourses, with a sense of pride. When bridging funds of knowledge with science learning caused wrong predictions and surprises, they were intrigued and motivated to learn more about the concepts. These findings call for engaging refugee youth’s life stories, experiences, and wisdom as productive resources for teaching and learning.

Endnotes

(1) All names are pseudonyms.

References

- Calabrese Barton, A., & Tan, E. (2009). Funds of Knowledge and Discourses and Hybrid Space. *Journal of Research in Science Teaching*, 46(1), 50–73.
- Calabrese Barton, A., & Tan, E. (2020). Beyond Equity as Inclusion: A Framework of “Rightful Presence” for Guiding Justice-Oriented Studies in Teaching and Learning. *Educational Researcher*, 49(6), 433–440.
- Furberg, A., & Silseth, K. (2022). Invoking student resources in whole-class conversations in science education: A sociocultural perspective. *Journal of the Learning Sciences*, 31(2), 278–316.
- Gutiérrez, K. D., Baquedano-López, P., & Tejada, C. (1999). Rethinking diversity: Hybridity and hybrid language practices in the third space. *Mind, Culture, and Activity*, 6(4), 286–303.
- Moje, E. B., Ciechanowski, K. M., Kramer, K., Ellis, L., Carrillo, R., & Collazo, T. (2004). Working toward third space in content area literacy: An examination of everyday funds of knowledge and Discourse. *Reading Research Quarterly*, 39(1), 38–70.
- Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of Knowledge for Teaching: Using a Qualitative Approach to Connect Homes and Classrooms. *Theory Into Practice*, 31(2), 132–141.
- National Research Council. (2015). *Identifying and Supporting Productive STEM Programs in Out-of-School Settings* (p. 21740). National Academies Press.
- Rosebery, A. S., Ogonowski, M., DiSchino, M., & Warren, B. (2010). “The Coat Traps All Your Body Heat”: Heterogeneity as Fundamental to Learning. *Journal of the Learning Sciences*, 19(3), 322–357.
- Ryu, M., & Daniel, S. M. (2020). How Did We Engage Resettled Chin Youth in Critical stem Literacy Practices? *Asia-Pacific Science Education*, 6(2), 319–345.
- Ryu, M., & Tuvilla, M. R. S. (2018). Resettled Refugee Youths’ Stories of Migration, Schooling, and Future: Challenging Dominant Narratives About Refugees. *The Urban Review*, 50(4), 539–558.
- Ryu, M., Tuvilla, M. R. S., & Wright, C. E. (2019). Resettled Burmese Refugee Youths’ Identity Work in an Afterschool STEM Learning Setting. *Journal of Research in Childhood Education*, 33(1), 84–97.
- Strauss, A., & Corbin, J. (1990). *Basis of qualitative research: Grounded theory procedures and techniques*.

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