Meaning Patterns Work 2: Interpretive Methods in Theory

Project Overview

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Project Description

Topic: Interpretive methods have been outlined in theory in several ways. The two Sense books (see below) are specific examples of the use of interpretive methods. There is a literature on an approach named “interpretive” (or interpretative) methods in their own right. This is relatively new and often lightly argued, at least compared to the extensive literatures on quantitative and qualitative methods. However, the disciplines of history, philosophy, and social/cultural theory have long been interpretive. So have meta-analyses, which overview and synthesize an existing literature.

Furthermore, even qualitative and quantitative empirical methods must involve some sort of interpretation when they ask, what is the existing theory or logic model that is being applied to the data? What is its relevance and appropriacy? (Sometimes, this is called “construct validity.”) What are the theoretical implications that emerge from the analysis of the data?

Key questions: What are interpretive methods, in general, or as applied in a mainly interpretive discipline (e.g. history, philosophy, cultural/social theory)? Or, how are interpretive methods operationalized in a meta-analysis? Or how are interpretive methods applied in qualitative or quantitative empirical research?

The focus of Work 2 is meta-theoretical, that is you are being asked to develop an account of the theory of interpretive methods – its purposes, possible deployment and types of analysis that it can produce. If you are a doctoral student, you may (or may not) wish to have your dissertation topic in mind as you write this work.

Word length: at least 2000 words

Rubric: Use the ‘Knowledge Processes Rubric’ against which others will review your work, and against which you will do your self-review at the completion of your final draft. which you will do your self-review at the completion of your final draft. Check here for some ways in which interpretive methods map against this rubric.

Media: Include media elements, such as images, diagrams, infographics, tables, embedded videos, (either uploaded into CGScholar, or embedded from other sites), web links, PDFs, datasets, or other digital media. Be sure these are well integrated into your work. Explain or discuss each media item in the text of your work. You should refer to specific points of the video with time codes or the particular aspects of the media object that you want your readers to focus on. Caption each item sourced from the web with a link and be sure to cite all media sources in the references list.

References: Include a References “element” or section with the scholarly articles or books that you have used and referred to in the text, plus any other necessary or relevant references, including websites and media. You should specifically add an asterisk in front of each new scholarly source that you use, considering using at least 5 new sources.

Related Books:

Cope, Bill and Mary Kalantzis. 2020. *Making Sense: Reference, Agency and Structure in a Grammar of Multimodal Meaning.* Cambridge UK: Cambridge University Press.
Kalantzis, Mary and Bill Cope. 2020. *Adding Sense: Context and Interest in a Grammar of Multimodal Meaning.* Cambridge UK: Cambridge University Press.

Student Agency in Culturally Responsive STEM Education

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May 15, 2022 at 8:34 PM

Introduction

Observing, studying, and participating in the secondary and post-secondary STEM (Science, Technology, Engineering, Mathematics) education field over the last 15 years has continuously confirmed the need for changes in pedagogy for STEM education to make methods more gender, culturally, and racially equitable. Government censuses reveal that women only make up 27% of STEM workers, while Black and Hispanic people only make up 9% and 7%, respectively (Funk & Parker, 2019; U.S. Census Bureau, 2021). These statistics indicate an ongoing problem in the career pipeline, possibly as early as elementary STEM education. Since the early 1990s, researchers such as Geneva Gay and Gloria Ladson-Billings have theorized equitable teaching and culturally responsive pedagogy. Since then, cultural responsiveness and equity have slowly but steadily become essential components of an intentional, practical learning experience. Essentially, teachers need to teach how culturally diverse student populations learn best (Sobel et al., 2011). While research abounds on what it means to be equitable and culturally responsive, further research on an interpretive aspect of culturally responsive teaching piqued my interest as a STEM teacher educator.

Some researchers state that Interpretive methods have been an essential aspect of cultural and social research since the 19th or 20 centuries and remain critical for developing future education methods (Quinlan, 2017). Many universities, teacher educators, and leaders, including myself and my university of employment, have devoted time and resources to developing frameworks for teaching aspiring educators to use equitable practices, including culturally responsive curricula for students and developing culturally responsive pedagogical mindsets in student-teachers. While countless hours of professional development, lessons, and professional learning have been deployed, professional ideas of what it means to be culturally responsive have differed among professors and researchers (Sobel et al., 2011). Time, space, and place impact how cultural responsiveness in STEM education is approached and what it has consisted of over the years. As the cultural identities and make-up of the students and learners in classrooms change, methods must also change. To illustrate this, the photograph below represents an educator employing student-centered and culturally responsive techniques to engage diverse learners as they collaborate in a STEM (possibly a secondary or post-secondary physics or engineering) class.

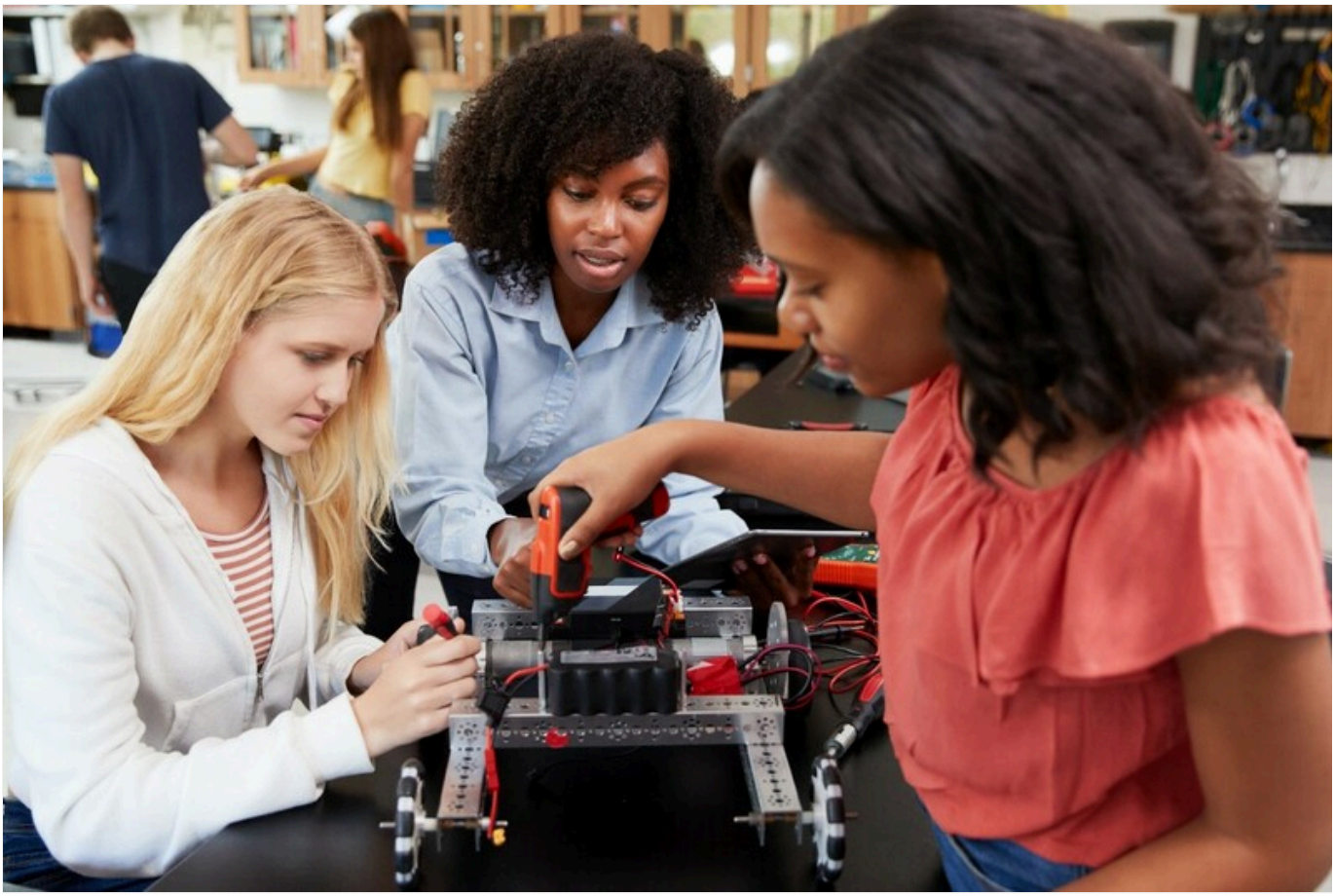


Figure 1: (Culturally Responsive Teaching in STEM, n.d.)

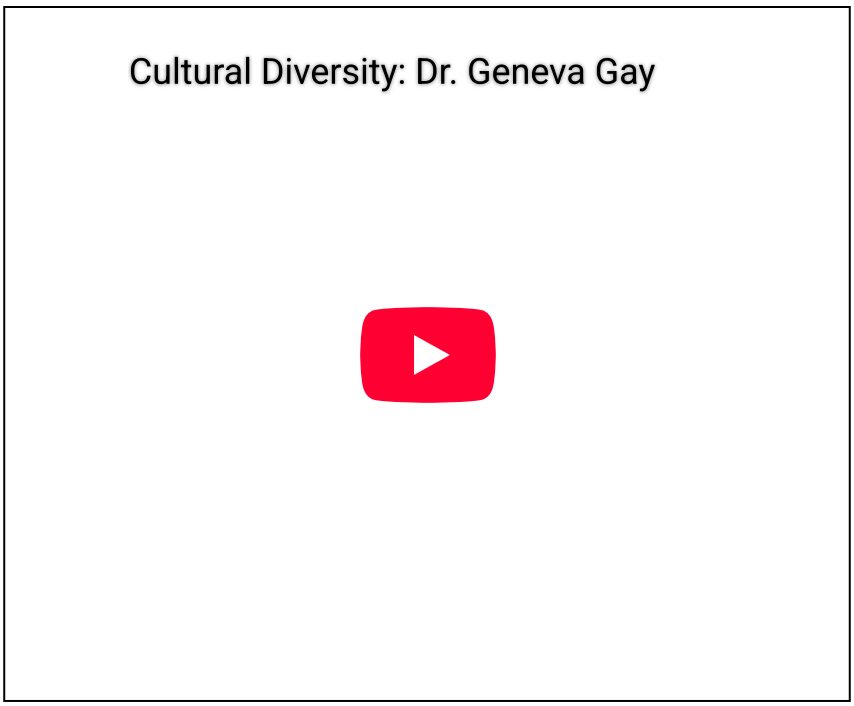
Furthermore, as discussed by Dr. Cope and Dr. Kalantzis in their research at UIUC on meaning patterns, in their texts *Making Sense* and *Adding Sense*, interpretive research is deeply based on meanings related to perspectives, experiences, and ideas. This work seeks to explore the interpretive aspects of culturally responsive pedagogy or culturally responsive teaching (CRP or CRT) in STEM education related to student agency by addressing the following research topics:

1. Agency in culturally responsive STEM education
2. Events (predication and transactivity) in culturally responsive STEM education
3. Roles and conditionality in culturally responsive STEM education

Agency in Culturally Responsive STEM Education

What is culturally responsive teaching (CRT), and how is Agency involved?

The video below features Dr. Geneva Gay as she discusses the importance of teaching with cultural responsiveness. While the video speaks of the higher education setting, Dr. Gay includes her insight on incorporating CRT at all levels of education.



Media embedded April 24, 2022

Figure 2: What is culturally responsive teaching? (ACC Teaching and Learning Excellence, 2015)

Gay specifically speaks to the importance of sending instructional and learning messages through the cultural filters of learners (ACC Teaching and Learning Excellence, 2015, 1:45–2:35). While minimal research addresses the meaning of cultural filters, my interpretation is that cultural filters might include student beliefs, values, norms, and gender ideas. When educators employ learning opportunities through relevant cultural filters in all education arenas, especially STEM, they increase learner engagement.

Zaretta Hammond compounds the research of Geneva Gay, Gloria Ladson Billings, and others when she explains that "culturally responsive teaching (CRT) is a serious and powerful tool for accelerating student learning" (Hammond, 2014, p. 16). The term culturally responsive is critical because students' cultures, lived experiences, and backgrounds are considered when developing lessons (Hammond, 2016; Gaye, 2015). Researchers and educators must consider different approaches to teaching when parsing the concept of cultural responsiveness as it relates to STEAM (Science, Technology, Engineering, integrated Arts and Mathematics) or STEM (Science, Technology, Engineering, and Mathematics) education. While most understand that CRT is imperative to including learners and scaffolding students' learning, many are unsure what this entails, the multiple roles included, and the conditionality educators might consider.

As student agency and CRT in STEM education are explored, researchers and educators must also consider agency features. Cope and Kalantzis discuss three parts of exploring agency in interpretive research (2020). The diagram below, retrieved from their book, *Making Sense*, provides a visual representation of how to parse elements of agency: events, roles, and conditionality.

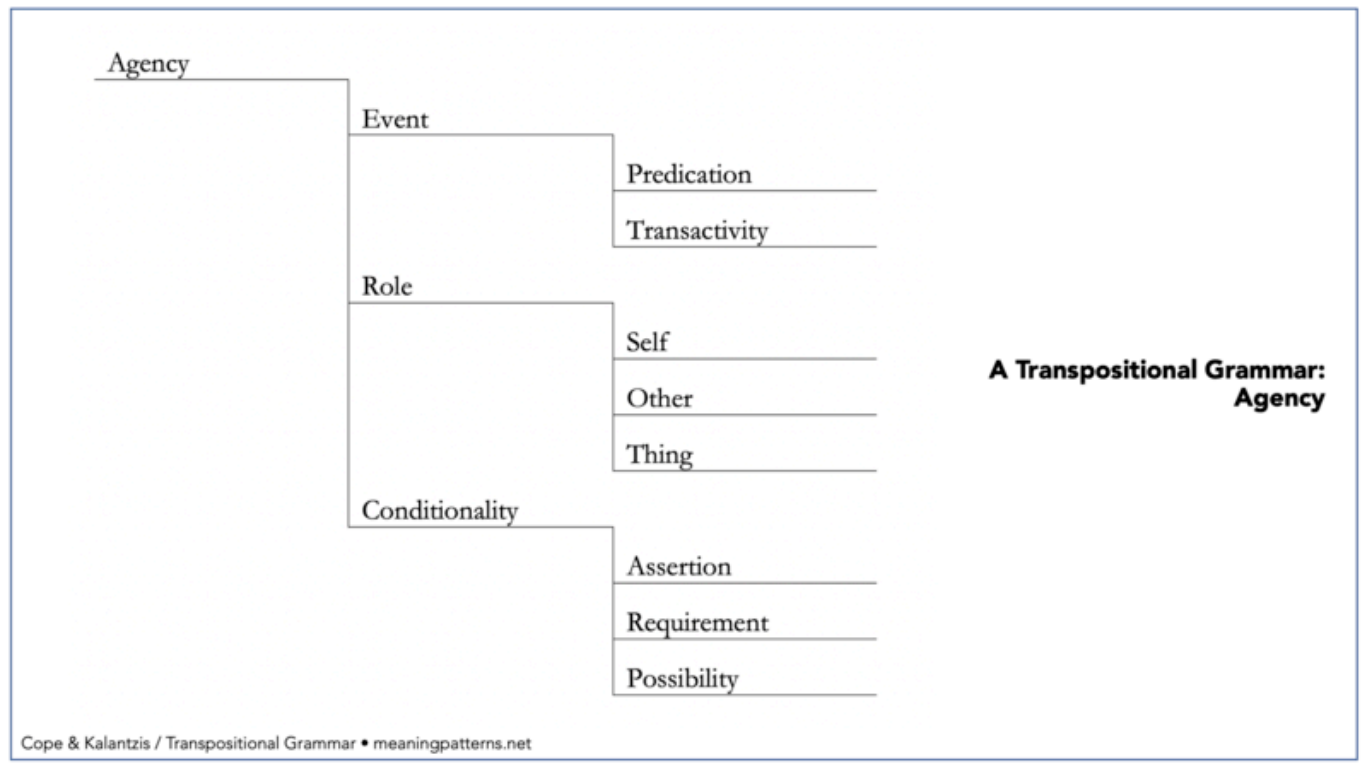


Figure 3: Agency (Cope & Kalantzis, 2020, pp. 173–174)

> Cope and Kalantzis state that "agency is constituted in events (predication by means of which entity into action fold into each other; and transactivity or the relations of entities-in-action to each other). Agents assume roles (as self, other, or thing). Different nuances of conditionality are established in the relations of entities and action (assertion, requirement, and possibility)" (Cope & Kalantzis, 2020, pp. 173–174).

Considering the definition of CRT, especially related to STEM education, leads to discovering the role of agency in CRT in STEM education. Breaking down each agency component will give readers, educators, and interested ones a view of agency and CRT in STEM. First, what events (part of agency) preclude and include a culturally responsive STEM education?

Events and Agency in Culturally Responsive STEM Education

The *events of agency* and CRT in STEM education can be described by parsing *predication* and *transactivity*. Cope and Kalantzis define predication as "a relation of a setting (the given, the found, a starting point), and the subsequent (what happens, effects, consequences)" (Cope & Kalantzis, 2020, p. 173).

Therefore, predication for developing CRP in STEM would determine the teaching and learning starting point (Cope & Kalantzis, 2020). This starting point could relate to a physical or invisible frame of reference. In culturally responsive STEM education for all levels, the foundation for learning might be students' cultural capital and lived experiences to connect them to the (STEM) subject (Gay, 2013). In other words, what assets, experiences, and thoughts do students already have that will bridge them to the topic, and how can educators include this in lesson development? Some examples might include connecting a potential physics lesson to a sport that students enjoy, connecting an engineering project to a local need or well-known interest in the community, or connecting a new topic to another familiar cultural experience. Additionally, what is the physical setting for learning? Is this the classroom, an informal setting (i.e., a museum or after-school club), a career setting, or something else? Educators should intentionally encourage student agency, when possible, in determining the initial "setting" for learning.

These aspects of *events* in agency lead to a determination of transactivity, which researchers defined as "patterns of action and the kinds of relations established between entities in action" (Cope & Kalantzis, 2020, p. 173). What does this mean for CRT and STEM education? Examining the information for a popular STEM curriculum that focuses on gender equity provides more insight. The SciGirls' strategies video below shares what these patterns of action and interactions might include.



Media embedded April 24, 2022

. Figure 4: SciGirls Strategies: How to engage girls in STEM (PBS [SciGirls], 2022)

The video above provides an overview of a STEM program that focuses its education media on cultural responsiveness and gender equity. The SciGirls curriculum created by PBS incorporates the ideas (resulting from an analysis of predication and transactivity) in how learning occurs. Concerning the starting point, elementary through high school learners are met with engaging and relevant material, appealing to cultural filters such as norms, gender-related interests, values, background knowledge, and familiar frames of reference (PBS, 2022). The starting points are established to lead to transactivity, which likely involves learning processes and what students will be doing when making connections. Patterns of action could include what the students will be doing and how they will do it (Cope & Kalantzis, 2020).

Furthermore, Scigirls requires students to participate in challenging interactions with real-world activities that promote critical thinking and problem solving with their peers, thus ensuring that they are at the appropriate zone of proximal development (ZPD) for learning, as indicated by socio-cultural research on ZPD (Walker, 2010). What about roles? What is the significance of roles as a concept of agency related to CRT and STEM education?

Roles, Conditionality, and Agency in Culturally Responsive STEM Education

Cope and Kalanztis "propose a classification roles into self, other, and thing, able to span forms of meaning" (Cope & Kalantzis, 2020, p. 174). Educators and learners must understand their roles in implementing CRT in STEM education. Some questions of interest might be, what relationships does identity bring to belonging in a learning environment, and how do changes in time and place impact those roles? Research by Verdin et al. addresses the idea of STEM roles and identities. Their work surmises that the identity formations that young people have related to STEM are based on how they see others who hold specific careers in STEM. This includes how they perceive their personalities or interests the persons in the occupation might have; learners can form these identities based on other variables, including self-perceptions and the perceived ideas that their educators hold of people who excel in STEM (Verdín et al., 2018). The diagram below explores the ideas that impact student identities and potential roles in STEM careers concerning their perceptions of successful STEM traits.

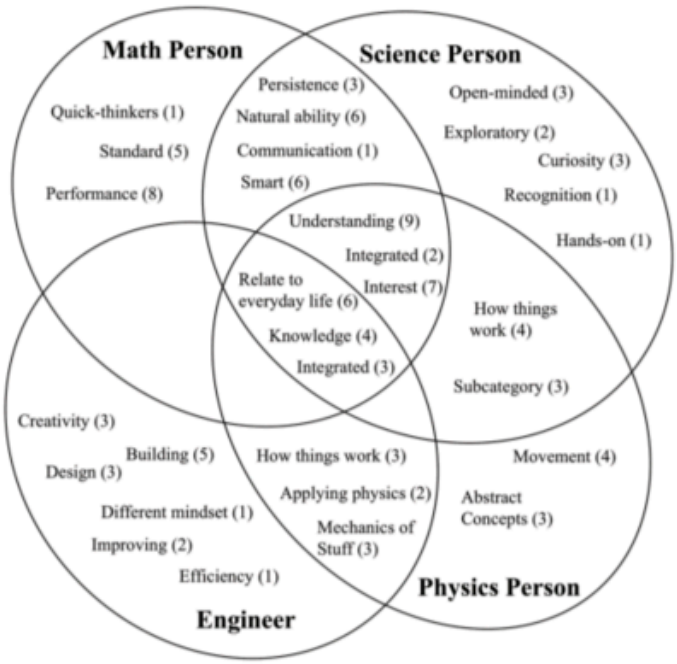
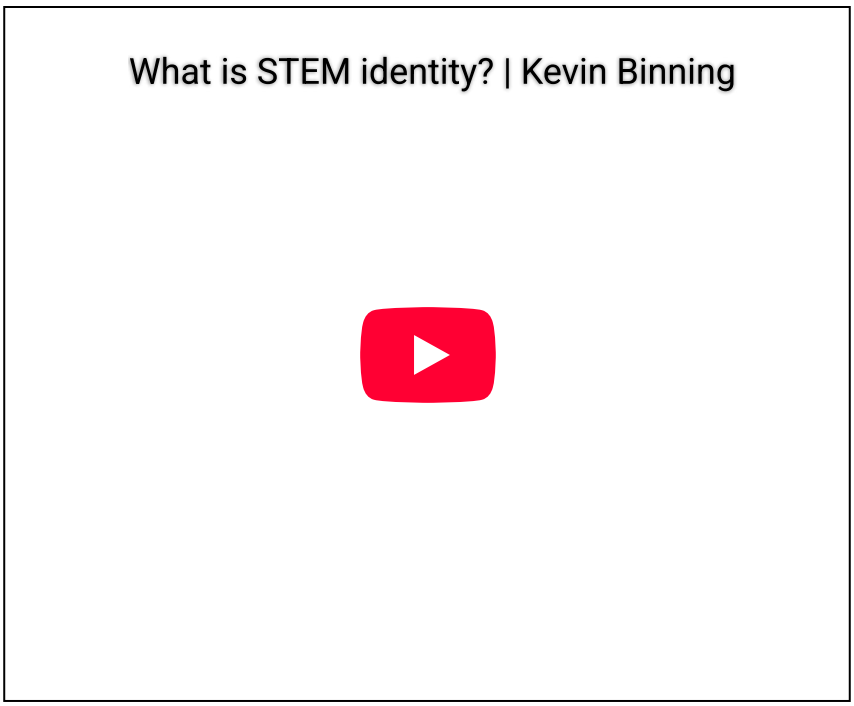


Figure 2. Diagram of students' perceptions of STEM subjects and the frequency of agreeance.

Figure 5: Diagram of students' perceptions of STEM subjects and the frequency of agreeance (Verdín et al., 2018)

Verdin et al. shared student perceptions of STEM persons. Note that student associations with the characteristics of who constitutes a Math Person versus a Science Person, an Engineer, and a Physics person have several overlapping perceptions. However, there is a large consensus that the characteristics of STEM people include intelligence (shown as "smart" in the diagram), natural ability, understanding, high performance, interest, and builder capabilities. While there are several other characteristics in the diagram, the majority mentioned the listed characteristics when thinking of someone in STEM (Verdin et al., 2018). Therefore, if students do not typically see themselves as intelligent or having the natural ability, they are less likely to see themselves in STEM roles or as potentially successful in STEM education. CRT in STEM education seeks to re-establish positive self-identities of students by helping them to become connected to the content, overcome challenges, and change their ideas of self and what a successful STEM person is (Hammond, 2014; PBS, 2022). While the role of the educator and their perceptions could also impact these theories, this paper focuses on instruction with the student identity at the center.

In the video below, social psychologist Kevin Binning addresses what it means to have a STEM identity.



Media embedded April 24, 2022

Figure 6: What is STEM identity? (Center for Advancement of Informal Science Education, 2018)

As Binning mentions, there is a continuum on the identity scale for how much or little someone may see themselves in a specific STEM domain (CAISE, 2018). The identity continuum relates to conditionality because roles contribute to the formation of the three facets of conditionality, which are officially defined as "modulations in relationships of agency between selves, others, and things according to the qualities of these relationships: assertion, requirement, or possibility" (Cope & Kalantzis, 2020, p. 237). When addressing roles, learners may vary in their level of certainty on their future in STEM, believing that they are for sure suited for STEM, they might enjoy STEM careers, or there is a slight possibility that they will succeed in STEM. These conditions might change depending on the student's identity and self-perception at any given time, but encouraging students to develop positive self-perceptions might move them toward the assertion that they can succeed in STEM versus the allegation that they cannot achieve or do not belong.

Conclusion

As shown in the video below, impactful educators promote student agency by using practices that build trust and confidence and establish positive identities in STEM throughout the learning experience. They can stir up enthusiasm for learning and push students from their comfort zones into the learning zone, a significant component of CRT. As students develop their own identities and exercise agency in STEM subjects with culturally responsive educators, they will expand their learning, build resiliency, and in many cases, begin to see themselves as STEM persons. While gaps in the literature exist regarding a specific definition of cultural filters, educators can imply that this has to do with any of the learners' beliefs, values, and experiences related to their culture (Gay, 2013). There has been some disagreement or confusion about what constitutes culture. Some believe culture is race or gender, but there is much more. Student culture is not dependent on race, and individuals from the same race may or may not share the same culture depending on their age, nationality, and lived experiences (ACC, 2015). Educators must understand that culturally responsive STEM education will naturally support and encourage student agency for all learners.



Media embedded April 24, 2022

Figure 7: Moving from the comfort zone to the challenge zone (Edutopia, 2020)

In conclusion, interpretive research (concerning agency and culturally responsive STEM education) has the potential to expand educators' knowledge and mindsets about effective CRT, thus impacting their overall teaching methods. Students' ideas, the learning setting, and the cultural capital contribute to student agency in a culturally responsive STEM education environment (Hammond, 2014; Gay, 2013). Furthermore, research reveals that learner identities and perceptions are significant factors in helping students assert and discover their abilities (Verdin et al., 2018). Educators also play an integral role in this process by encouraging learners to exercise agency in learning through providing them with a voice and choice in lessons, creating a community of collaboration, and teaching students in relevant ways. Although not explicitly stated, the video above shares an excellent example of CRT in STEM. Educators must be mindful that CRT involves creating an environment that includes and incorporates students' lived experiences and interests to teach content and facilitate a more significant depth of learning. Attaining this mindset will help educators focus on the students collectively while getting to know them individually.

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