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Accessing the elite figured world of science

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Abstract

This review explores Jackson and Seiler's "I am smart enough to study post-secondary science: A critical discourse analysis of latecomers' identity construction in an online forum" by considering the analytic framework for figured worlds guiding this study. We consider the specific affordances of cultural production theory for examining how sociohistorical and cultural discourses of *science as elite* impact individuals at every level of education. We then extend this discussion by exploring how an informal learning space at a prestigious science museum was designed to explicitly tackle cultural discourses of *science as elite* that act as barriers to identification with science.

Keywords

Figured worlds; Science identity; Third space

Phoebe Jackson and Gale Seiler's paper examines the potential affordances that online forums provide postsecondary students who are less likely to persist in their science degree programs opportunities to position themselves as people capable of participating in and succeeding in science. Through critical discourse analysis, the authors examine the online discussion between four "latecomers," or students with a history of mixed achievement in science (i.e. they are often missing prerequisites or have earned low or failing grades in prerequisite courses required for enrollment in postsecondary science or post-secondary science-related career programs). Using the lens of figured worlds, Jackson and Seiler examine the ways that these four students reflect on their prior experiences with science and understandings of themselves in science and use these reframed experiences to push back against dominant narratives that posit that science is an elite discipline reserved for particular types of people.

One of the important contributions of Jackson and Seiler's (2013) research on the science identity trajectories of latecomers to science is their methodological approach of privileging participants' stories. This foregrounding makes visible students' evolving understandings about themselves with respect to science *and* the larger discourses, or cultural models, that

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This review essay addresses issues raised in Phoebe A. Jackson and Gale Seiler's paper entitled: I am smart enough to study postsecondary science: a critical discourse analysis of latecomers' identity construction in an online forum. <https://doi.org/10.1007/s11422-018-9858-0>.

shape those experiences and perspectives. Anna Sfard and Anna Prusak (2005) posit that the stories learners tell themselves about their participation shape their future actions and impact the identities they are trying to develop. When shared with others, these stories become resources for reframing the self and imagining future selves. In the context of this study, the online forum becomes a space where the perspectives and interpretations of past experiences of struggle are reframed. The cultural model of asking questions is reconfigured as a resource for taking charge of learning, rather than a negative signifier of one's (lack of) intelligence or (in)abilities. Students' experiences of isolation—of feeling lost or confused in prior courses—get reframed as *shared* experiences that enable latecomers to foster a sense of solidarity with each other that could potentially shape their future engagement in science.

Jackson and Seiler's use of the theoretical lens of figured worlds enables them to explore the ways that these students' narratives push back against discourses that frame science as elite and accessible only to specific kinds of people. Grounded in cultural production perspectives of culture and identity, a figured world lens turns our attention to the ways individuals and groups create meaning, how this meaning develops over time within everyday practices, and how meaning and engagement are shaped by shared repertoires of resources (e.g. stories, tools, artifacts) and larger sociohistorical structures, patterns, and discourses (Holland and Lave 2009). The concept of cultural production, defined by Margaret Eisenhart and Elizabeth Finkel (1998, p. 44) as "meanings developed by groups in their everyday practices," considers the ways that groups of people produce and reproduce shared ways of doing, being, acting, interacting, valuing, and communicating. Cultural production theory also draws our attention to why, how, and when groups of people attach significance to some acts and identities and not others (Gee 2000). These patterned ways of interacting, or "storylines," shape the ways individuals act and interact with others, interpret other's actions and interactions, and explore and occupy particular positions within the figured world (Ryu 2015). When novices, or newcomers, gain entry into a figured world, their social positions are shaped by their acceptance and/or resistance to the various identities that are accorded by established members of the figured world and the resources they leverage from their participation in other figured worlds.

As Jackson and Seiler's research highlights, one of the dominant discourses that infringe on individuals' ability to identify with science and position themselves within the figured world of science is the pervasive message that science is reserved for "smart" people. As a discipline and cultural way of knowing, canonical science carries a sociohistorical legacy of power and privilege (Calabrese Barton and Yang 2000). This legacy shapes people's perceptions that science is reserved for individuals of particular racial and ethnic backgrounds, gender identities, socioeconomic statuses, and who possess specific physical and (innate) cognitive abilities (Hussénus 2014). Sociocultural and feminist critiques of this dominant narrative posit that science has been largely developed by Western men from the middle and upper classes, and is therefore laden with cultural histories, values, and interests (mainly male, Euro-centric, heterosexual) that shape social perceptions of science as a predominantly White and masculine endeavor reserved for the intellectual elite (Harding 2006). Louise Archer, Jennifer DeWitt, Jonathan Osborne, Justin Dillon, Beatrice Willis and Billy Wong (2010, p. 637) argue that these conceptualizations of science contribute to gendered, raced, and classed configurations of science identities that appear "unintelligible"

for many and contribute to pervasive perceptions of scientists and engineers as particular types of people (i.e. White, middle class, Western males) that lead to stereotypes regarding who can and should participate in science.

Research in science education has shown the ways the cultural narrative of *science as elite* is compounded and reproduced by the subculture of school science, where science is seen as out of reach for many students (Calabrese Barton 2002). Participation and academic success in school science requires students to negotiate the multiple identities they bring to school science from other figured worlds (Aikenhead 1996). These diverse gender, racial, ethnic, and discursive identities may or may not be valued in their schools and science classrooms, as school culture requires the adoption of behaviors, language, beliefs, and values (Wood, Erichsen and Anicha 2013). For example, numerous studies examining girls and young women's trajectories in science suggest that students' desire to construct and maintain *normative* science and school identities, including culturally-sanctioned definitions of "smart girl" or "good student" identities, limited their forms of participation and perceptions of themselves as legitimate members of science and science classrooms (Carlone, Scott and Lowder 2014). In her research on young women's participation in high school physics, Heidi Carlone (2004) found that students resisted meanings of science and scientists that they perceived as threatening to their ability to maintain desirable "smart" school identities within a high school physics class. Jennifer Adams and Preeti Gupta (2013) showed how high school youth who described themselves as "not being smart" in school felt they were recognized as "smart" in the context of their part-time jobs working as floor facilitators at a science museum. Youth in their study revealed that their ability to do science demonstrations and engage visitors in conversations about science enabled them to recognize themselves and be recognized by others as "smart" people in the context of the museum. Many youth in this study brought the science knowledge learned at the museum into their school classes and became recognized as "smart" by their teachers and peers. However, these youth were aware of the ways they were and were not recognized as particular types of science people in both the context of their classrooms and the context of the museum. Heidi Carlone, Angela Johnson and Catherine Scott (2015) argue that these "smart," "not too smart" identities are powerful structures that shape students' trajectories in science, as school science requires that students must perform particular identities that align with teachers and classmates' cultural expectations of the many and varied identities they bring to the classroom.

In the context of higher education, students face additional challenges in their attempt to access science and science degree programs. Traditionally, introductory courses in the sciences have sought to "weed out" students from science programs, cultivating a highly competitive academic atmosphere at the undergraduate level (National Research Council 2011). These "gatekeeper" courses—highly competitive classrooms that promote mastery rather than active participation "often seek to select out and distinguish those with some perceived ability in STEM" (National Academies of Sciences, Engineering and Medicine 2016, p. 173). Many of these courses may explicitly or implicitly function to eliminate students and cultivate the concept that success in science is determined by one's innate intellect and ability (Tobias 1990). These experiences serve as a critical barrier to students' progress towards STEM degree aspirations (Gasiewski, Eagan, Garcia, Hurtado and Chang 2012) and contribute to the production of discourses that frame science as inaccessible to

particular people. For example, Angela Johnson, Jaweer Brown, Heidi Carlone, and Azita Cuevas (2011) found that women of color enrolled in competitive college science courses were compelled to hide their academic achievements in order to be recognized by their classmates as “smart” but not “too smart.”

Despite powerful structural institutional, historical, and sociocultural discourses, individuals are not without agency. The interplay between structure and agency is core to our understanding of how individuals author identities-in-practice, particularly in science learning settings. Carlone, Johnson and Scott (2015, p. 475) argue that structures, whether or not they are hidden or explicit, are themselves “a result of agency—of the action of others” and can change “as a result of the choices and actions of individuals and group, whose choices and actions are constrained by structures.” As spaces of authoring, figured worlds provide room for change and agency *because* they are constantly and dynamically being remade, enabling individuals to actively construct, and sometimes oppose, social and cultural structures through local engagement (Buxton 2001). In Jackson and Seiler’s study, latecomers’ online conversations about their past experiences in science provided an opportunity to co-construct a new cultural model—reframing the process of asking questions as a bid for recognition as a “smart” learner who takes charge of their learning rather than a practice only used by those *not* “smart enough” to persist. This new cultural model enables these students to “carve out and position themselves within the crack they created in the elite figured world of science,” pushing back against the powerful institutional discourses within the figured world of science at Island College where success is equated with the ability to persist and succeed in a predetermined degree path of prerequisite coursework and the larger cultural message that accessing science requires a level of innate intellectual ability. In the online forum, latecomers *recognized* each other as “science people”: people with competence and abilities in science (Carlone and Johnson 2007). Jackson and Seiler posit that this reauthoring of experiences in science may enable latecomers to cultivate future identities that enable them to access and persist in science degree programs and position themselves as capable science people.

We are curious if, when, and how the participants in this study will draw on their experiences of being recognized by other latecomers as “science people” in the online forum as they participate in science coursework and learning experiences in the future. Given the powerful discourses that frame the figured world of science and school science at every educational level, we wonder what future contexts might these latecomers feel “comfortable or constrained” to position themselves as smart and capable science people (Holland, Lachicotte, Skinner and Cain 1998, p. 127)? How might these latecomers draw on the identity resources they co-constructed in the online forum in order to “persist through self-doubt,” when faced with the often competitive and isolating components of science degree programs (Adams, Gupta and Cotumaccio 2014, p. 18)? A cultural production framework reminds us that aspirations in science and choices to engage in science are shaped and constrained by the larger social structures that can limit what identities are “available” in specific locations within space and time, even when individuals are not consciously aware of these forces. While the latecomers in Jackson and Seiler’s study found ways to reframe and reposition themselves in science, a critical future avenue of study will be whether the identities that these latecomers bring into the activities of practicing science in other

contexts will translate into not just *feeling* successful with science, but *being* successful with achievement in science and in their continued identification with science.

As museum educators and researchers, we are excited to think about the affordances that informal learning contexts provide as spaces to potentially combat conceptions of science as elite and inaccessible to particular types of people. As Jackson and Seiler discovered, the third space of the online forum became a way to “bring multiple figured worlds together, thus creating more opportunities for participants to import resources from figured worlds other than school science and/or (co-)produce new resources to help them identify with science.” Below, we explore the ways that Science Cafes at the American Museum of Natural History provide resources that may support individuals who may or may not have a positive identification with science ways to position themselves inside the elite world of science.

Figured world of SciCafes

Science Cafes are social events that bring together scientists and people interested in learning about science in an open and inviting space. Science Cafes often take place in casual settings, such as libraries, coffee shops or bars. These informal settings enable participants to mingle, enjoy refreshments, and engage in scientific discussions with scientists and other attendees. Science Cafe events always incorporate a presentation from a scientist on a particular topic, from climate change to health and biodiversity. These presentations are often short and embedded with humor, contributing to the generally light atmosphere of the gathering. Science Cafes exist all over the world and vary in size from a small handful to hundreds of attendees.

Internationally, the goal of Science Cafes is to make science accessible to people who may or may not identify with science and to support people in learning about science-related issues that are relevant to their lives and their communities. Science Cafes are meant to welcome *all* individuals, regardless of their prior experiences with science; therefore, scientists’ presentations and discussion are designed to break down preconceived notions that cutting-edge research is too complicated and specialized for everyday people to understand.

At American Museum of Natural History (AMNH), Science Cafes are called SciCafes. SciCafes occur the first Wednesday of every month and are held at the museum in an exhibition hall that is visually inviting, large and includes dioramas that inspire wonder and curiosity. The event lasts an hour. Like most Science Cafes, there is no charge for attending but people can purchase drinks. SciCafes at AMNH feature scientists who are well regarded in their fields and are actively engaged in research. Topics range from learning about gene sequencing tools which affect mosquito populations and can have impact on our lives, to learning about research on snakes from Madagascar where the venom can potentially be used for treatments related to back pain. For example, Dr. Martin Blazer, a medical doctor and microbiologist, presented on the relationship between antibiotic use in children and relationship to obesity. During his presentation, he talked about how our human body is actually comprised of a large percentage of microbial bacteria, living on and inside of us,

making us healthy and functioning the way we do. He described the studies conducted in his lab showing the relationship of overuse of antibiotics in early stages of life to childhood diseases like asthma and obesity, a topic with important implications for public health.

A unique component of SciCafes at AMNH is that these events bring together elements of participating in science—attending a science lecture and discussion—with elements of engaging in an informal atmosphere like a bar or cocktail hour that reframe the cultural discourse of *science as elite* and only for particular types of people. In the figured world of SciCafes, the eliteness of science gets reconfigured, inviting new forms of participation and enabling scientists and individuals to position themselves, each other, and the discipline of science in important ways.

Our hypothesis is that SciCafes provide opportunities for attendees to alter their notions of science and scientists as inaccessible. Unlike traditional academic-style lectures, where participants sit passively in rows of seats quietly listening to an expert present from a podium, attendees stand around cocktail tables, sit together in clustered seating spread throughout the hall, and mingle in groups in an inspiring space as opposed to an auditorium or lecture hall. Scientist's presentations are short, at times humorous, and visually appealing. Scientists talk to the attendees as individuals who may or may not have prior knowledge of the science or the topic at hand but are capable of learning and engaging with scientific ideas and content. The presentations are clear, scaffolded with a combination of visuals and words and videos that provide multiple entry points for the diverse learners. In this way, SciCafes make science content accessible while positioning attendees as capable of understanding complex scientific research not only available to people who have science-related degrees or backgrounds. This positioning, of both the listener and knowledgeable presenter, breaks down the cultural discourse that one needs to be "smart" to participate in and learn science, which is the prevalent perception and experience of many learners in science education settings.

Over the last three years, AMNH has been studying the impact of SciCafes with particular interest in understanding who comes to these events, their motivations for attending, and if and how they intend to learn more about the particular topics scientists present. The museum has collected data from SciCafe attendees through post-event surveys, follow-up surveys, multiple focus groups, and observations. Preliminary findings suggest that attendees of SciCafes report that hearing from a live scientist is one of the main motivations for coming to these events. For many of these people, hearing from live scientists on science topics that are currently in the news or have more immediate implications becomes a way to access that elite science in ways that are manageable and enjoyable. Survey findings show that those who come to these events are repeat attendees, coming to several cafes in a year. They report that after they leave the SciCafes, they share with others, particularly with friends or family. Attendees also share the complex science they learn with others through social media platforms like Twitter, tweeting out during and after SciCafes, making science accessible to their followers. In a focus group, one participant said, "I like bringing it up to my friends who aren't science people too and it gets them kind of interested." Although we don't know if this person considered himself as a science person, he felt he gained the ability to talk about the content with people in his life who he defines as not science-interested. This one

example demonstrates the potential ways that attendees are able to take the resources produced at the SciCafe and use them for transformational work of sharing science with others, possibly breaking the cultural narrative of science as elite.

Informal science institutions, like AMNH, work hard at explicitly finding ways to break the perception that science is for the elite by creating exhibitions and programs that make science accessible. They work closely with the communities they aim to serve, and design exhibits and programs in a way that science is portrayed as a human endeavor and connected to lived experiences and relevant to learners (Bell, Lewenstein, Shouse and Feder 2009). AMNH is uniquely positioned because it has a dual mission of supporting scientific research and supporting the public communication of science. While dedicated to working with local communities and schools since its inception (i.e. Adams 2007), it is perceived as elite because of the grandeur of its building, its physical location in a wealthier neighborhood, and its long history of housing the research of world-renowned scientists. Programs like SciCafes specifically aim to break that perception of eliteness and make both the building, the content, and the scientists more accessible.

We recognize that SciCafes may attract adults for whom the “eliteness” of science is not a problem; most SciCafe attendees identify themselves as people interested in science and say that they are life-long learners of science. This means that they will choose to watch science documentaries, read science-related articles or attend programs like the SciCafes. Many have college degrees or science-related professions, but not all. Although the SciCafe cultural model is intended to address the elite reputation of science without sacrificing the rigor of the field, it is not always successful in attracting a broader group of adults, ones that are more like the latecomers in Jackson and Seiler’s study. Like the online forum in the authors’ research, we are interested in how informal spaces could be intentionally designed in ways that enable individuals on the margins of science to develop potentially long-term identification with science. Similar to the latecomers in Jackson and Seiler’s study, it is not clear if people who attend SciCafes are able to draw on resources they cultivate in informal spaces to participate in science in other contexts where their identities as *science people* may or may not be recognized by others and serves as a ripe area for study.

Jackson and Seiler theorized online forums as third spaces and described the type of identity work that can happen in such spaces. We extended the idea of third spaces to a completely different forum, a SciCafe, and described the type of identity work that is possible in this space. While vastly different as third spaces, both were structured in ways where individuals can reframe the cultural discourse of science as elite in ways that enable them to access and participate in science over their lifetimes. We are excited by the possibility of future research in such third spaces as they become more ubiquitous. What we learn will also mediate our understanding of how we can create new third spaces, making science accessible to all and shattering the perception of science as elite.

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