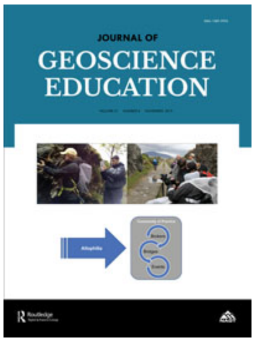

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The multicontext path to redefining how we access and think about diversity, equity, and inclusion in STEM

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ABSTRACT

Poor gender, ethnic, and racial diversity in the geosciences and most of STEM indicates that current approaches to facilitating inclusion and equity are not complete. The prevailing academic culture in the United States tends to value "low-context" approaches to learning, such as encouraging individuated work, adhering to strict time schedules, and subscription to compartmentalized and linear learning, among other values. Yet, many women and minority students come from "high-context" cultural backgrounds. They find communal work, flexibility in time, and nonlinear and contexted learning to be salient to their academic experience. In this article, we suggest that a shift in the academic culture is needed to further advance the inclusion of more women and underrepresented minorities, as well as many majority males who have tendencies toward high-context approaches to learning. Through the application of multicontext theory and context diversity concepts, we propose that academic culture can be broadened to value the full spectrum of context orientation, and academic communities like the geosciences can develop approaches and create environments that build on the different cultural strengths of all students. We posit that this strategy of academic culture change will grow the field and lead toward broader gender, ethnic, and racial diversity in academia.

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Introduction

Current approaches to diversity, equity, and inclusion are primarily defined by affirmative action systems that were instituted in the 1960s and rooted in multicultural programs and activities developed in the 1970s. Education scholars have argued that most institutional initiatives tend to focus on structural diversity, which aims to increase "the number/representation of individuals from diverse backgrounds" (Hurtado, Alvarez, Guillermo-Wann, Cuellar, & Arellano, 2012, p. 43). This strategy allows institutions to measure success primarily by counting the number of women and racial underrepresented minorities (URMs)[1] enrolled in their schools (e.g., Hurtado et al., 1998, 2012). Accordingly, institutional programs like multicultural student centers, ethnic studies, advocacy programs, identity workshops, and curriculum changes in colleges and universities rely on access, recruitment, and retention, which tend to promote assimilating and integrating women and URM students (i.e. Tinto, 1993) or socializing them to fit into the social and intellectual fabric of higher education (Teitelbaum, 2011; Weidman, 1989; Weidman, Twale, & Stein, 2001).

Although increasing recruitment, retention, and financial support systems has demonstrated some success and remains crucial in diversity initiatives, low diversity in student populations and even lower diversity in faculty positions in higher education—as determined by a head-count system—still persist, especially in the science, technology, engineering, and math (STEM) fields (American Geosciences Institute, 2017;

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[1]The term *URMs* is the plural form of URM (underrepresented minority), which is the preferred term to distinguish racialized groups that are underrepresented in education and employment relative to their population in the United States, as defined and used by federal research agencies such as the NSF as well as other diversity-oriented national organizations in STEM fields such as NACME (National Action Council for Minorities in Engineering). We use the term *URM scholars* to focus attention specifically on diversity issues of students in higher education STEM fields. These definitions do not include Asian American populations because, under the current diversity model, demographic data show that Asian American populations are overrepresented. However, we also use the term *racialized URMs* to indicate an inclusiveness of diversity that acknowledges that almost all of the ethnic "minority" populations in the United States, including Asian Americans, have been historically subjected to, and continue to be subjected to, discriminatory attitudes, behaviors, and practices by the majority populations in this nation.

Bernard & Cooperdock, 2018; Ibarra, 1999a, 2001; National Academy of Sciences, 2011; National Science Foundation [NSF], 2018). Indeed, the lack of diversity in geosciences and other STEM fields indicates that these initiatives, although partially successful, are not attaining the goals of producing a broadly diverse workforce (Bernard & Cooperdock, 2018; National Action Council for Minorities in Engineering, 2018; NSF, 2018). Furthermore, numerous studies have suggested that URM students seem to be less attracted to the world of academia, especially STEM disciplines, and those who do enter the academy often do not thrive in their endeavors and feel as though they are outsiders in the academic world (Burgess, 1997; Ibarra, 1996, 1999a, 2001, 2005; National Academy of Sciences, 2011; Seymour, 1995; Seymour & Hewitt, 1996). For example, many studies have shown that women and URMs feel unwelcome or excluded in conducting academic work (González, 1995; Ibarra, 1996, 2001; Lovitts, 2001; Padilla, 1997; Padilla & Chávez, 1995; Puritty et al., 2017; Rhoten & Pfirman, 2007; Seymour, 1995; Seymour & Hewitt, 1996).

In this article, we suggest that structural diversity strategies that rely on head counts may no longer address contemporary issues of inclusion, as could be evidenced by recent legal issues surrounding Harvard University's admission process (Hartocollis, 2018). We propose that structural diversity initiatives tend to overlook an embedded, systemic issue that fosters a disconnect between the academic culture of our institutions and those of our students and some faculty members. We propose the use of a new paradigm to diversify the academy. Using Ibarra's (1999a, 2001) multicontext theory, we expound on the notion of context diversity and posit that increasing this systemic form of diversity within geoscience programs and STEM in general may lead not only to more inclusion of URMs and women in geoscience fields but also to significant advances in modeling Earth systems as well as in other areas in which systems and holistic thinking is critical to science. We shift the focus from student deficits and numbers to academic culture, and articulate specific approaches to broadening the culture of academia in classroom settings and beyond. We propose that geoscience and other STEM faculty can become aware of and cast aside unconscious bias and deficit thinking (Valencia, 1997) by using a more engaged, interactive, and culturally inclusive approach that builds on the often-ignored cultural strengths of students from diverse backgrounds.

Multicontext theory, context diversity, and academic culture

The dominant academic culture in U.S. colleges and universities values individualism, rigid schedules and deadlines, and a predominantly faculty-oriented perspective, among other values. This largely reflects the Germanic and Northern European cultural roots of academia (Chávez & Longerbeam, 2016; Crow & Dabars, 2015; Ibarra, 1999a, 2001). Yet many students enter the system with socially appropriate but different cultural values, such as an integrated, collective, and student-oriented perspective learned from personal, community-oriented experiences (Chávez & Longerbeam, 2016; Ingle, 2007; Rendón, 2009; Yosso, 2005). This conflict between perspectives can be expressed in a variety of ways and can emerge in our quest for new knowledge about diversity (Siegel, 2006). Additionally, it can impact how women and URMs struggle with academic culture (e.g., Cajete, 1994, 2000; González, 1995; Padilla, 1997; Seymour & Hewitt, 1996; Steele & Aronson, 1995; Tannen, 1990/2007, 2000) or how they are hindered in their pursuit of interdisciplinary research in STEM (Rhoten & Pfirman, 2007).

Multicontext theory extends our understanding of diversity beyond structural and multicultural frameworks. Importantly, it provides a means to articulate how academic culture can be broadened to create a more inclusive environment (Ibarra, 1999a, 2001). This theory does not specifically focus on racial and gender issues when describing inclusion or exclusion in the academic world; instead, it also accounts for the role that conflict—between the academic culture and the cultural backgrounds of individuals—plays in hindering inclusion and/or facilitating exclusion in academia. However, we are not looking at these conflicts from a deficit perspective within people who seek to enter academic institutions. Rather, this is a systemic deficit located within the institutions, not within individuals or groups of people. Data show that activating multicontext interventions in our institutions results in dramatically high levels of achievement in STEM fields, such as math, regardless of a person's racial, gendered, or classed backgrounds (Rivera, Howland-Davis, Feldman, & Rachkowski, 2013).

This theory is derived from work by Hall (1959, 1966, 1977), who found that different cultures have diverse modes of learning, gaining knowledge, and conducting tasks that are highly dependent on individual's cultural upbringing. Hall (1959) identified and defined these differences in cognitive strategies to

Table 1. Contrasts between low-context (LC) and high-context (HC) academic cultures (modified from Ibarra 2001).

Low context	High context
Information or data may be separated from context (e.g., study something in isolation of other possible interacting factors). A STEM example of this is math worksheets, in which the problems are out of context of any real-world application.	**Information or data** must be evaluated in context with possible interacting factors, and information out of that context lacks meaning. Systems science is usually contexted, focusing on relationships among objects.
Examination of ideas is valued rather than broad comprehension of real-world applications; thus, theoretical STEM disciplines are often considered to be more important than local case studies.	**Application of knowledge** in real-world events (social skills) are most valued. Interconnected thinking fosters broad comprehension of multilayered events. Understanding of science through applied case studies developed in a community setting is valued.
Linear thinking is most valued, and publications in STEM fields follow linear logic.	**Nonlinear, relational thinking** is most valued and is often relayed in a storytelling sense.
Interactions use direct communication, in which facts and concepts are unembellished.	**Interactions** use indirect communication, in which facts and concepts are embellished with stories.
Task oriented, in which success is evaluated by how the task was completed.	**Process oriented,** in which success is evaluated by how cohesively the group conducted the work.
Time is perceived as a commodity, in which it is "spent, wasted, or saved." Emphasis on schedules, compartmentalization, and promptness. Deadlines are important.	**Time** is a process in nature, and things are completed in as much time as is necessary and may not fit into a specific schedule. Deadlines are goals to be achieved, but accurate completion of work is more important.
Space, in which personal property is shared less.	**Space**, in which personal property is shared more.
Academic teaching style is technical. Style is individual, less interactive, and teacher oriented. Research interests include people or communities, but they focus on theoretical and philosophical problems. Writing style uses fewer pronouns.	**Academic teaching style is personal**. Style is more open, interactive, and student oriented. Research interests are directed to real-life problems with people and the community. Writing style tends toward more use of personal pronouns.

be associated with *cultural context*, a term that describes how people from different cultural origins exhibit learned preferences, both conscious and unconscious, that were imprinted on them in childhood by family and community (Hall, 1977). These preferences continue to shape their world throughout life. They include how individuals interact and associate with others, use and perceive space and time, process and treat information, respond to various patterns of teaching and learning, perform academically or in the workplace, and perceive connections in the world around them.

Hall (1977) used a binary system to characterize individuals and their nations of origin as either falling into "low-context" (LC) or "high-context" (HC) categories (see Table 1). He used these end-members to describe a spectrum of how different cultural contexts operate. For example, he found that LC cultures tended to value individual success, were more likely to be task oriented, treat time as a commodity, use explicit language and words to convey ideas, compartmentalize tasks and concepts, and apply linear and logical thought processes. In contrast, HC cultures tended to be more community and group focused, process oriented, find meaning in the context of discussions beyond the specific words, subscribe to a holistic worldview, and think in terms of systems and connections. Although we recognize that the terms high- and low-context may reflect some preconceived judgment, these terms are not used to infer that one context is better than the other. They are equally valid and successful approaches incorporating sets of learned values and preferences used by individuals to guide them in understanding and interacting in appropriate ways in the world around them.

Hall (1977), supported by subsequent cultural context researchers (e.g., Halverson, 1993; Hofstede, Hofstede, & Minkov, 2010), recognized that exemplars of LC cultures were found in Northern Europe, such as in the nations of Great Britain and Germany. Higher education researchers (e.g., Chávez & Longerbeam, 2016; Crow & Dabars, 2015; Ibarra, 1999a, 2001) further noted that the British college systems and German research institutes were adopted by scholars in the United States and combined into a research-driven academic system during the 19th century that remains with us today. Thus, the cultural legacy of the modern Western academic system, which also incorporated the practices of the European educational systems, reflects the predominant LC culture of its origin (Ibarra, 2001).

Although Hall (1959, 1977) is most recognized for his work on differences in cultural contexts among populations within a common national origin, like Germany and the United States, his work on cultural context variation among multicultural student learners in the Southwest United States is less known (Hall, 1990). Hall and Hall (1990) additionally examined elements of organizational culture that are similar to academic cultures found in our educational institutions. By the end of the 20th century, the cultural context model had been adopted by researchers in the fields of business (Halverson, 1993; Hofstede, Hofstede, & Minkov, 2010), intercultural communication (Gudykunst et al., 1996), and higher education (Chávez & Longerbeam, 2016; Ibarra 2001). More

Table 2. Contrasts between individuated and integrated learners (modified from Chávez & Longerbeam, 2016).

Individuated	Integrated
In a culturally *individuated* framework, a private compartmentalized, linear, contextually independent conception of the world is common, assumed, and valued.	**In a culturally *integrated* framework, an interconnected, mutual, reflective, cyclical, contextually dependent conception of the world is common, assumed, and valued.**
Purpose of learning: Knowledge, individual competence, to move forward toward goals and the betterment of humanity.	**Purpose of learning**: Wisdom, betterment of the lives of those with whom we are connected—family, tribe, community.
Ways of taking in and processing knowledge: Mind as primary, best or only funnel of knowledge.	**Ways of taking in and processing knowledge**: Mind, body, spirit/intuition, reflection, emotions, relationships as important aspects and conduits of knowledge.
Interconnectedness of what is being learned: Compartmentalized and separate; belief that understanding how the parts work separately, abstractly and in isolation will lead to the greatest understanding.	**Interconnectedness of what is being learned**: Contextualized and connected; belief that understanding how things affect one another within the whole and within family and community will facilitate understanding.
Time: Linear, task oriented, can be measured and used, to be on time shows respect.	**Time**: Circular, seasonal, process oriented, dependent on relationships; to allow for enough time shows respect.
Sequencing: Learning by mastering abstract theory first, followed by testing; unlikely to include application, experience or doing in real life.	**Sequencing**: Learning by doing, listening to others' experiences, imagining, or experiencing first, then drawing out abstract theory.

importantly, his model was found valid for studying context differences among individuals within groups by researchers in intercultural communication (Gudykunst et al., 1996) and education (Ibarra, 2001; Rivera et al., 2013).

Ibarra (1999a, 2001, 2005) found evidence that these differences in cultural contexts played an active role in the conflict experienced by women and URMs engaged in higher education. He noted significant ways that people from different cultures may learn material on a continuum from LC to HC modes (Table 1). Although his initial work focused primarily on Latino/Hispanic students, faculty, and administrators (Ibarra, 1999a, 2001), he realized that the cultural context phenomenon crossed ethnic boundaries and had similar effects on other minority populations, women, and even some majority males. He recognized that the dominant academic culture is so powerful that it was adopted unconsciously by many minority faculty and reflected in their interactions with minority students who belong to the same ethnic group as they do (see Ibarra, 2001, p. 107).

Most of the Western academic culture and instruction typically reflects the LC side of the spectrum (Chávez & Longerbeam, 2016; Ibarra, 1999a, 2001). For example, time is structured; deadlines are firm; work is typically individuated; topics are often taught in fragmented ways, with theory coming before application; and relationships between different aspects of a subject may not be explicitly described. Thus, HC-oriented individuals often feel as if they do not belong in such a setting (Chávez & Longerbeam, 2016; Ibarra, 1999a, 2001). For example, many HC-oriented individuals who would be considered successful in academia (e.g., tenured professors, deans, and higher-level university administrators) still felt as if they were outsiders (Ibarra 2001). Yet despite this, they were able to achieve success by being able to flexibly operate throughout the context spectrum. In this sense, such individuals could be considered to have a "multicontextual" skill set. Ibarra (2001) hypothesized that a multicontextual approach to academic work may broaden participation of all students, enhancing their ability to conduct classwork and research. He called this model *multicontext (MC) theory*. He adopted the term to call attention to the impact of academic organizational culture on people and to differentiate MC theory from the multicultural diversity framework, which tends to focus on the characteristics of ethnic and racial populations in our institutions. Furthermore, he developed the term *context diversity* (CD) to describe how a systemic activation of MC theory is accomplished. We intentionally use the term *activation* rather than *application* to express how some forms of MC approaches may already be present in some circumstances but are not necessarily exercised systemically. Thus, CD is achieved if the norms, values, and practices of an organization reflect MC ways of knowing and doing. The dynamic effect is to create a community with myriad ways to attract diverse populations and have them thrive in an academic or workplace environment (Ibarra, 2001, 2005). In order to attain CD, institutions must be transformed at the micro (individual) and the macro (institutional) levels.

MC theory recognizes that even though individuals may prefer one end of the spectrum over the other, they are able to change and display flexibility across the cultural context spectrum in accordance to the situation (Ibarra, 2001). In other words, an individual's contextual orientation is not necessarily predetermined or static. For example, although many successful URM scholars preferred HC environments, success in academic settings required them to flexibly participate in their chosen fields in an LC manner (Ibarra, 2001).

Importantly, MC theory cannot be used to stereotype individuals and cultural groups. Individuals within groups may have very different context orientations than predicted by assumptions of context based on skin color, gender, or cultural origin (e.g., Gudykunst et al., 1996). Additionally, because individuals differ in how they interact with the world in any given situation, MC theory simply suggests that people are multicontextual and have unique cultural identities and orientations (Ibarra, 2001).

We expect that a context-diverse organizational culture will flexibly operate within and value all sides of the MC spectrum (Table 1). Research indicates that, given exposure to the concepts of MC theory, people are able to more flexibly operate across the cultural context spectrum (Rivera et al., 2013). Thus, CD can be achieved when people across the MC spectrum participate and feel fully included and integrated in activities of an organization. In this type of environment, our hypothesis is that individuals of all contextual orientations thrive. We posit that by applying MC theory in geoscience and STEM education and workplaces, greater inclusion will be possible and CD can be achieved. Because many women and URM scholars tend toward HC orientations, the CD approach could result in building gender and racial diversity, as well. This will help students and colleagues thrive in the academic setting.

Chávez and Longerbeam (2016) provided several examples of how MC concepts can be activated in the classroom. They suggested that a similar, MC approach to teaching could successfully help students thrive in college environments. They identified two end-member populations—individuated and integrated—that roughly correspond to LC and HC populations, respectively (Table 2). In their work, they showed that students and faculty of Northern European descent typically approach learning in an individuated manner. They are most comfortable with fragmented topics (e.g., separation of different fields in learning, such as engineering from humanities, and separation of subfields within a subject, such as fluid dynamics within civil engineering), firm deadlines, and individual responsibility for learning. Conversely, many students from Hispanic, Native American, and Middle Eastern cultures are more apt to approach learning in a more integrated manner. They look for relationships between topics and feel that learning is a community responsibility in which each individual holds responsibility for all to learn. Thus, they seek to build learning communities. Similar to Ibarra's (2001) findings, Chávez and Longerbeam (2016) recognized that most of higher education focuses on individuated learning; thus, students from cultures that value integrated learning feel as if they do not belong, often dropping out of a program (Ibarra, 1999a).

Activating context diversity in academic settings

Using the studies and tools provided by cultural context researchers and Tables 1 and 2 (e.g. Chávez & Longerbeam, 2016; Halverson, 1993; Ibarra, 1999a, 2001; Weissmann & Ibarra, 2018), geoscientists as well as all other STEM scientists can begin to develop or reframe learning environments that could help all students thrive in any discipline and at any educational level, no matter their context orientation. Although we focus on classroom education in this section, these concepts can be activated to broaden the academic culture in many higher education settings to be more inclusive of the full MC spectrum. For example, MC theory can be activated with regard to faculty hiring decisions, tenure and promotion, research development, and more (see Ibarra, 2001, chap. 8). The effectiveness of this MC approach has been shown in other fields (e.g., Beals, 2016; Beals & Ibarra, 2018; Brown, 2011; Cohen & Ibarra, 2005; Ibarra, 1999b; Ibarra & Cohen, 1999, Ibarra & Cohen, 2005; Kolo, 2016; Moore, 2007; Rivera et al., 2013; Siebritz, 2012); however, we are just beginning to explore applications in geoscience and STEM education.

In typical classroom settings, we find that if we clearly articulate how different exercises or their components reflect different sides of the MC spectrum, students can build flexibility to work across the range of contexts and use a broader range of tools to address geoscience problems. For example, we have used the concepts listed in Table 1 to articulate how the process of writing a paper is typically an LC exercise, in which linear logic is needed to guide the reader through the concepts the writer is trying to convey. Conversely, we have used the HC mode of thinking when considering the development of tasks to conduct an environmental assessment of an abandoned mine site, in which students needed to consider the context of all interactions occurring at the site in order to determine which detailed studies were needed and how they fit into the entirety of the site. In these ways, students are guided with specific language through a broad mode of contextual thinking.

An additional method we use to help the students understand the approaches and gain flexibility across the MC spectrum is to use the concepts in Tables 1 and 2 and incorporate them in a survey to determine student preferences at the beginning of the semester (Weissmann & Ibarra, 2018). We have used the information gleaned from the class survey to form different HC, LC, and mixed groups during classroom activities, articulating this explicitly to the students. With this awareness, we have found that the students are able to gain more flexibility across the MC spectrum as they work through different activities. This not only teaches students that a diverse way of learning science can be used, it also creates an environment that is more inclusive (e.g., Chávez & Longerbeam, 2016; Ibarra, 2001). Additionally, by understanding these differences, we found that conflicts can be better understood as contextual dissonance rather than ethnocentrism or racism.

In this section, we offer two specific examples of how the MC approach may be applied in a geoscience classroom. Because the CD concept is relatively new to geoscience education, research must be conducted to evaluate the effectiveness of building a MC approach to classroom activities and whether these will build an inclusive classroom. Many activities are already being done in classrooms that value different modes along the MC spectrum; however, by explicitly emphasizing different context orientations in classroom activities, we may develop an inclusive environment (Chávez & Longerbeam, 2016).

Sequencing classroom activities

Sequencing activities on a topic can emphasize LC or HC approaches to understanding that topic (Table 2; Chávez & Longerbeam, 2016). An example of sequencing can be demonstrated by contrasting two reasonable approaches to teaching systems thinking. In evaluating Earth systems, HC-oriented individuals might start by looking at the connections between components of a system, whereas LC-oriented individuals might begin by focusing on components of a system and attributes of those components. By sequencing activities toward one direction or the other, the instructor can explicitly emphasize either an LC and/or an HC approach to understanding.

For example, Scherer and Seman-Varner (2015) used a jigsaw activity (Tewksbury, n.d.) to effectively teach systems thinking in the LC mode. First, various components of the system were identified by the students as a large group. In the case presented by Scherer and Seman-Varner (2015), components of the Mono Lake system—including brine shrimp, tufa mounds, and salinity—were identified. Smaller groups then evaluated details of these components of the system. This was followed by rejoining the jigsaw to develop a systems diagram.

Conversely, a more HC-oriented approach would diagram and describe the system first through observation, thinking, feeling, hearing, and following up with detailed study of some components of the system, always reconnecting these components to the entire system. In an example developed by Doser and Weissmann (2017), students were led to a site or shown a photograph of a riparian area and asked to consider what they saw, heard, thought, and felt in the system, and to identify linkages between these elements. They built a systems diagram from this activity that included a broad range of connections in the riparian system. This systems mapping is followed by an exercise in which students detail and study attributes of different components of the system. Thus, sequencing in this case emphasized an HC approach to systems thinking.

We emphasize that neither of these approaches is better than the other. They simply highlight LC or HC thinking. Chávez and Longerbeam (2016) noted that an inclusive classroom will vary sequencing between LC, individuated approaches and HC, integrated approaches to different topics during the semester. Doing so shows students the value in both orientations. Because LC approaches are most emphasized throughout academia (Ibarra, 2001; Rivera et al., 2013), we hypothesize that students who tend toward HC orientations will feel more included in scientific endeavors if sequencing is explicitly used in this manner.

Place-based pedagogy

An example of a MC approach that is already being activated is place-based pedagogy. This pedagogical method has been shown to be important in building diversity in the geosciences (e.g., Apple, Lemus, & Semken, 2014; Boger, Adams & Powell, 2014; Cajete, 1994, 2000; Cohn et al., 2014; Gill, Marcum-Dietrich, & Becker-Klein, 2014; Johnson et al., 2014; Semken, Ward, Moosavi, & Chinn, 2017; Ward, Semken, & Libarkin, 2014). MC theory offers an explanation as to why this approach to teaching a diverse population of students is effective. A place-based approach primarily offers context to concepts being taught; thus, HC-oriented students will be able to understand the material within a familiar framework, whereas LC-oriented individuals will still be able to focus on specific topics found in that place (Table 1). The human connections to place are also emphasized by this pedagogical approach (Semken et al., 2017), thus also enhancing the learning experience for HC students without diminishing the experience for LC-oriented students.

We use the place-based pedagogy as an example of how MC theory is already being activated in many geoscience classrooms. We believe that many other examples exist in which MC theory is currently being successfully activated; however, explicitly articulating how and why MC theory is used will help instructors be deliberate in their development of a context-diverse classroom. Additionally, MC theory offers explanations as to why various pedagogical approaches are successful at helping a diverse population of students thrive (e.g., Huntoon & Lane, 2007; McCallum, Libarkin, Callahan, & Atchison, 2018; Treisman, 1985; Wilson et al., 2012).

Discussion and conclusions

The traditional models of diversity, labeled by some as structural and multicultural approaches, serve particularly important functions to address issues of admissions, financial support, and community building, but they are not able to address the contemporary issue of inclusion in academia and STEM. MC theory provides a new avenue that supports the current systems and has the ability to broaden the academic culture to be more inclusive of reasonable and culturally appropriate modes of thinking and doing (e.g., Ibarra, 2001). Although ethnic, racial, and gender issues remain key concerns regarding campus diversity, and programs that aim to diminish racism, sexism, and bias are critical for addressing diversity issues, MC theory provides a new dimension to understanding diversity and offers a different perspective of how it can be achieved (Ibarra, 2001). The fundamental principle of MC theory by its very nature does not—and indeed cannot—exclude any population from the dynamics and influence of the CD model described here.

Activation of the MC approach requires systemic, institutional cultural change by broadening values to be inclusive of HC approaches. This can start in a single classroom, department, or college, or across the whole institution. Although at present some activities in geoscience classrooms may reflect MC approaches, the academic culture primarily emphasizes and values LC approaches to knowing and doing, thus excluding many of our HC-oriented students and faculty. We hypothesize that by broadening the academic culture, HC-oriented students and faculty can be attracted into academia and thrive in that setting. Through this, we expect that the traditional goals of racial and gender diversity could also be achieved.

Application of the MC theory avoids ethnic, racial, or gender stereotyping. Monolithic labels for identifying ethnic, gender, and racial groups often stereotype populations throughout the world. CD reveals that, despite preferences for cultural customs, individuals cannot be sorted out by their cultural contexts (Gudykunst et al., 1996). At the individual level, minorities and women cannot be easily categorized as simply HC or LC. Each person differs as to how he or she interacts with the world in an HC or LC manner, and this can change according to situations. People are unique individuals with cultural and gendered identities, and therefore can be considered multicontextual. Although people have been shown to be flexible in shifting within the MC spectrum, our institutions have been static in their LC approaches.

Both LC and HC approaches are critical for the geosciences, and we believe an MC approach is needed to help move STEM fields forward. The LC approaches have moved scientific understanding to where we are today, offering significant advances in characterizing our world. Yet the compartmentalization and linear logic inherent in LC approaches may not offer as complete an understanding of complex interactions found in natural systems. As noted, HC-oriented individuals typically see the system and interactions within the system, whereas LC-oriented individuals typically see the components of the systems in detail. We do not suggest that one approach is more important than the other. However, the current STEM cultural legacy primarily values the LC approach and consequently minimizes the value of HC approaches. We hypothesize that by broadening the academic culture to be more multicontextual, advances may be possible in areas in which systems science is important.

We hypothesize that inclusion in STEM will not come without a focus on creating context diversity, and this can start in the classroom. Through explicit implementation of MC approaches to learning, both LC- and HC-oriented students can gain a sense of belonging and inclusion, thus leading to enhanced diversity in STEM fields. An inclusive classroom should have explicit training in both LC and HC approaches in order to build flexibility across the multicontext spectrum and improve student learning (e.g., Chávez & Longerbeam, 2016; Ramírez, 1999; Ramírez & Castañeda, 1974). The MC approach is not a multicultural learning style approach to diversity but instead focuses on a hidden dimension of how to understand and interact with the world. Activating the

MC classroom does not take significant amounts of time and money. Rather, development of curricula with multicontext theory in mind can help build the multicontext classroom.

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