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A critical-ecological approach to STEM P-20+ advising

Terrell R. Morton¹  | Maxine McKinney de Royston² 

¹Learning, Teaching, & Curriculum Department, University of Missouri-Columbia, Columbia, Missouri, USA

²Curriculum & Instruction, University of Wisconsin-Madison, Madison, Wisconsin, USA

Correspondence

Terrell R. Morton, Learning, Teaching, & Curriculum Department, University of Missouri-Columbia, 303 Townsend Hall, Columbia, MO 65211, USA.

Email: Mortontr@missouri.edu

Abstract

This essay is the second paper of a related three-paper set that examines, critiques, and offers responses to current conceptions of academic advising within P-20+ STEM education. In this essay, we offer a review of the current understandings of academic advising and its existing limitations with meaningfully supporting Black and Brown STEM learners. As a response to this critique, we call for a critical-ecological perspective to STEM academic advising, leveraging Phenomenological Variant Ecological Systems Theory (PVEST) as the conceptual background for this approach. We then provide a set of guiding principles for educators to consider when taking a PVEST approach to academic advising. In providing these guiding principles, we situate the third paper in the set as those authors offer specific examples for how this approach can be implemented across the P-20+ STEM spectrum.

KEYWORDS

academic advising, Holistic Advising, P-20+ STEM, PVEST

Thanks for all of your sound advice, that I didn't ask for. I'll take all of it in stride, and now I know...

1 | INTRODUCTION

In *Cheers to the Fall*, cowritten and recorded by R&B artist Andra Day in 2015, Day sings about the choice she is making to live life according to her own understandings, despite the "best" advice given to her by others regarding her capabilities and possibilities. The title of the song signals Day's embracing of the outcomes of her decisions, even if it is viewed as a "loss"



according to society's standards. The lyrics are a tribute to Day respecting her choices and being at peace with the outcomes resulting from her own decisions rather than those forced upon her.

We applaud Day in reflecting upon the advice she has been given and taking up her agency as a decision-maker and actor in ways that align with her experiences, perspectives, and dreams. Nonetheless, Day's lyrics raise questions about the kinds of advice she has received and the underlying assumptions that often shape the perspectives of those doing the advising. Who were her advisors? What were their ideological stances and how did those inform their advising? To what ends (or toward what and whose goals) was their advice directed? As critical researchers and educators, we, like Day, wonder about this same phenomenon—How to negotiate advice from presumably more informed and well-intentioned others in relation to what one feels is best. However, we are concerned about this phenomenon relative to Black and Brown learners in the context of P-20+ science, technology, engineering, and Mathematics (STEM) education. What kinds of advice do they receive about what is “best” for them? How is what is “best” for them determined? And how do they negotiate this?

We come to these questions as critical STEM educators, who recognize that Black and Brown learners continue to face multiple forms of oppression in STEM learning environments that make these contexts hostile and often traumatizing. In our research, we have examined learning spaces that actively seek to disrupt such trends and instead attend to the holistic well-being and success of Black and Brown learners (e.g., Madkins & McKinney de Royston, 2019; Morton, 2021). This study has examined the learning interactions and experiences of Black and Brown STEM learners and unpacked their experiences and decisions through critical frameworks that intentionally call out and account for structural and gendered racism. Yet empirically based understandings are not enough to transform STEM learning, learning spaces, and associated practices from being harmful and toxic for Black and Brown learners. Instead, we must revisit and disrupt the very epistemologies and theoretical frameworks upon which our understandings and practices are founded.

This essay extends the conversation previously offered Beatty and Suárez (this issue) that discusses the structure of academic advising in P-20+ STEM education, including its affordances and limitations. Considering the impact of the neoliberal, racialized political nature of STEM education on racially minoritized STEM learners (e.g., Basile & Lopez, 2015; Vakil & Ayers, 2019), in this paper we conceptualize a critical-ecological approach to academic advising in P-20+ STEM education that responds to the Beatty's and Suárez's critiques. In offering this perspective, we leverage Phenomenological Variant Ecological Systems Theory (PVEST; Spencer, 2006) to illustrate what we call the broader advising ecosystem and its key players that inform STEM learners' decision-making process regarding their academic pursuit of and continued engagement with STEM.

Specifically, we offer four components for a critical-ecological approach to academic advising:

1. Disrupting harmful institutional practices and STEM learning spaces.
2. Maintaining a holistic approach that fosters “learning as becoming.”
3. Maintaining a holistic approach that fosters “learning as belonging.”
4. Enacting advising that works toward collective social-cultural-structural transformative action and change and assesses learners' outcomes in relation to this process.

These approaches are taken up by Dodo Seriki and McDonald (this issue) to explicate the who, what, and how of reimagined science advising. In their paper, they demonstrate how this critical-ecological approach can be enacted in P-20+ STEM educational contexts to support learners in developing identities of becoming and belonging in science, and to foster structural change in P-20+ STEM education more broadly.

2 | A RECAP OF EXISTING PERSPECTIVES OF P-20+ STEM ADVISING

As Beatty and Suárez (this issue) shared, P-20+ advising refers to the process by which institutionally appointed agents—for example, precollege counselors, academic advisors, and so forth—support students¹ in considering their academic choices and trajectories, engage students' in developing plans for continuing and being successful in their academic pursuits such as completing their graduation or major requirements, and monitor students' academic progress. Academic advising is often limited to a students' academic development and advancement generally or as relates specifically to their potential or identified professional interests and goals (e.g., advising an intended pre-med student into a major vis-a-vis their postbaccalaureate aims). While academic advisors can also serve as mentors, we understand advising as conceptually different in form and function from mentoring. Unlike advisors who serve in appointed roles with associated job descriptions and positions within an institutional hierarchy, mentors may be formally appointed or informally established and/or recognized; they also may not be remunerated in anyway. Likewise, while advisors have a set of institutionally defined functions in relation to a students' academics (see above), the purview and tasks of mentors may be incredibly narrow (e.g., writing recommendation letters; offering a specific kind of feedback) to widely varied and span from the academic, to the professional, and even the personal. Nonetheless, effective P-20+ academic advising is still a highly relational activity that requires an advisor to have a varied skill set, including strong interdisciplinary knowledge about student development, communication theory, and academic disciplines.

Beatty and Suárez (this issue) identified three distinct advising approaches that predominate in the contemporary landscape of neoliberal, capitalist renderings of P-20+ STEM education—prescriptive, developmental, and intrusive. Prescriptive advising is characterized by its attention to supporting students in meeting specific curriculum requirements, rules, and regulations. By contrast, developmental advising is a more collaborative relationship between advisor and student where the student's educational, personal, and career goals are at the center. In this approach, the impetus for advising is more holistic, but still often does not consider who the student is as a sociopolitical being nor the implications these might have for their advising needs and interests. Finally, intrusive advising involves encouraging students to seek help when needed and is structured to respond to student-identified academic crises with specific courses of action.

Each of these approaches to advising yields different results relative to student outcomes and each has distinct limitations relative to supporting the success and well-being of racially minoritized STEM learners. Prescriptive advising while efficient and useful toward completing programmatic requirements can be too quick and impersonal, rendering it unable to attend to and be responsive to students' affective and motivational needs. Given that STEM learning environments are frequently hostile, isolating, and even dehumanizing for racially minoritized learners, this approach to advising can ignore the harms that racially minoritized students experience and even further reproduce those harms. Developmental advising responds to some of these constraints of the prescriptive approach in that it focuses on building an in-depth, responsive relationship between advisor and student. That said, unless that relationship explicitly works to create a context for interpersonal trust and solidarity, racially minoritized students may not see this advising relationship as a space to explore their interests and/or air their experiences or concerns as relates to their sociopolitical identities (race, gender, class, sexuality, etc.). Likewise, intrusive advising, while student-centered and driven, is limited to academic performance and reliant upon students asking for help and support. It is well-documented that racially minoritized learners often do not ask for help in order not to confirm existing racial and gender stereotypes in STEM about their preparation, capability, and potential for success.

Beatty and Suárez (this issue) aptly point out that these extent approaches to P-20+ STEM advising have substantive limitations that adversely affect the advising of minoritized STEM learners, namely that these approaches often fail to: (1) recognize and build upon the assets and interests that racially minoritized students bring to STEM education; (2) attend to or challenge existing deficit-based models of advising that frame minoritized students as needing remediation or the sociopolitical dynamics that surround students' choices to join STEM; and (3) appreciate the need for a whole person perspective in P-20+ STEM advising, especially for racially minoritized learners. They thus call for approaches to advising



that consider the broader ecosystem of human development—including the role and responsibilities of educational institutions in whole person development—and that have an explicit awareness about how systems of oppression operate on racially minoritized groups generally and specifically within the STEM fields. In response to this call, below we outline a critical-ecological approach to advising that attends pointedly to the experiences and needs of racially minoritized learners in P-20+ STEM education *and* the roles and functions of advisors.

3 | CONCEIVING A CRITICAL-ECOLOGICAL APPROACH

A critical-ecological approach to P-20+ STEM advising strives to shift the perspective of academic advising in STEM from focusing on the “track” or “pipeline” to thinking about the broader ecosystem at play, the various players, and the embedded rules and regulations governing the game. To ensure that this approach is responsive and relevant for racially minoritized learners, we draw upon PVEST (Spencer, 2006).

3.1 | PVEST

3.1.1 | Historiography of PVEST

Margaret Beale Spencer devised PVEST in the late 1980s–early 1990s to study strength and resiliency in identity formation and development for African American youth. As a framework, PVEST was designed to challenge the existing deficiency models that were used to pathologize African American youth's experiences and outcomes (Spencer, 1995). PVEST brought forward the idea that multiple, influential factors impact Black youth's identity development and outcomes, and that these processes occur within and differ between social and cultural contexts (Spencer, 1995).

Similar to how Bronfenbrenner's (1989) ecological systems framework explicates the intersections between process-person-context, PVEST integrates macro-level analyses with developmental and ecological analyses as is experienced at the micro-level of an individual's life (e.g., Black youth). Spencer additionally addresses the stressful nature of those intersections and the relationships between and effects of local and structural realities on the psychological well-being of racially, economically, and/or gender minoritized youth (Spencer, 1995). Moreover, Spencer took up the conceptual and methodological challenge of testing out the efficacy of PVEST through taking a phenomenological approach that centers individual youth's intersubjectivities, or their own meaning making processes about how they understand society and their experiences and roles within it, rather than relying simply upon a researcher's determinations. PVEST is thus an identity focused, cultural ecology framework that incorporates phenomenology and cultural ecology to examine the essence of individual experiences while navigating social structures regulated by societal, institutional, community norms, practices, and ideologies (Spencer, 2006). Demonstrating the robustness and adaptability of PVEST to an ever-changing array, or increasingly better articulated set of vulnerabilities and protective factors experienced by racially, economically, and/or gender minoritized youth, Spencer's more recent work illustrates how PVEST integrates with critical race theory to more explicitly consider race and racism (2006) as well as intersectionality (Velez & Spencer, 2018).

In examining and theorizing identity development processes, PVEST denotes how both perceptions of the self and experiences, as well as the experienced, “objective” reality influences decisions and outcomes (Spencer, 2008). This perspective pushed back against mindsets that context, alone, dictated outcomes and decisions, or that individual choices, alone, predicated one's possibilities (Spencer, 1995). By challenging these socio-politically evasive approaches to examining human development, PVEST offers a way to humanize racially, economically, and gender minoritized youth, as well as offers space to examine their decisions and experiences from an inclusive framework that accounted for the implications of structural oppression (i.e., racism and gendered racism) on

perceptions, experiences, and outcomes (Spencer, 1995, 2006; Velez & Spencer, 2018). Since its initial inception, PVEST has been adopted and leveraged as a framework for examining human development through a critical and inclusive lens, given its application to various identity groups across various social-cultural contexts (e.g., Corwin et al., 2020; Seaton et al., 2013; Swanson et al., 2002).

3.1.2 | PVEST applications in STEM education

The application of PVEST to STEM education research and practice demonstrates the interconnectedness between learners' identity, their perception and understanding of STEM learning environments and the extent to which their identities are valued or rejected in those spaces (e.g., McGee & Pearman, 2015; Morton, 2021). PVEST has also been used to attend to learners' metacognitive, cognitive, and behavioral responses in STEM given their perceptions and understandings of the self, separate from and in relation to the broader STEM ecosystem (e.g., Corwin et al., 2020; Morton, 2021). This includes insight on the structure of STEM learning environments, how it shapes learners' decision-making regarding persistence or attrition, and the various resources and challenges present within that learning environment that should either be enhanced or transformed.

3.1.3 | Components of PVEST

PVEST is comprised of five core components that bidirectionally influence one another and that highlight the roles of perception and decision-making on identity development and overall outcomes (Spencer, 2006). These five core components are: net vulnerability, stress engagements, reactive coping mechanisms, emerging identities, and life stage outcomes. These components are nested within the broader ecosystem that demonstrates the various dimensions of a particular environment (see Figure 1). Net vulnerability outlines the various identities that individuals are born with, born into, or acquire over time (e.g., race, gender, sexuality, socioeconomic status, religion, physical and neurological ability, etc.). Spencer (2006) positions these identities as net vulnerabilities given how, ontologically, they shape and inform the various interactions and engagements that a person experiences. Noted as "stress engagements," these various interactions and experiences are both perceived and felt, fostering the circumstances by which individuals understand their experiences and environments to be either risk averse or risk inducing (i.e., challenging or supportive). The cognitive decisions, and noted behavioral responses, that are made in response to the perceived and felt experiences depend on the presence (or absences) of various sources of support. This decision-making process, noted as a reactive coping mechanism, can vary for individuals, ranging from potentially maladaptive to adaptive responses.

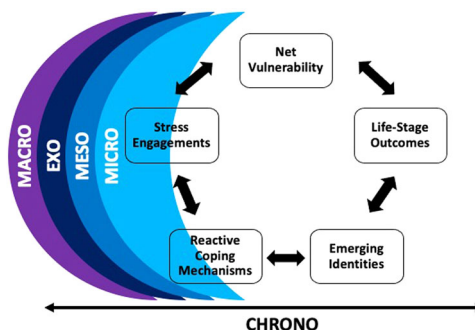


FIGURE 1 Diagram of Phenomenological Variant Ecological Systems Theory (PVEST) model



Spencer (2006) notes that as individuals continuously engage stressors and make similar cognitive and behavioral responses to those stressors, they develop an emergent identity. The emergent identity comprises how they perceive and understand themselves within context given the continuation of choices that they made because of their perceived and felt experiences. Emergent identities, being continuously embodied responses to the stress, thus impact the individuals' overall outcomes (i.e., life stage outcomes) as the person makes decisions that can determine the future trajectories. These life stage outcomes are also based on the external environmental influences as other people present then develop positions (leading to bias and stereotypes) about individuals and their capabilities, regulate their responses to those individuals, and thereby also constrain the potential trajectories of those individuals. Given the broader social-cultural-historical-political nature of the contexts in which these cognitive and behaviors processes occur, the various norms, values, beliefs, practices, and expectations of environment filter through the various layers of the ecosystem (i.e., Macro, Exo, Meso, and Micro) to influence and control circumstances and outcomes. Because these processes do not occur in a vacuum, time (i.e., the chronosystem) also plays an important role with how contexts are situated.

This diagram illustrates the two main components of the PVEST model, phenomenology as indicated by the bidirectional circle, and Bronfenbrenner's Ecological Systems Theory as noted by Micro, Meso, Exo, Marco, and Chrono layers of the environment. The two components together demonstrate the interconnectedness of perceptions, experiences, "the self" and the environmental contexts, and how they interact with one another to inform identity embodiment and life outcomes.

3.2 | Why a PVEST approach to P-20+ STEM advising

PVEST offers a multidimensional, multifaceted perspective of the relationship between the self and the environment on individual decision-making processes and outcomes. PVEST intentionally leverages scholarship from Critical Race Theory and Critical Whiteness Studies (Spencer, 2008) to bound the dimensions of identity examinations and outcomes to counteract and refute deficiency models and racist-sexist-oppressive ideologies about people and their capabilities. As a result of its conceptual backing, PVEST thus ensures that examinations of internal and environmental factors on decision-making processes and outcomes occurs in ways that do not diminish the person or situate them as the problem or in need of fixing. Using PVEST to bound advising allows advisors to "see" decisions as processes designed to mitigate, alleviate, or prevent risk as perceived and experienced by the individual learner. It also offers the opportunity to "see" that the choices made are contingent upon the presence or absence of support structures within the immediate context where the decision is being made, as well, that the choices are being regulated by structural norms, values, beliefs, and practices.

In seeing decisions and outcomes through this lens, definitions and understandings of success—the underlying mechanisms that drive advising practices and behaviors—shift. Success no longer becomes a fixed, universal benchmark that is set and expected for everyone to obtain. Rather, success becomes fluid and situationally defined, allowing for the individual and their collective identity group to determine what success looks like within that specified context at that particular moment in time. Moreover, defining decision-making and success in these more expansive ways reflects a view of learning not simply as knowledge acquisition, but as an iterative process of identification. Understanding learning as a process of becoming means that learning involves making sense of who one is in relation to what one does and wants to do.

Taking a PVEST approach forces the field and practice of advising to contend with and appropriately account for structural oppression that is embedded within and manifest through P-20+ STEM education across the nested ecosystems. Advising thus becomes a "support mechanism" that is present while learners contend with their stress engagements that manifest within their P-20+ STEM contexts. As a support mechanism, the role of advising would be to ensure that learners have sufficient information to fully process what they are experiencing, why they are experiencing it, and the multiple ways in which their in-the-moment decisions and long-term decisions could shape

their life. For Black and Brown STEM learners, this level of information would include how structural oppression operates to control their decisions and outcomes both within and outside of STEM contexts, as well as how in pursuing STEM, they would have to contend with the heightened challenges given the white supremacist ideologies that govern western, canonical STEM (e.g., McGee, 2020).

4 | PVEST, ADVISING, AND WHOLE PERSON DEVELOPMENT

Using PVEST to bound advising implicates STEM education, its ideologies, context, teaching, and learning as the problem in need of fixing and not the learners. As a result, any “advice” given would not focus on achieving neoliberal goals by encouraging learners to pursue STEM and supporting them through mechanisms that primarily foster resiliency. Instead, a PVEST bounded approach to advising would support the development of the “whole person”—attending to the social, emotional, physical, psychological, economic, and other needs of the person—as both an individual and member of broader sociopolitical identity communities or collectives. Attending to the whole person within the academic advising process does not necessarily entangle advising and mentoring. Rather, it requires those individuals who serve in official advising capacities to account for the holistic needs of learners through critical-ecological perspectives when offering advice regarding STEM learners’ academic development, progression, and professional attainment. In essence, when advising Black and Brown STEM learners on possible pathways, trajectories, and necessary experiences for their academic and professional success, we are calling for academic advisors to situate their perspectives and approaches to advising within a critical-ecological perspective so that their advice supports their holistic needs of Black and Brown STEM learners. To support the application of PVEST to P-20+ STEM advising, we offer the following guiding principles as outlined in Table 1.

TABLE 1 Guiding principles for taking a Phenomenological Variant Ecological Systems Theory (PVEST) approach to advising in P-20+ STEM education

1	Disrupt harmful institutional practices and learning spaces that perpetuate structural racism or gendered racism. To engage the process of disrupting, advising as a field and practice must contend with racism and gendered racism as real, structural, and embedded within all social institutions, including P-20+ STEM education. Such disruptions can include but are not limited to: A. Disrupting existing standards, conceptions of normality, and expectations for performance and success that contribute to hegemonic understandings of and engagements with STEM. B. Disrupting these practices by challenging presumed norms and values can lead to changes in the becoming and belonging processes in STEM.
2	Maintain a holistic perspective to advising practices by facilitating “learning as becoming” within the context of STEM teaching and learning. This process can occur through: A. Supporting learners’ self-determined notions of success over their life course (i.e., aspirational capital; Yosso, 2005). B. Fostering conversations about academic trajectories in ways that account for all of the “data” that informs learners’ outcomes in a way that centers their self-determined identities and sense of purpose. In centering learners’ identities and sense of purpose, the advising process centers learner’s and their strengths instead of centering STEM, pathologizing learners, and prescribing set outcomes. C. Accounting for learners’ community, both those noted as community (i.e., family, friends, neighborhoods, etc.) as well as their broader cultural and political communities. In accounting for learners’ communities, the advising process brings in voices external to the academic space to support their development while also holding others within the academic space (i.e., faculty, teachers, administrators, etc.) accountable for the strengths and sources of

(Continues)



capital that come from the learners' ecosystem. Such forms of capital include but are not limited to social, familial, linguistics, and navigational capital (Ortiz et al., 2019).

- D. Offering support that engages learners' affective and emotional intelligence. A person's social-emotional well-being impacts their decisions and outcomes, including the degree to which they believe that they should remain within or leave STEM domains (Corwin et al., 2020).
- E. Appropriately accounting for community-context specificity in the offering of advice and counseling. Community-context specificity recognizes how structural oppression manifests and differentially impacts people given their social identities and social locations (Kirk & Okazawa-Rey, 2018; Tatum, 2018).

3 Maintain a holistic perspective to advising practices by facilitating learning as belonging and social transformation. This process can occur through:

- A. Supporting minoritized learners' rightful presence—that is, legitimate membership and participation in STEM because of who one already is, not who they could or should be (Calabrese Barton & Tan, 2019).
- B. Exploring what gets made possible—in terms of minoritized learners' learning, identity development, decision-making, and views of success—when advisors frame learning as belonging and/or use advising practices that support belonging.

4 Advise toward collective social-cultural-structural transformative action and change, and assess learners' outcomes in relation to this process. This process can occur through:

- A. Advising from a perspective of what could be, given a critical reimagination of "what is" or "what should be." Current advising practices are situated within how we currently see and exist within the world. This process, particularly within STEM, supports advising toward the technical, individual social mobility components of STEM (i.e., STEM is the space in which an individual can advance their own social mobility, and STEM is a space in which the United States can benefit globally). Advising from a critically reimagined perspective of what is and should be incorporates sociopolitical consciousness and change. This perspective intentionally disrupts and transforms the existing reality into a future, collective possibility currently unfelt and unseen. This approach accounts for Black and Brown learners' equity ethic (McGee & Bentley, 2017), pushing STEM fields to facilitate and support agency and change among learners (e.g., Garibay, 2015).
- B. Changing the metrics as well as standards and norms of success, recognizing that these existing benchmarks are rooted in belief systems and values that do not consider Black and Brown learners' cultural identities, norms, and values.
- C. Shifting the tracking of learners' achievements to match the newly defined, critically and culturally situated standards and norms of success.

5 | CONCLUSION

We conclude with the reality that advising, as it is currently situated within P-20+ STEM education research and practice is in dire need of a critical reimagining. In response, we offer PVEST as a framework that can address the existing shortcomings of approaches to advising in P-20+ STEM education and present guiding principles that are rooted in a critical-ecological approach that lay out what would be required to engage this approach. The next step, a charge taken up by our colleagues Dodo Seriki and McDonald (this issue), is to offer specific examples for how this approach can be implemented across the P-20+ STEM spectrum.

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DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article.

ORCID

Terrell R. Morton  <https://orcid.org/0000-0002-3822-0848>

Maxine McKinney de Royston  <http://orcid.org/0000-0002-7046-800X>

ENDNOTE

- ¹ We use the term “student” or “students” in this section as that is consistent with how most of the advising literature refers to youth in the P-20+ system. Following this section we use the term learner to honor that “student” is but one, context-specific aspect of these youths' identity while learner better represents their positionality within and across systems.

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