Using Ecological Systems Theory to Examine the Underrepresentation of Black Women in Stem
By Dr. Shawn Joseph

Summary

In this article, Dr. Shawn Joseph, a former superintendent, walks us through his article laying the groundwork for how superintendents can create the conditions and provide the support and resources for increasing the numbers of Black girls in STEM. In this article Joseph and colleagues suggest an ecosystem conceptual framework for further understanding and enhancing Black women's representation in STEM.

The project illustrates the importance of using culturally responsive practices highlighting:
- Intersectionality
- Holistic approach for STEM

Guiding Questions

After reading the article, consider the following questions?
1. What resonated with you?
2. What did this spark in you or inspire you to think about?
3. What was an Aha moment for you while reading?
4. What is 1 thing you will do as a result of reading this piece? Explain.

Don't have time to view this project? Here is the synopsis sheet with what we learned.

In the video introduction to this article, Dr. Joseph reminds viewers that those who master science, technology, engineering, mathematics, control the future. Therefore, it is imperative that Black girls be included in that process.

Joseph, encourages superintendents and leaders to acknowledge that we have not resourced and created the culture, environment, and structures to support Black girls in STEM. Therefore, we must look at the school level
- ecosystem – policies, certifications, superintendent expectations and requirements; and
- culture level – what superintendents and boards can do to create the conditions to intentionally get more Black girls in STEM.

This project encourages superintendents to take an ecological, or holistic, approach when thinking about increasing the number of Black girls in STEM by examining the expectations and beliefs about girls, school and district processes and culture, and changes over time. This approach shifts the blame to a solutions approach, to identify resources to help Black girls and stem.

Figure 1 of the article
Ecological Model to Conceptualize Black Women's Underrepresentation in Science, Technology, Engineering, and Math Fields
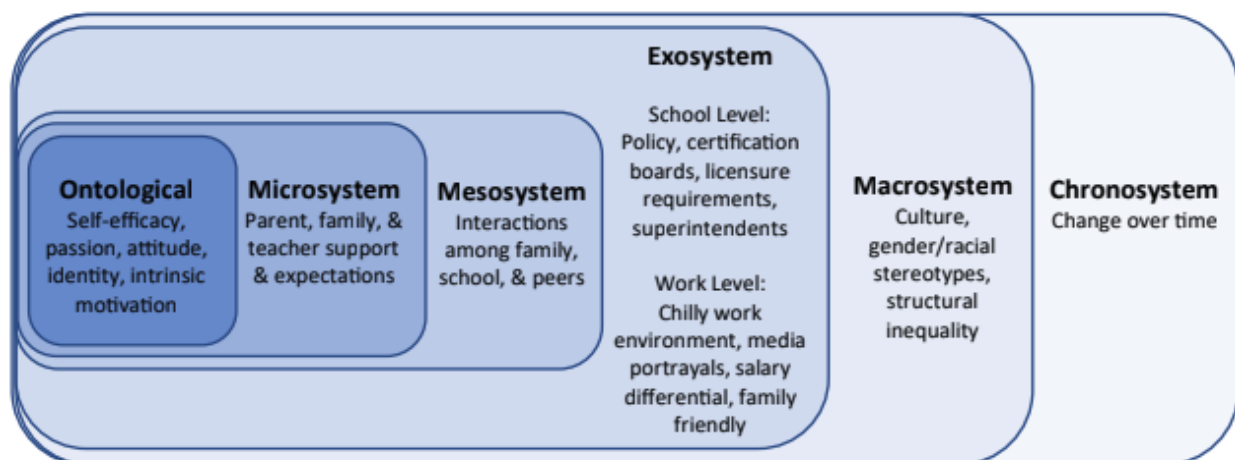
There are five systems to review when using this approach:
- Microsystem: processes that involve interactions between an individual and the immediate environment, including family, school, and work settings. Examples to support increasing Black girls in STEM include:
  - Creating gender affirming schools and systems fostering cooperative classrooms, imparts knowledge about the history of gender inequality, insists on high-quality instruction, carefully monitors student progress, and creates mentorship programs.
  - Create networks for women once in STEM programs

- Mesosystem: the interaction of two or more microsystems, such as parents and school staff that will affect a student's motivational aspiration to pursue STEM courses in school. Examples to support increasing Black girls in STEM include:
  - improve parental STEM awareness,
  - incentivized parents to attend school programs that promote STEM careers

- Exosystem: systems that can directly impact micro- or mesosystems without the student's direct participation or involvement in the environmental layer (e.g., a school superintendent). An example to support increasing Black girls in STEM include:
  - Supporting teachers so they can provide explicit vocabulary instruction, anchored instruction (where students use prior knowledge to solve reality-based scenarios), and content-area reading strategies

- Macrosystem: macrosystem captures the influence of broader cultural blueprints such as the belief systems, worldviews, or cultural identities, that envelop the other system ecologies. Examples influencing the lack of Black girls in STEM:
  - Stereotypes - both teachers and students attributed more masculine characteristics to the sciences and feminine characteristics to the humanities.
  - parents' endorsement of gender stereotypes can impact their children's self-perceptions.

- Chronosystem: captures the influence of time and transition on development, such as the impact of changing schools, or episodes of social crisis, such as impact of the Coronavirus 2019 (COVID-19) pandemic on the transition to virtual learning. Examples include:
  - The number of female students interested in science at the secondary level has increased since the 1990s, but unfortunately that has not

translated to more women pursuing STEM education at the tertiary level or STEM-related jobs.
   ○ Computer programming was, in its origins, a feminized occupation, however, now it is a male dominated field

Bonus
In the introductory video, Dr. Warren-Grice asked, what are some ways that superintendents can be a social justice advocate for Black girls in STEM. Below is his answer.
Dr. Joseph shared lessons learned from his article, [Superintendents as social justice advocates for African American female students in STEM](#)

Superintendents as social justice advocates must:
1. **Acknowledge** that they believe in Black talent and create the conditions to help Black children understand the greatness of their history in this world.
   a. Superintendents have the power through approving curriculum, resourcing and investing in curriculum, to say, yes you are somebody, you have a rich history that goes much deeper than slavery, and you have a future that is going to help improve this world.
2. **Create** partnerships, opportunities, access, and connect parents to resources that push their children harder than they are currently pushed.
3. **Give** students an invitation, access, and opportunity in STEM.

Tool for Black Superintendents working to increase Black girls in STEM

Let's get started. Use this tool to help navigate your superintendent tenure for an equitable school/district.

GUIDE	NOTES
Microsystem: processes that involve interactions between an individual and the immediate environment, including family, school, and work settings. What support can your district offer at the MICROsystem to increase the number of Black girls in STEM? Examples include: ● Creating gender affirming schools and ● Networks for girls once in STEM	
Mesosystem: interconnections among these settings, such as the collaborative relationship between parents and teachers that will affect a student's motivational aspiration to pursue STEM courses in school. What support can the district offer at the MESOsystem to increase the number of Black girls in STEM? Examples include: ● improve parental STEM awareness ● incentivized parents to attend school programs that promote STEM careers	
Exosystem: systems that can directly impact micro- or mesosystems without the student's direct participation or involvement in the environmental layer (e.g., a school superintendent). What support can the district offer at the EXOsystem to increase the number of Black girls in STEM? An example includes: ● Supporting teachers so they can provide explicit vocabulary instruction, anchored instruction and content-area reading strategies	

Macrosystem: macrosystem captures the influence of broader cultural blueprints such as the belief systems, worldviews, or cultural identities, that envelop the other system ecologies. What support can the district offer at the MACROsystem level to increase the number of Black girls in STEM? An example includes: ● Deterring gendered stereotypes	
Chronosystem: captures the influence of time and transition on development, such as the impact of changing schools, or episodes of social crisis, such as impact of the Coronavirus 2019 (COVID-19) pandemic on the transition to virtual learning. What support can the district offer at the CHRONOsystem level to increase the number of Black girls in STEM? An example includes: ● Examine how the number of female students interested in science at the secondary level has increased since the 1990s, but has not translated to more women pursuing STEM education at the tertiary level or STEM-related jobs.	
How can your district/school **shift the conversation from "blaming the victim"** orientations to a solution approach that emphasizes the importance of identifying a kit of resources that will boost the success of Black girls in STEM?	