

BRIEF

DESIGNING FOR DIVERSITY PART 2

The Equity and Inclusion Framework for Curriculum Design

Nonye Alozie
Patrik Lundh
Hui Yang
Caroline E. Parker

Designing for Diversity Part 2

The Equity and Inclusion Framework for Curriculum Design

The National Comprehensive Center

The National Comprehensive Center (NC) is one of 20 technical assistance centers supported under the U.S. Department of Education's Comprehensive Centers program from 2019 to 2024. The NC focuses on helping the 19 Regional Comprehensive Centers and state, regional, and local education agencies throughout the country to meet the daunting challenge of improving student performance with equitable resources.

This publication is in the public domain. While permission to reprint is not necessary, reproductions should be cited as:

Alozie, N., Lundh, H., Yang, H., and Parker, C.E. (2021). *Designing for Diversity Part 2. The Equity and Inclusion Framework for Curriculum Design*. Rockville, MD: National Comprehensive Center at Westat.

The contents of this publication were developed under a grant from the Department of Education. However, the contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal government.

A copy of this publication can be downloaded from <https://www.compcenternetwork.org/>.



Introduction

An essential element of school improvement is implementing high-quality, standards-based curriculum materials (e.g., materials aligned to the Next Generation Science Standards (NGSS) or the K–12 Computer Science Framework) that address the needs of all students. In [*Designing for Diversity Part 1: Where is Equity and Inclusion in Curriculum Design?*](#), we noted the lack of equity and inclusivity in the creation of widely disseminated curriculum materials. We asked the question: Are the established approaches to designing and implementing science, technology, engineering, mathematics, and computer science (STEM+CS) curricula suitable to the diverse needs of students? In this paper, we introduce the Equity and Inclusion Framework for Curriculum Design (EI-CD) approach and Equity and Inclusion Design Principles (EI Design Principles). The framework is guided by evidence-centered design (ECD) methods originally developed for formative assessment (Alozie et al., 2018) and the design of instructional materials (Fujii et al., 2020).

The EI-CD approach is intended to support the development of curriculum materials based on established STEM+CS standards and information about equity and inclusion specific to local contexts. However, smaller districts and classroom teachers typically do not have the capacity, time, or other resources required to create their own instructional materials and are often overwhelmed at the prospect of selecting high-quality materials on their own. District adoption cycles require a significant investment of time and purchasing budgets and usually take place on extended multiyear timelines; as a result, teachers sometimes must use older STEM+CS materials as they await the next adoption (LaVenía, 2020).

This paper describes how the EI-CD approach can be used to review and modify existing curriculum and instructional materials to meet equity goals. It is intended to help districts and schools work toward equity and inclusion within the constraints of their current curriculum. At its core, the EI-CD approach creates feedback loops that are grounded in EI Design Principles and aimed at continuously learning about and addressing the unique needs of students. The EI-CD approach makes equity and inclusion central tenets of the curriculum development and/or modification process.

In the following sections, we explain the EI Design Principles and EI-CD approach (see Appendices A and B) and provide illustrative cases to demonstrate how STEM+CS curriculum specialists, teachers, and local community groups can collaborate to apply the design principles to existing STEM+CS learning activities and experiences. *An Equity and Inclusion Planning Guide (EI Planning Guide)* for educators and leaders at state and local levels is provided in Appendix B to support the facilitation of the EI-CD approach. The goal of the *EI Planning Guide* is to share goals and visions about equity and inclusion and collaboratively make decisions about teaching and learning.

Equity and Inclusion Design Principles

Curriculum design grounded in EI Design Principles takes a systems-thinking approach. It empowers stakeholders such as curriculum developers, professional development providers, state



and district leaders, teachers, parents, students, and the assessment community to collaboratively engage in deep reflection and ongoing improvement toward educational equity. The EI Design Principles were developed and informed by empirical research on supporting learners with wide-ranging experiences and instructional needs (e.g., Mallya et al., 2012; Rose et al., 2005). The research was then clustered into three design principles with 11 guidelines to align the curriculum/instructional materials to the principles (e.g., Alozie et al.; Fujii et al., 2020): (a) understanding students and the influences on their learning (abbreviated as *Student Information*); (b) fostering student engagement with learning (*Engagement*), and (c) providing appropriate language supports (*Language Supports*).

EI Design Principle 1: Student Information: Understanding Students and Contextual Influences on Learning

An essential aspect of designing for diversity is knowing and understanding the student populations the district serves. Knowledge of students' cultures and backgrounds is critical for stakeholder decisions about how to support students' learning needs (Sleeter, 2011). Stakeholders should consult various equity indicators, such as achievement status, educational opportunities, social-emotional supports, climate and culture of the district and local environment, and family involvement and knowledge of student learning (Dougherty, 2015; Fabillar, 2018) to determine how to address historical and social inequities.

The *Student Information* design principle promotes the cultivation of relationships among stakeholders who know and care about the community and culture and their ability to critically examine district-wide assumptions about students (Margolis et al., 2015). Stakeholders refers to various collaborators involved in providing equitable and inclusive education in STEM+CS. These stakeholders can be curriculum developers, professional development providers, state and district leaders, teachers, parents, students, and the assessment community. *Student Information* supports diversity in voices, experiences, and expertise in STEM+CS education, thereby creating opportunities for conversations and learning. These collaborations will encourage grounding STEM+CS learning in personally and socially relevant contexts and make learning meaningful to students (Mallya et al., 2012).

Stakeholders refers to various collaborators involved in providing equitable and inclusive education in STEM+CS. These stakeholders can be curriculum developers, professional development providers, state and district leaders, teachers, parents, students, and the assessment community.

According to Dougherty (2015), *Student Information* can be used in various ways by districts and schools. He groups these actions into four categories: (1) clarify school system goals, (2) create infrastructure for data use, (3) ensure adequate educator knowledge on how to interpret and use data, and (4) support collaboration among educators. Below, each category is summarized:



- » Clarify school system goals
 - › Determine a content-rich and standards-aligned curriculum that prepares students for subsequent content-specific learning experiences and identify gaps in student learning
 - › Determine academic and social student behaviors (e.g., diligence in completing challenging tasks) that are important for student success
- » Create an infrastructure for data use
 - › Determine what data teachers and districts need to know so that appropriate actions towards change can be taken
 - › Provide a user-friendly electronic data system
 - › Determine student progress by administering ongoing, teacher-generated formative assessments
 - › Provide timely and user-friendly reports on school or district progress
- » Ensure adequate educator knowledge on how to interpret and use data
 - › Make knowledge of data use a criterion when hiring teachers and school leaders
 - › Embed data use training in ongoing teacher professional learning
- » Support collaboration among educators
 - › Promote teacher collaboration around curriculum, instruction, and assessments
 - › Bring teachers in the same subject together across schools

Student Information is made up of four guidelines (and Appendix A) that address Dougherty’s categories. Guideline 1 is the process of establishing structures and practices for dialogue, learning, and communication. Guideline 2 is the process of gathering and presenting information about the achievement status, educational opportunities, social-emotional supports, and climate and culture of the district and the local environment in which the students live. Guideline 3 is to list potential collaborators, such as curriculum developers, teachers, parents, and community representatives. The collaborator list should represent the composition of the community. Guideline 4 is to establish domain-specific standards that inform the content and sequencing of instructional materials to guide subsequent modifications of adopted or existing curriculum materials.

EI Design Principle 2—Engagement: Fostering Student Engagement with Learning

The *Engagement* design principle aims to provide multiple opportunities to include students’ life experiences into their learning process. Universal Design for Learning (UDL)(CAST, 2015) is a main precept of *Engagement*. UDL teaching approaches aim to provide students equal opportunities to succeed, regardless of how they learn. “Multiple modes of engagement” is a UDL principle that highlights the motivational aspects of learning. The principle states that students engage in information and activities that are relevant to their interests. Through this principle, the “why” of



learning is emphasized as are the aspects of learning that motivate students to persist. As such, the *Engagement* design principle promotes the idea that valuing, leveraging, and supporting students' culture, language, and interests can sustain learning and promote an identity as a competent learner of STEM+CS (CS K12, 2016; NRC, 2012).

The *Engagement* design principle consists of three guidelines (see Table 1 and Appendix A). Guideline 5 identifies intersections between the students' lives and the learning domain to make learning relevant and highlights how the content impacts their communities. Guideline 6 encourages the representation of diverse experiences and perspectives to reduce bias and stereotypes in gender, race, socioeconomic status, geography, cognitive and physical ability, and other social markers. Guideline 7 supports multiple opportunities for student participation. This includes the use of visual aids, meaningful activities that are hands-on and encourage reflection, collaboration, and opportunities for talking and writing.

EI Design Principle 3—Language Supports: Providing Appropriate Language Supports

The language used in instructional materials can support or challenge students' interpretation and understanding of the content. There are significant differences between the language and terms used in STEM+CS disciplines and the language people use in day-to-day communication. To facilitate students' learning and participation in STEM+CS fields, instructional materials need to provide supports and scaffolding for linking students' cultural and language backgrounds to domain-specific language (Lee and Buxton, 2013). For instance, Lee and Fradd (1998) argued that schools and educators must understand the nature and practice of science in combination with students' language and cultural experiences when teaching science. This means that using science-specific vocabulary, grade-level appropriate diction, and sentence structure are important when developing science instructional materials. Including students' language and cultural experiences will also help language learners not feel alienated in the classroom.

The *Language Supports* design principle consists of four guidelines (see Table 1 and Appendix A). Guideline 8 focuses on using plain language to align learning goals to question prompts. Guideline 9 focuses on the complexity of the language used in the instructional materials, including the provision of multiple representations for students at different levels to be able to access grade-level concepts as well as scaffolding to move from one level to another. Guideline 10 supports how well students comprehend the activities and tasks by eliciting and building on prior knowledge. Guideline 11 encourages the use of multiple modes of expression with scaffolds, response templates, and alternative communication tools.



The Equity and Inclusion Framework for Curriculum Design and Modification

What if districts had access to high-quality curriculum materials that integrated equity and inclusion from the start? Similarly, what if districts had the resources and supports for adapting and modifying already-adopted curriculum materials for their local needs? The EI-CD approach uses the structure and systematicity of evidence-centered design (ECD) to apply EI Design Principles to curriculum design and adaptation that integrates the needs of diverse students. ECD (Mislevy et al., 2017) is traditionally a systematic design process used to create assessments with complex models of student proficiency. The systematic approach it takes to define the learning domain and student expectations also lends itself to curriculum development (e.g., Chiu et al., 2018; Harris et al., 2016).

Ideally, integrating equity and inclusion to address the strengths and needs of students would be part of the initial design process. However, districts often do not have the time or resources to develop curriculum from the ground up. The EI-CD approach can be used to modify existing materials through a thoughtful process of data gathering and interpretation. The goal is to identify where and how equity and inclusion are lacking, make informed decisions about modifications and supplements, and incorporate continuous feedback about progress and improvement (see Figure 1). This avoids simply “tacking on” additional activities as an afterthought. All parts of the approach can be achieved using the *EI Planning Guide* (see Appendix B).

Figure 1. Equity and inclusion framework for curriculum design approach

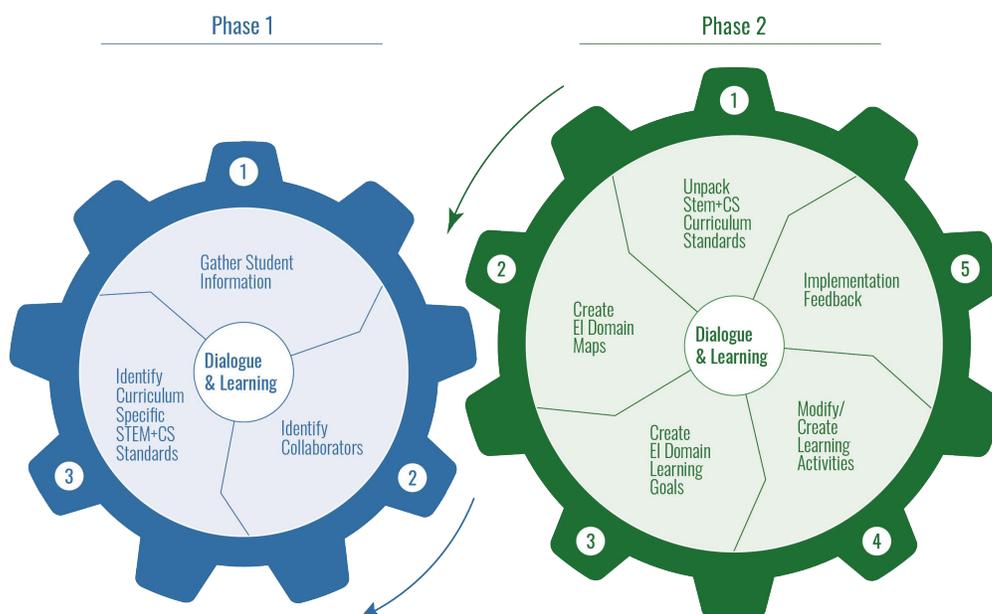


Table 1, below shows how the components of the EI-CD approach in Figure 1 align with the EI Design Principles and EI Guidelines. Note that Phase 2 of the EI-CD approach can use a combination of multiple EI guidelines to create the most appropriate learning experiences for the students.



Table 1. EI-CD Approach Alignment with EI Design Principles and EI Guidelines

EI-CD approach component	EI-CD approach phase	EI design principles	EI guidelines
Dialogue and learning	All phases	All EI design principles	All EI guidelines
<ol style="list-style-type: none"> 1. Gather student information 2. Identify collaborators 3. Identify Curriculum Specific STEM+CS Standards 	Phase 1	Student Information	<ol style="list-style-type: none"> 1. Dialogue and Learning 2. Student-Centered Information 3. Collaborators 4. Learning Standards
<ol style="list-style-type: none"> 1. Unpacking the Standards 2. Creating Domain Maps 3. Creating Learning Goals 4. Aligning and Modifying Learning Activities to EI Design Principles 5. Implementation and Continuous Feedback 	Phase 2	<p>There are no specific EI design principles for this component.</p> <p>Engagement Language Supports</p>	<p>There are no specific EI design guidelines for this component.</p> <p>Each of the following EI guidelines may be considered for each component of Phase2:</p> <p>Engagement</p> <ol style="list-style-type: none"> 5. Cultural Sensitivity 6. Engagement and Contextualization 7. Participation <p>Language Supports</p> <ol style="list-style-type: none"> 8. Clarity of Prompts and Questions 9. Language Complexity 10. Student Comprehension 11. Student Response/ Expression of “Knowledge-in-Use”

Dialogue and Learning

An important part of the EI-CD approach is to include a variety of stakeholders, such as (but not limited to) student advocacy groups, nonprofit dropout prevention programs, teachers, students, informal learning professionals, and local industry members, who can provide their contributions, experiences, and voices throughout the entire design or modification process. Dialogue among participants must be organized and facilitated so that everyone can be heard and meaningfully contribute at all times. This requires building trust through common language, multiple expert voices, and collaboratively determined issues (including district-specific issues), goals, outcomes, and guiding questions (Lieberman and Young, 2020). Guiding questions help facilitate and support



productive and consistent dialogue that promotes learning. For example, questions like, “What are the main challenges we want to address?” “What does the research say and how can it be applied in a concrete way?” and “What tools and resources are needed to apply what was learned through conversation?” can be useful for encouraging collaborators to openly think about how their personal experiences align with research (Lieberman and Young, 2020).

Phase 1: Exploring the Educational Landscape and Indicators of Equity

1.1. Gather Student Information (EI Design Principle: Student Information)

Collaboration between local and state leaders must be based on an honest assessment of the educational needs and strengths throughout the district (see Figure 1 and Table 1). The EI-CD approach reflects state and local commitments to design for particular learning outcomes and to ensure that the social context is represented in the learning experiences of the students. This commitment will inform decisions for all design phases of the curriculum modification process.

A recent report (Lieberman and Young, 2020) showed how educational stakeholders can work with community members and district staff to gather student information on equity and diversity. Digital Promise convened a day-long workshop with The League of Innovative Schools to prioritize equity-related challenges while considering gaps in existing research and solutions. Participants were also encouraged to share artifacts to illustrate how they experience these challenges in their unique contexts. They were given information on current inequities and challenges, strategies for breaking stereotypes, and opportunities for future equity-centered research. This workshop included brainstorming on how to make concrete changes and increase opportunities for all students. Participants considered guiding questions such as, “Were any of the findings surprising to you? Did any of the findings help you think differently about an aspect of computational thinking? If so, in what ways?” and “Are there findings that seem relevant to instructional practice but would require bridging or scaffolding to be more useful? What research translation strategies (e.g., technical assistance, professional learning/coaching, format, venue) could make those findings more actionable?”

The EI-CD approach uses similar guiding questions (see Appendix B for the *EI Planning Guide*) to help collaborative groups reflect and act on identified STEM+CS issues as they relate to the local district. For example, the *EI Planning Guide* asks questions like, “How can you improve your district’s and school’s data management to encourage focused teaching? Is there an electronic source for teachers to access this information?” “How have you used the data from all local and state data to inform your decision-making and goal setting?” and “How are you helping your teachers to be experts in the curriculum? What kinds of professional learning opportunities are teachers provided?”

1.2. Identify Collaborators (EI Design Principle: Student Information)

Engaging a variety of stakeholders in the adoption process is an important part of the EI-CD approach (see Figure 1 and Table 1). Districts can organize opportunities for stakeholders to give



feedback on potential curriculum materials through workshops, surveys, or focus groups (LaVenía, 2020).

For example, the Digital Promise workshop mentioned previously included educational researchers and K–12 practitioners that were committed to equity and experienced in their subject matter. Collaborators included teachers, coaches, school and district leaders, developers of educational products and programs, researchers, and funders (Lieberman and Young, 2020). Another example of assembling collaborators is the Science Projects Integrating Computing and Engineering (SPICE) project. It included elementary STEM coordinators, math and science teachers, researchers, professors, graduate students, and former teachers (Chiu et al., 2018). The rich expertise and experience of the SPICE team were necessary for effectively understanding specific challenges and needs in the participating districts’ diverse settings. Digital Promise and SPICE created collaborative groups that reflected diversity in expertise and experiences in STEM+CS and equity research. We suggest that collaborative groups also reflect the diversity of the communities they are representing. Community contributions can help ground the conversations in real-world histories, issues, and needs.

1.3. Identify Curriculum Specific STEM+CS Standards (EI Design Principle: Student Information)

Collaborative groups can work together to determine whether curriculum materials are aligned to STEM+CS standards and whether they apply to the diverse strengths and needs of the students. Curriculum-specific standards should respond to the diversity of the district and consider the voices, perspectives, and experiences that may historically have been omitted from STEM+CS.

The SPICE curriculum mentioned above is an example of collaborative groups working together to align the NGSS standards and the curriculum to provide equitable learning opportunities. According to Chiu et al. (In Press), “equity in engineering education is not just incorporating students’ and community-based resources into instruction but creating ways to make students’ personal and community-based epistemologies more central and valued within engineering learning experiences” (p.4). SPICE was based on a cluster of three NGSS performance expectations:

- » 3-ESS3-1 *Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.*
- » 3-5ETS1-1 *Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost;*
- » 3-5ETS1-2 *Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem; and*
- » 3-5ETS1-3 *Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.*

The content standards for engineering and science were identified to create opportunities for equitable learning experiences (Chiu et al., in press). The standards were used to leverage and make



specific connections to student and community resources by engaging students in activities that were specific to the problems in their school environment, determine solutions to those problems, and carry out tests of their solutions. Engineering processes provided a way to leverage and privilege student and community resources within classroom settings. Teachers, district personnel, and local professors contributed their knowledge of the local school community to determine how to identify and apply NGSS standards to the development and modifications of the curriculum materials. Furthermore, since NGSS does not explicitly have computational modeling standards, the curriculum team added a computational modeling component to the lessons. This enhanced student engagement and helped create inclusive (e.g., girls, students of color, etc.) opportunities for developing computational skills.

Phase 2: Exploring STEM+CS Curriculum Materials

2.1. Unpacking the Standards (In Preparation for EI Design Principles Engagement and Language Supports)

Once curriculum specific standards have been identified, “unpacking” each standard follows (see Figure 1 and Table 1). This can be done by local STEM+CS teachers, coordinators, and professional development leaders. Unpacking standards requires breaking down the curriculum content standards into smaller essential components (Harris et. al., 2016). Unpacking will also highlight any needed prerequisite knowledge, potential challenges, and boundaries of what students should know and do. This information forms the foundation of the activities of the curriculum. The process of unpacking the standards builds a deeper understanding of the curriculum materials and can help educators determine whether the learning experiences and activities in the curriculum are appropriate.

Table 2 is an example of NGSS’ standard 1LS1-2: *Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive* and how its dimensions (disciplinary core ideas, science and engineering practices, and crosscutting concepts) are broken down into essential components of the standard. The essential components are smaller in scale and more manageable than the larger standard. Keep in mind, NGSS standards are organized by dimensions but other content standards, like the standards articulated in the Standards for Mathematical Practice, may not have dimensions. Unpacking standards that are not made up of dimensions may exclude the rows specific to Science and Engineering Practices and Crosscutting Concepts.



Table 2. Unpacking Essential Components of NGSS Elementary Standard 1LS1-2

Standard	Component
<i>NGSS Standard</i>	1LS1-2: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
<i>Essential Components of Disciplinary Core Ideas</i>	<ul style="list-style-type: none"> » Offspring need food and protection to survive » Some animal parents do things to help their offspring survive » Some offspring do things to help themselves survive
<i>Essential Components of Science and Engineering Practices</i>	Read text and use media
<i>Essential Components of Crosscutting Concepts</i>	Find patterns of the science in the real world or in the human-designed world
<i>Essential Knowledge and Attributes</i>	<ul style="list-style-type: none"> » Knowledge that food and protection are needed to survive » Knowledge that animals may engage in different behaviors, some that help them survive, some that help their offspring survive, and some that signal to their parents their needs
<i>Potential Challenges</i>	Students might not believe that offspring can survive on their own
<i>Prerequisite Knowledge</i>	<ul style="list-style-type: none"> » LS1.C: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. » ESS3.A: Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)
<i>Boundaries for instruction and learning</i>	Students only need to know about obtaining food and protecting themselves from predators for survival.

2.2. Creating Domain Maps (EI Design Principles: Engagement and Language Supports)

After unpacking the curriculum standards, education leaders can make a domain map to show connections between the essential components (see Figure 1 and Table 1). Domain maps provide guidance for subsequent curriculum activities and learning experiences (Chiu et al., 2018). Educators can create domain maps for adopted curriculum materials using the standards to which the curriculum materials were aligned. Creating domain maps using EI Design Principles *Engagement* and *Language Supports* will highlight connections between the essential components of the standards (shown in Table 2) and the unique needs of the students. For example, Table 3 is an example of a simplified domain map of the NGSS elementary life science standard 1LS1-2 from the previous section. It shows how the standard is broken down into essential components and how guidelines from EI Design Principles *Engagement* and *Language Supports* are integrated. These connections give further guidance to educators for the kinds of specific curricular activities that would help students make sense of the content.



The shaded regions show connections between the essential components of NGSS disciplinary core ideas, science and engineering practices, and crosscutting concepts and guidelines from the EI Design Principles *Engagement* and *Language Supports*. The shaded regions in the last row of Table 3 shows how the components of the NGSS standard and the EI Design Principles come together to inform subsequent EI Learning Goals.

Table 3. Example domain map and EI learning goals for elementary science standard 1LS1-2

		Disciplinary Core Idea		
		Offspring need food and protection to survive	Some animal parents do things to help their offspring survive	Some offspring do things that help themselves survive
Science and engineering practices	Read text and use media	X	X	X
Crosscutting concepts	Patterns	X	X	X
Equity and inclusion design principle: Engagement	Use visual aid and meaningful activities	X		X
	Bridge with students' background and interactions with parents at home		X	
Equity and inclusion design principle: Language supports	Use scaffolds for science vocabulary	X	X	X
Resulting EI Learning Goals		A	B	C



2.3. Creating Learning Goals (EI Design Principles: Engagement and Language Supports)

Once domain maps have been created, EI Learning Goal statements can be written (Harris et al., 2016, refer to Learning Performances). EI Learning Goals (see Tables 3 and 4) are smaller in scope than the standards. They serve as anchors for curriculum activity sequences. Because EI Learning Goals address different aspects of standards, appropriate features and supports for equity and inclusion may differ from one learning goal to another. For example, EI Learning Goal A promotes the use of visual aids, while EI Learning Goal B connects the science to students' backgrounds.

When working with an existing set of curriculum materials, it is important to determine whether they came with learning goals. Ask, "What are the learning goals for the curriculum materials?" and "Does each learning goal highlight a different skill and experience?" When attending to equity and inclusion, EI Learning Goals should vary the kinds of opportunities that students have as they build toward the standards. At this step, it is important to comb through the EI Design Principles *Engagement* and *Language Supports* to make sure that each EI Learning goal highlights and addresses unique student needs and strengths.

For instance, a life science lesson adopted from an online resource identified one learning goal to help students move toward the NGSS standard 1LS1-2. The learning goal supplied by the online lesson may not be enough to help students reach a deep understanding of the entire standard. This is a good time to check the lesson's learning goal against the domain map. Table 3 shows three EI Learning Goals (A, B, and C) represented through the domain map. EI Learning Goal A integrates the use of visual aids, text and media, and vocabulary supports to help students understand that *Offspring need food and protection to survive*. EI Learning Goal B integrates text, media, and science vocabulary and bridges the content with students' backgrounds to help students learn that *Some animal parents do things to help their offspring survive*. EI Learning Goal C also integrates the use of text, media, and science vocabulary to help students learn that *Some offspring do things to help themselves survive*. Finding intersections and gaps between the provided curriculum learning goals and the EI Learning Goals generated through the domain maps can guide how lesson activities need to be modified and/or supplemented.

Table 4 compares the learning goals from the online lesson with the EI Learning Goals generated from the domain map. Both sets of learning goals are aligned to the NGSS standard 1LS1-2: *Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive*. EI Learning Goal B is similar to the learning goal for the online lesson because they both address finding patterns in how adult animals help their offspring survive. They differ because the learning goal for the online lesson does not integrate equity and inclusion principles. This is a modification opportunity to include learning experiences that align with the EI Design Principles *Engagement* and *Language Supports* (see Appendix A). In addition, the use of three EI Learning Goals, instead of one, allows for the students to address the standard in its entirety.



Table 4. Intersections and gaps between learning goals from an online lesson and EI learning goals generated from the domain map

Learning goal from online lesson	EI learning goals from domain map
<p><i>Students will be able to determine patterns in eagles' behavior that help their offspring survive.</i></p>	<p>Learning Goal A: Students make live camera observations of baby birds and write summaries of patterns they observe of baby birds needing food and protection.</p> <p>Learning Goal B: Students make and record observations of patterns they see in their local neighborhoods of parent birds helping their offspring survive.</p> <p>Learning Goal C: Students create a media representation showing patterns that they observed in the real world of how baby birds help themselves survive.</p>

Specific characteristics that pertain to the diversity found in different districts can be added to the learning goals articulated in Table 4. Appendix D of the NGSS standards (NGSS Lead States, 2013) provides several case studies of lessons that attend to different kinds of diverse classrooms. For example, in an economically disadvantaged district, the EI Learning Goals can be refined to incorporate language that connects the science to students' sense of place. The learning goal can also connect students' "funds of knowledge" and cultural practices to the essential components of the standard. For districts with high language diversity, the EI Learning Goals could incorporate the use of literacy strategies, discourse strategies, and home culture connections.

2.4. Aligning and Modifying Learning Activities to EI Design Principles (EI Design Principles: Engagement and Language Supports)

Articulating EI Learning Goals helps determine when and how existing curriculum lessons should be modified to integrate equity and inclusion. The EI Design Principles (Appendix A) and *Planning Guide* (Appendix B) help determine whether the curricular learning activities and experiences are aligned to the EI Learning Goals. The learning activities and experiences should be checked for (a) alignment to the EI Learning Goals and (b) integration of EI Design Principles. The *EI Planning Guide* provides a set of guiding questions to support alignment to EI Design Principles *Engagement* and *Language Supports*. Some guiding questions include:

1. Do you need to create new curriculum materials, lessons, or activities? If so, why and what kind?
2. Do you need to make modifications to existing curriculum materials, lessons, or activities? If so, why and what kind?



3. Do you need to supplement the existing curriculum with additional materials, lessons, or activities?
 - a. Why do you need to supplement current materials?
 - b. Where will you locate these additional supports?
4. Do the new, modified, or added curriculum materials sufficiently include equity and inclusion design components (refer to the Equity and Inclusion Design Principles)?
 - a. Which design principles are you addressing?
 - b. Which guidelines will help you tailor the curriculum materials to your students' needs?

If the existing activities do not adequately align to the EI Learning Goals or EI Design Principles, the activities may be modified or additional activities may be added (e.g., open education resources). For example, to apply the EI Learning Goals in Table 4 into learning activities for students from economically disadvantaged backgrounds (see [NGSS Appendix D](#) case studies), education leaders can address the equity and inclusion guiding questions for *Engagement* that ask, “How can school culture, students’ home communities, and real-world contexts be used to enhance what students learn in the classroom?” and “What kinds of alternative tools for communication can be provided for students (e.g., multimedia, manipulatives, drama, drawings)?”

In another scenario, students from a low-income rural district can be engaged in a lesson about habitats and biodiversity. During this lesson, students may collect data on plants and animals in their communities and work collaboratively to create a nature guide for their neighborhood. The additional lesson transforms students’ learning experiences into scientific experiences that leverage the “funds of knowledge” and cultural practices that are based on their local community ecology for place-based learning opportunities.

2.5. Implementation and Continuous Feedback (EI Design Principle: Student Information)

During the adoption, review, and modification of curriculum materials, it is essential to obtain ongoing feedback from teachers, students, and community partners. Collaborative groups of stakeholders (Margolis et al., 2015) can take advantage of their knowledge of students’ needs and interests and historical and systemic disparities in education to inform their feedback. Having contributors with different areas of expertise involved will improve the materials and help assure that the materials support equity and inclusion.

Continuous feedback must be actionable, timely, and open for discussion. The *EI Planning Guide* in Appendix B provides a set of guiding questions to support the continuous feedback process. For example, feedback from local community partners, such as K–12 education researchers, K–12 practitioners, and nonprofit student advocacy groups, can be gathered by using informal surveys,



interviews, or focus groups at different times of curricular modification and implementation. Questions might include:

- » How have the strengths and needs changed in your district?
- » In what way has the EI-CD approach been implemented in your district?
- » How have your students benefited from the EI-CD approach?
- » How have the teachers changed their instructional decisions, attitudes, and awareness to promote equity and inclusion in their classrooms?
- » What is the plan to review district and school progress in equity and inclusion?

Teachers implementing the modified curriculum materials can reflect on their implementation and provide feedback for themselves and other teachers using guiding questions such as:

- » Are you getting sufficient support to implement instruction that promotes equity and inclusion?
- » How are students responding to the curriculum?
 - › Are students engaged?
 - › Are students excited to learn?
 - › Do students apply what they learn to real-world situations?
 - › Do students feel safe and valued in the class as they learn through the curriculum?
 - › Are students actively participating in conversations related to STEM+CS concepts?
 - › Are students fostering critical thinking and knowledge transferring?
 - › Are students showing interest in learning more about the concepts?

Teachers can also observe and document how the materials are enacted and how students use them (e.g., Kumi-Yeboah et al., 2017). These observations and insights will contribute to future revisions of the curriculum materials and build teachers' and students' capacity to assess curriculum based upon their needs.

Conclusion

Although adopting high-quality, content-rich curriculum is an important step toward ensuring equitable educational opportunities for all students, it is not sufficient to ensure equitable and inclusive learning environments. Districts must include professional learning supports and strong implementation plans to ensure that the materials are modified and used in alignment with the strengths and needs of the students and teachers (LaVenía, 2020).

This paper provides an approach for systematically reviewing and modifying curriculum materials by leveraging the knowledge, expertise, and resources of state and local leaders. This modification process is cyclical; it uses student information to actively respond to students' needs and systematically improve the curriculum materials. The *EI Planning Guide* uses the EI Design Principles through guiding questions to help support the process of modifying curriculum materials



that attend to diversity in an intentional and informed way. The efforts needed to modify curriculum materials for equity and inclusion cannot be done by any one person, team, or school alone. Nor will it look the same everywhere. The most important goal is to ensure that students have rich learning opportunities that are relevant and conducive to their academic and professional growth.

In Paper 3, *Implementation of the Equity and Inclusion Curriculum Development Approach: The Role of State and Local Education Agencies*, we discuss how state and local leaders can work together to make sure that schools are supported in applying the EI-CD approach to STEM+CS curriculum materials.

Acknowledgments

Special thanks to Felicia Moore-Mensah and Gina Townsend for conceptual support, feedback, and attention to this work.



References

- Alozie, N., Haugabook Pennock, P., Madden, K., Zaidi, S., Harris, C. J., and Krajcik, J. S. (2018). *Designing and Developing NGSS-Aligned Formative Assessment Tasks to Promote Equity* [Paper presentation]. Annual conference of National Association for Research in Science Teaching, Atlanta, GA, United States.
- CAST. (2015). *Universal Design for Learning*. <http://www.cast.org/our-work/about-udl.html#.X1I6PnlKg2w>
- Chiu, J. L., Fick, S. J., McElhaney, K., Alozie, N., and Fujii, R. (in press). Elementary Teacher Customizations to Engineering Curricula to Leverage Student and Community Resources. *Journal of Pre-College Engineering Education Research*.
- Chiu, J., McElhaney, K. W., Zhang, N., Biswas, G., Fried, R., Basu, S., and Alozie, N. (2018). *A Principled Approach to NGSS-aligned Curriculum Development Integrating Science, Engineering, and Computation: A Pilot Study* [Paper presentation]. Annual Conference of National Association for Research in Science Teaching, Atlanta, GA, United States.
- Dougherty, C. (2015, April). *How School District Leaders Can Support the Use of Data to Improve Teaching and Learning* [Issue brief]. ACT Research and Policy. <http://www.act.org/content/dam/act/unsecured/documents/Use-of-Data.pdf>
- Fabillar, E. (2018). *Systemic Equity Review Framework: A Practical Approach to Achieving High Educational Outcomes for All Students*. Education Development Center, Inc.
- Fujii, R., McElhaney, K., and Alozie, N. (2020). Promoting Equity and Inclusion in STEM Curriculum Design. In Gresalfi, M. and Horn, I. S. (Eds.), *The Interdisciplinarity of the Learning Sciences: Vol. 3*. (pp. 1747-1748). International Conference of the Learning Sciences.
- Harris, C. J., Krajcik, J. S., Pellegrino, J. W., and McElhaney, K. W. (2016). *Constructing Assessment Tasks that Blend Disciplinary Core Ideas, Crosscutting Concepts, and Science Practices for Classroom Formative Applications*. SRI International.
- Kumi-Yeboah, A., Yuan, G., and Dogbey, J. (2017). Online Collaborative Learning Activities: The Perceptions of Culturally Diverse Graduate Students. *Online Learning*, 21(4), 5–28.
- K–12 Computer Science Framework Steering Committee (CS K12). (2016). *K–12 Computer Science Framework*. <https://k12cs.org/wp-content/uploads/2016/09/K%E2%80%9312-Computer-Science-Framework.pdf>
- LaVenia, M. (2020). *The State of the Instructional Materials Market: 2019 report*. EdReports.org, Inc. https://storage.googleapis.com/edreports-206618.appspot.com/resources/241250001/2019StateoftheMarketReport_Final_52820-v1.pdf



- Lee, O., and Buxton, C. A. (2013). Integrating Science and English Proficiency for English Language Learners. *Theory Into Practice*, 52(1), 36–42.
- Lee, O., and Fradd, S. H. (1998). Science for All, Including Students From Non-English-Language Backgrounds. *Educational Researcher*, 27(4), 12–21.
- Liberman, B. and Young, V. (2020). *Equity in the Driver's Seat: A Practice-Driven, Equity-Centered Approach for Setting R&D Agendas in Education*. Digital Promise.
- Mallya, A., Mensah, F. M., Contento, I. R., Koch, P. A., and Barton, A. C. (2012). Extending Science Beyond the Classroom Door: Learning from Students' Experiences with the Choice, Control and Change (C3) Curriculum. *Journal of Research in Science Teaching*, 49(2), 244–269.
- Margolis, J., Goode, J., and Chapman, G. (2015). An Equity Lens for Scaling: A Critical Juncture for Exploring Computer Science. *ACM Inroads*, 6(3), 58–66.
- Mislevy, R. J., Haertel, G., Riconscente, M., Rutstein, D. W., and Ziker, C. (2017). Evidence-Centered Assessment Design. In *Assessing Model-Based Reasoning Using Evidence-Centered Design* (pp. 19–24). Springer.
- National Research Council (NRC). (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core ideas*. National Academies Press.
- NGSS Lead States. (2013). *Next Generation Science Standards: For States, by States*. The National Academy Press.
- Rose, D. H., Meyer, A., and Hitchcock, C. (2005). *The Universally Designed Classroom: Accessible Curriculum and Digital Technologies*. Harvard Education Press.
- Sleeter, C. E. (2011). An Agenda to Strengthen Culturally Responsive Pedagogy. *English Teaching: Practice and Critique*, 10(2), 7–23.



Appendix A: Equity and Inclusion Design Principles and Guidelines

Full Equity and Inclusion Design Principles and Guidelines

Design Principle 1: Understanding the Students and Contextual Influences on Learning

Equity and Inclusion Guideline 1: Dialogue and Learning

State and local leaders should determine structures and practices to facilitate and guide conversations about district curricular needs.

1. Provide opportunities for multiple voices, experiences, and types of expertise to be heard
2. Build trust among collaborators through a common language, multiple expert voices, and collaboratively determined issues, goals, outcomes, and guiding questions

Equity and Inclusion Guideline 2: Student-Centered Information

State and local leaders should gather information about the students in the district from multiple sources.

1. Achievement status of students
2. Educational opportunities provided to students within and outside of school
3. Social-emotional supports that are required and provided to students
4. Climate and culture of the district and the local environment in which the students live

Equity and Inclusion Guideline 3: Collaborators

State and local leaders should determine appropriate collaborators who are knowledgeable about the living and learning context. Some examples include, but are not limited to:

1. Curriculum developers
2. Teachers
3. Parents
4. Students
5. Informal learning institutions (e.g., museums)
6. Professional development providers
7. Assessment experts
8. Local youth advocate groups
9. Nonprofit and community organizations
10. Industry professionals



Equity and Inclusion Guideline 4: Learning Standards

State and local leaders determine the standards that will guide subsequent vetting, selecting, or modifying of curriculum materials.

1. Learning standards should be stated and be aligned to learning requirements
2. Standards should respond to the diversity of the district
3. Standards should consider the history of public education and the voices, perspectives, and experiences of traditionally marginalized peoples in STEM+CS

Design Principle 2: Fostering Student Engagement with Learning

Equity and Inclusion Guideline 5: Engagement and Contextualization

Learning should intersect with students' lives. Connect STEM+CS learning to student's culture, home, and community.

1. Make learning relevant to students
 - a. Vivid phenomenon-based learning
 - i. Builds on prior knowledge, the use of relevant phenomena, and representations
 - ii. Focuses on lived experiences
 - iii. Connect to students' cultural and background knowledge, skills, and experiences outside of school and leverage them to connect to science
 - iv. Connect to school culture, students' home communities, and real-world contexts
 - v. Use students' knowledge, skills, and experiences as a gateway to learning
 - vi. Anticipate preconceptions students may have gained through their lived experiences
 - b. Impacts on self and community
 - i. Increase student understanding of how STEM+CS impacts the real world
 - ii. Explore causes and impacts of STEM+CS on the cultural and social environment
 - iii. Critically examine ethical, safety, legal, cultural, and social issues related to human solutions (e.g., design, technology, innovation, intervention) to problems
 - iv. Explore how new knowledge can be applied to addressing the impacts

Equity and Inclusion Guideline 6: Cultural Sensitivity

Learning should include diverse experiences and perspectives. Learning experiences should reduce biases and stereotypes related to gender, race, ethnicity, socioeconomic status, religion, or geography.

1. Avoid bias
 - a. Give attention to issues such as gender, race, socioeconomic status, geography, and cognitive and physical ability
 - b. Include contexts that are inclusive and not marginalizing to particular groups



2. Include diverse perspectives and experiences
 - a. Include voices (experts and non-experts) from people of diverse backgrounds in STEM+CS learning
 - b. Present STEM+CS contributions of experts from diverse backgrounds (e.g., ethnic, gender, socioeconomic status, age, physical abilities, religious beliefs, political beliefs)

Equity and Inclusion Guideline 7: Participation

Learning should provide multiple opportunities for students to participate in order to support comprehension.

1. Use visual aids
 - a. Uses interactive and/or simulation-based assessments and simulations as appropriate to aid comprehension
 - b. Uses different kinds of images and visual aids
2. Use meaningful activities
 - a. Learning is active, hands-on, minds-on and/or authentic
 - b. Learning urges students to reflect on things happening in the broader society as well as how it ties into their everyday lives
3. Use meaningful materials and tools
 - a. Materials include diverse experiences, perspectives, and contain real-world connections that connect to students' backgrounds
 - b. Tools that support and connect deeper learning and mirror tools used by members of the STEM+CS community
4. Provide collaboration opportunities
 - a. Include interactions (small group, think-pair-share) among students, teachers, family, and community to leverage as resources for perspectives, information, negotiate meaning, feedback, and efficiency
5. Use discourse activities
 - a. Include opportunities for students to talk, discuss, and write (e.g., interactive journals, small group) to promote learning and participating in STEM+CS, using informal language, students' native language, and other communication styles



Design Principle 3: Providing Appropriate Language Supports

Equity and Inclusion Guideline 8: Clarity of Prompts and Questions

Instructional activities should clearly elicit the intended response and avoid superfluous information.

1. Use clear and direct prompts
2. Make sure the prompt targets focal knowledge, skills, and abilities

Equity and Inclusion Guideline 9: Language Complexity

Instructional activities should be accessible to students with diverse levels of English reading ability.

1. Designers should connect vocabulary in context for moving from everyday language to STEM+CS language
 - a. Provide grade-appropriate vocabulary words, sentence structure, and reading level
 - b. Highlight and embed supports for STEM+CS specific vocabulary
 - c. Identify general academic vocabulary that is used in other disciplines and clarify if meaning and skills are different and similar across multiple disciplines
 - d. Identify and clarify everyday words (e.g., vocabulary such as force, energy, work; phrases such as “Why did that happen?”) to the STEM+CS -specific meanings
 - e. For ELLs, identify cognates in their home language (e.g., English science words solar/lunar is everyday Spanish sol/luna)
2. Designers should demonstrate and include multiple modes of representations (e.g., mathematical representations, pictures, models, tables) to communicate STEM+CS ideas
 - a. Highlight and present how STEM+CS information can be represented in other modes (e.g., mathematical representations, models)
 - b. Uses representations to help support vocabulary
3. Designers should attend to and build STEM+CS discourse skills.
 - a. Use everyday language to teach concepts
 - b. Use appropriate gradual linguistic scaffolding
 - c. Highlight precision and attention to detail of logic connecting cause and effect and validity of claims
 - d. Use multiple explanation strategies of the same concept (e.g., paraphrasing, repeating)
 - e. In developing STEM+CS text, attend to the “voice” used, sentence length, and technical vocabulary



Equity and Inclusion Guideline 10: Student Comprehension

Construct meaning and generate new understanding of information by connecting students' prior knowledge and experiences. Also, make sure that the instructional activities are consistent and relevant throughout all the activities.

1. Designers should support prior and/or additional knowledge, skills and/or abilities needed for learning or task
 - a. Scaffold information in the task scenario
2. Designers should bridge students' background knowledge with STEM+CS learning and language
 - a. Use terms in a consistent manner throughout activities
 - b. Use visual aids/graphic organizers with guided instruction
3. Designers should make the language used accessible to students with limited English and reading ability
 - a. Use vocabulary words, sentence structure, and reading level that are grade-level appropriate
 - b. Use other modes of representations (e.g., simulations, visuals) to express or connect concepts/ideas

Equity and Inclusion Guideline 11: Student Response/ Expression of “Knowledge-in-Use”

Provide multiple modes of expression by providing tools and alternative modes for students to communicate ideas. Ensure that students use varied modes of expression during learning activities and present their learning in diverse ways.

1. Scaffold information in question prompts
2. Use different response templates and/or scaffolds to support student expression of knowledge (e.g., sentence frames)
3. Provide alternative tools to communicate (e.g., multimedia, manipulatives, drama, drawing)
4. Provide hands-on, inquiry-based activities that do not necessarily require mastery of language, foster language acquisition of academic language and communication, and provide a variety of communication formats to promote authentic communication in STEM+CS
5. Use discourse activities (e.g., interactive journals, small group) that promote learning and participation using informal language or students' native language



Abridged Equity and Inclusion Design Principles and Guidelines

Design Principle 1: Understanding the Students and Contextual Influences on Learning

Equity and Inclusion Guideline 1: Dialogue and Learning

Create structures and norms for open and productive communication and learning.

1. Provide opportunities for multiple voices, experiences, and expertise to be heard
2. Build trust among collaborators through a common language, multiple expert voices, and collaboratively determined issues, goals, outcomes, and guiding questions

Equity and Inclusion Guideline 2: Student-Centered Information

Gather information about the students in the district.

1. Achievement status of students
2. Educational opportunities provided to students within and outside of the school
3. Social-emotional supports that are required and provided to students
4. Climate and culture of the district and the local environment in which the students live that supports the engagement of multiple stakeholders

Equity and Inclusion Guideline 3: Collaborators

Determine and invite the participation of appropriate collaborators.

1. Curriculum developers
2. Teachers
3. Parents
4. Students
5. Informal learning institutions (e.g., museums)
6. Professional development providers
7. Assessment experts

Equity and Inclusion Guideline 4: Learning Standards

Determine learning standards.

1. Check for standards alignment to national and state learning requirements
2. Respond to the diversity of the district
3. Consider the history of public education and the voices, perspectives, and experiences of traditionally marginalized peoples in STEM+CS



Design Principle 2: Fostering Student Engagement with Learning

Equity and Inclusion Guideline 5: Engagement and Contextualization

Connect STEM+CS learning to student's culture, home, and community.

1. Make learning relevant to students
2. Use vivid phenomenon-based learning
3. Consider impacts on self and community

Equity and Inclusion Guideline 6: Cultural Sensitivity

Reduce bias and stereotypes for a particular gender, race, socioeconomic status, geography, cognitive and physical ability, and other social markers.

1. Avoid bias
2. Include diverse perspectives and experiences

Equity and Inclusion Guideline 7: Participation

Provide multiple opportunities for students to participate.

1. Use visual aids
2. Use meaningful activities
3. Use meaningful materials and tools
4. Provide collaboration opportunities
5. Use discourse activities

Design Principle 3: Providing Appropriate Language Supports

Equity and Inclusion Guideline 8: Clarity of Prompts and Questions

Elicit student exemplary responses and avoid superfluous information.

1. Use clear and direct prompts
2. Make sure the prompt targets focal knowledge, skills, and abilities of task

Equity and Inclusion Guideline 9: Language Complexity

Make tasks accessible to students with limited English reading ability.

1. Connect vocabulary in context so students can code-switch from everyday language to science language
2. Demonstrate and include multiple modes of representations (e.g., mathematical representations, pictures, models, and tables) to communicate STEM+CS ideas
3. Attend to and build discourse skills in STEM+CS domains



Equity and Inclusion Guideline 10: Student Comprehension

Constructing meaning by connecting students' prior knowledge and experiences.

1. Support prior and/or additional knowledge, skills and/or abilities needed for learning
2. Bridge students' background knowledge and with STEM+CS learning and language
3. Make language used accessible to students with limited English and reading ability

Equity and Inclusion Guideline 11: Student Response/ Expression of "Knowledge-in-Use"

Providing tools for students to communicate ideas in different ways.

1. Scaffold information in the question prompt
2. Use different response templates and/or scaffolds to support student expression of knowledge
3. Provide alternative tools to communicate
4. Provide hands-on, inquiry-based activities that require less mastery of language, foster language acquisition, and provide a variety of communication formats
5. Use discourse activities with informal language or students' native language



Appendix B: Equity and Inclusion Planning Guide

Designing for Diversity Equity and Inclusion Planning Guide

Using equity and inclusion design principles to inform the design of STEM+CS curriculum materials

Working together to bring meaningful science, technology, engineering, mathematics, and computer science curriculum materials to diverse student populations

The National Center
2021

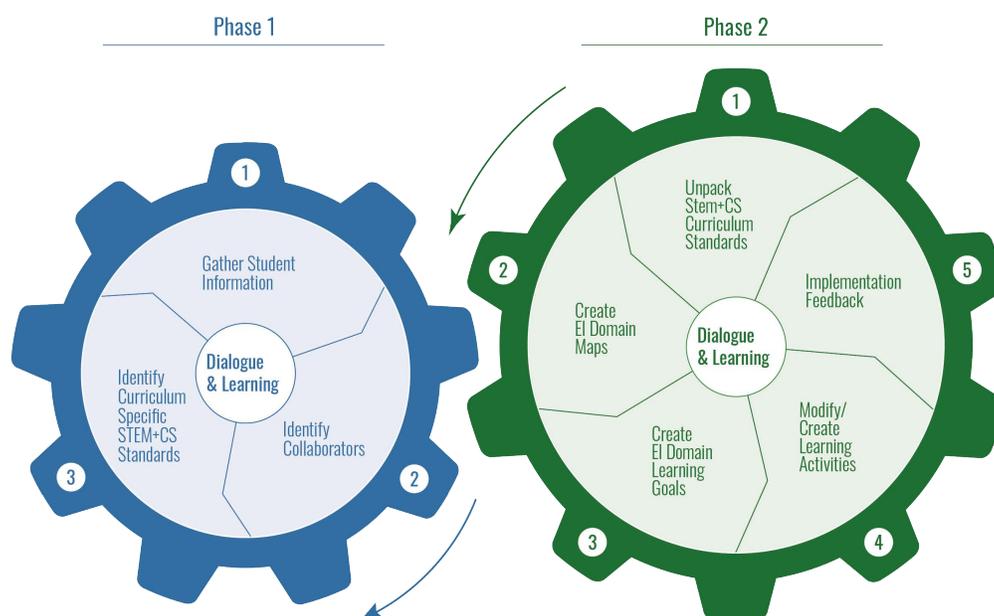


Introduction

Equitable and inclusive instructional materials in STEM+CS are essential to providing students with quality learning experiences. As the student population across the United States continues to diversify, the need to support the development of students who belong to groups with less social power, prestige, and institutionalized privilege in STEM grows.

Curriculum design that considers the diversity of the population it serves requires understanding the progress of individuals, curriculum materials, and the system in which they exist and aligning that with STEM+CS curriculum materials. The Equity and Inclusion Framework for Curriculum Design (EI-CD) approach guides educators and leaders at the state and district levels to gather information about the social context of learning as a driver for the design, development, and modification of STEM+CS curriculum materials. The EI-CD approach is grounded in three design principles for equity and inclusion: (1) Understanding Students and the Contextual Influences on Learning, (2) Fostering Student Engagement with Learning, and (3) Providing Appropriate Language Supports.

Figure B-1. Equity and Inclusion Framework for Curriculum Design (EI-CD)



The EI-CD approach is a cyclical process (see Figure B-1) requiring continuous communication, collaboration, and partnership of K–12 STEM+CS researchers, practitioners, leaders, and community stakeholders. The design process positions the social context of students’ lives as an asset to their learning. The focus is on ensuring equitable learning experiences that promote feelings of acceptance and belonging for all students, particularly those that are traditionally underrepresented and underserved in STEM+CS.



Roles

As you work through this *Equity and Inclusion Planning Guide*, allow ample time to explore and analyze the context of your state and its school districts.

State Education Leaders

1. Support local districts and schools in identifying relevant community partners
2. Contribute to the alignment of learning standards for STEM+CS curriculum materials
3. Identify the strengths and areas of improvements within your state
4. Determine how local districts and schools can access information on diversity, equity, and inclusion to strengthen the system
5. Determine how state education leaders will diversify supports among districts and schools
6. Provide supports to local districts and schools to promote equity and inclusion in
 - a. Curriculum materials that are adopted
 - b. Curriculum materials that are locally developed
 - c. The process of modifying existing curriculum materials
7. Create a plan to review progress made in districts and schools in equity and inclusion integration and implementation
 - a. Collect information from districts and schools and provide feedback about equity and inclusion integration and implementation
 - b. Create and maintain lines of communication and build partnerships
 - c. Support districts and schools that are struggling in STEM+CS disciplines and who demonstrate achievement gaps among student demographic groups
8. Determine how to balance support and accountability

Local Education Leaders

1. Identify stakeholders who know and care about the local communities in which the students live and learn
2. Identify the strengths and areas of improvements within your district and school
 - a. Determine how the district and school can access information on diversity, equity, and inclusion to state education leaders



3. Provide supports to districts and schools to promote equity and inclusion in
 - a. Curriculum materials that are adopted and modified
 - b. Curriculum materials that are locally developed
4. Create a plan to review and report on students of various demographics (e.g., gender, physical and cognitive ability, race, language proficiency)
5. Support teachers and students who are struggling in STEM+CS discipline
 - a. Collect information from teachers and students about equity and inclusion implementation and achievement
 - b. Determine how to balance support and accountability
 - c. Include community partners and various stakeholders
6. Implement professional development to help teachers integrate instructional practices that are equitable and inclusive

The table below shows how the components of the EI-CD approach align with the EI Design Principles and EI Guidelines. Note that Phase 2 of the EI-CD approach can use a combination of EI guidelines to create the most appropriate learning experiences for the students.

EI-CD approach component	EI-CD approach phase	EI design principles	EI guidelines
Dialogue and learning	All phases	All EI design principles	All EI guidelines
1. Gather student information	Phase 1	Student Information	1. Dialogue and Learning 2. Student: Centered Information Learning 3. Student: Collaborators 4. Student: Learning Standards
2. Identify collaborators			
3. Identify Curriculum Specific STEM+CS Standards			
1. Unpacking the Standards	Phase 2	There are no specific EI design principles for this component.	There are no specific EI design guidelines for this component.
2. Creating Domain Maps		Engagement Language Supports	Each of the following EI guidelines may be considered for each component of Phase2: Engagement 5. Cultural Sensitivity 6. Engagement and Contextualization 7. Participation Language Supports 8. Clarity of Prompts and Questions 9. Language Complexity 10. Student Comprehension 11. Student Response/Expression of “Knowledge-in-Use”
3. Creating Learning Goals			
4. Aligning and Modifying Learning Activities to EI Design Principles			
5. Implementation and Continuous Feedback			



Guiding Questions for the Equity and Inclusion Framework for Curriculum Design Process

Phase 1: Exploring the Educational Landscape and Indicators of Equity

Phase 1 of the Equity and Inclusion Framework for Curriculum Development (EI-CD) approach attends to Design Principle 1: *Understanding Students and the Contextual Influences on Learning*. This is a process of learning, discussing, and brainstorming how to apply contextual information about students and their living and learning environments into concrete actions—designing, developing, and modifying curriculum materials in STEM+CS. Suggested guiding questions are below. Please supplement the questions with your own for maximum utility in your district and school.

Dialogue and Learning

Establish establishing structures and practices for dialogue and learning for all parts of the EI-CD process.

1. Are teachers in the same school working together to modify STEM+CS curriculum materials for student needs?
2. What are norms that we can establish for effective and strategic communication? For example, equal speaking time for various participants, document sharing, etc.
3. How can teachers be prepared to use student information to inform their teaching practices?
4. Are there assumptions about communication that need to be addressed?
5. How are conflicts and disagreements addressed?
6. Is there a space for different communications styles?

Gather Student Information

Gather information about the achievement status, educational opportunities, social-emotional supports, and climate and culture of the district and the local environment in which the students live.

1. What visions and missions do you have for your district or school?
2. How are your school's goals related to the district goals and the goals for continuous academic improvement?
3. What have you done this year to stay current on research related to student achievement?



4. What would be helpful to know about your student population in relation to:
 - a. Student achievement
 - b. Social-emotional learning needs and supports
 - c. Out-of-school-time resources that can contribute to student learning
5. What kinds of attitudes and behaviors do you want students to exhibit?
6. What do you do to nurture a climate of trust and continuous improvement in your district and school?
7. How can you improve your district's and school's data management? Is there an easy way for teachers to access student data?
8. How have you used local and state data to inform your decision-making and goal setting?
9. How are you helping your teachers to be experts in their curriculum? What kinds of professional learning opportunities are teachers provided?
10. What safety nets do you have in place to support teachers/students/schools?

Identify Collaborators

List potential collaborators including curriculum material developers, states, districts, teachers, the professional learning community, parents, teachers, students, formal and informal communities, and the assessment community.

1. List organizations, institutions, individuals, etc., that are representative of the diversity in your district. How can they serve as community partners?
2. Identify organizations, institutions, and individuals in your district that you can partner with to collect contextual information about the district or schools.
 - a. What types of information do you need?
 - b. What knowledge, skills, and expertise can partners bring?
 - c. How can you work together to remain well informed about district and school contexts?

Aligning Standards for STEM+CS Curriculum Materials

Identify standards to guide subsequent modifications of adopted or existing curriculum materials.

1. What are the goals of the adopted curriculum?
2. What standards were chosen for this curriculum?
3. Do these standards align with the state standards?
4. Do these standards support success among students in STEM+CS courses?



5. Do these standards support students' success in their professional future?
6. Are there standards missing from this curriculum? What are they?



Guiding Questions for the Equity and Inclusion Framework for Curriculum Design Process

Phase 2: Exploring STEM+CS Curriculum Design Materials

Unpacking Standards

Using the selected curriculum materials, determine the learning standards that have been determined for your specific grade band. If your curriculum materials do not show the standards that they are aligned to, use the Next Generation Science Standards, the Common Core State Standards, or the K–12 Computer Science Standards to determine curricular alignment.

Unpacking Step	Details	Notes
<p>Standards aligned to the curriculum</p> <p>Essential components of standards</p> <p>Essential skills students should be able to do</p> <p>Potential student challenges</p> <p>Prerequisite student knowledge</p> <p>Boundaries for instruction and learning</p>		



Guiding Questions for Design Principles: Engagement with Learning and Providing Appropriate Language Support

Use Design Principles *Fostering Student Engagement with Learning* and *Providing Appropriate Language Supports* to help you determine the most appropriate equity and inclusion features for the remaining sections. This will help you integrate appropriate equity and inclusion features into curriculum activities.

Fostering Student Engagement with Learning

Equity and Inclusion Guideline 5: Engagement and Contextualization

Connect STEM+CS learning to students' culture, home, and community.

Make STEM+CS learning relevant to students

1. How can cultural and background knowledge, skills, and experiences outside of school be leveraged to connect to STEM+CS?
2. How can school culture, students' home communities, and real-world contexts be used to enhance what students learn in the classroom?
3. What ideas, understandings, and perspectives do students have that are particular to your state or district?
4. How can learning build on prior knowledge, the use of relevant phenomena, and representations?

Connect to how science, engineering, and computer science impact students and their communities

1. What are ways that students can understand how society, the environment, and nature are impacted by STEM+CS?
2. Identify some examples of the ethical and safety implications of human solutions to problems and questions in STEM+CS that are particular to your state.

Equity and Inclusion Guideline 6: Cultural Sensitivity

Reduce bias and stereotypes for gender, race, socioeconomic status, cognitive and physical abilities, geography, and other social markers.

1. Identify how the identified social markers are represented in your state.
2. What are positive and unique contributions to STEM+CS by the identified social markers represented in your state?
3. What are views and experiences from the identified social markers represented in your state?



Equity and Inclusion Guideline 7: Participation

Provide multiple opportunities for students to participate.

1. What kinds of visual aids could you incorporate to help students understand what they are learning? (e.g., interactive and/or simulations)
2. How can you make the learning activities meaningful to students in your district? (e.g., active, hands-on, minds-on, authentic)
3. How can you connect what students are learning to what is happening in the broader society?
4. How can you include diverse experiences and perspectives from the real-world?
5. How can you make sure that students have opportunities to collaborate with each other and with community members?
6. What kinds of learning experiences will allow students opportunities to talk, discuss, and write about what they are learning?

Providing Appropriate Language Supports

Equity and Inclusion Guideline 8: Clarity of Prompts and Questions

Elicit student exemplary responses and avoid superfluous information.

1. Are the directions clear and direct?
2. Are students set up to be successful?
3. Do the questions in learning activities target the essential components of the standards?

Equity and Inclusion Guideline 9: Language Complexity

Make tasks accessible to students with limited English reading ability.

1. What are the diverse languages that are represented in your district?
2. How can students be supported to use languages and ways of speaking that are familiar to them as an entry point for domain-specific discourse?
3. What are resources in your district that students who speak multiple languages can access?

Equity and Inclusion Guideline 10: Student Comprehension

Construct meaning by connecting students' prior knowledge and experiences.

1. What kinds of supports can be included that will help elicit student prior knowledge (e.g., graphic organizers like KWL charts, anticipatory guides, etc.)?
2. What kinds of supports can help student bridge language that is familiar to them with domain-specific language (e.g., graphic organizers like KWL charts, Venn diagrams, concept of definition cards, etc.)? with guided instruction
3. Are the text and language grade-level appropriate?



Equity and Inclusion Guideline 11: Student Response/Expression of “Knowledge-in-Use”

Provide tools for students to communicate ideas in different ways.

1. What kinds of scaffolds can help students express themselves clearly (e.g., sentence frames, organizer templates)?
2. What kinds of alternative tools for communication can be provided for students (e.g., multimedia, manipulatives, drama, drawings)?
3. What kinds of hands-on, inquiry-based activities that do not necessarily require mastery of domain-specific language can be used to support students who struggle to communicate?
4. What kinds of learning experiences will allow students opportunities to talk, discuss, and write about what they are learning?



Create Domain Maps

Use the table below to organize the essential components and skills of the standards. Then include which equitable and inclusive supports can be added. Next, shade in the areas that will create different EI Learning Goals, making sure to include a domain-specific practice, crosscutting concept (if applicable), and different EI Design Principle for each column. Add more rows if necessary.

1. What are the essential components of the standards?
2. What are the equity and inclusion components?
3. How do the equity and inclusion components align with the *Student Information* gathered in Phase 1?
4. How do equity and inclusion components promote appropriate and relevant academic and social student behaviors?

Standard		Disciplinary Core Idea		
		Fill in the essential components of the disciplinary core idea	Fill in the essential components of the disciplinary core idea	Fill in the essential components of the disciplinary core idea
Domain-specific practice	Fill in the essential components of the domain-specific practice			
Crosscutting concepts	If applicable, fill in the essential components of the crosscutting concept			
Equity and inclusion design principle: Engagement	Fill in the essential components of the EI Design Principle: Engagement			
Equity and inclusion design principle: Language Supports	Fill in the essential components of the EI Design Principle: Language Supports			
Resulting EI Learning Goals				

*Note: If you are not using NGSS standards, omit rows "Domain-specific practice" and "Crosscutting concepts".



Articulate Equity and Inclusion Learning Goals

Using the domain maps that you created in the previous section, list the learning goals that emerge in the bottom row.

1. Have you attended to the equity and inclusion guidelines in your EI Learning Goals?
2. Are there any missing EI Learning Goals in your curriculum?
3. Do the existing EI Learning Goals include equity and inclusion features that align to the Equity and Inclusion design principles?
4. Do the EI Learning Goals that emerged from the domain map properly include equity and inclusion design features?
5. Do the equity and inclusion components adequately provide learning experiences for different kinds of diversity (e.g., language, socioeconomic status, ethnic, cultural, etc.)?

Align and Modify Learning Activities to Equity and Inclusion Design Principles

Using the learning goals that emerged from the domain map, answer the following questions:

1. Do you need to create new curriculum materials/lessons/activities? If so, why and what kind?
2. Do you need to make modifications to existing curriculum materials/lessons/activities? If so, why what kind?
3. Do you need to supplement the existing curriculum with additional materials/lessons/activities?
 - a. Why do you need to supplement current materials?
 - b. Where will you locate them?
4. Do the new, modified, or added curriculum materials sufficiently include equity and inclusion design components (refer to the Equity and Inclusion Design Principles and guidelines on pages 9–10)?
 - a. Which design principles are you addressing?
 - b. Which guidelines will help you tailor the curriculum materials to your students' needs?



Implementation and Continuous Feedback

Answer the following questions to encourage continuous improvement of curricular design and development that meets the needs of diverse student populations.

1. Have you identified the learning standards for STEM+CS curriculum materials that are relevant to students in your district?
2. How have the strengths and needs changed in your state or district? How are you responding to those changes?
3. In what way has the EI-CD approach been implemented in your districts?
4. How have your students benefited from the EI-CD approach?
5. How have the teachers changed their instructional decisions, attitudes, and awareness to promote the EI-CD approach in their classrooms?
6. What is the plan to review district and school progress in equity and inclusion integration and implementation? How will you help them when information on progress is gathered?
7. Are you getting sufficient support to promote equity and inclusion in your state or local district?
8. How are students responding to the curriculum?
 - a. Are they engaged?
 - b. Are they excited to learn?
 - c. Do students apply what they learn to real-world situations?
 - d. Do students feel safe and valued in the class as they learn through the curriculum?
 - e. Are students actively participating in conversations related to STEM+CS concepts?
 - f. Are students fostering critical thinking and knowledge transferring?
 - g. Are students becoming interested in learning more about the concepts?
9. How and what are you communicating with and sharing at the state education department level and with community partners?



Guiding Questions for the Equity and Inclusion Framework for Curriculum Design Process

Wrapping Up

1. Summarize the goals of the meeting
2. Review the main challenges and solutions
3. Create a *Plan of Action* document to be shared with the team
4. Review strategies for continued communication

