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LGBTQ-Inclusive Education

Strategies for Research and
Practice in Science and STEM

Agenda

12:00pm - 1:30pm EST

This Webinar is being recorded

1. Meet & Greet
2. Reflection #1
3. Teacher Preparation
4. Inclusive Curriculum
5. Student Success
6. Inclusive Research
7. Reflection #2
8. Wrap Up

Meet & Greet



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In Solidarity

In the last few years U.S. states have advanced a record number of bills that attack LGBTQ+ rights, especially transgender youth. **Nearly half of the 321 bills filed in 2023 have been focused on schools and education (ACLU, 2023).**

Worldwide, hate crimes are against the LGBTQ+ community are increasing, particularly against transgender and gender-nonconforming people, and especially for transgender women and people of color.

In Solidarity

As educators and researchers, we stand in solidarity against acts of physical, social, and political violence against the LGBTQ+ community. We are dedicated to creating safe spaces and celebrating the diversity and pride of LGBTQ+ people in science and STEM education.

Join our Padlet!



<https://go.ncsu.edu/lgbtqedu>

NSTA Call for Gender Equity Reform



“... Science educators must recognize and respect diversity within gender and sexuality to include LGBTQ students, and become sensitized to the ways in which language, curricular materials, and pedagogical choices can impact, both positively and negatively, students’ feelings of belonging and competence in science classes and careers” (NSTA, 2019, para. 3).

Teacher Preparation

Background

- Gender & Sexual Diversity (GSD) rarely addressed in teacher education programs (e.g., Gorski et al., 2013; Macgillivray & Jennings, 2008; Sherwin & Jennings, 2006)
- Explicit focus on pre-service teachers' attitudes and beliefs about sexual orientation (e.g., Athanases & Larrabee, 2003; Kitchen & Bellini, 2012; Riggs et al., 2011)
- Gap in literature on PSSTs and GSD in science teacher education programs (e.g., Airton & Koecher, 2019; Szalacha, 2004)

Background

Table 2.2 Positive Representations of LGBTQ+-Related Topics Taught in Class

Classes	% of LGBTQ+ Students Taught Positive Rep of LGBTQ+-Related Topics (n = 3580)	% of All LGBTQ+ Students Who Answered the Question (n = 21922)
History or Social Studies	62.3%	9.9%
English	39.2%	6.2%
Health	20.6%	3.3%
Art	16.2%	2.6%
Music	13.8%	2.2%
Science	12.4%	2.0%
Social Science	11.4%	1.9%
Foreign Language	8.4%	1.3%
Gym or Physical Education	5.6%	0.9%
Math	5.1%	0.8%
Other Class (e.g., Multicultural/Ethnic Studies, Advisory, Electives)	7.6%	1.2%

- GSD-inclusive curriculum leads to:
 - Feeling less unsafe
 - Improved academic performance
 - Greater sense of school belonging and well-being
 - Enhanced empathy/acceptance

Drew said, “I think that **those** students specifically, often have a **tougher time** and need **more support** from **understanding adults**.”

Intervention Description

Week 1

National Center for Case Study Teaching in Science: Generating evidence-based arguments to explain origins of gender and sexual diversity

Week 2

Socratic Seminar: Origins of gender and sexual diversity

Week 3

HHMI Bio-interactive Module: Sex Verification Testing of Athletes

Week 4

Interactive Direct Instruction: Supporting LGBTQ Students in STEM

Week 5

Modified edTPA Thinking Organizer: Knowledge of Student Assets

Aria said, “I’d like to make it so that all of my units are like that - based around something like the **sex testing of athletes**.”

Drew said, “for the Punnett squares, **gender-neutral designations** should be used for the parents (i.e., parent 1 instead of father).”

Science Teacher Education Programs should:

1. Provide coursework & field experiences that focus on LGBTQ identities
2. Develop PD beyond bullying/safety
3. Integrate accurate knowledge of intersex, hormones, & LGBTQ scientists
4. Embrace emotional discomfort and group dialogue around GSD language
5. Anchor GSD w/ Ambitious Science Teaching framework

Impactful Design Elements

Group Dialogue

“I like the fact that we had a lot of discussion in groups and in whole-class settings”
(Drew)

Coherence to *Ambitious Science Teaching*

“You gave a great example of what [AST] looks like and what multicultural education looks like”
(Aria)

GSD Terminology

“I feel that is a great way to start is just understanding the difference between these different vocab words and same goes for like students”
(Maddox)

Knowledge of Intersex, Hormones, & LGBTQ Scientists

“Learning about the different spectrum that people can be born on of intersex”
(Erin)

Relevant Case Studies

“I thought the case studies were good to make it more concrete than just the vague generalization”
(Drew)

Framework for GSD-Inclusive STEM Education

Science
Education



RESEARCH ARTICLE | [Open Access](#) | 

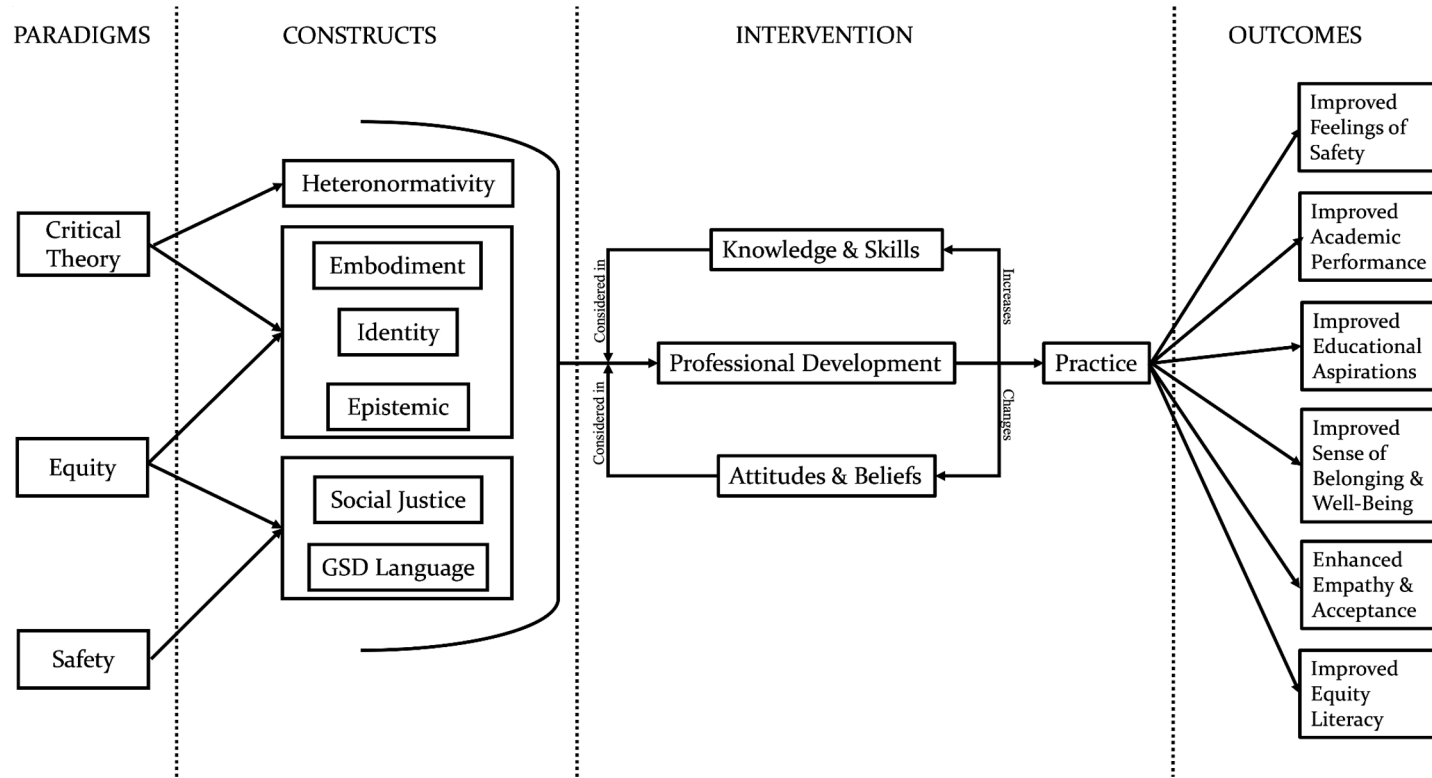
Generating a framework for gender and sexual diversity-inclusive STEM education

Gary William Wright  Cesar Delgado

First published: 05 February 2023 | <https://doi.org/10.1002/sce.21786>

- Systematic literature review (Gough et al., 2017) of 81 publications
- Inductive thematic synthesis (Thomas & Harden, 2008) and epistemic network analysis (Kubsch et al., 2019)
- Theoretical framework: 3 paradigms of GSD-inclusive education - safety, equity, and critical theory (Gorski et al., 2013; Szalacha, 2004)

Framework for GSD-Inclusive STEM Education



The Gendered and Heterosexist Evolution of the Teacher Exemplar in the United States: Equity Implications for LGBTQ and Gender Nonconforming Teachers

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ABSTRACT: Challenges confront lesbian, gay, bisexual, queer, and transgender public school teachers or those who are perceived as such or who desire to be open about their sexual orientations or gender identities or expression. Teachers who do not conform to gender and sexual orientation norms currently are and historically have been the subject of persecution, urban myths, and general hysteria—part of bigger efforts to normalize heterosexuality and cisgender-ness through the development of a distinctive “exemplar” related to who teachers should be. We examine the related historical and legal context of gender and sexuality in schools and then offer suggestions regarding how to redress the lingering impacts of gender- and heteronormativity.

KEYWORDS: teachers, gender, sexual orientation, heterosexism, LGBT

- Most LGBTQ and GNC teachers working in “apartheid of the closet” (p. 25)
- Challenges:
 - Religious fundamentalism
 - Policy change does little if individual and institutional cultures stay static
 - TEPs omit gender identity, sexual orientation, and institutional oppression

Curriculum

How Science Education Upholds LGBTQ+ Oppression

Bioessentialism: The belief that 'human nature', an individual's personality, or some specific quality is an innate and natural 'essence'.

Cisnormativity: the assumption that all, or almost all, individuals are cisgender.

Cissexism/Cisgenderism: The belief that there are, and should be, only two genders and that one's gender or most aspects of it, are inevitably tied to assigned sex at birth.

The Gender Binary: Gender is only male/female, is determined at birth, and fits traditional expectations of gender roles and expressions.

Heteronormativity/Heterosexism: the assumption that heterosexual identity is the norm and that all people should be heterosexual.

Normativity: Designating some actions or outcomes as good, desirable, or permissible, and others as bad, undesirable, or impermissible.

What Science Actually Says:

There is no scientific evidence that biology predetermines things like intelligence, creativity, sexuality, masculinity/femininity, behavior.

Diversity across sex and sexuality are normal and natural across animal species, including humans.

Gender is both self-defined and society-defined. Gender is not binary.

Sex is not binary, nor is it simply defined or uniformly enacted.

Sex is a composite of many biological attributes including genitalia, gonads, hormone levels, hormone receptors, chromosomes, and genes. Many of these variables can change in humans and other animals via natural and artificial processes.

Literature Review

Big Picture

Lack of consensus on what is an LGBTQ-inclusive science curriculum.

Who "Counts"

Trans perspectives underexplored in curriculum & teacher education studies.

Out of Frame

Lack of nuance may be due to narrow conceptual and theoretical framing.

Trans Teachers

Limited studies on K-12 trans teachers. Most focus on experiences not pedagogy.

Trans-Informed Science Education

<i>Name</i>	<i>Gender Descriptors</i>	<i>Pronouns</i>	<i>Race / Ethnicity</i>	<i>Years Teaching</i>	<i>Grades Teaching</i>	<i>Teaching Discipline</i>	<i>School Information</i>	<i>School Locality</i>	<i>Geographic Region</i>	<i>Other Identities</i>
Harper	Femme genderqueer person	She/they	White	11-15	9-12	AP Bio, Earth/Space Science	Public School	Suburban	East North Central	Queer, first-gen college student, disabled
Jenna	Woman, trans woman, trans feminine, nonbinary, trans, transgender, transsexual	She/they	White	11-15	6, 8, 11	Biology, Chemistry, Earth and Environmental Science	Religious Private School	Urban	Middle Atlantic	Queer, lesbian, disabled
Ken	Trans masculine, trans guy	He/him	White	1-2	8	Biology, Anatomy	Public Charter School	Urban	East North Central	Working class, gay, disabled, first-gen college student
Kylie	Trans woman	She/her	White	6-10	7-8	Life science, Earth science, Physical sciences	Public School	Suburban	South Atlantic	Queer, working/middle class, bi-pan, lesbian
Liam	Trans man	He/him	Asian American	6-10	7-12	Biology, Anatomy	Public School	Urban	Mountain	First-gen Chinese-American-Canadian
Martin	Trans guy	He/him	White	16-20	9-12	Biology, Environmental Science, Anatomy	Public School	Urban	Middle Atlantic	Queer, gay, disabled
Parker	Trans, nonbinary	They/them	White	6-10	6-7	General Science, STEAM	Secular Private School	Suburban	Middle Atlantic	Queer, asexual, religious
Sparrow	Transgender man, trans masculine	He/him	Asian American	1-2	9-10	Biology	Public Magnet School	Urban	South Atlantic	Queer, first-gen Chinese-American, liberal
Steven	Trans, nonbinary	They/them	White	3-5	9, 11	Chemistry, Physical Science	Public School	Rural	Middle Atlantic	Queer
R. J.	Nonbinary, genderqueer	They/them	White	20+ years	9-12	Chemistry, Biology, Physics, Environmental Science	Secular Private School	Urban	Middle Atlantic	Queer, Jewish, disabled

Data and Analysis


- Three serial, in-depth phenomenological interviews were conducted with each of the study participants (Seidman, 2006). Interviews focused on **pedagogy and practice**.
 - Teachers submitted materials that included positive and negative representations of LGBTQ-inclusive science education.
 - Interview transcripts, submitted instructional materials, and reflective statements were triangulated and underwent several rounds of inductive and deductive coding analysis.
-

Practice 1: Power

Engage in lessons and activities that showcased how science has been historically upheld oppression, but can also be a corrective measure for addressing inequity.

Reflect: Am I engaging in the constant practice of knowing and disrupting the ways that science education reinforces social functions of gender sex and sexuality?

Case Study Connections

 **SEX VERIFICATION
OF ATHLETES**


[Introduction](#) [Human Development](#) [Case Studies](#) [Conclusion](#)

SEX VERIFICATION OF ATHLETES

Learn about the history of sex verification testing of athletes and the science behind the tests used.

[→](#)

[About](#) [Educator Resources](#) [Help](#)

hhmi | **BioInteractive** 

Beware Resources That:

Encourage students to "argue" or "broadcast opinions" about validity or "nature" of marginalized groups.

Reinforce bioessentialist viewpoints, stereotypes, or uphold cisheterosexual norms.

Practice 2: Precision

Refuse oversimplified and bioessentialist scripts of gender, sex, and sexuality by affirming diversity and embracing accuracy and scientific precision.

Reflect: Are my materials and explanations oversimplifying content to the point of exclusion or inaccuracy? Do my lessons/curriculum/practices celebrate or stigmatize variation in sex, gender, and sexual diversity?

Gender Inclusive Language Guide

Reproduced with permission from Long, S., Steller, L., & Suh, R. (2021) Gender-inclusive biology: A framework in action—Practical strategies for teaching about gender, sex, and sexuality in biology. *The Science Teacher*, 89(1), 27–33.

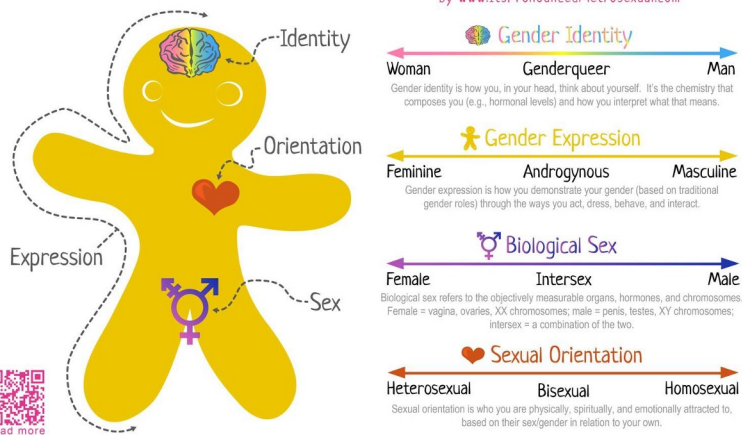
Building Continuity in Gendered Language			
Instead of...	Focus on...	Example	Why?
Men Male Women Female	the organ, functional activity, or role	<p>“Women Ovaries produce eggs.”</p> <p>“Males XY individuals are more likely to be color blind.”</p> <p>“The mother gestational parent carries the fetus for 9 months.”</p>	<p>All people, cis & trans, experience different bodies, reproduction, and families.</p> <p>Many organisms thrive in stable families where a male-female relationship is only one of many options.</p>
Male/female hormones	testosterone, estrogen, and progesterone	<p>“People with testes produce large amounts of testosterone.”</p> <p>“In an estrogen-dominant body, the bones develop like ...”</p>	Testosterone and estrogen also regulate many non-sexual processes. Both hormones exist in most people of any sex with active gonads.
Normal Natural Typical	patterns and probability	<p>“In many species, the female provides more parental investment than the male.”</p> <p>“XX and XY are the most common combinations of sex chromosomes.”</p>	<p>Living things are diverse, with no one “typical” body or behavior.</p> <p>When discussing humans, many medical & scientific statistics only use data from white, cisgender, European populations.</p>

Beware Resources That:

Substitute “scripts” about sex, gender, and sexuality.

The Genderbread Person

by www.ItsPronouncedMetrosexual.com



Teaching the accurate science will always be the best bet.

Practice 3: Provenance

When selecting LGBTQ-inclusive teaching materials, assess the provenance and credibility of the resource. This is critically important given that many resources may appear to be properly researched, reviewed, and verified.

Reflect: Was this resource created by someone with the content knowledge and experience to speak on these topics? Does the resource reinforce or reject hegemonic scripts about gender and sexual diversity?

Student Success

What do we know about college students with MloSG in STEM?

- **Gender and sexuality-based oppressions** are a persistent reality on campuses (Bilimoria & Stewart, 2009; Bilodeau, 2009; Gortmaker, & Brown, 2006; Hurtado & Guillermo-Wann 2013, Nicolazzo, 2016)
-

- STEM learning environments have **consistently proven inhospitable to students with minoritized identities**—most notably, for women, people of color, and people with disabilities (e.g., Gottfried et al., 2016; O’Brien et al., 2015; Stout et al., 2016)

- Contrast drawn between the experiences of (cis) men and women in STEM fields—predicated on cis-heteronormativity—runs the risk of **ignoring the experiences of people with minoritized identities of sexuality and gender** (MloSG), namely, LGBTQIA+ people

Methods

- **Constructivist grounded theory, interview-based study**
(Charmaz, 2014)

- **3 public, 1 private institution; 3 in Northeast, 1 Southeast**

- **56 semi-structured, audio-recorded individual interviews**

- **Based on data analysis, we created an emergent theoretical model, and numerous more targeted papers to share powerful student stories**

56 student participants

51 undergraduates, 5 graduate students recruited using both MloSG & LGBTQIA+ terminology

Gender identities

- man (24)
- woman (18)
- cisgender (14)
- transgender (7)
- genderqueer (6)
- non-binary (5)
- female (4)
- male (2)
- agender (1)

Sexual identities

- gay (22)
- bisexual (18)
- pansexual (11)
- lesbian (7)
- asexual (4)
- queer (4)
- questioning (3)
- gray-asexual (2)
- dyke (1)
- gynophile (1)
- homoromantic (1)
- panromantic (1)
- straight (1)
- woman-loving-woman (1)

Racial/ethnic identities

- Black (4)
- Latinx (4)
- Asian American (2)
- Arab/North African (1)
- Bi/Multiracial (2)
- Native American (2)
- South Asian (1)
- white (45)

Majors

- engineering (29)
- computer science (9)
- biology (5)
- food science and nutrition (4)
- environmental science (2)
- marine science (2)
- neuroscience (2)
- kinesiology (1)
- mathematics (1)
- natural resources (1)

Selected Findings & Implications

● MloSG Students in STEM make meaning of their experiences in the context of past & future, and broader systems of power, privilege, & oppression → **Increase visibility, inclusion, & equity for MloSG people and topics in curriculum and campus programming**

● The postsecondary context is made up of their academic & professional environments, sociocultural environment, and everyday microclimates → **Explicit recruitment, retention, & climate initiatives to increase inclusion**

Selected Findings & Implications

- STEM climates have pervasive “dude” or “bro” cultures that emphasize heterosexuality, hyper masculinity, and anti-LGBTQIA+ discourses → **Recognize, Disrupt, & Dismantle “bro” culture (students, faculty, staff)**

- Participation in clubs & organizations fraught because of time commitments, potential hostility, & a lack of opportunities on campus→ **Student orgs should be flexible, safe spaces that work around curriculum and support intersectional identities**

In Research

Conducting Research Together

Though we know the science education community has the best intentions, it is important to conduct research **WITH** the LGBTQ+ community and not **ON** the LGBTQ+ community.

Remember, LGBTQ+ people are not a monolithic group. Be intentional about the focus of your work and who is speaking for whom.

We are all learning together!

Building Relationships

Working with LGBTQ+ communities means being an ally to those communities.

- Follow LGBTQ+ educators/scholars on Twitter
 - Listen and Learn
 - Do your homework to gain knowledge of LGBTQ+ issues and perspectives
-

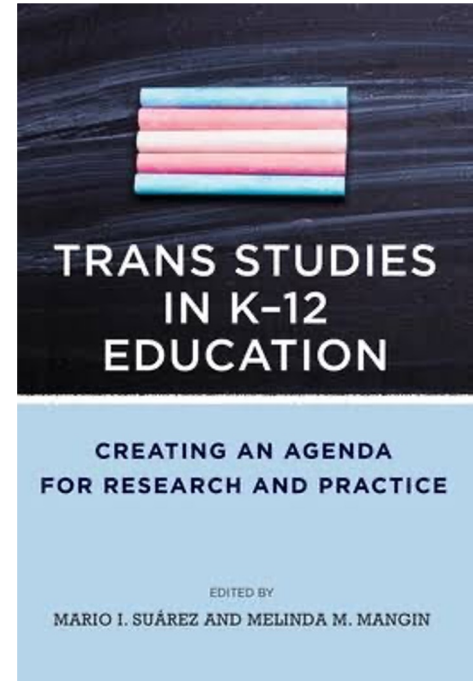
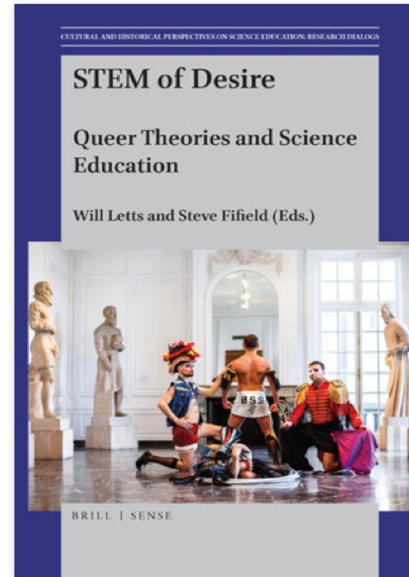
Trans Epistemologies

Trans perspectives are significantly limited across science education research.

- Build trust with trans participants and researchers.
 - Cite and amplify trans scholars and teachers. Experts exist!
-

Theoretical Frameworks for Queer/Trans-ing STEM Education

- Queer Theory (Letts & Fifield, 2019)
- Critical Trans Theory (Kean, 2021)
 - Gender is a multidimensional system
 - Genderism interacts with other systems of oppression
 - Epistemic injustice and the importance of Trans experiential knowledge



Doing Difficult Work



Dr. Ren Rende

@ResearcherRende · [Follow](#)



Given everything that is going on right now I wanted to compose a thread about extending and receiving care while engaging in qualitative data collection during times of crisis, or when dealing with potentially difficult or uncomfortable topics.
1/16

12:16 PM · Feb 25, 2022



[Read the full conversation on Twitter](#)



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Revisit our Padlet!



<https://go.ncsu.edu/lgbtqedu>

THANK YOU!

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Watch your email for a link to the video, presentation, and resource guide.