



Science in the Classroom: A Guide for Educators to Navigate Sex and Gender Education Materials

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Abstract

This paper introduces a comprehensive guide designed to assist educators in discerning high-quality, scientifically accurate teaching materials for sex and gender education. In response to the challenge of navigating a wide array of educational content, the guide establishes clear criteria grounded in good scientific practice, enabling educators to effectively evaluate and select appropriate resources. The focus of the guide is two-fold: firstly, it outlines key characteristics of scientifically robust teaching materials, including accuracy, inclusivity, age-appropriateness, and alignment with current scientific understanding. Secondly, the paper identifies common pitfalls and erroneous concepts often present in substandard materials, providing educators with practical tools to recognize and avoid these flaws. By delineating these criteria and common errors, the guide aims to empower educational professionals to make informed choices in their instructional materials, ensuring that students receive factually correct, comprehensive, and respectful education in the areas of sex and gender.

Keywords: Sex Education, Gender Studies; Educational Quality; Scientific Accuracy; Pedagogical Resources

Introduction

The involvement of non-governmental organizations (NGOs) in academic programs has grown significantly in many Western countries (Krimmer, 2019). Over the past few decades, NGOs from the third sector and civil society have reshaped education, becoming key partners in achieving governmental education goals and participating in the school curriculum (Mercan & Selçuk, 2023; Salamon & Sokolowski, 2018, p. 72). Collaborative partnerships between institutions, NGOs, private organizations, associations, publishers, informal science organizations, and businesses have been promoted to ensure good scientific practice. Educational offerings from the third sector, including those from NGOs and museums, have been emphasized and expanded to address gaps many teachers face, particularly in delivering current scientific knowledge (Kolleck, 2019; Stocklmayer, Rennie, & Gilbert, 2010). Given that textbooks are often not up-to-date with the latest scientific discoveries, it is crucial for teachers to obtain curriculum materials from these diverse sources. In the digital era, this includes utilizing internet sharing platforms, social media, and educational material print, brochures, and books facilitated by third parties and organizations (Laurillard, 2013; Greifenberg, 2020).

Discussing sex and gender, particularly within the context of sex education, remains one of the most controversial and politicized aspects of the school curriculum (Berheide & Segal, 1985). In the field of educational sociology, there is a growing movement to transition from a traditional curriculum that primarily focuses on imparting established knowledge to one that actively addresses societal needs, tackles injustices, and aims to shape society in a specific direction. Consequently, there is increasing advocacy for more comprehensive teaching about sex and gender (Young, 2008). In most countries, sex and gender education remains a politically charged issue because it is organized and funded by the state (Rubenstein, 2017). This politicization influences how educational systems incorporate concepts of gender and sex into the curriculum. Some countries have made mandatory provisions to ensure these aspects are included in the curriculum, while others have imposed political directives explicitly prohibiting the discussion of sex and gender in education under threat of penalties. For example, in some states in the USA and in Poland, teachers face legal challenges and potential penalties for addressing sex and gender topics in the classroom (New America, 2021). In 2023, the Polish parliament considered banning organizations that promote the sexualization of children in schools and preschools, with severe penalties for principals who allow such activities (Human Rights Watch, 2023). In 2020, England mandated sex education for secondary school students starting at age 11. This curriculum covers topics such as sexual orientation and other legally protected characteristics for students aged 11-18. However, beginning in June 2024, new draft guidelines from the Department for Education will prohibit the teaching of the "contested theory of gender identity" at any educational level (Department for Education, 2024).



Although there have long been tensions surrounding sex education—where teachers' backgrounds, training, and knowledge levels vary significantly—the topics of sex and gender present new challenges for educators (Berheide & Segal, 1985). Teachers often find themselves at the center of conflicts involving students, parents, and colleagues, despite frequently having limited knowledge themselves about the concepts of sex and gender because these subjects were not part of their own education and often take considerable time to be integrated into textbooks and classroom instruction. Adding to these challenges is the rapid pace of digital innovation, which has often placed education and teachers in a reactive position. Meanwhile, students have unprecedented access to a vast array of information online, which they can readily share, particularly through social media (Measor, 2004). This abundance of information necessitates that teachers play a crucial role in helping students contextualize and distinguish between reliable, accurate content and misleading material (Bode & Heßling, 2015; Van de Bongardt et al., 2013). Therefore, teachers increasingly depend on third-party curriculum materials, which they receive from various external sources. Numerous NGOs, as well as associations and brands, produce teaching materials on these topics or offer partnerships with schools to teach these concepts. This situation requires teachers to analyze, modify, and implement the provided curriculum materials to ensure they meet educational standards and select tools and materials, specific projects, or lessons that accommodate their students' needs. (National Science Foundation, 1996)

Since teachers' science education backgrounds vary significantly across countries and are often not research-based, they frequently lack the necessary resources to analyze curriculum materials critically for scientific accuracy, leaving many without a strong foundation in science didactics (Burns & Gibbons, 2011). Several studies have shown that most current science curriculum materials are of low quality and fail to support students in achieving specified learning goals (Kesidou & Roseman, 2002; Stern & Roseman, 2004). This situation is particularly problematic because new teachers tend to rely heavily and uncritically on curriculum materials to determine what and how to teach (Ball & Feiman-Nemser, 1988; Grossman & Thompson, 2004; Kauffman et al., 2002; Mulholland & Wallace, 2005).

Methods

As someone who teaches biology at both the school and university levels and has navigated the intersection of education and academia, I have observed firsthand the complexities educators face when teaching sex and gender. To support teachers in this endeavor, I have designed a questionnaire to help them evaluate curriculum materials. This questionnaire outlines key characteristics of scientifically robust teaching materials and ensures their alignment with current scientific understanding.

This guidance emphasizes that high-quality, curriculum-based comprehensive sexuality education (CSE) should be scientifically accurate, based on an established curriculum, cover a variety of topics, and be tailored for different age groups (UNESCO, UNAIDS, UNFPA, UNICEF, UN Women, & WHO, 2018). According to this guidance, these principles apply equally to education from NGOs and community-based organizations, which should always be based on scientific evidence and best practices.

These guidelines for teachers are based on the research conducted by Schwarz et al. (2008), which investigated how predefined criteria for analyzing curriculum materials, grounded in good scientific practice, could assist elementary school teachers in evaluating and assessing these materials (Schwarz, Meyer, & Sharma, 2008). Additionally, recommendations and criteria for age-appropriate education were derived from the International Technical Guidance on Sexuality Education.

Recommendations for inclusivity in sex and gender education are informed by Solotke et al.'s "Twelve Tips for Incorporating and Teaching Sexual and Gender Minority Health in Medical School Curricula" (Solotke et al., 2019) and Khamisy-Farah and Bragazzi's study (2022) on integrating sex and gender medicine into medical education and allied health profession undergraduate, graduate, and post-graduate education (Khamisy-Farah & Bragazzi, 2022). Additional sources such as Laurillard's "Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology" (Laurillard, 2013) and Burns and Gibbons' "Implementing Response-to-Intervention in Elementary and Secondary Schools: Procedures to Assure Scientific-Based Practices" (Burns & Gibbons, 2011) offer strategies for integrating scientific-based practices into teaching.

The findings by Schwarz et al. (2008) revealed a limited overlap between the teachers' selection criteria and the analytical framework provided by researchers. This discrepancy arises because researchers and teachers focus on different aspects when reviewing teaching materials. Teachers primarily emphasize the practicality, clarity, provision of explanations, and background information of the teaching units, rather than their scientific accuracy and currency. For instance, teachers particularly emphasize the importance of clear communication, as well as the points outlined under Educational Settings, which include fostering an inclusive classroom community, connecting with students' experiences, and promoting critical thinking and



problem-solving skills. Additionally, teachers' routines and interactions are shaped by their environments, communication habits, and biases.

To address this gap, I have incorporated the practical concerns of teachers into the design of a questionnaire that aligns with their focal points when evaluating curriculum materials.

While the questionnaire has not been formally tested, it is designed to reflect best practices in education and is informed by extensive teaching experience and a review of relevant literature. This approach ensures that the materials selected are not only scientifically robust but also meet the practical needs of teachers in the classroom and is intended as a recommendation to help educators critically evaluate and select scientifically robust, inclusive, and age-appropriate materials for teaching sex and gender.

Teaching Sex and Gender: Three Fundamental Concepts

It is crucial for teachers to understand the three main concepts: sex, sexuality, and gender and to recognize the importance of distinguishing between biological concepts and the social aspects of gender education. Before selecting teaching materials, teachers should therefore determine the learning objectives they aim to achieve and identify the type of knowledge they intend to convey (Laurillard, 2013). Sex, sexuality, and gender are concepts that are often misunderstood and misused interchangeably, yet these terms have distinct meanings and implications that are essential to grasp, particularly in educational settings. In the context of both science and social science education, the way formal concepts are acquired and taught differs significantly. While biological education focuses on scientifically accurate information about reproduction and physical development, gender education encompasses the social, cultural, and psychological dimensions of gender and sexual orientation. According to Chi and Roscoe (2002) and Novak (2002), concept learning requires distinct approaches to learning and understanding. Vygotsky (1962) emphasizes that "systematic knowledge," such as that found in science, must be acquired through specific methods that foster critical and analytical thinking, the synthesis of ideas into new interpretations, and the solving of complex real-world problems. On the other hand, social sciences place greater emphasis on contextualized perspectives, allowing for a broader interpretation of societal phenomena (Palmer & Marra, 2004; Wise et al., 2004). In recent years, there has been a shift from strictly segregated disciplinary teaching to a more holistic approach, focusing on broader research domains and teaching cross-disciplinary research skills to students (CEC 2006: 8). This approach recognizes the importance of teaching concepts like sex and gender across various subjects, highlighting their relevance in multiple contexts and promoting a comprehensive understanding. However, it is crucial to remember that the foundation for successful cross-disciplinary work lies in students' ability to learn about fundamental concepts and organize and critically evaluate information. In science, this might involve experimentation and data analysis, while in social sciences qualitative analysis and the interpretation of social patterns and behaviors.

The first step for teachers when addressing sex and gender education is to establish clear teaching goals and context for the lesson.

Sex: Sex refers to the biological categories based on reproductive anatomy and functions in all sexually reproducing organisms, dividing them into two distinct sexes: male and female (Heidari et al., 2016). This differentiation primarily arises from the size of the gametes produced by the organisms, a phenomenon known as anisogamy. Males produce small, mobile sperm, while females produce larger, nutrient-rich eggs. The difference in gamete size is the basis for categorizing organisms into males and females. In sexually reproducing species, this fundamental biological distinction plays a crucial role in the reproductive process. Over the course of evolution, several mechanisms have been established to determine whether an organism is male or female, or in some cases, capable of changing sex during its lifecycle. Humans, like all higher terrestrial vertebrates, are gonochoric, meaning they have distinct male and female sexes and cannot change sex. The binary development of sex results in anatomical and physiological differences between men and women in every aspect and every organ. These differences can manifest phenotypically, affecting various physical attributes such as height, weight, body mass, cell counts, hormonal cycles, and more. Like in other mammals, only females are capable of gestation and giving birth. The sex of an individual is determined at conception by a cascade of genetic events triggered by genes located on the sex chromosomes (XX for females and XY for males), with the sex of a human usually being identifiable a few weeks after conception. These genetic determinants initiate the development of reproductive anatomy and functions corresponding to each sex (Sadava et al. 2019).



Example: A study on human reproductive biology demonstrates how chromosomal determinants (XX for females and XY for males) trigger the development of sex-specific anatomy. For instance, the presence of the SRY gene on the Y chromosome initiates the development of testes, which produce hormones leading to the development of male secondary sexual characteristics.

Sexuality: Sexuality is a multifaceted aspect of human life that involves biological, psychological, social, and cultural dimensions. It refers to the enduring pattern of romantic or sexual attraction that an individual feels towards others. This concept is widely referred to as sexual orientation, which includes categories such as heterosexuality (attraction to the opposite sex), homosexuality (attraction to the same sex), bisexuality (attraction to both sexes), and asexuality (lack of sexual attraction) (Bode & Heßling, 2015). Recently, the term sexual identity has become more commonly used in place of sexual orientation. Sexual identity describes how individuals perceive themselves and what they call themselves in terms of their sexuality. This includes specific sexual interests and preferences, as well as relationship preferences. For example, sexual identity encompasses how a person structures and lives their relationships, such as through monogamy, polyamory, or open relationships (Dillon, et al 2011).

Example: A classroom activity involves students participating in an interactive workshop where they rotate through stations, each focused on a different contraceptive method. At each station, they engage with hands-on materials, read personal testimonials, and watch short educational videos explaining how each method works.

Gender: Gender refers to the social and cultural roles of men and women and the expectations and norms that societies and cultures create for them. (Heidari et al., 2016) From these expectations, "gender roles" are derived, providing a framework for how individuals should behave, dress, communicate, and interact within their community. Traditionally, women are expected to perform feminine roles, while men are expected to perform masculine roles. Within sociology, gender is a critical area of study that explores the values, ideas, and assumptions that underpin gender roles, and how these roles are maintained and changed. Gender roles are culturally diverse, and the theories sociologists create help explain these social phenomena (Khamisy-Farah & Bragazzi, 2022)

Gender identity: One of the most debated topic of gender studies is "gender identity." Queer feminist scholars argue that gender is fluid and changeable. They posit that gender can be singular or multiple and may resist clear definition altogether. According to this view, all forms of gender and gender roles are performances, and thus, the concept of gender identity is subject to various interpretations. In contrast, a political and legal definition of gender identity often stands in opposition to this view and defines it as an internal feeling and personal sense of being masculine, feminine, a blend of both, or neither.

Example: In a sociology class, students could analyze advertisements from different decades to see how gender roles have been portrayed and how these portrayals have changed over time. This helps students understand the social construction of gender and the evolution of gender roles.

Teaching Sex and Gender: Language and Inclusivity

Developing a specialized vocabulary is crucial for effectively learning and practicing science. This includes the ability to clearly describe observations, reason about causes and effects, pose precise questions, formulate hypotheses, critically examine competing explanations, and summarize results (Mercer, Neil, et al., 2004). Studies have demonstrated that students' learning of science is inherently a discursive process, with scientific concepts forming the foundation of reasoning and practice. (Laurillard, 2013) Consequently, it is vital that these concepts are clearly defined and that the language used is precise in their respective fields. When it comes to inclusivity, educational materials should be tailored to reflect the diverse needs of students, considering factors such as age, disability, and sex (Berheide & Segal, 1985).

Educational content should be aligned with students' age and cognitive levels. Concepts for younger students should include more basic information, less advanced cognitive tasks, and simpler activities. (Mercer et al., 1999) The language, context, and content should be appropriately tailored to ensure comprehensibility and engagement (Verdonk et al., 2010). Policies and laws regarding sexuality education vary, with some regions making it mandatory and others banning it. Teachers should ensure that the material aligns with the respective laws and frameworks of the school, country, and district. When addressing LGBTQ topics and sexuality, it is crucial to be sensitive, avoid stereotyping, and involve students without overburdening them. (Khamisy-Farah & Bragazzi, 2022)

Teaching Sex and Gender: Age Appropriateness



For children aged 5 to 8 years, it is crucial to introduce the basic differences between biological sex and gender. They should learn the names and functions of internal and external genitalia and understand their basic functions. Introducing the concept that a sperm and egg must join to begin a pregnancy is also essential. Additionally, children should recognize the similarities and differences between male and female bodies and understand that these bodies change over time. As children grow older, between the ages of 9 and 12 years, they should gain a more detailed understanding of the body parts involved in sexual health and reproduction. This includes understanding puberty and the associated physical changes, such as the menstrual cycle. By the time they are 12 to 15 years old, students should delve deeper into the biological processes of puberty and reproduction. They should learn in detail about the menstrual cycle and sperm production and understand how hormones influence growth, development, and the regulation of reproductive organs and sexual functions, including their roles in puberty and pregnancy.

Between the ages of 15 and 18 years, students are ready to be educated on the complexities of sexual health. This includes important topics such as contraception and the prevention of sexually transmitted diseases (STDs). They should also understand the legal aspects of sexual consent and learn to make responsible decisions regarding their sexual behavior.

When it comes to teaching gender, recommendations suggest starting at age 9. Children should be encouraged to discuss social, cultural, and religious beliefs, reflecting on how these roles impact their views and addressing gender inequalities. For adolescents aged 12-15, they are ready to critically question gender roles and stereotypes while understanding both the biological and social aspects of reproduction. Between 15 and 18 years, students should delve into the negative consequences of gender bias in society and the importance of gender equality, understanding the profound impact of gender bias on society.

Common Pitfalls in Teaching Sex and Gender

In my experience as an educator, both in schools and at the university level, I have encountered numerous misconceptions and misunderstandings related to sex and gender education. Unfortunately, even scientific and journalistic publications are not immune to these errors. A primary factor contributing to these misconceptions is the frequent conflation, confusion, or misinterpretation of the concepts of sex and gender.

Misconceptions about Biological Sex: Despite claims circulating in various discourses, there is a strong consensus in biology and the natural sciences that there are only two biological sexes: male and female. This binary classification is rooted in the fundamental biological roles that these sexes play in reproduction. The notion that there are more than two sexes, such as five sexes or a spectrum of sexes, is incorrect. This confusion often stems from the phenotypical variations between men and women, such as height and weight. For example, while men are on average taller than women, there are both tall women and short men. This variation does not prove the existence of more than two sexes but rather highlights that each phenotypical trait exists on a spectrum within the binary classification.

Misconception of Sex Being Assigned Rather Than Observed: Another common misconception is that sex is arbitrarily assigned at birth. Biological sex is determined by the presence of XX or XY chromosomes at fertilization and can be observed as early as the first trimester of pregnancy, rather than being assigned at birth. Chromosomal variations, such as Turner syndrome (XO) or Klinefelter syndrome (XXY), do not constitute additional sexes. These conditions are variations within the male and female categories, not separate sexes. Intersex individuals, who possess atypical chromosomal, gonadal, or anatomical sex characteristics, do not invalidate the concept of the sex binary. For such individuals, the term "third gender" is sometimes used in legal or social contexts, but it is not considered a separate biological category.

Confusion Between Sex and Gender: Unlike sex, which is biologically determined, gender can be understood as a spectrum. Attributes typically labeled as masculine or feminine, such as clothing, hairstyle, and hobbies, can vary widely among individuals, creating unique patterns for each person. Confusion often arises from post-modern thinkers who claim that sex, like gender, is a social construct that exists only through language and can be deconstructed.

Overgeneralizing from Animal Biology or Behavior: It is problematic to apply animal behaviors directly to humans. Human behavior is influenced by a multitude of factors, and the term "biologism" describes the oversimplified application of purportedly natural phenomena to social or cultural contexts. This concept often manifests in claims that certain gender roles are "natural and rooted in biology." For instance, the idea of the "alpha male" wolf, popularized by early studies on wolf packs, has been used to justify hierarchical and aggressive male behaviors in human societies. Similarly, just because certain fish like the clownfish can change sex from male to female, it does not imply that such biological mechanisms apply to humans. Although some humans, previously termed transsexual and now referred to as transgender, choose to live in the gender role of the opposite sex, this is a matter of gender rather than biology. Even though in seahorses, the male carries the fertilized eggs in a brood pouch until they hatch, this does not imply that males in



mammals, including humans, can become pregnant. The existence of hermaphroditic animals like snails, which produce both sperm and eggs, also does not imply that this is possible in humans.

Given the discussed concepts and potential pitfalls, I have designed the following guidelines. The purpose of this questionnaire is to provide teachers with a comprehensive tool to self-assess and critically analyze curriculum materials when teaching sex and gender. The checklist is designed to ensure that the teaching materials are scientifically accurate, inclusive, age-appropriate, and aligned with educational goals and standards. It helps teachers to identify strengths and weaknesses in the materials, make necessary modifications, and ensure they meet the diverse needs of their students.

Teacher Self-Evaluation Questionnaire for Curriculum Materials

Teaching Goals

Which concepts do you plan to convey?

Do you aim to teach about biological sex (e.g., the human body, human development, body parts and their functions, fertility, and reproduction)?

Do you aim to teach about sexuality (e.g., health, hygiene, contraception)?

Do you aim to teach about gender (e.g., gender inequality, gender stereotypes)?

Do the materials address the intended learning goals?

Concepts and Language

Which concepts of sex, sexuality, and/or gender does this material include?

Does the material address scientific content and/or habits of mind?

Are all information and definitions presented clearly and concisely?

If more than one concept (sex/gender) is used, are the distinctions between these concepts clear?

In what relationship are both terms presented? Complementary or contrasting?

Are the terms sex and gender used carefully to avoid confusion?

Does the material use accurate biological terms to describe sex characteristics and reproductive functions?

Can children differentiate between sex and gender based on the material?

Does the material use a consistent and understandable vocabulary?

Is the language clear and understandable for the students' age group?

Scientific Accuracy

What are the actual scientific knowledge, factual information, theories, and principles that can be learned?

Do the materials provide accurate, up-to-date information?

Does the material make the intended practices visible and relevant?

Are the scientific theories and principles presented in the material widely accepted within the scientific community?

Is the content placed within relevant disciplines such as medicine, biology, social studies, or interdisciplinary fields?

Does the material help students understand the dynamic nature of scientific knowledge or the social nature of knowledge construction?

Does the material distinguish between factual information and open categories that are still being debated?

Do the materials/lessons provide an opportunity for analysis of data or experiences into patterns?

Are there opportunities for students to engage with experts or guest speakers on these topics?

Does the material present realistic experiential problems?

Does the material include visual aids such as diagrams, charts, or videos to enhance understanding?

Does the material include data and statistics from reputable sources to support its claims?

Does the material encourage collaboration and teamwork among students?



- Are the sources of the information provided, including the original source and later contributors?
- Who designed the material? Who is the contact person for further information?
- Are there additional links or references to cited studies?
- Are there recommendations for further reading or research for interested students?

Educational Settings

- Does the material draw motivations from students' experiences of informal learning?
- Does the material connect with students' experiences and interests?
- Does the material take account of and build on student ideas?
- Does the material include case studies or real-life examples to illustrate key points?
- What communication mediums and digital technologies are used in the material?
- Are educational skills such as critical thinking and problem-solving promoted?
- Does the material provide multiple and varied phenomena to support learning?
- Does the material encourage students to ask questions and seek further information?
- Does the material promote critical thinking and encourage students to think critically?

Age Appropriateness

- Is the content tailored to the developmental stages of the students?
- Does it include basic information and simpler activities for younger students?
- Are more complex concepts introduced appropriately for older students?
- Does the material use language that is understandable for the specific age group?
- Are the examples and scenarios used in the material relatable to the students' age group?
- Does the material provide age-appropriate explanations of complex concepts?
- Are visual aids and illustrations suitable for the developmental level of the students?
- Does the material avoid overwhelming younger students with too much information at once?
- Are there opportunities for age-appropriate discussions and questions?
- Is the material flexible enough to be adapted for different age groups within a class?

Inclusivity and Sensitivity

- Does the material enable children and teachers to find a common language?
- Does the material help to create a classroom community where all students feel comfortable?
- Does the material reflect the diverse needs and backgrounds of students, considering factors such as age, disability, culture, and sex?
- Are there resources available for students who need additional support or information?
- Does the material provide multiple perspectives to ensure a well-rounded understanding of the topics?
- How does the material challenge biased opinions and ideas about sex and gender?
- Are there activities that promote empathy and understanding of different experiences?
- Does the material incorporate a learning strategy based on social and communicative competence and skills?
- Does the material include self-assessment and feed-back tools for students?

Conflict Potential and Error Analysis

- What are the main topics (keywords) covered in the material?
- Does the material align with school policies, counseling practices, and national laws regarding education?
- Does the material align with current educational standards and frameworks?
- Is there feedback from previous teaching experiences included?
- Are there examples of successful implementation of these materials in other educational settings?
- Does the material provide strategies for teachers to facilitate discussions on controversial topics?



Are there suggestions for involving parents or guardians in the education process?

Can you recognize the strengths and weaknesses of the materials and make appropriate modifications?

Does the material provide context for the biological roles of males and females in reproduction without implying social roles?

Is the concept of anisogamy (different sizes of gametes) accurately explained as the basis for distinguishing males and females in sexually reproducing species?

Are intersex conditions explained accurately as variations within the male and female categories, rather than additional sexes?

Does the material clarify that sex is observed through physical and genetic traits, not assigned arbitrarily at birth?

Does the material avoid presenting sex as a spectrum?

Does the material contain animal comparisons? If so, are animals compared to humans, or is human behavior inferred from animal behavior (e.g., clownfish, snails, seahorses)?

Does the material contain stereotypes or gender roles? If so, how are they addressed?

Does the material address sexuality topics? If so, how are they addressed?

Does the material address LGBTQ topics? If so, how are they addressed?

REFERENCES

- [1] Ball, D. L., & Feiman-Nemser, S. (1988). Using textbooks and teacher's guides: A dilemma for beginning teachers and teacher educators. *Curriculum Inquiry*, 18(4), 401-423. <https://doi.org/10.1080/03626784.1988.11076045>
- [2] Berheide, C. W., & Segal, M. T. (1985). Teaching sex and gender: A decade of experience. *Teaching Sociology*, 12(3), 267-283.
- [3] Bode, L., & Heßling, A. (2015). *Jugendsexualität 2015. Die Perspektive der*, 14.
- [4] Burns, M. K., & Gibbons, K. (2011). *Implementing response-to-intervention in elementary and secondary schools: Procedures to assure scientific-based practices*. Routledge.
- [5] CEC. (2006). *Delivering on the modernisation agenda for universities: Education, research and innovation*. Brussels: European Commission.
- [6] Department for Education. (2024). *New draft guidelines on the teaching of gender identity*. Retrieved from <https://www.gov.uk/government/consultations/new-draft-guidelines-on-gender-identity>
- [7] Dillon, F.R., Worthington, R.L., Moradi, B. (2011). Sexual Identity as a Universal Process. In: Schwartz, S., Luyckx, K., Vignoles, V. (eds) *Handbook of Identity Theory and Research*. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-7988-9_27
- [8] Greifenberg, J. (2020). *Teaching Digital Competences-An Approach to Engage Multiple Parties into the Process of Teaching Digital Competences in German Schools* (Doctoral dissertation, Hochschulbibliothek der Technischen Hochschule Köln).
- [9] Grossman, P. L., & Thompson, C. (2004). Learning from curriculum materials: Scaffolds for new teachers? *Teaching and Teacher Education*, 20(2), 201-215. <https://doi.org/10.1016/j.tate.2003.11.001>
- [10] Heidari, S., et al. (2016). Sex and gender equity in research: rationale for the SAGER guidelines and recommended use. *Research Integrity and Peer Review*, 1(1), 1-9.
- [11] Human Rights Watch. (2023). *Poland: Veto bill targeting sex ed*. Retrieved from <https://www.hrw.org/news/2023/02/22/poland-veto-bill-targeting-sex-ed>
- [12] Kauffman, D., Johnson, S. M., Kardos, S. M., Liu, E., & Peske, H. G. (2002). "Lost at sea": New teachers' experiences with curriculum and assessment. *Teachers College Record*, 104(2), 273-300. <https://doi.org/10.1111/1467-9620.00164>
- [13] Kesidou, S., & Roseman, J. E. (2002). How well do middle school science programs measure up? Findings from Project 2061's curriculum review. *Journal of Research in Science Teaching*, 39(6),

522-549.

- [14] Khamisy-Farah, R., & Bragazzi, N. L. (2022). How to integrate sex and gender medicine into medical and allied health profession undergraduate, graduate, and post-graduate education: Insights from a rapid systematic literature review and a thematic meta-synthesis. *Journal of Translational Medicine*, 20(1), 40. <https://doi.org/10.1186/s12967-022-03269-7>
- [15] Kolleck, N. (2019). The power of third sector organizations in public education. *Journal of Educational Administration*, 57(4), 411-425
- [16] Krimmer, H. (2019). *Dalenreport zivilgesellschaft*. Springer Nature.
- [17] Laurillard, D. (2013). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.
- [18] Measor*, L. (2004). Young people's views of sex education: gender, information and knowledge. *Sex Education*, 4(2), 153-166.
- [19] Mercan, G., & Selçuk, Z. V. (2023). Non-governmental organizations (NGOs) operating in the field of biology education in Germany. *Journal of Interdisciplinary Education: Theory and Practice*, 5(1), 42-50.
- [20] Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, 30(3), 359-377. <https://doi.org/10.1080/01411920410001689689>
- [21] Mulholland, J., & Wallace, J. (2005). Growing the tree of teacher knowledge: Ten years of learning to teach elementary science. *Journal of Research in Science Teaching*, 42(7), 767-790. <https://doi.org/10.1002/tea.20070>
- [22] New America. (2021, June 17). Six states have now passed LGBTQ+ inclusive curriculum legislation—each with a different definition of 'inclusion'. Retrieved from <https://www.newamerica.org>
- [23] Rubenstein, R. (2017). Sex education: funding facts, not fear. *Health Matrix*, 27, 525.
- [24] Sadava, David, et al. *Purves Biologie*. Springer-Verlag, 2019.
- [25] Schwarz, C. V., Meyer, J., & Sharma, A. (2008). Developing preservice elementary teachers' knowledge and practices through modeling-centered scientific inquiry. *Science Education*, 92(2), 197-217. <https://doi.org/10.1002/sce.2023>
- [26] Schwarz, C. V., Reiser, B. J., Davis, E. A., Kenyon, L., Achér, A., Fortus, D., ... & Krajcik, J. (2009). Developing a learning progression for scientific modeling: Making scientific modeling accessible and meaningful for learners. *Journal of Research in Science Teaching*, 46(6), 632-654. <https://doi.org/10.1002/tea.20311>