Teaching at the intersection of science and society: an activity on healthcare disparities

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Abstract
Understanding the relationship between science and society is an objective of science education and included as a core competency in the AAAS Vision and Change guidelines for biology education. However, traditional undergraduate biology instruction emphasizes scientific practice and generally avoids potentially controversial issues at the intersection of biology and society. By including these topics in biology coursework, instructors can challenge damaging ideologies and systemic inequalities that have influenced science, such as biological essentialism and health disparities. Specifically, an ideologically aware curriculum highlights how ideologies and paradigms shape our biological knowledge base and the application of that knowledge. Ideologically aware lessons emphasize the relationship between science and society with an aim to create more transparent, scientifically accurate, and inclusive postsecondary biology classrooms. Here we expand upon our ideologically aware curriculum with a new activity that challenges undergraduate biology students to consider the impacts of healthcare disparities. This lesson allows instructors to directly address systemic inequalities and allows students to connect biomedical sciences to real-world issues. Implementing an ideologically aware curriculum enables students to challenge prevailing worldviews and better address societal problems that lead to exclusion and oppression.
Introduction

Integrating science and society in science education is an important goal for many organizations (UNESCO, 2016, AAAS, 2011, National Research Council, 2012). In the United States, the Vision and Change report laid out the core competencies for undergraduate biology education, which included understanding the relationship between science and society (AAAS, 2011). However, in a recent assessment of the implementation of the Vision and Change recommendations, authors found that overall, societal topics are rarely included in undergraduate biology courses (Clemmons et al., 2022). When they are included, they are most likely found in smaller advanced courses rather than introductory courses, which educate a larger body of students with diverse educational trajectories. Introducing students to biology as ‘value-free’ and disconnected to society in their first year may leave lasting impressions of its actual reach and influence (Cross and Price, 1996, Douglas, 2009). The lack of inclusion of science and society in undergraduate biology education communicates to students that biology and society are unrelated entities and we should avoid discussions of controversial issues that sit at their intersection. To bridge this gap in our teaching, we have developed course materials intended for introductory biology courses that enable instructors to implement socially-relevant activities in the classroom (Beatty et al., 2021, Costello et al., 2023, Adams et al., 2023, Ballen et al., 2023).

Promoting ideological awareness in introductory biology

One way to integrate societal topics into biology content is to clarify how personal views and beliefs have historically and currently affect the way science is conducted (Cross and Price, 1996, Douglas, 2009). Ideological awareness is an undergraduate biology curriculum resource for supplementing traditional biology course content with active learning lessons focused on addressing and challenging structural inequities in biological and biomedical sciences (Beatty et al., 2021, Costello et al., 2023). Ideological awareness is grounded in culturally relevant pedagogy developed by Gloria Ladson-Billings (1992, 1995b, 1995a, 2006). Culturally relevant pedagogy provides biology students with relevant social context to address complex issues they will encounter in society as medical professionals, research scientists, and cognizant citizens. Ideological awareness aligns with one of the central pillars of culturally relevant pedagogy: critical or sociopolitical consciousness (Costello et al., 2023). Critical or sociopolitical consciousness allows students to “critique the cultural norms, values, mores, and institutions that produce and maintain social inequities” (Ladson-Billings, 1995a, pg. 162, Young, 2010). Teaching through ideological awareness reveals the underlying values,
biases, assumptions, and stereotypes that ultimately “inform approaches to and outcomes of science” (Costello 2023).

**What are the impacts of the ideological awareness curriculum on students?**

The ideological awareness curriculum has been implemented in a variety of settings (i.e., 2-year, 4-year, and R1 research intensive schools). After a series of lessons ranging from unethical experimentations and its relationship to current research ethics, the use of science to justify societal suppression of nonconforming identities, and the lack of representation in STEM, Beatty et al. (2021) found that students reported preferring these materials compared to traditional course content. Additionally, between 43% and 50% of students were not familiar with the topics before the lesson was taught. Adams et al. (2023) found that when asked to build a concept map of the biology course material, with explicit instructions to connect the material to aspects of society, students who did not receive ideologically aware curriculum were unable to make societal connections (median = 0 societal topics included). Students in the ideologically aware section included more societal content and cover a greater variety of topics in their end-of-semester concept maps, while including the same amount of biological content (Adams et al., 2023). Collectively, students were not previously familiar with these topics and did not make connections between science and society on their own. However, after instruction on these topics, they were capable of making the connections between science and society and reported preferring this material over the traditional biology textbook. Finally, we found the inclusion of ideologically aware material did not come at the expense of traditional biology content coverage, as measured by the grade comparisons and the amount of biology concepts students could identify at the end of the semester (Beatty et al., 2021, Adams et al., 2023).

**Instructors value ideological awareness, but express hesitancies**

Our previous work underscored the importance of the instructor’s role in forging the connection between science and society for their students, as students struggle to make these connections without this explicit instruction (Adams et al., 2023). Despite the documented benefits that we described above, why do we observe such low rates of inclusion of these materials in undergraduate biology courses (Clemmons et al., 2022)? A national survey of 128 biology instructors concluded the main goal of science education was “understanding the world,” and instructors agreed that students should receive instruction about “the biases, stereotypes, and assumptions that shape contemporary and historical science” before they graduate (Beatty et al., 2023). Instructors reported that teaching ideological awareness is important because of increased student engagement.
and belonging in the class, its tendency to address misconceptions of science, and by providing students with connections between science and society. Despite their enthusiasm for the material, instructors were hesitant to include ideological awareness into their biology curricula (Beatty et al., 2023). Instructors may not include these topics because they perceived it took time away from coverage of existing core content, a lack of familiarity with the materials, and over concern that students are not prepared or mature enough for these discussions. When prompted to describe the worst-case scenario, instructors expressed fear over poor implementation, inadvertently alienating students or making them uncomfortable, and potential pushback from authorities (e.g., administrators, other faculty, outside forces) and termination. This reluctance may explain, in part, the scarcity of instructors who implement these materials in their courses. However, our previous work addresses some of these concerns, such as provisioning instructors with vetted course materials (current manuscript; Ballen et al., 2023), documentation of student preference for these materials (Beatty et al., 2021), and positive student outcomes after teaching this material (Adams et al., 2023).

### Ideological Awareness Implementation

We have developed ideological awareness activities on a variety of topics that are tailored for undergraduate biology classrooms (Table 1). These activities are available in a regularly updated GitHub repository and include an instructor activity explanation, student worksheet, and lesson PowerPoint (Ideological Awareness activities available here: [https://tinyurl.com/IdeologicalAwareness](https://tinyurl.com/IdeologicalAwareness)). Activities range from reading and discussing scientific articles and case studies to interacting with publicly available data (e.g., Ballen et al., 2023). Each instructor worksheet contains an activity description, suggested courses for implementation, learning goals and objectives, references, and adaptation suggestions for alternate implementations. All of these lessons have an active learning component which allows students to interact with and discuss these topics (Driessen et al., 2020, Miller and Tanner, 2015).

Below we provide readers with an extended example of one activity focused on healthcare disparities among people with excluded identities. First, we will offer an overview of the topic, and follow with relevant information about the activity to guide readers who wish to implement this or a similar topic in their classroom. We provide an instructor worksheet (Supplementary Materials S2), student worksheet (Supplementary Materials S3), and slide deck for the introductory lecture and discussion (Supplementary Materials S4).
Table 1. Summary of activities developed to promote ideological awareness in undergraduate biology.

<table>
<thead>
<tr>
<th>Activity Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Injustice</td>
<td>Students discuss the basic principles of pollution, exposure to chemicals, and air pollution. Students use publicly available data to look at real world examples of the disproportional implications of environmental degradation on oppressed populations.</td>
</tr>
<tr>
<td>Integration of Evolution and Religion</td>
<td>Students will receive instruction on cultural competency and evolution, as well as examples from religious leaders and evolutionary biologists of faith. Students will then discuss the intersection of science and religion specifically relating to evolution.</td>
</tr>
<tr>
<td>Tissue Ownership and Biological Ethics</td>
<td>Students will learn about the legality of tissue ownership in the context of HeLa cells collected from Henrietta Lacks. Through a discussion of research ethics, students will work in groups to build arguments about compensation for tissue donations that lead to financial or societal gains in science.</td>
</tr>
<tr>
<td>Gender Identity and Sexuality</td>
<td>Students will read scientific articles and/or chapters related or organismal sex and sex determination. They will make connections to prior knowledge, learn appropriate terminology (for sex and gender concepts), and discuss the implications for both science and society.</td>
</tr>
<tr>
<td>Representation in STEM</td>
<td>Students will read the summary of a research article about intersectional representation in introductory science textbooks (Wood et al., 2020). Students will then scan their own textbooks for depictions of scientists to generate an authentic dataset and address a research question about representation in biology curricular materials (Ballen et al., 2023).</td>
</tr>
<tr>
<td>Healthcare Disparities</td>
<td>Students will learn about the sources of healthcare disparities among people with historically excluded identities. Students will be assigned into groups to read a scientific article and build concept maps.</td>
</tr>
</tbody>
</table>
| Designer Babies                       | Students will learn about the new gene-editing technologies and CRISPER-cas9. They will then explore the ethics of gene
Extended Activity Example: Healthcare Disparities among People with Systemically Excluded Identities

Healthcare disparities are “a particular health difference that is closely linked with social, economic, and/or environmental disadvantage” (from Healthy People 2020, Office of Disease Prevention and Health Promotion). Healthcare disparities disproportionately affect “groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion” (from Healthy People 2020, US Department of Health and Human Services, Office of Disease Prevention and Health Promotion). This topic has clear connections to ideological awareness, as many of these disparities are rooted in structural inequalities (e.g., access to affordable healthcare), discrimination (e.g., bigoted laws targeting transgender individuals), and values or beliefs (e.g., impacts on women’s ability to make reproductive decisions). This topic also has strong connections to biology and the future careers of many students who are taking biology, particularly those who wish to become medical professionals. In this activity, students read primary literature and construct a concept map that requires they make explicit connections between the biology content and the societal topic. Finally, students are challenged to articulate the sources and impacts of healthcare disparities, as well as actionable strategies to reduce them.

Learning Goals

- Students will have a deeper understanding of the healthcare field by learning about the sources, effects, and solutions for healthcare disparities on marginalized communities.
- Students will know how to synthesize and connect concepts related to the sources, effects, and solution of healthcare disparities from primary research.

Learning Objectives

Students will be able to:

- Engage in critical thinking about implicit biases and healthcare inequalities.
- Identify sources of healthcare disparities among minoritized individuals.
- Identify strategies to reduce healthcare inequalities.
• Compare central themes from various research topics.

• Synthesize concept maps.

• Analyze disproportionate effects of healthcare disparities on intersecting identities.

**Intended Audience**

The activity was designed for and has been implemented in introductory biology courses for majors and non-majors. However, it could also be incorporated into courses beyond first-year biology sequences. For example, it would also be appropriate in upper-level coursework such as genetics, cell biology, health sciences, or any biomedical course. The slide deck engages students in a discussion of healthcare disparities and systemic inequities that affect marginalized communities (Supplementary Materials S4). Students will then read a scientific article on a focal healthcare disparity topic. Students are not required to have any disciplinary biology knowledge prior to completing this lesson but should be able to read and interpret scientific articles with guidance. This activity does assume students possess prior knowledge of concept mapping. If students are not familiar with concept mapping, additional in class and/or out of class prep may be necessary. Instructors should familiarize themselves with the scientific articles that students will be reading as well as information about healthcare disparities from the US Department of Health and Human Services, Office of Disease Prevention and Health Promotion reports Healthy People 2020 & Healthy People 2030 (Office of Disease Prevention and Health Promotion, a & b).

**Lesson Plan**

The required in-class time for this activity is approximately 75 minutes, and it can be completed in one or two class periods depending on the length of the class period and variations in implementation (see Table 2 for timeline of course activities in an ~75-minute class). In preparation for class, students will read an assigned article for homework (~1 hour). At the beginning of class, the instructor delivers a 15-minute introductory lecture to provide context on the assigned articles and kickstart student discussions (Supplementary Materials S4). After the lecture, students will work collaboratively in their assigned scientific article groups to build their concept maps for the article (~20 minutes; each student completes their own concept map which can be collected as an assessment), followed by building a full-class concept map covering all the healthcare disparity articles (~20 minutes). The instructor should then wrap-up the discussion and provide any closing remarks on the central themes of healthcare disparities across the scientific articles (>5 minutes). Students will then complete the
assessment in class (~15 minutes). The final whole-class concept map will allow students to become familiar with all the articles used in the activity and to build connections between the different factors contributing to healthcare disparities. The implementation of this activity will depend on the length of the class period. In a 50-minute class period, the activity could be split over two class periods: in the first, the instructor delivers the introductory lecture; in the second, concept maps are built individually and as a whole class, with students reading the assigned scientific articles between these two class periods (see alternate timeline: Supplementary Materials S1, Table S1).

### Table 2. Timeline of course activities in a 75-minute class period.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Est Time</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Preparation for Class</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students read selected articles</td>
<td>In groups, students are assigned an article to read.</td>
<td>&lt;2 hours</td>
<td></td>
</tr>
<tr>
<td>Concept Map Introduction</td>
<td>Students will watch a video and read instructions on concept mapping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Class Session Components</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introductory Lecture</td>
<td>The instructor reviews healthcare inequalities and connects them to prior knowledge throughout. The instructor introduces concept mapping (if new for this class).</td>
<td>&gt;15 mins</td>
<td>PowerPoint included</td>
</tr>
<tr>
<td>Collaborative Work: Concept Mapping</td>
<td>Students break into groups to discuss their assigned scientific article and build their individual concept maps.</td>
<td>&gt;20 mins</td>
<td>Electronically or with paper/pencil</td>
</tr>
<tr>
<td>Full-Class Concept-Map</td>
<td>Dissolve groups; The class will work together to discuss their scientific articles and build a concept map combining ALL of the scientific articles.</td>
<td>&gt;20 mins</td>
<td>Electronically or with paper/pencil</td>
</tr>
<tr>
<td>Discussion &amp; Wrap-Up</td>
<td>End the class with a discussion of the central themes/ideas that surround the idea of healthcare inequalities.</td>
<td>&gt;5 mins</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>Students complete the post-activity assessment.</td>
<td>~15 minutes</td>
<td>Included in student hand-out</td>
</tr>
</tbody>
</table>

**Student Preparation for Class**

Before class, students will be assigned to read one article within one of three focal topics: (1) socioeconomic disparities (Baumer et al., 2020); (2) racial disparities (Oribhabor et al., 2020, Chambers et al., 2020, Yaya et al., 2020, Braun, 2015); or (3) LGBTQ+ disparities
(Kattari et al., 2015, McKay, 2011, Voisin et al., 2013, Melendez and Pinto, 2009). While reading students are asked to reflect on the questions:

- What are the sources/causes of the healthcare disparities?
- What are the effects/impacts of the healthcare disparities?
- What are the strategies to reduce the healthcare disparities?

They will then review introductory materials for concept mapping (Figure 1b, Supplementary Materials S3).

**Figure 1.** Students will receive a hand-out guiding them through the activity (Supplementary Materials S3). During the introductory lecture they will be prompted to fill out the chart to reflect on what they know and what they’ve learned (a). Students also receive instructions on building concept maps (b). At the end of class students will complete an assessment covering the topic of healthcare disparities (c).

**Introductory lecture**

The introductory lecture sets the stage for the forthcoming activity and discussion. First, the instructor will define healthcare disparities and place the topic in the context of their course. They will describe how it is relevant to the careers of the students in class (many of whom may be interested in entering the medical fields). The lecture then covers specific examples, such as the percentage of nonelderly adults who did not see a doctor in the past year, rates of uninsured individuals, maternal mortality, and enrollment in clinical trials by race/ethnicity. The instructor also discusses the barriers to healthcare access experienced by transgender Americans, ranging from intentional discrimination to insurance refusals.

During the lecture students will reflect on the prompt “As you are introduced to the topic of healthcare disparities, what are some things that you already knew and what new things did you learn?” They will fill in a chart for “What I Know” and “What I’ve Learned” (Figure 1a).

The instructor will then introduce concept mapping to the students using the provided instructor resources (Supplementary Materials S2).

**Collaborative work: concept mapping**

After the introductory lecture, each student will build their concept maps for their assigned article while discussing the article with their group members. They are instructed to work collaboratively with and discuss the concepts or relationships between concepts with the group. We generally give students the option to build the concept map
with pen and paper or electronically. The individual concept maps can be taken up at the end of the class and assessed for participation.

**Full-Class Concept Mapping & Wrap-up**

The instructor will then lead the classroom in the construction of a full-class concept map. The concept map can be drawn on a white board or built with electronic concept-map building software and projected to a screen depending on resources available in the classroom. Starting with the central theme of “healthcare disparities,” the instructor will invite students to share information about their assigned articles and connect their ideas to a larger class concept map. The instructor can prompt the students to share information with questions such as: “what are the sources/causes of healthcare disparities?,” “what are the effects/impacts of those sources on the affected communities?,” and “what strategies can we use to reduce the causes and impacts of healthcare disparities?” Each group will share information directly from their assigned article including: (1) new concepts to add to the class’s model from their article/concept map, (2) new relationships between concepts from their group’s article or concept maps, and (3) adding new concepts or connection between existing concepts on the class concept map. The final concept map should provide a summary of the causes/sources of healthcare disparities, the impacts and effects of healthcare disparities on specific groups of people, and strategies for addressing the underlying causes of healthcare disparities. The instructor should end the class period with a discussion of the central themes and ideas surrounding the healthcare disparities. If time allows, open the class to discussion or to share reflections on what students have learned throughout this activity.

**Assessment**

The assessment can be completed at the end of class or as a post-class assignment. 10 short answer questions assess student knowledge of healthcare disparities and challenge students to connect biology content with societal topics (Figure 1c).

1. Describe the activity. What was the issue you learned about?
2. What did this activity teach you about the relationship between biology and society?
3. How did the activity illustrate how human values influence science?
4. What are the different perspectives presented as part of the activity today?
5. How do your personal values or experiences relate to the themes presented in this activity, if at all?
6. Has the activity impacted your personal values or views?
7. Did the activity make you think differently about the issue than before today’s activity? How?

8. What are some causes of the healthcare disparities you learned about today?

9. What are some effects of the healthcare disparities you learned about today?

10. What are some solutions to the healthcare disparities you learned about today?

Extensions/Alternate Assessments:

There are several ways to modify the activity to suit the needs of individual courses (Supplementary Materials S2). For example, one way to extend the activity would be for students to submit a proposal outlining a plan of action for a solution to a particular healthcare disparity supported by the literature reviewed in class. If instructors are interested in additional forms of assessment, they can require students or groups of students submit their concept maps for a grade (recommendations for concept map assessment can be found in Supplementary Materials S2). Finally, we recommend the following additional reflection or discussion questions that could be posed to students during class time:

- What three main themes did all of the research topics on healthcare disparities have in common?
- Describe the relationship between the cause, effect, and solution for a particular health disparity you learned about today.
- Describe a solution for a specific healthcare disparity you learned about today and discuss how it will impact the cause and effect for that healthcare disparity.
- Describe the intersectional (considering multiple aspects of one’s identity) effects of a particular healthcare disparity.

Conclusions

Teaching ideological awareness in biology such as healthcare disparities is important for nonmajor and biology major student populations. This activity challenges students to consider structural systems of oppression that disadvantage people on the basis of their identities and circumstances, leading to inequalities in healthcare that can have dire consequences. We believe that the timing of discussions that can potentially transform how students view their place in education is critical, and essential to deliver at the beginning of their science career (rather than in more advanced courses). Incorporating ideologically aware content into introductory coursework meets this need, and invites students to question, challenge, and engage with curricular materials that sit at the intersection of biology and society.

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Supporting Materials

- S1. Supplementary Materials: Alternate Class Timeline
- S2. Instructor Handout
- S3. Student Handout
- S4. Slide Deck

Acknowledgements

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References


Figure 1. Students will receive a hand-out guiding them through the activity (Supplementary Materials S3). During the introductory lecture they will be prompted to fill out the chart to reflect on what they know and what they've learned (a). Students also receive instructions on building concept maps (b). At the end of class students will complete an assessment covering the topic of healthcare disparities (c).
Supplementary Materials S1

Alternate Timeline

In a 50-minute class period, the activity will need to be split over two days. Supplemental Table 1 shows a proposed timeline for implementing this in a 50 minute class period. The first day requires the introductory lecture (~15 minutes) which could also include a detailed introduction to concept mapping if students are unfamiliar. If you do not introduce concept mapping in the first lecture, you will still have ~30-35 minutes of class period for your normal course material. Students will read their assigned articles for homework and review materials on concept mapping. On day two, students will break into their groups to build their individual concept maps and discuss their assigned article (~20 minutes). You will then dissolve the groups, and bring the students back together to build a full-class concept map covering all of the assigned articles (~20 minutes). End the class with a wrap-up discussion, and assign the assessment to be completed for homework.

Supplemental Table 1. Alternate timeline of course activities.
<table>
<thead>
<tr>
<th>Activity</th>
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<th>Notes</th>
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<td></td>
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<tr>
<td>Introductory Lecture</td>
<td>The instructor reviews healthcare inequalities and connects them to prior knowledge throughout. The instructor introduces concept mapping (if new for this class).</td>
<td>&gt;15 mins</td>
<td>PowerPoint included</td>
</tr>
<tr>
<td><strong>Student Preparation for Class Part II</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students read selected articles</td>
<td>Student in groups are assigned an article to read.</td>
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<tr>
<td>Concept Map Introduction</td>
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</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative Work: Concept Mapping</td>
<td>Students break into groups to discuss their assigned scientific article, and build their individual concept maps. If students are unfamiliar with concept mapping, instructor can provide guidance as the students work in groups.</td>
<td>&gt;20 mins</td>
<td>Electronically or with paper/pencil</td>
</tr>
<tr>
<td>Full Class Concept-Map</td>
<td>Dissolve groups; The class will work together to discuss their scientific articles and build a concept map combining ALL of the scientific articles.</td>
<td>&gt;20 mins</td>
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<tr>
<td>Discussion &amp; Wrap-Up</td>
<td>End the class with a discussion of the central themes/ideas that surround the idea of healthcare inequalities.</td>
<td>&gt;5 mins</td>
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<tr>
<td>Assessment</td>
<td>Students complete the post-activity assessment for homework.</td>
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Learning Goals

Students will have a deeper understanding of the healthcare field by learning about the sources, effects, and solutions for healthcare disparities on marginalized communities.

Students will know how to synthesize and connect concepts related to the sources, effects, and solution of healthcare disparities from primary research.

Learning Objectives

Students will be able to:
- Engage in critical thinking about implicit biases and healthcare inequalities
- Identify sources and/or of healthcare disparities among minoritized identities.
- Identify strategies to reduce healthcare inequalities
- Compare central themes from various research topics
- Synthesize concept maps
- Analyze disproportionate effects of healthcare disparities on intersecting identities

Suggested Courses

Introductory Biology; Health Sciences
Piecing It All Together: Healthcare Disparities among People with Historically Excluded Identities

Project | Module 3: Persisting Biases in STEM

Created by:

Instructor Resources

- **Scientific Processing Skills:** Reading research papers, sorting/classifying information, synthesizing information, and communicating information
- **Pedagogical Approaches:** Active Learning, Inclusive Teaching, Concept Mapping, Think-Pair-Share, Brainstorming, Collaborative Work
- **Bloom's Cognitive Levels:** Understanding, Application, and Analysis
- **Principles of How People Learn:** Motivates students to learn material, reveals prior knowledge, predominantly students doing work, real-world relevant topics
- **Vision and Change Competencies:** Ability to understand the relationship between science and society, interdisciplinary nature of science
- **Core Biological Concepts Covered:** Systems

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**Implementation Guide**

<table>
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<th>Activity</th>
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<td>In groups, student are assigned an article to read. Additionally, they will watch a video and read instructions on concept mapping.</td>
<td>&lt; 2 hours</td>
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<td>Review healthcare inequalities and connect to prior knowledge throughout</td>
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<td>End the class with a discussion of the central themes/ideas that surround the idea of healthcare inequalities.</td>
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</tbody>
</table>
Piecing It All Together: Healthcare Disparities among People with Historically Excluded Identities

1. Describe the activity. What was the issue you learned about?
2. What did this activity teach you about the relationship between biology and society?
3. How did the activity illustrate how human values influence science?
4. What are the different perspectives presented as part of the activity today?
5. How do your personal values or experiences relate to the themes presented in this activity, if at all?
6. Has the activity impacted your personal values or views?
7. Did the activity make you think differently about the issue than before today's activity? How?
8. What are some effects of the healthcare disparities you learned about today?
9. What are some solutions to the healthcare disparities you learned about today?

Adaptations

Alternative Assessments/Extensions:
- Have students submit a proposal outlining a plan of action for a solution to a particular healthcare disparity supported by the literature reviewed in class
- Have students submit their concept maps and graded according to a rubric
- Have student reflect or discuss the following questions:
  - What were 3 main themes that all of the research topics on healthcare disparities had in common?
  - Describe the relationship between the cause, effect, and solution for a particular health disparity you learned about today.
  - Describe a solution for a specific healthcare disparity you learned about today and discuss how it will impact the cause and effect for that healthcare disparity.
  - Describe the intersectional (considering multiple aspects of one’s identity) effects of a particular healthcare disparity.
Instructor Resources

Piecing It All Together:
Healthcare Disparities among People with Historically Excluded Identities
Project | Module 3: Persisting Biases in STEM

Additional Resources

Healthcare Disparities Articles:

**Socioeconomic Disparity Focal Papers**

**Racial Disparity Focal Papers**


**LGBTQ+ Disparity Focal Papers**


Instructor Resources

Additional Resources

**Concept Map Resources:**

*Sites for free concept mapping*
- MindMup: [https://www.mindmup.com](https://www.mindmup.com)
- Lucid Chart: [https://www.lucidchart.com/pages/examples/concept-map-maker](https://www.lucidchart.com/pages/examples/concept-map-maker)
- Google Jamboard: [https://jamboard.google.com/](https://jamboard.google.com/)
- Google Draw: [https://docs.google.com/drawings/](https://docs.google.com/drawings/)
- Excalidraw: [https://excalidraw.com/](https://excalidraw.com/)

*Explanation of concept mapping*
[https://www.kent.edu/ctl/concept-maps](https://www.kent.edu/ctl/concept-maps)

*Sample rubrics to assess concept maps:*
[https://teach.its.uiowa.edu/sites/teach.its.uiowa.edu/files/docs/docs/Concept_Map_Rubrics_ed.pdf](https://teach.its.uiowa.edu/sites/teach.its.uiowa.edu/files/docs/docs/Concept_Map_Rubrics_ed.pdf)

*Site for more info on Health and Healthcare disparities*
Piecing It All Together: Healthcare Disparities among People with Historically Excluded Identities

Pre-course work: Become Familiar with Concept Mapping!

Please look through all of the links provided below in order to familiarize yourself with concept maps and how to properly produce this particular map.

1. Visit this webpage and watch the tutorial on completing concept maps: https://www.youtube.com/watch?v=8XGQGhli0I0
2. Visit the following links for more detailed written directions on concept mapping, as well as a guide on an alternative program “cMAP”. https://www.evidencebasedteaching.org.au/concept-mapping-complete-guide/
3. Choose a platform to create your map. The above YouTube video uses a free web-based platform “Lucid”. You are welcome to do that. Additionally, you may draw it by hand, or use one of the other following programs: ClickCharts Diagram & Flowchart Software and Gliffy are web-based products that include built in templates to help you get started.
4. Check out this paper detailing the importance and usefulness of concept mapping as a learning tool. The author provides advice on using concept maps in regards to structure, feedback, exam alignment, and learning styles and study habits.


Essential Reminders

Tips and tricks:
1. Use arrows to explain the connections between your key terms
2. Don’t forget to show the interconnectivity of topics. Remember to show how concepts relate to each other. This is not a flow chart and should not be entirely linear. If you need to, look up additional information on the differences between flow charts and concept maps.
3. Touch on as many topics as possible- including specifics. Start with your main topics (genetics, anatomy, physiology, ecology, evolution, cells, the nature of science, etc.) and continue to build on those main topics to include more detailed explanations. For example, if you were concept mapping genetics, you may want to detail trait dominance, inheritance, Mendel, Punnett squares, pea plants, etc.). The connect inheritance to pea plants with the connection term explaining that pea plants were "experimented on" to learn about inheritance.
4. We want to know what you know, not what google knows. Each one of you will turn in a vastly different concept map, and that is okay! Do not panic about catching every little detail, just be a thorough as possible. This is open-note in the sense that you may use your notes, each other, and your textbook. Do not use the internet. This assessment is made to help you draw connections, and internet searches will not help you do that. We are very familiar with the results from such google searches, and we expect you to go beyond what can be found through such a search.
5. Be creative! Make jumps… don’t get stuck on “my book doesn’t say this”. You will need to take the knowledge gained throughout the semester to draw new connections with the world around you. Those connections won’t always be found in your text, and we do not expect citations. You will need to think critically, and outside the scope of information given to you explicitly in order to complete this assignment.
Introduction:
In the healthcare field, we apply what we know about biology to serving a variety of people to the benefit of their health. However, the quality of services and perspectives of practitioners have not always been equitable across identity groups. In this lesson, you will learn about the sources of these inequities, the disproportionate impacts on different identity groups, and the possible solutions for addressing the disparities.

Introductory Lecture:
As you are introduced to the topic of healthcare disparities, what are some things that you already knew and what new things did you learn?

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Article Reading and Concept Map:
You will be assigned in groups to read a primary research article about healthcare disparities among people with excluded identities. While reading the article consider the following questions:
• What are the sources/causes of the healthcare disparities?
• What are the effects/impacts of the healthcare disparities?
• What are the strategies to reduce the healthcare disparities?

In class you will create a concept may while working collaboratively with your groupmates. This concept map can be created electronically or using paper and pencil.

Example Concept Map:
A concept map is a visual representation of relationships between topics. It is made of two main components: concepts and relationships.
• Concepts- Any major topics/findings/information from your article in circles or boxes
• Relationships- Concepts should be connected to one another with lines that are labeled with the relationship
There can be multiple relationships between concepts, showing the interconnectivity of ideas. See the example below:

Electronic Concept Maps Resources:
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Full Class Concept Map and Discussion:
As a class you will share your concept map and connect your ideas to a larger class concept map.
When it is your group’s turn share information that directly comes from your article:
• New concepts to add to the class’s model from your article/concept map
• New relationships between concepts from your article/concept map
• Add any new concepts or lines between existing concepts for new relationships.

You can use the space below to record the class concept map or take notes if you need to.
1. Describe the activity. What was the issue you learned about?

2. What did this activity teach you about the relationship between biology and society?

3. How did the activity illustrate how human values influence science?

4. What are the different perspectives presented as part of the activity today?

5. How do your personal values or experiences relate to the themes presented in this activity, if at all? Has the activity impacted your personal values or views?

6. Did the activity make you think differently about the issue than before today's activity? How?

7. What are some causes of the healthcare disparities you learned about today?

8. What are some effects of the healthcare disparities you learned about today?

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**Visual Understanding Environment** is a free open source software that you can download to your personal computer. cMAP from the Florida Institute for Human and Machine Cognition (IHMC).

**Microsoft Office** products have many templates for displaying relationships and processes, The SmartArt feature is built into the Insert tab within Microsoft Word and PowerPoint that you can use to create your concept map.

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Full Class Concept Map and Discussion:
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