Curriculum Design with the End in Mind: Creating an Interdisciplinary Unit on Climate Change

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CURRICULUM DESIGN WITH THE END IN MIND: CREATING AN INTERDISCPLINARY UNIT ON CLIMATE CHANGE

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INTERDISCIPLINARY UNIT PLAN

Unit Theme: Climate Change
Teacher(s): Sydney Roberts
Subject(s): Language Arts, Math, Science, Social Studies
Grade: 9th Grade

TEXTS	MATERIALS
• *Ship Breaker*, Paolo Bacigalupi • *The World Without Us*, Alan Weisman • *No One is Too Small to Make a Difference,* Greta Thunberg • *Eyes Wide Open: Going Behind the Environmental Headlines,* Paul Fleischman	• Articles • News Videos • Graphic Organizers • Climate Change-The Facts • Daily Journal

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
• Climate change is the long-term change of Earth's weather patterns as a result of the warming of Earth's atmosphere. • Climate change is influenced by human emissions of greenhouse gasses into the atmosphere. • Climate change is a global issue that impacts people throughout the world. • Climate change has led to an increase in extreme weather patterns. • Activists have impacted government policy in regards to climate change. • Climate change cannot be prevented but it can be mitigated.	• Why should I care about climate change? • What is climate change? • What causes climate change? • How does climate change impact the environment? • How does climate change impact people? • What are the long-term consequences of climate change? • What impact does climate change have on your life? • How have people responded to the issue of climate change? • Can we stop climate change?

STANDARDS

Language Arts Standards

- **RL.9-10.2** Determine a theme or central idea of a text, including those by and about American Indians, and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
- **RI.9-10.7** Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia, paying specific attention to cultural nuances), determining which details are emphasized in each account.

- **W.9-10.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **SL.9-10.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively.

Social Studies

(1) The benchmark for social studies content standard 1 for a student upon graduation is the ability to:

(a) analyze and adapt an inquiry process (i.e., identify question or problem, locate and evaluate potential resources, gather and synthesize information, create a new product, and evaluate product and process);

(b) apply criteria to evaluate information (e.g., origin, authority, accuracy, bias, distortion of information and ideas); and

(c) synthesize and apply information to formulate and support reasoned personal convictions within groups and participate in negotiations to arrive at solutions to differences (e.g., elections, judicial proceedings, economic choices, community service projects).

Science

HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impact to Earth systems.

ASSESSMENT

Activity:

Drawing upon your knowledge of climate change, as well as utilizing outside resources, including fiction and nonfiction texts, research a country outside of the United States, focusing on their response to Climate Change. Through this research you should address how climate change impacts this country, how the country is trying to mitigate climate change, and what the future implication of climate change are for this country. You will film a short video highlighting the key points of your research to present to the class and then participate in a group simulation. You will be discussing global issues related to climate change from the perspective of the country you researched.

Student Work:

Student will research their country, including at least three reputable sources.
Students will create a research document that details the information they have discovered.
Student will create a short video the answers the questions;

- How does climate change impact this country?
- How does this country influence climate change?

- What is this country attempting to do to mitigate climate change?
- What are the future consequences of climate change for this country?

Students will present their project during a whole class discussion. Students will discuss global climate change issues from the perspective of the country they are researching. Students will orally present their information, supported by visuals either presented on a display board or electronically. By the end of the assessment students should understand how different countries address climate change.

Teacher Work:

The teacher will provide support for students as they conduct their research.
The teacher will evaluate students' discussions and research using an analytic rubric.

CRITERIA

- Students will be evaluated on their ability to analyze and synthesize the multiple texts presented throughout the unit as well as their individual research.
- Students will be evaluated on their ability to orally discuss the project with peers

	4 Points	3 Points	2 Points	1 Point
Criterion 1 Video	The video includes answers to the 4 key questions, is visually appealing, and provides factual information.	The video includes answers to 3 key questions, is visually appealing, and provides factual information.	The video includes answers to two key questions, is somewhat visually appealing, and provides mostly factual information.	The video does not provide answers to the key questions, is not visually appealing, and the information is not factual.
Criterion 2 Discussion Content	Research content is factual and answers the four key questions.	Research content is factual and answers at least three of the key questions	Research content is factual, but only answers one or two of the key questions.	Research content is not factual and does not answer any of the key questions.
Criterion 3 Discussion Technique	Speaks clearly during the discussion, does not read from notes, and does not use more than 3 filler words.	Speaks clearly during the discussion, rarely read from the notes, and does not use more than 5 filler words.	Speech is slightly unclear at times during the discussion, consistently read from the notes, and uses more than 5 filler words.	Does not speak clearly during the discussion, always reads from the notes, and uses more than 10 filler words.
Criterion 4 Research	Utilize at lease 5 sources and 3 of these sources come from reputable locations outlined in the research activity.	Utilize at least 4 sources and 2 sources come from reputable locations outlined in the research activity.	Utilize 1 to 3 sources. One source comes from a reputable location.	No sources are cited or no research is utilized.

UNIT CALENDER

Calendar Key:
Math Lessons
Science Lessons
Social Studies Lessons
Language Arts Lessons

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Unit Starts Lesson #1	Lesson #2	Lesson #3 Lesson #4	Lesson #5	Lesson #6 Lesson #7	
	Lesson #7 Lesson #8	Lesson #9 Lesson #10	Lesson #10 Lesson #11	Lesson #11	Lesson #12	
	Work Day	Work Day	Work Day	Work Day	Unit Ends Presentation Day	

LESSON PLANS

Lesson #1

Lesson Title: Why should I care about climate change?

Subject: Language Arts

Connections:
- What is climate change?

Materials:
- Graphic Organizer
- Daily Journal
- Climate Change-The Facts
    - https://www.bbc.co.uk/programmes/p075tsy2

Activity:
- **Introduction:**
    - Start the class off with a whole group discussion asking students what they know about climate change.
    - Write down students answers on a large sheet of paper or record it on a shared google document.
- **Activity:**
    - Once students have finished discussing what they know about climate change have them complete a quick write answering the question, why should I care about climate change?
    - Watch a documentary that provides a general overview of climate change. Have students take notes on anything they did not know and record their notes on a graphic organizer.
- **Wrap-Up:**
    - To end class, have students share one fact they learned about climate change after watching the video. They can also share about any differences between what they knew about climate change and what they learned in the video.

Assessment:
- The quick write will act as a preassessment for this unit. Make sure to collect students' quick writes so they can refer back to them at the end of the unit and see what new knowledge they have gained about climate change.

Lesson #2

Lesson Title: What is Climate Change

Subject: Science

Connections:
- What is climate change?
- What causes climate change?
- How does climate change impact the environment?

Materials:
- Printed Pictures
- Climate Change Presentation

Activity:
- **Introduction:**
  - Have students look at a few images related to climate change. Have them write down their observations and ideas about the context of each image.
  - Students should share their observations with the class.
- **Activity:**
  - Have students take notes while you directly teach specific information that pertains to what climate change is, what its underlying causes are, as well as how climate change impacts the environment.
  - Make sure to include questions and discussion into the presentation to test students' knowledge and engagement.
- **Wrap-Up:**
  - Have students look at the images from the beginning of the lesson. Have them make connections between what they learned in the presentation and what they see in the image.

Assessment:
- The formative assessment for this lesson occurs when students reflect on what they have learned by referring back to the images. Students should be able to apply what they learned about climate change to provide context for the images.

Lesson #3

Lesson Title: Analyzing Graphs

Subject: Math

Connections:

- What is climate change?
- What causes climate change?
- **HS-ESS3-5** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impact to Earth systems.

Materials:

- Climate Graphs (CO2, Global Temperature, Ice Melt, Ocean Rise)
    - https://climate.nasa.gov/vital-signs/ice-sheets/

Activity:

- **Introduction:**
    - Review the parts of a graph.
    - Have students name each part of different types of graphs and relate what type of data that graph represents.
    - Students should have a good understanding of how to read graphs and determine what type of data they represent before completing the activity.
- **Activity:**
    - Students will be completing a picture walk in small groups. At each station there will be a graph or multiple graphs that relate to climate change. Students will use their knowledge about the parts of a graph and types of graphs to analyze the data.
    - Have students rotate through each station, provide students who need additional support with a graphic organizer to help support note taking of what the group is learning.
- **Wrap-Up:**
    - Have the class discuss what conclusions they drew from each graph, and provide specific evidence from the graph to support their analysis.

Assessment:

- This formative assessment will test student's ability to analyze graphs. When they discuss their conclusions about the graph they will need to demonstrate their knowledge of graphs by providing specific evidence.

Lesson #4

Lesson Title: Extreme Weather

Subject: Language Arts

Connections:
- How does climate change impact the environment?
- How does climate change impact people?

Materials:
- *Ship Breakers* Paolo Bacigalupi
- Videos of people who have been impacted by natural disasters
    - **https://abcnews.go.com/Politics/video/hurricane-harvey-survivor-tells-story-years-disaster-65574372**
    - **https://www.youtube.com/watch?v=LrrgtY2LO78**
- Presentation on Extreme Weather
- Daily Journal

Activity:
- **Introduction:**
    - Introduce *Ship Breakers* by providing students with an overview of the story and provide context for the setting of the story.
- **Activity:**
    - Present information about extreme weather.
    - Draw connections between global warming and an increase in the frequency of extreme weather events.
    - Have students explore a few first-person accounts from people who have experienced these extreme weather events.
    - Have students discuss how these extreme weather events impacted the person whose story they are watching.
- **Wrap-Up:**
    - Students will write down their reaction to the video.
    - They will write down how these extreme weather events impact individuals.

Assessment:
- Students will draw connections between large climate change events and the impacts these events have on individual people.

Lesson #5

Lesson Title: Coastline Simulator

Subject: Science

Connections:

- Climate change is a global issue that impacts people throughout the world.
- What are the long-term consequences of climate change?
- How does climate change impact the environment?

Materials:

- Ocean Rise Simulator
  - https://coastal.climatecentral.org/map/5/1.2629/51.7234/?theme=sea_level_rise&map_type=year&basemap=roadmap&contiguous=true&elevation_model=best_available&forecast_year=2100&pathway=rcp85&percentile=p95&refresh=true&return_level=return_level_1&slr_model=kopp_2014

Activity:

- **Introduction:**
  - Introduce students to the coastline simulator.
  - Review the tools on the simulator as well as how students can change and alter the settings.
  - Ensure that students understand how to run the simulator and have a print up of directions that students can refer to if they need support.
- **Activity:**
  - Have students pick a specific location in the world that is bordered by an ocean.
  - Students will explore what this location will look like in the future based on ocean levels.
  - Students should explore a variety of scenarios to understand how their location could be impacted.
- **Wrap-Up:**
  - Each student will report about their specific location, revealing what the future potentially holds for this coastal area.

Assessment:

- Students will draw connections between sea level rise and climate change. Students will reflect on how climate change is a global occurrence by reporting about a location outside of the United States.

Lesson #6

Lesson Title: Compare/Contrast: Big Oil vs. Small Islands

Subject: Language Arts

Connections:

- How does climate change impact people?
- How have people responded ot the issue of climate change?

Materials:

- Primary Sources from Big Oil Companies
  - **https://corporate.exxonmobil.com/Sustainability/Environmental-protection/Climate-change**
- Primary Sources from Small Islands
-
- Graphic Organizer
- Daily Journal

Activity:

- **Introduction:**
  - Ask students to think about why Oil Companies are still so successful even though we know that oil is polluting the environment when it is burned.
  - Have them share their answer with a neighbor.
- **Activity:**
  - Students will be provided with documents from Big Oil Companies and documents from small island communities that have been impacted by climate change.
  - Students will compare and contrast the view points in each document.
  - They can work either individually or in a small group to analyze these documents.
- **Wrap-Up:**
  - Students will complete a quick write as their exit ticket for the class pertaining to the differences between the two different accounts they reviewed and analyzed in class.

Assessment:

- This formative assessment will test students on their understanding of how climate change impacts individuals as well as how individuals view climate change in different ways.

Lesson #7

Lesson Title: Climate Change Activism

Subject: Social Studies

Connections:

- How have people responded to the issue of climate change?
- Activist have impacted government policy in regards to climate change.

Materials:

- *No One is Too Small to Make a Difference,* Greta Thunberg
- Computers

Activity:

- **Introduction:**
  - Have students watch a speech by Greta Thunberg
  - Discuss her key points and what the most important aspects of her speech are.
- **Activity:**
  - Introduce the research activity by allowing students to pick one activist group or organization that is trying to prevent climate change through politics.
  - Explicitly teach students how to conduct research. Show them how to determine the quality of a source and ensure that the source they are reviewing is providing accurate and unbiased information.
  - Have students utilize the research strategies you just taught them to research their organization.
  - Students will create a short presentation about their organization using the research they completed.
- **Wrap-Up:**
  - Students will present their research for the class.

Assessment:

- Students will be formatively assessed on their knowledge of how activism has shaped climate change policy and views though their presentation.

Lesson #8

Lesson Title: The Future

Subject: Language Arts

Connections:

- What are the long-term consequences of climate change?
- **RI.9-10.7** Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia, paying specific attention to cultural nuances), determining which details are emphasized in each account.

Materials:

- *Ship Breakers,* Paolo Bacigalupi
- *The World Without Us,* Alan Weisman

Activity:

- **Introduction:**
  - Introduce *The World Without Us*. Provide context for the books setting and content.
- **Activity:**
  - Divide the class in half and assign them either chapter 10 or chapter 19 from *The World Without Us*.
  - Each group will read their chapter and draw connections between it and *Ship Breakers*, as well as other text or resources explored throughout the unit.
  - Students discuss their analysis within their group.
- **Wrap-Up:**
  - Pair each student up with someone from the opposite group.
  - Each student will share what their chapter was about and what connections they made using specific textual evidence.

Assessment:

- The formative assessment of the pair and share is testing students' ability to analyze different types of text and draw connections between the long-term consequences of climate change.

Lesson #9

Lesson Title: Themes & Connections

Subject: Language Arts

Connections:

- **RL.9-10.2** Determine a theme or central idea of a text, including those by and about American Indians, and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

Materials:

- *Ship Breaker,* Paolo Bacigalupi

Activity:

- **Introduction:**
  - Have students share their impressions of the book with a partner.
- **Activity:**
  - Divide the class into small group to discuss the book.
  - Utilize the speak last discussion strategy. Each student will pick a specific quote, event, or topic from the book. Other students in the small group will discuss this topic and the student who chose the topic gets to speak last.
  - Make sure every student has the chance to discuss the section they wanted to.
- **Wrap-Up:**
  - To wrap-up the classroom discussion of the text have the class discuss the main ideas and themes of the story as a whole class.
  - Write down any idea the students have and encourage them to provide specific evidence from the text to support their ideas.

Assessment:

- Students will be assessed on their participation in the discussion and their contribution to their small group.

Lesson #10

Lesson Title: Calculating CO2

Subject: Math

Connections:

- Can we stop climate change?
- **HS-ESS3-5** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impact to Earth systems.

Materials:

- CO2 Data
- Daily Journal

Activity:

- **Introduction:**
  - Review how to read exponential graphs and how to calculate specific points on those graphs using an equation.
- **Activity:**
  - Have students utilize information about the current amount of CO2 in the atmosphere as well as information about the exponential growth of the CO2.
  - Have students calculate the theoretical amount of CO2 in the atmosphere in ten, twenty, fifty, and one hundred years using the exponential equation.
  - Have students discuss their findings and then experiment with the variables.
    - This could include a variable where CO2 emission stop suddenly, or an increase in emissions.
- **Wrap-Up:**
  - Using the data students have gathered pertaining to the future of climate change and global warming have them complete a quick write answering the question, can we stop climate change?

Assessment:

- Student will complete a quick write that addresses the future implications of climate change and whether we can truly stop climate change.

Lesson #11

Lesson Title: Can we stop climate change?

Subject: Science

Connections:

- Can we stop climate change?
- **HS-ESS3-5** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impact to Earth systems.

Materials:

- Supplemental graphs

Activity:

- **Introduction:**
  - Discuss the question, can we stop climate change?
- **Activity:**
  - Present information on what individuals can do to mitigate climate change.
  - Discuss general goals for society and specific individual goals.
  - Introduce activities that students can complete to help mitigate their own impact on the environment.
  - Have everyone chose and activity and complete it over the two days of this lesson.
- **Wrap-Up:**
  - Have students share their mitigation activity with the whole class so everyone can learn about. A different technique.

Assessment:

- Students will be assessed on their ability to understand that we cannot stop climate change but we can help mitigate it.

Lesson #12

Lesson Title: Conclusion

Subject: Language Arts

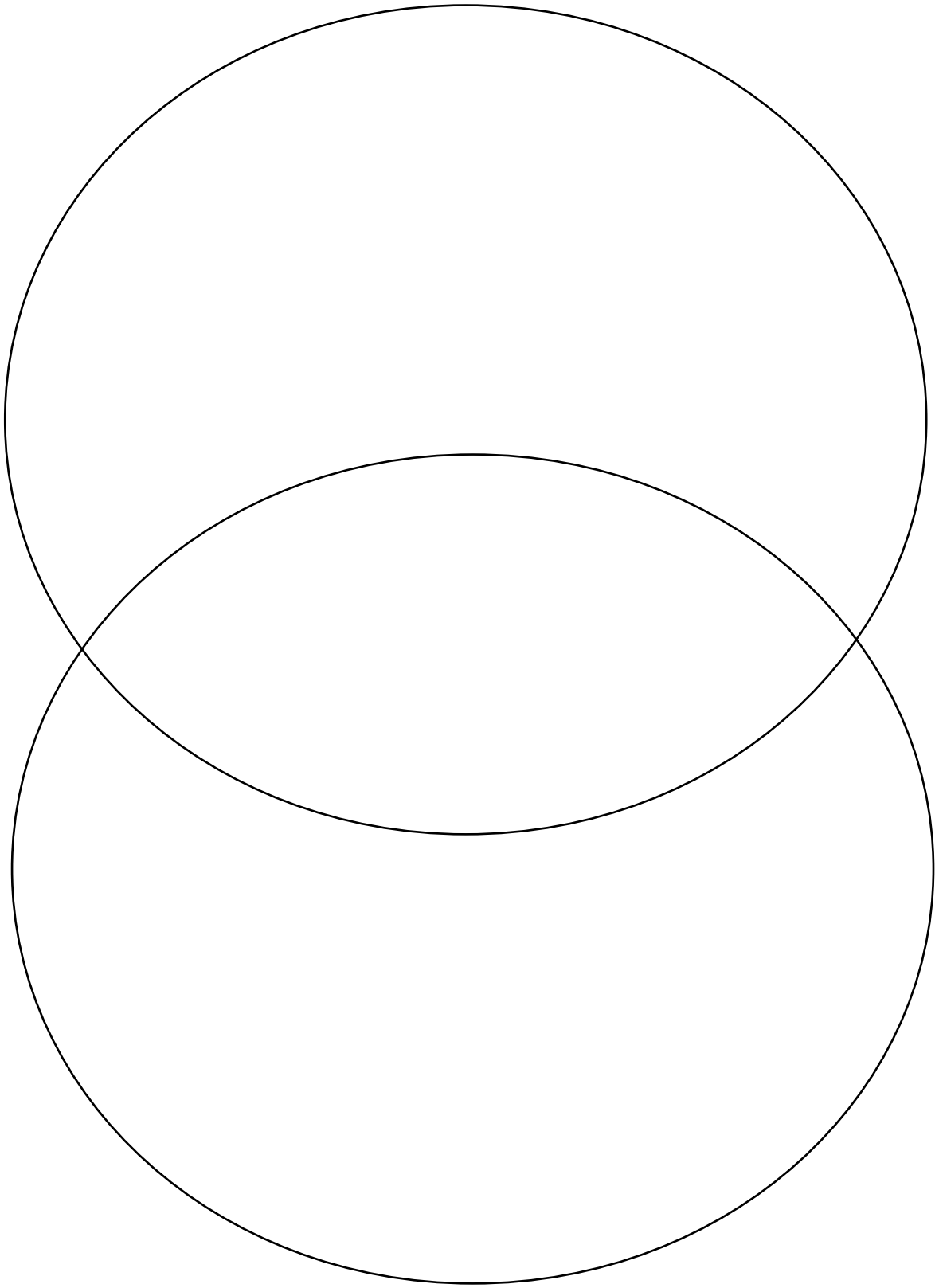
Connections:
- What is climate change?

Materials:
- Daily Journal

Activity:
- **Introduction:**
  - Have a class discussion about what they learned throughout the unit about climate change. Address the question, why should I care about climate change?
- **Activity:**
  - Have student read through their journal entries for the unit.
  - Write a final quick write that answers, why should I care about climate change?
- **Wrap-Up:**
  - Introduce the unit assessment, expectations, and the final product.
  - Also address why the students will be completing this assessment.

Assessment:
- Students will be completing a post-assessment by completing their quick write and reflecting on the knowledge they have gained about climate change throughout the unit.

Graphic Organizers:



What do you know?	What did you learn?	What do you wonder?

Date:_____

Resources:

Beach, R., Appleman, D., Fecho, B., Simon, R. (2021). *Teaching Literature to Adolescents.* 4th ed. New York, NY: Routledge.

Beach, R., Share, J., Webb, A. (2017). *Teaching Climate Change to Adolescents*. New York, NY: Routledge.

Sarigianides, S., Petrone, R., Lewis, M. (2017) *Rethinking the "Adolescent" in Adolescent Literacy.* National Council of Teachers of English.

Wiggins, G. & McTighe, J. (2005) *Understanding by Design.* Association for Supervision & Curriculum Design.