

Scientists Who Changed the World

TEACHER'S GUIDE

Our modern world has been shaped by scientific discoveries. Scientists Who Changed the World is a series that looks at some of the world's greatest scientists and how their work changed society at the time and influenced people in the future. Special "History's Story" boxes highlight achievements and events in each scientist's personal life. A timeline in each book also shows milestones and mentions other influential scientists at the time.

The Scientists Who Changed The World Teacher's Guide is packed with engaging, student-centered lessons that develop the critical thinking and research skills students need to consider the significance of events on history and the individuals of the time. Students will learn to think critically about the information they read and draw connections between different sources of information and their own understandings. Overall, students will learn of some important figures in science and the impacts they have had, as well as how the historical events of the time have impacted the lives and work of these scientists.

The innovative and multimodal lesson plans in this guide are tailored for grades 6 to 7 and have a history and language focus. The lesson plans in this guide follow a sequential order that works to scaffold understanding. Reproducible worksheets and assessment tools accompany each lesson plan. The titles in Scientists Who Changed the World include:

Albert Einstein

Charles Darwin

Galileo Galilei

Rachel Carson

Sir Isaac Newton

Stephen Hawking

PACING CHART AND VOCABULARY

Lesson Plan Title	Pacing	Vocabulary
What Was the World Like Then?	1-2 periods	century global historical events impact local personal events timeline
Great Successes and Challenges	1-2 periods	accomplishment challenges headings success summarize
Cause and Effect	1-2 periods	cause effect opinion perspective
Interview with a Scientist Who Changed the World	3-4 periods	closed-ended question interview open-ended question

* 1 class period = 40 to 60 minutes

ACCOMMODATION STRATEGIES

Accommodations provide equal access to learning and equal opportunity to demonstrate what is learned. Accommodations allow a student access to the subject or course without any changes to the knowledge and skills the student is expected to demonstrate.

Educators are encouraged to adapt the instructional approach, activities, and assessments included in this guide to best meet the diverse interests, needs, and abilities of their students. Possible accommodations may include:

Instructional Strategies

- Break tasks into parts with accompanying timelines
- Provide extra time for processing of oral information
- Pair oral instructions with visual ones (writing or symbols)
- Pre-teach new vocabulary and regularly review previously taught vocabulary
- Provide model of completed work
- Frequently check with the student to get him/her started
- Provide oral and visual instructions and examples
- Provide a checklist of tasks for the student

Environmental Strategies

- Proximity to teacher
- Strategic seating
- Flexible or mixed-ability grouping
- Provide an alternative setting for learning that is free from visual and auditory distractions.

Assessment Strategies

- Build in extra time to allow student to process questions asked and answers given
- Provide written instructions and rubrics for assignments
- Offer a choice of assessment activities so that the student can choose one suited to their strengths
- Space out or extend assignments to prevent student feeling overwhelmed
- Reduce the number of tasks used to assess skill or concept
- Allow students to use assistive devices or technology

LESSON 1

What Was The World Like Then?

Curriculum Correlations

C3 Framework for Social Studies

D2.His.1.6-8

Ontario Social Studies and History Standards

Grade 6

Overall Expectation A.2

A2.2

Grade 7

Overall Expectation A.2

A2.4

Materials

- Roll of paper or printer paper that can be taped together
- Writing utensils
- Meter sticks or rulers
- *Timeline Template*
- *Timeline Reflection*
- *What Was The World Like Then? Checklist*

Objectives

Students will be able to:

- Explore significant events of a particular time period on a global and local scale.
- Research events from various time periods.
- Reflect on their class created timeline.

Setting the Stage

Begin by writing on the board the terms “personal events” and “historical events”.

Have students in pairs or small groups brainstorm some examples for both categories.

Allow both vague and specific examples. For example, “war” would be a vague example while “The War of 1812” would be a more specific example.

Have the class share examples that they generated and write some of the ideas on the board under the proper heading.

Then, discuss the difference between a personal event and a historical event. Ask the class “Can an event ever be both a personal and historical event?”

Activity

Pick a specific historical event from your class created list. Ask students:

- What was the world like then? What impact did this event have on the world?

Discuss the impact it would have had globally and locally. Explain these terms if necessary. Encourage students to consider how their lives would have been impacted if they were alive during this time. If students find this challenging, pick an event during their lifetime or something more recent that they are familiar with.

Inform the class that together, we are going to create a timeline that covers the 1500s to present day.

Students will be split into six groups. Each group will be in charge of one century. They will research major events from that time period. Groups will have choice over which events they feel they want to include.

All events included should be historical events (e.g., the end of World War One) with a local and/or global impact and should not be a personal event (e.g., Josh’s grandfather was born). Give some examples of the types of events that should and should not be included.

Place the class into 6 groups. Each group will be assigned a century

- a) 1500-1600
- b) 1600-1700
- c) 1700-1800
- d) 1800-1900
- e) 1900-2000
- f) 2000- present day *

*This group has the smallest time frame and will have the most access to information, therefore this time frame should be assigned strategically—possibly to a smaller group.

Encourage students to use a variety of sources, including the Internet, textbooks, encyclopedias, non-fiction books, etc.

Have students work in their group to pick 8 to 10 events for their century. Once they have created this list, have each group member take on one event to research more in depth.

Give each group 5 copies of the *Timeline Template* to record their information on. Give students at least one class period to research their events. The completed *Timeline Templates* can be cut up into individual events to be attached to the class constructed timeline.

Let students know that events need to include start and end dates. On the timeline, they can put start and end dates in one place (e.g. World War One July 28, 1914- November 11, 1918) or more than one event (e.g., World War One began: July 29, 1914 and World War One Ended: November 11, 1918). If students choose an event that extends into another group's time period, they must communicate with the other group to ensure no overlap.

Once events are finished, students can attach them to the class-created timeline to on the wall. If there is not space to create one linear timeline, display the centuries in chronological sections.

Extensions

- Students can create additional timeline events using extra copies of the *Timeline Template*. They can do so during additional lessons or while reading *Scientists Who Changed The World* books. Or, have students do so after completing their *Timeline Reflection*.
- Encourage students to choose an event from the timeline to research more in-depth. They may wish to seek out additional sources including primary sources when available. Or explore the impact the event may have had on people in different areas (e.g., their local community or the location of the event etc.)

Wrap-Up

After completing the class-created timeline, give students a chance to complete a gallery walk of the entire timeline.

Then, have students complete the *Timeline Reflection*, encourage students to share part or all of their reflection with the class. If there are any events that the students feel should be added to the timeline, ask for volunteers to add them. Leave the timeline up for students to refer back to during additional lessons.

Assessment

Assess students' understanding during lessons using observational and anecdotal notes.

Collect students *Timeline Reflection* sheets and assess them using the *What Was The World Like Then? Checklist*.

Timeline Template

Event: _____

Date: _____

Explanation: _____

Impact: _____

Timeline Template

Event: _____

Date: _____

Explanation: _____

Impact: _____

Timeline Review

Name: _____

List one event that you learned about by reviewing the class timeline:

What did you find interesting about this event?

Name one event you think should be included in the timeline and explain.

Timeline Review

Name: _____

List one event that you learned about by reviewing the class timeline:

What did you find interesting about this event?

Name one event you think should be included in the timeline and explain.

What Was the World Like Then? Checklist

Student: _____

The student completed their timeline events accurately.	Achieved	Somewhat Achieved	Has Not Yet Achieved
The student completed the timeline reflection with clarity and detail.	Achieved	Somewhat Achieved	Has Not Yet Achieved

Additional comments:

What Was the World Like Then? Checklist

Student: _____

The student completed their timeline events accurately.	Achieved	Somewhat Achieved	Has Not Yet Achieved
The student completed the timeline reflection with clarity and detail.	Achieved	Somewhat Achieved	Has Not Yet Achieved

Additional comments:

LESSON 2

Successes & Challenges

Curriculum Correlations

Common Core State Standards

RI.6.3 , RI.7.1, RI.7.3

Ontario Language Arts Standards

Grade 6 Reading

Overall Expectation 1

1.4, 1.5

Grade 7 Reading

Overall Expectation 1

1.4, 1.5

Materials

- Writing materials
- Scrap paper
- Scientists Who Changed The World books
- *Successes & Challenges Summarizer*
- *Successes & Challenges Exit Card*

Objectives

Students will be able to:

- Explore the Scientist Who Changed the World books to pull out information.
- Gather and summarize information into graphic organizers.
- Consider the effect different events have on scientists' lives.

Setting the Stage

Remind students of the discussion from the previous lesson about historical and personal events. In the prior lesson we focused on historical events. Today, the focus will be on personal events.

On a scrap piece of paper, have each student write down five personal events that they feel are important to their life. Ask for students to share an example if they are comfortable with the class.

After sharing, ask students to consider the events they have written down. Ask them to try to categorize these events into either a success (i.e. learning to walk) or a challenge (i.e. moving schools). Discuss with students if some of the events could fit into both categories, or do not fit into either.

Activity

Following the Setting the Stage activity, introduce the names of each of the scientists featured in the Scientists Who Changed the World series.

- *Albert Einstein*
- *Charles Darwin*
- *Galileo Galilei*
- *Rachel Carson*
- *Sir Isaac Newton*
- *Stephen Hawking*

Explain to students that we will be exploring the personal events of these scientists. We will look specifically at the successes and challenges they experienced.

Allow students to choose a scientist or sort them into groups. Give each group the book associated with the scientist they will be examining.

Using the *Successes and Challenges Summarizer*, have groups skim through the book looking at headings, chapter titles, and graphics to help pull out important personal events that helped to shape the scientist they are investigating. Encourage students to consider what impact each personal event would have had on their scientist.

Give an example of how to complete the organizer:

For Albert Einstein:

Date	Event	Personal Impact
1894	Einstein dropped out of school and moved to Milan with his family.	Success Challenge What impact did this event have? <ul style="list-style-type: none">• He was not happy in school and was a poor student• He was able to spend more time in museums and libraries doing his own learning• Led to him wanting to attend the Polytechnic Institute in Switzerland• He returned to high school at a school of his choosing which encouraged creative thinking and questioning

Have groups complete their *Successes & Challenges Summarizer* together to cover the major personal events from the Scientists Who Changed The World book. They should include a minimum of six events.

Encourage groups to discuss the events and what impact they would have had on the individual. When complete have the organizers submitted to check for quality and completion.

Extensions

- Have students locate their scientists' personal events on the class-created timeline or on a historical timeline. Explore what events were happening in the world at that time and how those events would have impacted the personal events of their scientist.
- Plot some of the major historical events mentioned in the book onto the timeline by completing a small summary of the event and placing it in chronological order on the timeline.
- Have students complete a journal response in the perspective of their scientist during one of the personal events listed on their *Successes & Challenges Summarizer*. Alternatively, students can write a journal entry about how they personally would have felt to experience this event.

Wrap-Up

Once each group has completed their *Success & Challenges Summarizer*, have each student in the group complete the *Success & Challenges Exit Card* independently. On the exit card, students need to detail one event they felt was important in the life of their scientist and what impact they think it may have had on that person. These will be submitted to check for comprehension.

Assessment

Assess students' understanding during lessons using observational and anecdotal notes. Collect groups' *Successes & Challenges Summarizers* to check for quality and completion, adding feedback notes or edits as needed if continuing on with the Interview with a Scientist activity.

Collect *Successes & Challenges Exit Card* to check for independent comprehension of the material. Give the students a spotlight rating: green- great work, yellow- more detail and information needed, red- review the material and see the teacher to resubmit.

Name: _____ Date: _____

Successes & Challenges Summarizer

Scientist: _____

Date	Event	Personal Impact	
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge

Name: _____ Date: _____

Successes & Challenges Summarizer

Scientist: _____

Date	Event	Personal Impact	
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge
		Success What impact did this event have? _____ _____ _____ _____ _____	Challenge

Name: _____ Date: _____

Successes & Challenges Exit Card

Choose one personal event and explain in detail the impact it had on your scientist's life.

For Teacher Use:

Green: Great Work	Yellow: Needs more detail	Red: Review and Submit
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Notes: _____

LESSON 3

Cause and Effect

Curriculum Correlations

C3 Framework for Social Studies

D2.His.5.6-8

D2.His.14.6-8

Ontario Language Arts

Grade 6 Reading

Overall Expectation 1

1.5, 1.6

Grade 7 Reading

Overall Expectation 1

1.5, 1.6

Materials

- Class-created timeline (or historical timeline)
- Completed *Successes and Challenges Summarizer*
- Scientist Who Changed the World books
- *Cause & Effect Organizer*
- Writing utensils
- Sticky notes

Objectives

Students will be able to:

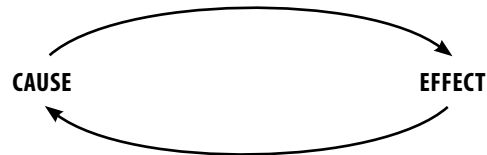
- Explore the impacts of the time period on their scientist's life and work
- Consider and explore the relationship between the cause and effect of life events.
- Investigate how the time period would and having impacted the scientist's perspective

Setting the Stage

On the board write the words "Cause" and "Effect". Discuss with students how every action has a resulting reaction.

- For example, if the fire alarm rings the effect of that would be that everyone would stand up and leave the school. Therefore, the cause of everyone exiting the school would be that the fire alarm ringing.

Connect the words "cause" and "effect" on the board with arrows, reminding students that cannot have one without the other.



Have students work with an elbow partner. Give each pair a cause (see examples) and have them brainstorm some possible effects of that action.

Examples:

- Littering in the park
- Not following school rules
- Being late for an appointment
- Missing a team practice
- Holding the door for someone
- Giving someone a compliment

Acknowledge that depending on the people involved in the situation and the specifics, the effect could be different in different circumstances.

Activity

If a class timeline was created, remind students that the timeline is there to help them and to refer to it whenever needed. Students should also have their completed *Successes and Challenges Summarizer* to help them.

Have students work in the same groups as the previous lesson, studying the same scientist. At this point, students should be familiar with the scientist they have been working with. If not, allow groups time to read through some of the sections of the *Scientist Who Changed the World* book that they are working with.

Have each group of students look through the first chapter of their *Scientist Who Changed the World* book.

As a group, students will pick one important event from the early life of that scientist to examine as their first cause. Using that cause, each group will complete one section of the *Cause & Effect Organizer*. Encourage groups to search through the text for effects of their chosen cause.

Have students fill out the "From the text" section of the organizer first. Then, invite them to brainstorm inferred effects of the action as well. When making inferences, encourage students to use information from the text, class timeline, or their own research.

Give each group a chance to share their first cause and effect section with the class. Ask other groups to provide feedback regarding how the event might have had other effects than the group listed.

Discuss with the class what perspective means, and how many of the inferred effects may involve a change of perspective for the scientist.

Give groups time to further dive into their *Scientists Who Changed the World* book to search for at least 4 other cause and effect situations to complete the *Cause & Effect Organizer*.

Extensions

- Students can further research an event during the life of the scientist they are focused on. They can try to find additional information or, if possible, a primary resource that can help them to further infer how the cause led to change of perspective for that scientist.
- Students can refer back to the class-created timeline to choose an event to add to a *Cause & Effect Organizer*. This will help students see how a historical event, as a cause, led to different long- and short-term effects.

Wrap-Up

Have each group display their *Cause & Effect Organizer* on a table with their *Scientist Who Changed the World* book. Give each student a few sticky notes to write positive feedback or suggestions for their classmates' work. Spend 10 minutes allowing students to travel to different groups to learn more about the different scientists and explore the *Cause & Effect Organizers* related to each scientist.

Assessment

Complete anecdotal notes about group work and collaboration for each student and group. Keep this information to help in the final lesson assessment of their Interview with a Scientist presentation.

Visit with groups throughout the lesson to hold informal conferences and assess if the group has an understanding of how cause and effect relationships work.

Name: _____

Date: _____

Cause & Effect Organizer

Scientist: _____

Cause	Effects
	From the text: (include page numbers)
	Inferred:
	From the text: (include page numbers)
	Inferred:
	From the text: (include page numbers)
	Inferred:

Name: _____

Date: _____

Cause & Effect Organizer

Scientist: _____

Cause	Effects
	From the text: (include page numbers)
	Inferred:
	From the text: (include page numbers)
	Inferred:
	From the text: (include page numbers)
	Inferred:

LESSON 4

Interview with a Scientist Who Changed the World

Curriculum Correlations

C3 Framework for Social Studies

D2.His.4.6-8

Ontario Language Arts

Grade 6 Reading

Overall Expectation 1

1.6

Grade 7 Reading

Overall Expectation 1

1.6

Materials

- Class created timeline (or historical timeline)
- Completed *Successes and Challenges Summarizer* (if following lesson sequence)
- Completed *Cause & Effect Organizer* (if following lesson sequence)
- Scientist Who Changed the World books
- Writing utensils
- *Interview with a Scientist Planner*
- *Draft Interview* pages
- *Interview with a Scientist Checklist*
- *Interview with a Scientist Rubric*

Objectives

Students will be able to:

- Analyze the information they gathered to create connections.
- Create a scripted interview with their scientist.
- Perform the interview for their classmates.

Setting the Stage

On the board write the following question:

- If you could interview any one person, who would it be?

As students enter the classroom, have them write their answers on board. Let them know that their choice can be a person who is living, dead, or even fictional.

Have each student sit down and turn to an elbow partner. Each student should share their answer and one question they might ask their person of choice.

Around the classroom, either on walls or desks, set up papers with the name of a person listed at the top of each paper. Include some of the students' interview choices as options. See some examples of people to include below:

- The Queen
- Your Great-great grandparents
- The Pillsbury Doughboy
- George Washington
- Sherlock Holmes
- William Shakespeare
- Bugs Bunny
- An Alien
- Amelia Earhart

Put students into pairs or groups of three. Designate one person to be the writer. Give each group a different colored marker or pencil to write with.

Have each group spend 1 minute at each paper and write at least 1 question they would ask this person if they were able to interview them. Encourage students to ask detailed questions they would not be able to find by quickly researching this person.

Once every group has visited each paper, ask the groups to read through the questions listed. Have them together select one or two questions that they feel would get the most detailed and interesting response. Have each group share with the class the question they selected and explain why they felt it was a great question.

Activity

Explore the questions listed in the Setting the Stage activity and take note of the questions that were selected as good questions.

Introduce the idea of an open-ended question as encouraging the person being interviewed to include more detail and explanation in their response. Point out some more open-ended questions that were brainstormed in the setting the stage activity. Discuss with students the issues with closed-ended questions.

If you have completed the previous lessons have students return to their groups, or create groups associated with each *Scientist Who Changed the World* book. If applicable, have each group take out their *Success and Challenges Summarizer* and their *Cause & Effect Organizer*.

Using the *Interview with a Scientist Planner* have each group brainstorm at least 10 questions they would ask their scientist.

Encourage students to think beyond the content of *Scientists Who Changed the World* book. They may use information from the book to help them answer the questions, but should be embellishing further with more details including information they learned about the time period their scientist was working in. Focus only on the question brainstorm to begin with, but have students keep in mind they will be answering some of these questions.

Once each group has brainstormed at least 10 questions, trade their *Interview with a Scientist Planner* with another group. Have each group read through the brainstormed questions and circle 4 or 5 questions that they feel are good open-ended questions for an interview with a scientist. Return the *Interview with a Scientist Planner* to the original group.

Each group then needs to select a minimum of 5 questions to include in their interview with their scientist. Groups are free to choose from the peer selected questions, other brainstormed questions, or newly generated questions.

Once groups have selected their interview questions, assign each group member specific questions to draft answers for. Encourage students to use information from both their summarizer and organizer, their *Scientists Who Changed the World* book, and any other additional research they may need to do.

Once the *Interview with a Scientist Planner* is completed, have groups use the planner to draft a script for their interview. Assign roles to the group members for the interview.

Once draft scripts are written conference with each group using the *Interview with a Scientist Checklist*. After the conference, groups can start to practice and prepare their Interview With a Scientist Presentation. Ensure each group is given a copy of the rubric following their conference to ensure they are aware of and meeting all criteria.

Give groups at least 1 class period to practice and prepare their performance, consider scheduling performances on a separate day in order for students to gather any additional items (e.g., props, costumes etc.).

Extensions

- Allow students to pre-record and edit their interview adding additional segments and creative aspects such as music, graphics etc. Either as a video or podcast presentation.
- After watching the Interview with a Scientist presentations have students generate additional questions for the scientists they saw interviewed during the presentations. Discuss with a partner how they feel the scientist may have answered or responded to the questions.
- Draft a fictional discussion between two Scientists who were the focus of the interview or include a scientist that wasn't focused on. Focus on how they would have had similar or differing experiences and opinions.

Wrap-Up

Have each group present their final Interview with a Scientist in front of the class. Following each presentation allow the class to ask the group questions about their interview or the scientist they focused on.

Assessment

Observe and record anecdotal notes throughout the process regarding, researching, teamwork and leadership skills. After each group has completed their draft script for their interview conference with the group to review their draft using the *Interview with a Scientist Checklist*. Give immediate feedback to the group so they are able to implement this as they prepare their presentation.

Use the *Interview With a Scientist Rubric* to assess each group's final performance of their interview with a scientist.

Interview with a Scientist Planner

Group members: _____

Scientist: _____

Question Brainstorm:

Generate a list of questions you would be interested in asking your scientist:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Draft Interview

QUESTION: _____

Details for answer: (include citations when necessary):

QUESTION: _____

Details for answer: (include citations when necessary):

QUESTION: _____

Details for answer: (include citations when necessary):

Draft Interview

QUESTION: _____

Details for answer: (include citations when necessary):

QUESTION: _____

Details for answer: (include citations when necessary):

QUESTION: _____

Details for answer: (include citations when necessary):

Interview with a Scientist Checklist

Group members: _____

Scientist: _____

Criteria	Yes	Almost	Comments
Includes at least 5 open-ended questions			
Answers to the questions are detailed and utilize information from their research			
Everyone in the group has a role in the interview			

Overall Comments:

Interview with a Scientist Rubric

Group members: _____

Scientist: _____

Strengths	Criteria	Next Steps
	Students were professional and appropriate during the presentation (communication)	
	Students represented their scientist using accurate information and details (knowledge)	
	Students included the perspective of their scientist as informed by their research (thinking)	
	Students added creative elements (props, costumes etc.) to enhance their presentation	

Additional Comments:
