

# LOCALLY DEVELOPED COURSE OUTLINE

Myth-Busting Science25-3

Submitted By:

**The Elk Island School Division**

Submitted On:

**Feb. 28, 2019**

# Course Basic Information

| <u>Outline Number</u> | <u>Hours</u> | <u>Start Date</u> | <u>End Date</u> | <u>Development Type</u> | <u>Proposal Type</u> | <u>Grades</u> |
|-----------------------|--------------|-------------------|-----------------|-------------------------|----------------------|---------------|
| 25-3                  | 62.50        | 09/01/2019        | 08/31/2023      | Developed               | Reauthorization      | G10 G11 G12   |

## Course Description

Myth busting Science (2019) 25 encourages students to explore the nature of science through practical inquiry and problem-solving. Students examine the history of science as a methodology that challenges cultural and contemporary myths.

This course begins with an introduction to the nature of both mythological and scientific thinking by taking a critical look at thought-provoking research. Other topics of discussion include ethical (versus unethical!) research methods, and how the media influences public perceptions of science. Students will also be supported in designing and implementing their own research project. Student access to electronic, digital and/or print resources is necessary for the delivery of this course, and research project development.

In order to develop student understanding about the nature of scientific thinking, students must make comparisons with other perspectives, which includes mythological and sometimes faith-based ways of constructing our understanding of the world. According to Section 50.1(1) of the School Act “A board shall provide notice to a parent of a student where courses of study, educational programs or instructional materials, or instruction or exercises, include subject-matter that deals primarily and explicitly with religion or human sexuality.”

For their research project, students will be required to follow safety guidelines according to:

Alberta Education (2006). Safety in the Science Classroom.

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada (2005).

Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. (1998, with amendments in 2000, 2002, and 2005)

## **Course Prerequisites**

Science 10 or 14

## **Sequence Introduction (formerly: Philosophy)**

Myths, defined as traditional views, fables, legends or stories, help people make sense of the world. This explanatory function accounts for their development, spread and persistence. Myths can, however, be pernicious when fact and fiction blur, serving to feed misconceptions and even block full understanding.

By using scientific processes to critically evaluate some of the many myths that persist today, *Myth Busting Science* (2019) 25 provides students with opportunities to experience the nature of science while also appreciating non-scientific approaches for their contributions to our worldview. In taking an historical journey through the development of scientific process, students will be able to place scientific thought within the broad spectrum of human knowledge and experience.

Through this course, students will develop their ability to find, evaluate and synthesize information about their world. They will determine which claims are scientifically valid and which contribute to other ways of constructing our worlds. They will analyze ethical issues in research, bias in sources, and the types of methods used by today's science and social science researchers. Moreover, this course also emphasizes an interdisciplinary approach to critical analysis of research methods and approaches used to 'bust' a particular myth.

## **Student Need (formerly: Rationale)**

Myth Busting Science (2019) 25 recognizes that students benefit from grounding scientific ways of thinking within the social and historical frameworks of modern society. By using myths as a compelling starting point, students will gain appreciation for why the scientific process was developed and how science differs from other ways of thinking.

The overarching goal of this course is for students to be able to critically read and evaluate literature in the sciences and social sciences in order to discern the validity and reliability of published claims. This course also aims to develop student's ability to engage in their own "myth-busting" by generating their own questions which they can investigate using qualitative or quantitative research methods.

## Scope and Sequence (formerly: Learner Outcomes)

Myth Busting Science (2019) 25 is a science option that offers a fun and stimulating environment where students (and their teachers) can investigate every day and not so everyday topics in science. Myth-Busting Science is designed to give students multiple opportunities to experience the nature of science and to use scientific processes to help them critically evaluate some of the many myths that persist today. Myth busting Science will also give students some familiarity and understanding of non-scientific ways of knowing, and to help them appreciate when and how alternative ways of knowing contribute to our understanding of the world.

Students will have opportunities to write critically and creatively about both myth and science as ways of knowing, they will display their learning through alternative means (e.g. visual documentaries, poster presentations, group construction of creative representations, etc.), and they will become more able to evaluate statistical and graphical scientific evidence (numeracy skills).

The Essential Understandings of this course are:

1.  
By investigating historical and contemporary topics, students will appreciate various understandings of the world through multiple frameworks.
2.  
Critically examining myths deepens understandings and ways of knowing.

## **Guiding Questions (formerly: General Outcomes)**

- 1 How have myths shaped early and modern society?**
- 2 How is scientific inquiry different from myths and other ways of knowing?**
- 3 How has scientific inquiry changed over time?**
- 4 What modern scientific methodologies do we use to answer questions about the world around us and how do we effectively apply them?**
- 5 How do we determine the accuracy and validity of information and popular claims?**
- 6 How can scientific inquiry be used and designed to dispel common modern myths? How can scientific inquiry be used and designed to dispel common modern myths? How can scientific inquiry be used and designed to dispel common modern myths?**

## Learning Outcomes (formerly: Specific Outcomes)

|                                                                                     |             |
|-------------------------------------------------------------------------------------|-------------|
| <b>1 How have myths shaped early and modern society?</b>                            | <b>25-3</b> |
| 1.1 explore some of the common myths in early civilizations                         | X           |
| 1.2 explore some common myths of pre-industrial societies                           | X           |
| 1.3 explore some common myths present in modern, industrialized societies           | X           |
| 1.4 explore and analyze some common myths about science and the scientific process. | X           |

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|--------------------------------------------------------------------------------------------------------------|-------------|
| <b>2 How is scientific inquiry different from myths and other ways of knowing?</b>                           | <b>25-3</b> |
| 2.1 explain the characteristics of scientific thinking as it compares to other ways of thinking              | X           |
| 2.2 analyze the differences between science and pseudoscience to be able to classify examples using evidence | X           |
| 2.3 critically analyze reports in popular media to determine their validity and reliability                  | X           |
| 2.4 describe the function of myth and other ways of thinking within society                                  | X           |

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| <b>3 How has scientific inquiry changed over time?</b>                                                                                                                                                                                                | <b>25-3</b> |
| 3.1 describe the role of several major historical figures in the development of the scientific method including, but not limited to: Plato, Aristotle, Bacon, Descartes, Newton, Hume, Kuhn, Popper, Einstein and post-modernist views of 'scientism' | X           |
| 3.2 generate questions to which the scientific method can be appropriately applied and iterate these within the historical continuum                                                                                                                  | X           |

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| <b>4 What modern scientific methodologies do we use to answer questions about the world around us and how do we effectively apply them?</b>                                        | <b>25-3</b> |
| 4.1 explore key research methods used in the natural and social sciences (such as experiments, observational studies, correlational studies, case studies, models and simulations) | X           |
| 4.2 determine the role of certainty with respect to measurement and be able to calculate certainty in research                                                                     | X           |
| 4.3 understand the concepts of validity and reliability and how they are applied to research                                                                                       | X           |
| 4.4 differentiate between inductive and deductive reasoning and determine when each type of reasoning is appropriate                                                               | X           |
| 4.5 differentiate between quantitative and/or qualitative research and determine when each approach is appropriate                                                                 | X           |
| 4.6 evaluate the strengths and weaknesses of different research methodologies                                                                                                      | X           |
| 4.7 consider ethical and legal implications that affect the social and natural sciences                                                                                            | X           |

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| <b>5 How do we determine the accuracy and validity of information and popular claims?</b>                                         | <b>25-3</b> |
| 5.1 compose a literature review on a myth or popular claim of choice                                                              | X           |
| 5.2 investigate the role of the media (digital, social, and print) in transmitting scientific discoveries/concepts to the public. | X           |
| 5.3 read online and print journal, magazine and newspaper articles and evaluate the validity and reliability of their claims      | X           |
| 5.4 engage in debates / discussions reflecting different (including scientific) ways of thinking about a topic of choice          | X           |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>6 How can scientific inquiry be used and designed to dispel common modern myths? How can scientific inquiry be used and designed to dispel common modern myths? How can scientific inquiry be used and designed to dispel common modern myths?</b> | <b>25-3</b> |
|                                                                                                                                                                                                                                                       |             |

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 6.1 use electronic, digital, print or other resources to develop a historical and contextual literature-based background for a research topic of interest           | X |
| 6.2 use background research to develop a simple research question on a limited topic in the natural or social sciences                                              | X |
| 6.3 design and implement an appropriate method for conducting research                                                                                              | X |
| 6.4 explore and address ethical / safety issues that may arise concerning their research topic and prepare a plan to deal appropriately with these issues           | X |
| 6.5 perform research during the time period given in the course and creatively solve challenges that may arise during the course of the research                    | X |
| 6.6 evaluate the validity and reliability of student performed research                                                                                             | X |
| 6.7 present research in a matter of student choice, placing the topic within a meaningful context                                                                   | X |
| 6.8 properly cite references/resources used for student research. - APA (American Psychological Association) format is preferred in the natural and social sciences | X |

## Facilities or Equipment

### Facility

Standard science lab may be required for student research projects.

#### Facilities:

## **Equipment**

No special equipment required.

## **Learning and Teaching Resources**

There are no required resources for the teaching of this course.

Recommended resources can be found in the accompanying Teacher Resource.

## **Sensitive or Controversial Content**

In order to develop student understanding about the nature of scientific thinking, students must make comparisons with other perspectives, which includes mythological and sometimes faith-based ways of constructing our understanding of the world.

Section 50.1(1) of the School Act reads “A board shall provide notice to a parent of a student where courses of study, educational programs or instructional materials, or instruction or exercises, include subject-matter that deals primarily and explicitly with religion or human sexuality.”

## **Issue Management Strategy**

It must be made clear to students that the intention of this course is not to criticize or refute other ways of thinking. The intention of addressing these topics is to provide contrast which serves to highlight how and why science is unique. It is expected that both students and teachers address these topics in a way that respects individual differences.

Students will be required to submit their topics for an ethics and safety approval before performing their final project. This approval will comply with the Interagency Advisory Panel on Research Ethics (Government of Canada, 2003).

## **Health and Safety**

Students will be required to follow safety guidelines according to:

Alberta Education (2006). Safety in the Science Classroom.

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada (2005).

Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. (1998, with amendments in 2000, 2002, and 2005)

## **Risk Management Strategy**

## Statement of Overlap with Existing Programs

In Myth Busting Science (2019) 25, students will have the opportunity to develop their ability to gather, evaluate and synthesize information about their world. Students will explore the validity and reliability of information and how that contributes to their understanding of the world around them. They will analyze ethical issues in research, bias in sources and the types of methods used by today's science and social science researchers.

There is some similarity between Myth Busting Science (2019) 25 and the Nature of Science in the core senior high science course. The aim of this course is to examine the historical and contemporary relationships between the natural and social sciences as a continuum of research methods that address the verification and falsification of myths.

### Provincial Courses with Overlap and/or Similar

Science 10, 20, 24 and 30

#### Identified Overlap/Similarity

-there is overlap in the Nature of Science section of curriculum of the Science 10, 20, 24 and 30 courses. In all of these courses' and in Myth Busting Science (2019) 25 students will be asked to test their scientific knowledge through experimentation, investigation and scientific inquiry to answer questions about the world around them.

#### Reasoning as to Why LDC is Necessary

-Myth Busting Science (2019) 25 is necessary because students research, develop and implement a scientific inquiry of their own design, while evaluating the biases, validity and reliability of different scientific methodologies. Students also have an in-depth opportunity to think critically about the information they find and are presented in class. This LDC is specifically research and literature driven, providing students with the opportunity to write a literature review on their topic of choice, participate in ethical research methods supported by their teacher and experience the rigor of proving or disproving scientific or (nonscientific) claims.

### Locally Developed Course with Overlap and/or Similar

Big History 15

#### Identified Overlap/Similarity

-Big History and Myth Busting Science (2019) 25 both address scientific inquiry, and how with new information what we know about the world around us changes and evolves.

#### Reasoning as to Why LDC is Necessary

-Myth Busting Science is necessary because it addresses different scientific methodologies that Big History does not. Big History asks questions about our universe, where Myth Busting Science (2019) 25 asks students to investigate myths and topics of choice, use the scientific inquiry to dispel those myths, and become critical consumers of the information they encounter on a daily basis, on social media, and in news media, relating to science and the world around us.

## **Student Assessment**

**For a list of assessment recommendations please see the Teacher Resource.**

**There are two required assessments for Myth Busting Science (2019) 25:**

1.

Literature Review:

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Students will gather and evaluate appropriate literature about a myth / topic of their choice.

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Students will summarize the historical development of the myth /topic.

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Students will identify the limitations of the body of knowledge and provide suggestions about what further research is needed in this area.

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Literature review is intended to assess but not limited to the outcomes identified under guiding question 5. Students should be able to arrive at an individual response to the guiding question based on their topic of choice and learning experiences.

1.

Myth-Busting Research Project:

As a culminating activity for this course, students will do a study of a topic of choice reflecting myths found within the natural sciences or the social sciences. Students will then prepare a final research project. Given that this project represents a significant portion of the course evaluation, students will be expected to hand in portions of the project in stages before submitting their final product. In this report, students must include:

- .  
A research proposal identifying the topic of study and a focusing research question
- .  
Background information / research on the top
- .  
A suitable methodological design
- .  
Evidence of ethical/ safety considerations regarding methods used or content studied
- .  
Justification for the choice of data collection methods
- .  
Clear data processing and analysis
- .  
Clear conclusions that reflect the relevance and validity of the research done
- .  
Discussion of issues that occurred throughout the research leading to unsolved questions and new questions that have emerged as a produce of the research activity
- .  
The Research project is intended to assess but not limited to the learning outcomes found under guiding questions 4 and 6.

## **Course Approval Implementation and Evaluation**

No specific processes for this locally developed course.

