

LOCALLY DEVELOPED COURSE OUTLINE

Mythbusting Science25-3

Submitted By:

Red Deer Catholic Regional Division No. 39

Submitted On:

Jun. 17, 2016

## 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	09/01/2016	08/31/2019	Acquired	Authorization	G10 G11 G12

### Course Description

**This course is designed to encourage students to explore the nature of science through practical inquiry and problem-solving. Students will explore the history of science as it challenges cultural and contemporary myths. It is intended to be a hands on inquiry-based course where students have a range of choice of topics for exploration.**

This course begins with an introduction to the nature of both mythological and scientific thinking, and a critical look at some interesting research. Other topics of discussion include ethical (and unethical!) research methods, and how the media influences public perceptions of science. The majority of time in this course will be devoted to helping students to design and implement their own research project!

### Course Prerequisites

## Sequence Introduction (formerly: Philosophy)

**Myths are typically defined as traditional views, fables, legends or stories and as such, myths can help people make sense of the world. The explanatory role of myths most likely accounts for their development, spread and persistence, however, when fact and fiction blur, myths may also serve to block full understanding. Myth-Busting Science is designed to give students 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, while appreciating non-scientific approaches for their contributions to our worldview.**

By 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. In Myth-Busting Science, students will have the opportunity to develop their ability to find, evaluate and synthesize information about their world. They will be able to 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. There is some similarity between Science 25 and the Nature of Science aspects of the core senior high science course as well as between Science 25 and the research methods section from Psychology 20, however, 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. This course also emphasizes an interdisciplinary approach to critical analysis of research methods and approaches used to 'bust' a particular myth.

**This philosophy is in alignment with Inspiring Education due to its emphasis on student exploration of the world beyond the science textbook. Students are asked to think creatively and critically. Mythbusting Science 25 is a course which is inquiry-based – it uses projects, group work and student research to show students how science 'really' works. That students will be more able to “find, evaluate and synthesize information about their world” is a goal that both engages students and allows them to become more critical consumers of scientific knowledge claims. That ethical issues in science are directly addressed and both discussed and experienced is also in agreement with the current initiative.**

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

**Myth-busting Science recognizes that students need to ground an understanding of a scientific way of thinking within the social and historical framework of modern society. By addressing myths as a starting point, students will be able to understand why the scientific process was developed and how science differs from other ways of thinking. The 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 is a science option that offers a fun and stimulating environment where students (and their teachers) can investigate everyday 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. Mythbusting 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).

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

- 1 Students will develop an understanding of the role of myth in early and modern societies.**
- 2 Students will develop an understanding how scientific inquiry differs from myth and other ways of thinking.**
- 3 Students will develop a general understanding of the historical evolution of the process of scientific inquiry.**
- 4 Students will be able to identify, apply and evaluate modern scientific methodologies that answer questions about the world around them.**
- 5 Students will be able to critically read and evaluate information and popular claims.**
- 6 Students will be able to design and perform inquiry projects that dispel common modern myths.**

## Learning Outcomes (formerly: Specific Outcomes)

<b>1 Students will develop an understanding of the role of myth in early and modern societies.</b>	25-3
1.1 Students will identify some of the common myths in early civilizations (i.e. Hunter gatherer, agrarian, ancient Greek) and how those myths were established and perpetuated.	X
1.2 Students will identify some common myths of pre-industrial societies (i.e. Bloodletting, etc.)	X
1.3 Students will identify some common myths present in modern, industrialized societies (i.e. Homeopathy, divination, paranormal phenomena, pseudoscience)	X
1.4 Students will identify some common myths about science and the scientific process.	X

<b>2 Students will develop an understanding how scientific inquiry differs from myth and other ways of thinking.</b>	25-3
2.1 Students will be able to explain the characteristics of scientific thinking as it compares to other ways of thinking including (i.e. Religion, pseudoscience, intelligent design, creationism, anecdotal evidence, consensus, etc.)	X
2.2 Students will differentiate between science and pseudoscience.	X
2.3 Students will be able to critically analyze reports about claims in popular media to determine their validity and reliability.	X
2.4 Students will be able to recognize the function of myth and other ways of thinking within society.	X

<b>3 Students will develop a general understanding of the historical evolution of the process of scientific inquiry.</b>	25-3
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3.1 Students will describe the role of several major historical figures in the development of the scientific method including, but not limited to: The ancient Greek philosophers (Plato, Aristotle). Development of Science in the Middle Ages (Bacon) Early Modern Ideas of the Scientific Revolution (Descartes, Newton) Modernist Ideas (Hume, Kuhn, Popper, Einstein) Post-modernist views of 'scientism'	X
3.2 Students will be able to identify suitable questions to which the scientific method can be appropriately applied and iterate these within the historical continuum.	X

<b>4 Students will be able to identify, apply and evaluate modern scientific methodologies that answer questions about the world around them.</b>	<b>25-3</b>
4.1 Students will develop an understanding of key research methods in the natural and social sciences. research methods such as experiments, observational studies, correlational studies, case studies, models and simulations are examples of key research methods in both natural and social sciences.	X
4.2 Students will ascertain the role of certainty with respect to measurement and be able to determine/calculate relative certainty in research.	X
4.3 Students will understand the concepts of validity and reliability and how they are applied to research.	X
4.4 Students will be able to differentiate between inductive and deductive reasoning and determine when each type of reasoning is appropriate.	X
4.5 Students will be able to differentiate between quantitative and qualitative research and determine when each approach is appropriate.	X
4.6 Students will be able to evaluate the strengths and weaknesses of different research approaches.	X
4.7 Students will consider the ethical and legal implications and principles that affect the social and natural sciences. examples of ethical/legal issues could include animal research, nuclear research, stem cell/embryonic research, etc.	X

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<b>5 Students will be able to critically read and evaluate information and popular claims.</b>	<b>25-3</b>
5.1 Students will compose a literature review on a myth or popular claim of their choice.	X
5.2 Students will appreciate the role of the media in transmitting scientific discoveries/concepts to the public.	X
5.3 Students will read journal, magazine and newspaper articles and evaluate the validity and reliability of their claims.	X
5.4 Students will engage in debates / discussions reflecting different (including scientific) ways of thinking about a topic of choice.	X

<b>6 Students will be able to design and perform inquiry projects that dispel common modern myths.</b>	<b>25-3</b>
6.1 Students will use electronic, print or other resources to develop a historical and contextual literature based background for their research topic of interest.	X
6.2 Students will use their background research to develop a simple research question on a limited topic in the natural or social sciences.	X
6.3 Students will design an appropriate method for conducting their research.	X
6.4 Students will analyze ethical / safety issues that may arise concerning their research topic and prepare a plan to deal appropriately with these issues.	X
6.5 Students will perform their research during the time period given in the course and creatively solve difficulties that arise during the course of their research.	X
6.6 Students will evaluate the validity and reliability of their own research.	X
6.7 Students will present their research, placing their topic within a meaningful context. - this presentation may be in many formats including: debates, dialogues, websites, class presentations, or written papers.	X
6.8 Students will properly cite references/resources used for their research. - APA (American Psychological Association) format is preferred in the natural and social sciences.	X

# Facilities or Equipment

## Facility

No special facilities are required for this course.

Facilities:

## Equipment

**Access to technology will be required on a regular basis for academic research in this course. Internet access is required. Access to a variety of electronic or print resources / databases will also be required for student research.**

# Learning and Teaching Resources

**Print resources will be generated during course development. No textbook will be required for this course. Resources and links may be uploaded to the school webpage as course development proceeds.**

References:

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

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada (20

Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. 1998 2002 and 2005 amendments).

Delivery of this course will conform to the following Elk Island Public Schools Administrative Procedures (These procedures are found on Staff Connect under Division Documents then under Procedures):

Administrative Procedure 270 Learning Resources Selection

## Sensitive or Controversial Content

In order to develop student understanding about the nature of scientific thinking, students must make comparisons with other forms of thinking, including mythological and faith-based ways of constructing our understanding of the world. 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 should 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).

Delivery of this course will conform to the following Red Deer Catholic Regional Schools Administrative Procedures (These procedures are found on our website):

· Administrative Procedure 103 Safe and Caring Learning Environments

## Issue Management Strategy

### Health and Safety

#### Safety Components

Students will be required to follow safety guidelines according to Safety in the Science Classroom (Alberta Education, 2006) with respect to laboratory based research projects.

Delivery of this course will conform to the following Red Deer Catholic Regional Schools Administrative Procedures that can be viewed on our website:

- Administrative Procedure 342 Field Trips and Other Curricular Activities
- Administrative Procedure 113 Occupational Health and Safety
- Administrative Procedure 341 Transportation of Students During and after the school day.

## Risk Management Strategy

### Statement of Overlap with Existing Programs

**In Myth-Busting Science, students will have the opportunity develop their ability to find, evaluate and synthesize information about their world. They will be able to determine which claims are scientifically valid and which contribute 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. There is some similarity between Science 25 and the Nature of Science aspects of the core senior high science course as well as between Science 25 and the research methods section from Psychology 20, however, the aim of this course is to examine the historical and contemporary relationships between the natural and social sciences a continuum of research methods that address the verification and falsification of myths. This course also emphasizes interdisciplinary approach to critical analysis of research methods and approaches used to 'bust' a particular myth

# Student Assessment

## **To assist students in meeting the outcomes for Myth-Busting Science 25, assessment**

should be an ongoing process, engaging students, level appropriate, and include identified and communicated assessment criteria.

Assessment for Learning will play an important role in the development of students' skills before evaluation for grading purpose occurs.

Assessment of student learning will confirm to EIPS Learning Assessment Administrative Procedure 360.

Teachers can create a balanced assessment by using a variety of tools including, but not limited to:

- group discussion
- analytic responses
- peer-evaluation
- journals
- portfolios
- audio and video recordings
- multi-media presentations
- written assignments

Assessment will reflect the following principles:

•  
Assessment of student performance is explicitly tied to the learning outcomes of the course

•  
Students are involved in understanding and articulating learning targets and criteria of success

•  
Students have opportunities to receive feedback in non-graded and formative learning activities and assignments before submitting assignments or engaging in activities for summative evaluation

Assessments are purposefully designed in ways that motivate and challenge students, and are respectful of student diversity

Students are provided choice in how they demonstrate learning

Assessment data is gathered from a broad range of assessment activities and includes information from student work products and performances, from teacher observations of student learning processes, and from student reflections/student-provided evidence of success

Assigned grades emphasize the most recent and/or most consistent evidence of student learning

### **Suggested Assessments**

#### **1.**

#### **Student Reflective Journal:**

Journal entries should illustrate how the student is making meaning and connections with the topics discussed (ie. understanding of myth and the place of myth within the social and historical contexts)

Journal entries should develop the students' ability to distinguish scientific thinking from other ways of thinking.

Journal entries are intended to illustrate how a student is thinking about the subject matter, and to provide a record of how student thinking and attitudes may change throughout the course.

Journal is intended to assess General Learning Outcomes 1, 2 and 3.

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 General Learning Outcome 5.

1.

Myth-Busting Research Project:

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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 report. 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 report. In this report, students must include:

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A research proposal identifying the topic of study and a focusing research question

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Background information / research on the topic

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A suitable methodological design

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Evidence of ethical/ safety considerations regarding methods used or content studied

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Justification for the choice of data collection methods

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Clear data processing and analysis

.  
Clear conclusions that reflect the relevance and validity of the research done

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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

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The Research project is intended to assess General Learning Outcomes 4 and 6.

## **Course Approval Implementation and Evaluation**

