

**FREEHOLD REGIONAL HIGH SCHOOL DISTRICT**

**OFFICE OF CURRICULUM AND INSTRUCTION**

**MEDICAL SCIENCES  
SPECIALIZED LEARNING CENTER**

**HONORS RESEARCH II/STATISTICS**

**COURSE DESCRIPTION**

MS Honors Research II/Statistics includes the incorporation of the scientific method, background research, laboratory techniques, ethics, writing skills, statistical analysis and data collection to produce a unique research project by each student enrolled in the course.

Grade Level: 11

Department: Medical Sciences Specialized  
Learning Center

Course Title: Honors Research II/Statistics

Course Code: 160450

Credits: 5

**BOARD OF EDUCATION ADOPTION DATE: AUGUST 31, 2009**

# **FREEHOLD REGIONAL HIGH SCHOOL DISTRICT**

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## **Course Philosophy**

Research II is designed as the Junior component of the Research Curriculum to be taken after completion of Research I, AP Statistics, Medical Sciences Biology and Medical Sciences Chemistry. Research Methods is designed to incorporate into the Medical Sciences Learning center a blend of scientific method discovery techniques, laboratory skills, and practical application of statistical analysis. During the course the students will develop critical thinking skills as they select, develop, evaluate, and report on their individual research projects, both orally and in a formal scientific research paper.

In our technological world, the extent of information available makes it impossible for anyone to know everything he/she will need during a lifetime. This course instills the ability in the students to be able to determine the ethical and scientific validity of the ever-increasing plethora of information. The research skills help the students become life long learners.

## **Course Description**

MS Honors Research II/Statistics includes the incorporation of the scientific method, background research, laboratory techniques, ethics, writing skills, statistical analysis and data collection to produce a unique research project by each student enrolled in the course. The course builds upon the prior knowledge and skills obtained by the Juniors enrolled in the Medical Science Learning Center. The students use hands on laboratory or survey techniques to complete their projects. The students communicate their findings with a formal research paper as well as a formal oral presentation at the Medical Science Research Symposium. At the conclusion of the symposium, the instructors will select papers to be submitted to the Monmouth Junior Science Symposium (MJSS). Those students will attend the MJSS and those chosen by MJSS will present their work. Along with the student presenters the freshman and sophomore classes will attend the MJSS. Speakers will be invited from Centra State Medical Center to address the Junior class about research techniques and ethical issues in research.

**Freehold Regional High School District  
Curriculum Map**

**MS Honors Research II/Statistics**

Relevant Standards <sup>1</sup>	Enduring Understandings	Essential Questions	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
5.1A.1-2, 4; B1, 2.	Research is the basis for scientific progress.	What is research? Why is research important to society?	Class discussion	Journal Entry  Research – internet and college data base  Teacher /student – brainstorming  Written proposal for project approval	Power point presentation of one academic journal article  Outline the basic method of your project
5.1.B.1, C.1	Laboratory safety and established lab methods should be used in all research.	What are good laboratory methods? What are some laboratory safety rules for all lab situations? Why are some standard laboratory procedures always followed?	Lab Safety contract Journal entry	Lab Safety Quiz Progress reports by teacher to asses proper use of lab techniques and safety	On going use of lab safety equipment and proper use of equipment for your own research
5.1A.1; B2., 5.4A.1; B1; C1	Research can be accomplished by using the scientific method.	What is the scientific method? How can the scientific method be used in your research project?	List the steps to the scientific method	In your journal write the step of the scientific method applies to your work today.	Proposal – illustrating the methods one used to create your project
5.1A1-4	Ethical methods should be used to do any research.	Why is ethics important to a research project? How does research affect society? What is bioethics? How should a research subject be treated (human, animal)?	Why do scientists commit fraud? With a partner write 2 reasons?	After video on fraud, articles and class discussion – Amend your original reasons?	Group creative presentation on scientific fraud and solving the problem of scientific fraud and ethics. Use rubric to grade.
5.1A1-4, 5.2A1, B1-2 5.4A1; B1; C1	Any research topic should come from the studying past research.	Why study past research? How can you study past research?	Journal entry – why do scientists read and analyze past research?	List some topics that you would like to delve into further and maybe conduct your research on	Choose 2 topics to research at the college library.
5.1A1, 3-4; 5.3D1	Scientific research uses statistical analysis and data gathering to evaluate findings.	Why must you use specific statistical analysis in scientific research? How can you gather data?	Journal entry	Class discussion on sample size and importance of using accurate statistics to report your findings.	Use an example of a scientific project and discuss sample size and stats to report and analyze the project.

Relevant Standards <sup>1</sup>	Enduring Understandings	Essential Questions	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
5.1A1, 2; B1, 2	Critical thinking is the basis for any problem solving.	Why is problem solving important to any research? What is a problem statement?	Use puzzles and logic problems to evaluate critical thinking skills	Class discussion of various problems. Writing a proposal for your project.	Proposal and problem statement for the background paper.
5.1A1-4,5.1B2, 5.2A1	Research findings should be shared with others in the scientific community.	Why should research be shared with others? How can research be presented?	Journal entry – why do scientists share their findings	Summarize and give a power point presentation of an article related to your research topic and describe how it will help you conduct your research.	Final written paper and presentation of the students' individual research.
5.1A3, 5.1B2, 5.3D1, 5.4C1	Clear and precise record keeping is essential to good scientific research.	Why is recording keeping important in doing research? What is good record keeping in science?	Various open ended questions, class discussions and journal entries	Journal entries, data keeping and recording Progress reports by teacher.	Presentation of findings in final paper and presentation

**Freehold Regional High School District  
Course Proficiencies and Pacing**

**MS Honors Research II/Statistics**

<b>Unit Title</b>	<b>Unit Understandings and Goals</b>	<b>Recommended Duration</b>
Unit #1: Selection of Topic for Individual Research project	Research is the basis for all science. Any research topic should come from the studying past research. <ol style="list-style-type: none"> <li>1. Students will be able to define and apply the guidelines of student research.</li> <li>2. Students will study previously done student research.</li> <li>3. Students will do extensive reading in the area of interest.</li> <li>4. Students will select a specific problem to analyze for the individual research project.</li> </ol>	5 weeks
Unit #2: Background Research	Research can be accomplished by using the scientific method. Any research topic should come from the studying past research. <ol style="list-style-type: none"> <li>1. Students will be able to search existing scientific literature relating to their research problem.</li> <li>2. Students will be able to use a college media center and various online databases.</li> <li>3. Students will be able to use the scientific method.</li> </ol>	(10 weeks through marking periods 1 and 2)
Unit #3: Research Ethics and Biomedical Ethics	Ethical methods should be used to do any research. <ol style="list-style-type: none"> <li>1. Students will be able to analyze articles, films other media concerning ethical issues in science.</li> <li>2. Students will be able to apply logical reasoning and critical thinking to defend a position on scientific ethics.</li> <li>3. Students will be able to synthesize scientific ethics into their individual projects.</li> </ol>	(3 weeks and on going though the course)
Unit #4: Planning a Research Project	Research can be accomplished by using the scientific method. Laboratory safety and recognized lab methods should be used in all research. <ol style="list-style-type: none"> <li>1. Students will be able to develop a hypothesis to be tested.</li> <li>2. Students will be able to develop an experimental design using variables and controls.</li> <li>3. Students will be able to collect and order the necessary materials to conduct their experiment.</li> <li>4. Students will be able to organize and keep a laboratory journal for data collection.</li> </ol>	4 weeks and on going
Unit #5: Implementing the Research Project	Critical thinking is the basis for any problem solving. Laboratory safety and recognized lab methods should be used in all research. Clear and precise record keeping is essential to good scientific research. <ol style="list-style-type: none"> <li>1. Students will be able to conduct a research project.</li> <li>2. Students will keep accurate, precise and organized data.</li> <li>3. Students will be able to statistically analyze their data.</li> </ol>	10 weeks

Unit #6: Presentation of the Research Project	Research findings should be shared with others in the scientific community.  <ol style="list-style-type: none"><li data-bbox="554 107 1587 168">1. Students will be able to write a scientific research paper analyzing their findings and the literature.</li><li data-bbox="554 172 1587 233">2. Students will be able to do an oral presentation using power point at the yearly Medical Sciences Symposium.</li></ol>	2-3 weeks
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**Freehold Regional High School District  
MS Honors Research II/Statistics**

**Unit #1: Selection of Topic for Individual Research project**

**Enduring Understandings:** Research is the basis for all science.  
 Any research topic should come from the studying past research.  
 Research can be accomplished by using the scientific method.

**Essential Questions:** What is research?  
 Why is research important to society?  
 What is the scientific method?  
 How can the scientific method be used in your research project?  
 Why study past research?  
 How can you study past research?

**Unit Goal:** The students will be able to choose a research topic.

**Duration of Unit:** 5-6 weeks

**NJCCCS:** 5.1A1, 5.1A2, 5.1A3, 5.1A4, 5.1B1, 5.1B2, 5.2A1, 5.2B1, 5.2B2, 5.4A1, 5.4B1, 5.4C1

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
What is the Scientific Method?  What are the guidelines and criteria for the research project?  How does one choose a topic?	Students should implement the scientific method to find a research topic  Guidelines and definition of student research  Study previously done student research  Extensive reading and research in an areas of interest to define a topic or problem for further research  Selection of specific problem to be studied	Phases of a Project Packet  Past student papers  Internet sources  College Library Data Base  Writing in Science Text	Class discussion and brainstorming for topic ideas  Individual discussion with student  Criteria for research	Journal assessments  Topic Choice  Written Proposal

**Suggestions on how to differentiate in this unit:**

- Students will pick project according to preference and interest.
- A wide variety of assessments and strategies complement the individual learning experience.



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**Unit #2: Research Ethics**

**Enduring Understandings:** Ethical methods should be used to do any research.

Research is the basis for scientific progress.

**Essential Questions:** Why is ethics important to a research project?

What is bioethics?

How should a research subject be treated (human, animal)?

How does research affect society?

Why is research important to society?

**Unit Goal:** The students will be able to incorporate the importance of ethics and bioethics into their own projects.

**Duration of Unit:** 3 weeks and on going through course

**NJCCCS:** 5.1A1-4, 5.1C1, 5.2A1, 5.4A1, 5.4B1, 5.4C1

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
What are some past ethical blunders in scientific research?  What is the importance using ethical methods in scientific research?  What is a code of ethics?  How does one do ethical research?	Study of articles concerning past research ethics  Defend a position on scientific ethics by logical reasoning and critical thinking  Identify a code of ethics used in medical research  Establish a code of ethics for a research project	Films – on Ethics in science (Tuseggee Study, PBS film)  Articles current and past cases of scientific fraud  Guest Lecture – Centra State – Ethics and IRB members	Lecture & Discussion of films and articles  Creative group project defining scientific fraud cases and presenting ways to avoid or fight fraud  Guest lecturers and discussion of biomedical ethics, treatment of participants in a study  Establish ethical guidelines for implementing an individual research project	Journal entries and essays  Group presentation  Code of ethics and proposal of the individual project

**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through students picking project according to preference and interest.
- A wide variety of assessments and strategies complement the individual learning experience.

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**Unit #3: Background Research**

**Enduring Understandings:** Research is the basis for scientific progress.  
 Research can be accomplished by using the scientific method.  
 Any research topic should come from the studying past research.

**Essential Questions:** What is research?  
 Why is research important to society?  
 What is the scientific method?  
 How can the scientific method be used in your research project?  
 Why study past research?  
 How can you study past research?

**Unit Goal:** The students will write a background paper and develop a problem statement for their project.

**Duration of Unit:** 10 weeks (ongoing through marking periods 1 and 2)

**NJCCCS:** 8.1 A1, 9.2 A1-5; B1-3; C1-2; D1-5

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
<p>How does one search for peer reviewed academic articles?</p> <p>What is the correct method to search a College Media Center Data Base?</p> <p>How does one write a scientific background paper?</p> <p>How does the scientific method apply to writing a scientific background paper?</p>	<p>Effective use of media center</p> <p>Effective use of scientific journal articles</p> <p>Correct method to writing a background paper</p> <p>Defining a research problem</p> <p>Writing a proposal</p>	<p>Current textbook and resource binders</p> <p>TCNJ Library</p> <p>Timeline for Paper</p> <p>Paper Guidelines and skills</p> <p>Text for scientific writing</p>	<p>Lecture and class discussion</p> <p>Collection of Journal articles</p> <p>Individual discussion and brainstorming with students</p>	<p>Journal Entries</p> <p>Collection of peer reviewed articles</p> <p>Oral presentation of one scientific article</p> <p>Background paper</p>

**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles can be assisted through adjustments in assessment type.
- A wide variety of assessments and strategies complement the individual learning experience.

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**Unit #4: Planning a Research Project**

**Enduring Understandings:** Research can be accomplished by using the scientific method.  
Laboratory safety and recognized lab methods should be used in all research.

**Essential Questions:** What is the scientific method?  
How can the scientific method be used in your research project?  
Why is problem solving important to any research?  
What are good laboratory methods?  
What are some laboratory safety rules for all lab situations?  
Why are some standard laboratory procedures always followed?

**Unit Goal:** The students will be able to plan a research project.

**Duration of Unit:** 4 weeks and on going

**NJCCCS:** 5.1A1-4, 5.1B1, 5.1C1; 5.4A1, 5.4B1, 5.4C1

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
<p>How can one plan a research project?</p> <p>How can one develop a hypothesis?</p> <p>How does one develop an experimental design using variables and controls?</p> <p>How can one order and collect materials for the project?</p> <p>How does one collect and organize data?</p>	<p>Develop a hypothesis and research plan</p> <p>Use the scientific method to develop a scientific design</p> <p>Ordering of materials</p> <p>Record keeping</p>	<p>Phases of a Project Packet</p> <p>Past student papers</p> <p>Scientific journals</p>	<p>Lecture and class discussion</p> <p>Individual planning</p> <p>Work with individual students</p>	<p>Journal assessments</p> <p>Proposal</p> <p>Ordering</p>

**Suggestions on how to differentiate in this unit:**

- Students with individual learning styles are working on their own projects.
- A wide variety of assessments and strategies complement the individual learning experience.

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**Unit #5: Implementing the Research Project**

**Enduring Understandings:** Scientific research uses statistical analysis and data gathering to evaluate findings.  
 Critical thinking is the basis for any problem solving.  
 Clear and precise record keeping is essential to good scientific research.  
 Laboratory safety and good lab methods should be used in all research.

**Essential Questions:** What are good laboratory methods?  
 What are some laboratory safety rules for all lab situations?  
 Why are some standard laboratory procedures always followed?  
 Why is recording keeping important in doing research?  
 What is good record keeping in science?  
 Why is problem solving important to any research?

**Unit Goal:** Students will be able to conduct a scientific research project.

**Duration of Unit:** 10 weeks

**NJCCCS:** 5.1A1-4, 5.1B1-2, 5.1C1; 5.3D1; 5.4A1, 5.4B1, 5.4C1

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
How can a research project be implemented?  What lab techniques are necessary to conduct the project?  How can data be recorded?  How can the data be evaluated?	Conduct the actual study or experiment using good laboratory techniques.  Conduct the actual project following all lab safety  Conduct the project following ethical guidelines of research  Collect accurate data  Statistically analyze data	Lab manuals  Stat Textbooks  Journal Articles  Consult experts  Stats teacher works with students	Implementation of actual project on an individual basis  Journal entries of data and progress  Guide individual students	Grade journals  Individual Progress Reports

**Suggestions on how to differentiate in this unit:**

- A wide variety of assessments and strategies complement the individual learning experience.
- Students work on individual basis.

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**Unit #6: Presentation of the Research Project**

**Enduring Understanding:** Research findings should be shared with others in the scientific community.

**Essential Questions:** Why should research be shared with others?

How can research be presented?

**Unit Goal:** The students will be able to present the findings of their unique research project both in the oral and written form.

**Duration of Unit:** 2-3 weeks and on going

**NJCCCS:** 5.1A1-4, 5.1B2; 5.3D1; 5.4A1, 5.4B1, 5.4C1

<b>Guiding / Topical Questions</b>	<b>Content, Themes, Concepts, and Skills</b>	<b>Instructional Resources and Materials</b>	<b>Teaching Strategies</b>	<b>Assessment Strategies</b>
<p>How is a research paper constructed?</p> <p>How is statistical analysis presented?</p> <p>How is an oral presentation constructed using power point?</p>	<p>Writing of the final research paper following guidelines for citations and content</p> <p>Presentation of research at the annual symposium</p>	<p>Outline and guidelines for paper</p> <p>Text – Writing the science research paper</p>	<p>Lecture and class discussion</p> <p>Presentations</p> <p>Papers</p> <p>Abstract – into program for symposium</p>	<p>Grade final paper &amp; presentation use rubric with Stats teacher</p> <p>Student critiques of projects</p> <p>Chose papers for MJSS</p> <p>Other competitions for outstanding research will be chosen for select projects</p>

**Suggestions on how to differentiate in this unit:**

- Individuals conduct and present work.
- A wide variety of assessments and strategies complement the individual learning experience.