

# Global Climate Change Research Project

Ghanim Alenizi, Andrew J. Cerniglia, Annette Dyer

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## Contents

<b>1 Project Overview</b>	<b>3</b>
1.1 Overview . . . . .	3
1.2 Notes . . . . .	4
<b>2 Plagiarism APA Style</b>	<b>4</b>
2.1 Introduction . . . . .	4
2.2 Day One: What is Plagiarism? . . . . .	5
2.3 Day Two: Citing Sources . . . . .	6
2.4 Day Three: APA Format . . . . .	6
<b>3 Conducting Research</b>	<b>7</b>
3.1 Overview . . . . .	7
3.2 Day Four: Choosing a perspective . . . . .	8
3.3 Days Five & Six: Preliminary Research . . . . .	8
3.4 Day Seven: Writing Summaries . . . . .	8
3.5 Days Eight & Nine: The Rough Draft . . . . .	8
3.6 Day Ten: Peer Review . . . . .	9
3.7 Days Eleven & Twelve: The Final Draft . . . . .	9
3.8 Homework: The Presentation . . . . .	10
3.9 Homework: Formulating the Quiz . . . . .	10
3.10 End of Year Debate . . . . .	10
<b>4 Student Handout</b>	<b>12</b>
4.1 Introduction . . . . .	12
4.2 Perspectives . . . . .	12
4.3 Expectations . . . . .	13
4.4 Calendar Of Events . . . . .	14
4.5 Grade Overview . . . . .	14
4.6 Collecting Information . . . . .	15
4.7 Research Perspective (5 points) . . . . .	16

4.8	Research Question (10 points)	16
4.9	Topic Areas (Points awarded below)	16
4.10	Resource One (5 points)	17
4.11	Resource Two (5 points)	17
4.12	Resource Three (5 points)	17
4.13	Subtopic Summary (15 points)	19
4.14	Resource One (5 points)	20
4.15	Resource Two (5 points)	20
4.16	Resource Three (5 points)	20
4.17	Subtopic Summary (15 points)	22
4.18	Resource One (5 points)	23
4.19	Resource Two (5 points)	23
4.20	Resource Three (5 points)	23
4.21	Subtopic Summary (15 points)	25
4.22	Research Points	26
4.23	Rough Draft Points	26
4.24	Final Draft Points	27
4.25	Concept Map	28
<b>5</b>	<b>Related Cognition Concepts</b>	<b>29</b>
5.1	Attention	29
5.2	Levels of Processing	29
5.3	Construction in Perception	29
5.4	Priming	29
5.5	Meaningful Learning	30
5.6	Elaboration	30
5.7	Visual Imagery	30
5.8	Enactment	31
5.9	Prior Knowledge	31
5.10	Misconceptions	31
5.11	Automaticity	32
5.12	Advance Organizer	32
5.13	Spaced Practice and Repetition	32
5.14	Overlearning	33

# 1 Project Overview

## 1.1 Overview

There are several key aspects of this project. The first of which is its cross-curricular (multi-disciplinary if you wish) nature. Students completing this project will have been immersed in the writing process via a traditional research paper using [APA style guidelines](#). The nature of the overarching topic, global climate change, ensures that aspects from the field of environmental science are considered as well. Additionally, the field of mathematics is incorporated as a graphical representation of data must be included as a figure in the final draft. Lastly, aspects of the project such as the presentation and end-of-the-year debate ensure that facets of social studies are included as well.

In order to allow for the customization of the project in a way that makes it more meaningful, students are encouraged, in fact required, to choose a “perspective” from which to approach their research. Several are listed in the perspectives section of the handout, however other perspectives are certainly available, and the choice is up to the discretion of the student and the teacher. In an attempt to extend students beyond what might typically be achieved through the completion of a research project, students are asked to broaden the array of activities typically associated with this type of project.

Three major additions are included in the design.

- I. Presentation with student created quiz
- II. One presentation per week until all students have presented
- III. End of the year debate of the issue

Although some research assignments require students to generate presentations in addition to, or in lieu of a paper, this design goes further by asking students to do both *and* generate a ten question multiple choice quiz. Thus, students are required become more comfortable extending and using the knowledge they’ve studied.

Secondly, rather than have all of the presentations over the course of a couple days directly after the final drafts are submitted, they will be spread out over the majority of the year, as each week will close with one student’s offering, followed by their quiz. This drawn out procedure accomplishes several goals. Although students’ work will differ in the perspective, general content information should overlap, i.e., specific to global climate change. Therefore, the weekly presentation will allow for repetitive practice. Moreover, the requisite quizzes target automaticity via overlearning.

Finally, the end of year debate allows students to assume roles of advocate and activist. We recommend getting individuals from outside the classroom, at the minimum other instructors or administrative personal, to proctor these events. The deliberative process provides students with the opportunity to examine issues from all sides, e.g., arguments they find appealing and those they do not, as such intimate knowledge of a topic is necessary if one hopes to win a debate.

## 1.2 Notes

Although this document provides more than enough information for an individual to employ its use in the classroom, it is not as thorough as it could be. We encourage uses of this document to use “what works”, and to make modification as they deem necessary. Correspondence can be forwarded to any of the authors by clicking our name on the title pages.

## 2 Plagiarism APA Style

### 2.1 Introduction

When it comes time for students to compose research papers, the issue of plagiarism inevitably must be addressed. Some students may not even understand that what they are doing is illegal and very serious. During the next three class periods, students need to become aware of plagiarism issues and familiarize themselves with the proper techniques for citation of their sources. Students should come away with the knowledge that plagiarism will not be tolerated, but that there are ways of using information from other authors, as long as credit is given to those individuals.

The goal of this lesson is to have students explain what plagiarism is, why it is a problem, and how to avoid it. Also, they will learn the correct way to cite a source.

I. Analyze Learners: Grade Level: 11th & 12th Graders

II. Subject: Language Arts

III. National Standards

- Students read a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g., philosophical, ethical, aesthetic) of human experience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

#### IV. Lesson Objectives

- The students will be able to site sources using APA style guidelines.
- The students will be able to describe the theoretical underpinning of plagiarism.
- The students will research and list copyright laws ([resource](#)).

#### V. Methods and Media

- Methods
  - With this lesson students will be using a guideline for citing a source according to the APA Format that will help them through their lessons.
- Media
  - LCD Projector
  - Laptop computer on a cart for student usage

### 2.2 Day One: What is Plagiarism?

Before class begins, the following starter question will be written on the board: “What is plagiarism”. Many students may not be familiar with this term, and may simply refer to it as “copying”. Have the class write the definition of the word according to what they think it is. Give them a few minutes.

Discuss with the class their interpretation of this word. What does it mean to plagiarize someone else’s work? What are the punishments at your school or in this class for such behavior? Ask students to comment on this. Ask them to consider a different situation. Imagine that you are a rock star or a recording artist, perhaps a rapper. What would happen if some other artist stole a song you had written, recorded the song, and made millions from it? You wrote it, but another benefited from it. What would result? Probably a complicated law suit, besides frustration and resentment. Explain to the class that plagiarism in all forms is illegal, and a very serious matter.

Using the LCD Projector, the teacher will access the Internet. The teacher will go to the following website <http://www.lemoyne.edu/library/plagiarism/index.htm>, and explain that this website will have all the information your group will need regarding plagiarism to complete an activity.

Class Activity: Split the class up into six groups. Give each group a topic. Students will be given 25 minutes to research a topic. Remind the students that there are a lot of links to each topic so use them. If they do not have time to complete this task it will be homework. Each group will report their findings in class tomorrow. How each group presents their topic will be solely the decision

of the group. Options are listed below.

- Copyright laws
- Detecting Plagiarism
- Guides for Students
- In the News
- Policies & Procedures (What does your school’s handbook say about plagiarism?)
- Preventing Plagiarism

### **2.3 Day Two: Citing Sources**

Begin class with a few questions to see what students understood from the previous day’s work. Each group will be given approximately 5 -8 minutes to report on their topic.

Ask the students if they know how a writer can use the ideas of another without plagiarizing. Take a few minutes to gather student ideas and suggestions, writing these on the board. Students may come up with “use quotes” or “give credit to the original author”, but they may need some help. Inform the class that using quotes and giving credit to an original work or author is called “citing your sources”. This process allows us to use information from many different sources without compromising the rights of the authors. Ask the class why this is so important when doing research, and discuss answers.

### **2.4 Day Three: APA Format**

For the next 25 minutes, tell the class that they are going to learn more about how to document our resources in a research papers. A handout will be given to each student indicating guidelines for citing a source according to the APA Format.

The following questions will be on the board.

- I. How do I cite work by two authors?
- II. How would I cite a short quotation?
- III. Example: How would one reference information from pages 34-45 of *Common Water Contaminants*, a book by William Anchor, published by Hoffman and Brooks in 1995 in the city of Atlanta.

Class activity – give the students about 10 minutes to answer these questions, which should be evaluated for correctness. Students don't necessarily have to know citation format from memory, but encourage them to use their notes, which they collected the previous day. Review answers with the class, and discuss again why we need to cite our sources.

Tell the class that today you going to practicing writing proper citation techniques. Now that we know how a little bit about how to write citations, it is important to give the students a practical use for this tool. Ask the class: "What might be a good way to credit all of these authors in your final projects?" Take some suggestions, and explain that the place in the paper where sources are referenced is simply called a "works cited" page, which goes at the end of their document.

Use the LCD Projector and outline how you would like this works cited page to look when finished. Make a suggestion to the students that this is a good time to take notes.

## **3 Conducting Research**

### **3.1 Overview**

The research procedure is divided into several sections.

- I. Choosing a perspective
- II. Preliminary research
- III. Writing summaries
- IV. The rough draft
- V. Peer review
- VI. Final draft
- VII. Design Presentation
- VIII. Formulating quiz

Each section is described in detail below.

### **3.2 Day Four: Choosing a perspective**

Initially, students are asked to compile a list of what they know, or believe they know, about global climate change. Once these inventories have been created, they are reviewed as a class and misconceptions are probed via questioning. The goal here is to orient students towards a more open perspective as to the truth of what they believe, and to inspire some degree of curiosity as a way of facilitating a more thorough investigation of the topic. Class lists are maintained by the instructor so that they can be referred back to as the process unfolds. After this initial brainstorming phase, the handout is passed out to students and reviewed. The primary focus is to direct students toward a perspective of their choosing. Students are encouraged to choose a perspective that is intrinsically motivating, i.e., an area of interest.

### **3.3 Days Five & Six: Preliminary Research**

This project is designed to allow students to consume literature extant on the World Wide Web. Teachers should feel free to use other resources if they are uncomfortable using the Internet. In either case, students are to begin by gaining an overall understanding of how their “perspective” fits within the context of global climate change. Their first order of business will be to subdivide what they find into three subcategories, which will subsequently be divided into information from three differing resources. This is rather formulaic, and again, it is up to the end user as to whether or not they follow this process completely. However, the benefits of following this approach is that it ensure that at least nine different sources are used for the project. Once students have completed this task, they are to summarize each of their nine sources using the handout.

### **3.4 Day Seven: Writing Summaries**

Writing summaries from the three disparate sources of information per subcategory begins the abstraction process. That is, requiring students to integrate information from three sources should aid in “making the information their own”. These mini-summaries, one per subcategory, serve as the foundation for the rough draft. At least one class period should be budgeted for this process, although it is conceivable that, and certainly understandable if, much of this work occurs outside of class time. It is critical that student begin to cite information according to APA guidelines.

### **3.5 Days Eight & Nine: The Rough Draft**

As stated above, the majority of the rough draft is culled directly from the summaries generated for each subcategory. The other sections of the report must also be written here, and it is probable that many will be foreign to the students. The components of the final paper are listed below.



- I. Title page
- II. Abstract
- III. Introduction
- IV. Research problem
- V. Methodology
- VI. Discussion
- VII. Conclusions and Recommendations
- VIII. References

In the past, when we've done this assignment with our own students, separating the abstract and the introduction have been difficult for our students. They've also had problems understanding what to include in the methodology section. This information is provided in the handout, and we've found that it's best to refer students to this document before acquiescing and simply providing the answer. Rough drafts should be submitted by the assigned date and are assessed (via a checklist) before they are returned.

### **3.6 Day Ten: Peer Review**

Each student will receive a rough draft to be revised at the beginning of the period. Over the course of the first half of the day's meeting, each individual will critique a peer's work. The technical structure of the research should be examined against the information that was provided in the hand out. Comments and observations related to the research should be written down to be discussed with the author during the later half of the period.

It is essential that each comment or suggestion is supported with valid reasoning and ideas. Reviewer's criticisms should be aligned with the purposes of the study, as their analysis should be objective and directed towards the quality of content. The second half of the class period will be divided again into three small (roughly five minute) time blocks to ensure that all participants are able to (a.) meet with the individual who's work they've reviewed, and (b.) receive commentary from the person who's reviewed their own work.

### **3.7 Days Eleven & Twelve: The Final Draft**

After the peer review process is complete, students are to take the recommendations from their peers and make the appropriate corrections. The peer review process exposes students to an important facet of scholarly research, an additional benefit of this design. Final drafts are assessed in accordance with the provided rubric and returned as soon as all have been graded.

### **3.8 Homework: The Presentation**

Presentations are scheduled to take place, one per week, for the majority of the year. Hence, we view it as unnecessary to allot class time for this work to be completed. Furthermore, since each student will be creating a unique product, based on a particular interpretation of the topic, there is virtually no benefit to setting aside time for this work to occur during school. Once exception is the student who does not have a computer at home and is unable to secure time in the computer lab during school hours. However, exceptions can be made, and the final decision is left to the discretion of the classroom teacher. Presentations are assumed to be made using PowerPoint or comparable software, and should be at least ten slides long. Teachers should encourage students to attend to the generalities of global climate change initially, then delve into the idiosyncrasies of their “perspective”.

### **3.9 Homework: Formulating the Quiz**

It is imperative that the development of the student created quizzes follow the construction of the presentations, following the tenets of [backwards design](#). Whether or not individual teachers chose to explain this philosophy in detail is entirely of their choosing, however this is the rationale behind the chronological ordering of tasks. Each quiz should be ten questions in length, and all questions must be multiple choice. One day prior to their presentation, students are required to supply the teacher with (a.) a copy of their presentation, (b.) a copy of their ten-question quiz, and (c.) an answer key for their quiz. We suggest that quiz scores should count towards marked grades in the course.

### **3.10 End of Year Debate**

Students will have spent a good deal of time on the topic of global climate change by the end of the school year. It is our hope that they will have heard from multiple sides of the issue, as well as the varying, predefined perspectives. And through this exposure, reinforced by the weekly quizzes, a more complex and nuanced understanding of the topic should materialize. In order to assess, and in part to reinforce, the learning that has occurred throughout the year, we recommend setting up and facilitating a debate for each class. As previously stated, in order to win a debate, one needs to understand completely both sides of an argument. We use this reality to challenge our students once more.

Choosing a topic for the debate is critical, and time should be taken to ensure that the type of scenario which facilitates vigorous dialogue is crafted. A simple way of working towards this goal is to frame such a story line around the standard arguments that are often made, those of the free market evangelists and those of the environmentalists. For example,

A large agricultural conglomerate, AGBIS is seeking the city council's blessing in the purchase of 2500 rural acres surrounding your town. In addition to grain farming, this entity proposes to raise 1500 dairy cows and maintain a 5000 square foot chicken operation. AGBIS promises to add 300 jobs, as well as immediately and dramatically lowering local prices of food and dairy products. However, the emissions produced by the operation are significant. Millions of dollars in machinery will be brought in and used year round. Additionally, the greenhouse contributions of the dairy cows and chickens cannot be overlooked. Should the city council endorse this deal?

The class could then be broken into two groups, or debate teams. Each team could then subdivide responsibilities as they see fit. For example, there might be additional research to conduct (it would be ideal if the teacher can choose a scenario, based on their knowledge of what has been presented, so that teams must conduct more research), which will have to be documented. Counter research would have to be conducted as well. Additionally, members of each team who will actually debate need to be prepped by those who have completed the research. In the end, we recommend gathering administrators and other instructors, as well as members from the community, to sit as "council members" and judge the veracity of each side's claims.

## 4 Student Handout

### 4.1 Introduction

The [Intergovernmental Panel on Climate Change](#) released a [report](#) summarizing the changes that are occurring. As a scientist, your job will be to research the science behind global climate change and then use that research to write a report using [APA style guidelines](#).

You have two rather large decisions to make before you begin your research.

- Perspective - how will you look at the issue?
- Research Question - what question will you be seeking to answer?

You are *required* to look at the issue of global climate change from a certain perspective. You are not to focus exclusively on general information, although you will have to do some research in this area to gain an overall understanding of the issue. Instead, you are to choose a specific area of interest and then assemble a paper that reflects this area's relationship to the issue as a whole. Several examples of these "perspectives" follow, however there are other possibilities. Be sure to check with your teacher prior to choosing an alternative.

### 4.2 Perspectives

#### **Agricultural Scientist**

America's agricultural industry is a significant contributor to global climate change, and as such has the potential to play a major role in reducing the threat of climate change. Your job is to describe the nature of the agricultural industry's contributions to global climate change and what members of this community can do or are doing to have a more positive effect.

#### **Health Specialist**

Global climate change has the potential to place great strain on the human population, especially in undeveloped parts of the world. Your job as a health specialist is to describe the potential effects of global climate change related to the lack and/or contamination of food and water sources and the spread of disease. Be sure to address the significant numbers of refugees that could result from the inability of those less fortunate to deal successfully with these changes.

#### **Horticulturalist**

Green plants “lock up” carbon via photosynthesis. This is also referred to as “carbon fixing”. Carbon based compounds released into the atmosphere lead to the greenhouse effect. Your job is to research how communities can utilize the planting of green plants to lesson the amount of carbon compounds in the atmosphere.

### **Physical Scientist**

If you choose this perspective, the focus of your paper will be the actual science. You will look at the ways in data is collected and analyzed. It would also be appropriate to investigate the ways in which scientist measure, what they measure, and how these measurements factor into their final analysis. Lastly, the ways in which computer models are used to make predictions should be discussed in some detail.

### **Political Scientist**

Governments must deal with competing interests when constructing public policy on global climate change. Corporations tend to resist restrictions or changes in emissions requirements as these typically cost money. Environmental groups focus on what the government could be doing but isn't. Energy groups publish their own reports and put scientists on their payroll to combat peer-reviewed research of the scientific community as a whole. Your job is to describe ways in which public policy can be and/or has been used to affect the United States contributions in this area.

### **Transportation Specialist**

America's dependence on oil, specifically foreign oil is becoming problematic on a variety of levels. New ways of fueling America's vehicles are being pushed by the environmental conscious. Your job is to describe possible changes in existing transportation systems that are being examined as possible ways of reducing the destructive effects of the present situation, specifically mass transit and alternative forms of energy.

## **4.3 Expectations**

This is the largest project that you'll complete for this class. Students are expected to work both in and outside of class. Seven days of in-class time have been allotted for work on this project. These days will be spent in the computer lab. Two days will be used for research, and two days each will be devoted to work on each of the drafts.

I believe that it is possible to finish all the necessary (computer related) work during these seven days. However, it will be next to impossible to complete the entire project by only working during this time. Your goal should be to produce the finest paper that you've ever written, both in terms of content and style. Tasks related to the writing of the paper (organizing your thoughts, outlining, and editing) should be done outside of class time. This will allow you to focus on word processing while in the computer lab.

#### 4.4 Calendar Of Events

Part of your grade for this assignment will come from the work that you do collecting research. Included in this package is a structured set of materials that you will use to collect information. **This is the only format that will be accepted.** We'll be breaking the project into distinct steps. These are listed below along along with the approximate day they will be due.

- Choose perspective, begin research *Day One*
- Research submitted for review *Day Four*
- Research returned, begin work on rough draft *Day Five*
- Rough draft submitted for review *Day Seven*
- Rough draft returned, peer review *Day Eight*
- Submit final draft for grade *Day Ten*

This work will take us right up to the end of the third nine weeks. You should assume that these dates will not change.

#### 4.5 Grade Overview

The grade for this assignment will be comprised of three components, the research, the rough draft, and the final draft. The weight assigned to each part follows.

- Research *100 Project Points*
- Rough draft *50 Project Points*
- Final draft *200 Assessment Points*

A rubric delineating specifics as to how the final draft will be assessed is included in this document.

## 4.6 Collecting Information

The following pages contain multiple forms which are to be filled out as you collect your information. Once you have your research question, you will need to start looking at the information related to that question. As you do this work, you should begin to formulate ways to break this information up into smaller parts. The goal is to end up with three smaller areas of research that fall under your larger “research question”. Don’t be worried if these questions do not become apparent right away. You will have to do some reading and note taking (not on the following pages) before these areas “appear”.

Once you’ve decided on your subtopics, you will have to fill in the following seven pages of information. The first page asks for some general information, basically your research question and subtopics. The next six pages should be viewed as three sets of two, one set for each subtopic. The first of these two pages requires that you identify three pieces of research related to the subtopic. In preparation for writing this paper using [APA style guidelines](#), you are required to note the relevant citation information as well.

The second of the two pages asks you to summarize the three pieces of information *in your own words*. This essentially acts as part of your rough draft, as you begin to construct your own understanding and generate some of your own ideas related to the information that you’ve collected. **Your goal should be to finish one of these “pairs” each of the first three days spent in the computer lab.**

#### **4.7 Research Perspective (5 points)**

State the perspective from which you will research global climate change.

#### **4.8 Research Question (10 points)**

In the space below, articulate the question which will guide your research as you progress through the steps needed to complete this project.

#### **4.9 Topic Areas (Points awarded below)**

You will need to identify three “subtopics” derived from your research question. Each will correspond to a section within your final paper.

1.

2.

3.



## Subtopic 1

### **4.10 Resource One (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.11 Resource Two (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.12 Resource Three (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:

- URL:
- Mini-summary:

## Subtopic 1

### **4.13 Subtopic Summary (15 points)**

In the space below, summarize the information *and your thoughts* related to the research collected for this subtopic.

## Subtopic 2

### **4.14 Resource One (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.15 Resource Two (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.16 Resource Three (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:

- URL:
- Mini-summary:

## Subtopic 2

### **4.17 Subtopic Summary (15 points)**

In the space below, summarize the information *and your thoughts* related to the research collected for this subtopic.

## Subtopic 3

### **4.18 Resource One (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.19 Resource Two (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:
- URL:
- Mini-summary:

### **4.20 Resource Three (5 points)**

- Author:
- Date of publication:
- Title of document:
- Date retrieved:

- URL:
- Mini-summary:



## Subtopic 3

### **4.21 Subtopic Summary (15 points)**

In the space below, summarize the information *and your thoughts* related to the research collected for this subtopic.

## Project Totals

### 4.22 Research Points

The following is a summary of the points that you've received for your research, your work filling out the forms for each of your subtopics.

### Research Points

Item	Score
Subtopic 1	
Subtopic 2	
Subtopic 3	

Total \_\_\_\_\_ /100

### 4.23 Rough Draft Points

Below is the scoring guide for your rough draft. Each student assumes the majority of the responsibility for corrections, as the assessment of the rough draft is essentially a check list. Rather, students will work on corrections together using the peer review process. This scoring guide is more of a checklist than a rubric, and serves to ensure that your work is progressing at the appropriate rate.

### Rough Draft Checklist

Item	Absent (0 points)	Observed (5 points)
Title Page		
Abstract		
Introduction		
Research Question		
Methodology		
Discussion		
Conclusion		
Reference List		
In-text Citations		
Graph Included		

Total \_\_\_\_\_ /50

## 4.24 Final Draft Points

What follows is the rubric that will be used to assess your final report. Each of the following categories will be examined to determine the quality of your work. The total number of points will represent *assessment points*, which will contribute significantly to your overall grade for the third nine weeks.

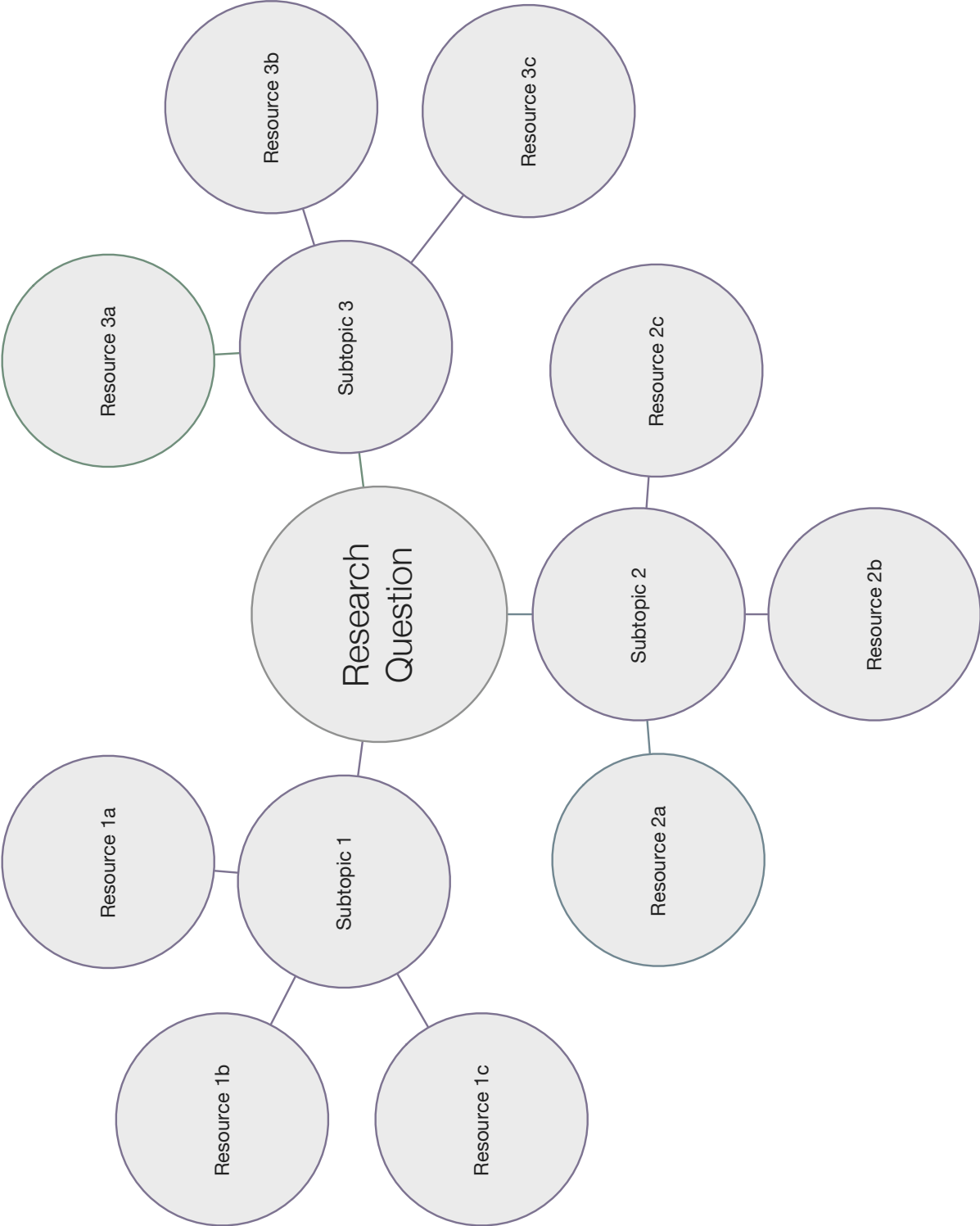
### Final Draft Rubric

Item	No Effort	Developing	Accomplished	Exemplary
Title Page	0	3	4	5
Abstract	0	6	8	10
Introduction	0	9	12	15
Research Question	0	9	12	15
Methodology	0	9	12	15
Discussion	0	30	40	50
Conclusion	0	15	20	25
Reference List	0	9	12	15
In-text Citations	0	9	12	15
Graph Included	0	6	8	10
Writing Style	0	15	20	25

**Total \_\_\_\_\_ /200**

# 4.25 Concept Map

Research Project Concept Map



## **5 Related Cognition Concepts**

### **5.1 Attention**

- Orients individual towards stimulus; gateway into working memory
  - Starter question used to direct students attention for APA lesson
  - Introduction to research project via choice of perspective

### **5.2 Levels of Processing**

- Hierarchical in nature; the more a learner “works” with information, the more likely they will be able to retrieve it later; example - answering “why” better than repetition
- Implementation
  - Students are asked “why” citing sources is important when conducting research
  - First retrieve related information
  - Next pull information together to form mini-summaries
  - Finally relate summaries and all content in coherent report
  - Students are required to analyze peer’s work, a process that necessitates a high level of understanding and processing

### **5.3 Construction in Perception**

- Learners construct meaning from their interpretation of their environment, their perception; actually more and less than actual stimuli
  - Students are required to search, combine, and present finding to class during APA lesson
  - Students are required to choose a perspective from which to conduct their research, the assumption is that this perspective is derived from their perception of their environment

### **5.4 Priming**

- Activation spreads from one idea to another, so that previously presented stimuli can cue the retrieval (via activation) of other information
- Implementation
  - Brainstorming activity begins research process, activate information necessary for elaboration and meaningful learning

- Students are asked what they know about global climate change
- Student presentation “prime” their classmates for the following quizzes

## 5.5 Meaningful Learning

- The process of relating new information to knowledge already stored in long term memory, finding meaning in content
- Implementation
  - Students choose career field or area in which they have interest
  - Pursue information on global climate change as it relates to this field
  - Integration of career area and global climate change
  - Class debate that ends the year is related to the local issues if possible (we’ve chosen agriculture in our example, which would work in any rural setting)

## 5.6 Elaboration

- Learner adds/combines their own information with to-be-learned information
- Implementation
  - Students asked to consider different situations as they relate to plagiarism
  - Students are required to generate questions derived from their presentation and report
  - Students are required to provide their own interpretations of content in the discussion section
  - Students are required to provide an analysis in the conclusions section
  - Students are required to provide recommendation in the conclusions section

## 5.7 Visual Imagery

- Forming mental images of to-be-learned information; “mental pictures”
- Implementation
  - Students must present a graphical representation of data in their report as a figure
  - Also adds mathematics as a discipline/subject for the project

## 5.8 Enactment

- Actually doing something (acting out) that reflects what is being learned; role playing
- Implementation
  - Debate held at the end of the year in which students are assigned to two sides
    - \* True believers
    - \* Skeptics
  - Presented with a debate questions, related to budgetary considerations of the U.S. government
  - Debate the merits of spending allocations as they relate to global climate change

## 5.9 Prior Knowledge

- What the students already know
- Implementation
  - Students are asked to define plagiarism early in the APA lesson
  - Informal pre-assessment of general global climate change concepts, misconceptions, and terminology
  - The use of perspectives allows students to draw from prior knowledge in approaching their research project

## 5.10 Misconceptions

- What students perceive to be true but in actuality is not
- Implementation
  - Teacher checks for understanding on the second day of the APA lesson
  - Pre-assessment of general global climate change concepts, misconceptions, and terminology
  - Brainstorming activity begins unit
  - Students are asked what they know about global climate change
  - Misconceptions are challenged with scientific results

### **5.11 Automaticity**

- “Automatic processing”; occurs with little or no conscious attention or effort and requires little working memory
- Implementation
  - Students are asked to type their report
  - Word processing (typing) is an automatic task for most students
  - The repetitive nature of the year long quizzes should lead to automaticity as it relates to the fundamental principles of global climate change

### **5.12 Advance Organizer**

- A general introduction to new material that is typically designed to either provide a rough overview or outline (an internal organizational scheme) or show how new material relates to already learned material
- Implementation
  - Handout given to students describing how to cite using APA style guidelines, i.e., how to apply covered information
  - Options for research are presented during the APA lesson
  - An advanced organizer demonstrating the structure of the activity will be provided to the students, which will demonstrate how their topic will be divided into three subtopics, which will each have to be sourced by three citations
  - The above mentioned organizer is reinforced with a concept map illustrating the same structure

### **5.13 Spaced Practice and Repetition**

- Practice is spaced out over time; typically leads to slower but more persistent learning
- Implementation
  - After the project is complete, students take turns presenting their findings one per week
  - General global climate change information should be included in each presentation
  - Students take presenter created quizzes after each presentation



## 5.14 Overlearning

- The learning of material to mastery, and then practice it for additional study trials; enables retention
- Implementation
  - Weekly quizzes after presentation
  - Quizzes created by the presenter and follow predetermined format