

Course Title: Food and Exercise Science

Department: Science

Grades: 11-12 **Credits:** 0.5

Course Overview/Description

This course is designed for any student with the desire to learn more about the science behind food, in addition to exercise physiology. Students will learn about various nutrition topics, including food energy; the biochemistry of proteins, lipids and carbohydrates; the efficacy of fad diets; and the scientific basis of a variety of exercise regimens. Assessment is based on a constructivist model, wherein students become active participants in their learning by participating in various health and fitness activities, delivering super food and workout presentations, and completing various projects that have students demonstrate what they're learning.

Course Materials

Binder, Colored Pencils / Markers, Recipe Ingredients

Scope and Sequence

Timeframe	Unit	Instructional Topics
3 weeks	Personal Health Assessment and Goal Setting	<ul style="list-style-type: none">• Dietary Pre- and Post- Assessment• Fitness Pre- and Post- Assessment• Using Technology to Measure Health• Using Health Metrics to Set SMART Goals
2 weeks	Calories	<ul style="list-style-type: none">• Defining a Calorie• Estimating Calories• Calorimetry and Calculating the Calorie Content of Various Foods• Measuring One's Daily Calorie Expenditure (RMR)
3 weeks	Carbohydrates	<ul style="list-style-type: none">• Types of Carbohydrates• The Glycemic Index and the Impact of Foods on Blood Sugar / Insulin Response• Blood Sugar and Diabetes• Comparing and Contrasting Sugar Alternatives• Dietary Fiber
3 weeks	Proteins	<ul style="list-style-type: none">• Classifying Proteins• Determining Protein Quality• The Relationship Between Protein and Muscle Growth
2 weeks	Fats	<ul style="list-style-type: none">• Classifying Fats• The Benefits and Drawbacks of Dietary Fat• The Relationship Between Dietary Fat and Body Fat

		<ul style="list-style-type: none"> • Dietary Cholesterol
3 weeks	Diet Science	<ul style="list-style-type: none"> • Measuring the Efficacy of a Diet
1 weeks	The Food Industry	<ul style="list-style-type: none"> • Identifying Shortcomings of Modern Food Industrial Complex
1 week	Scientific Research	<ul style="list-style-type: none"> • Food Science • Exercise Science

Detailed Curriculum Map

Unit 1: Personal Health Assessment and Goal Setting (3 weeks)

- General Description: Introduction to personal health assessment and the importance of setting health-related goals.
- Student Learning Objective: Understand how to conduct dietary and fitness assessments and use technology to measure health and set SMART goals.
 - Dietary Pre- and Post- Assessment
 - Fitness Pre- and Post- Assessment
 - Using Technology to Measure Health
 - Using Health Metrics to Set SMART Goals

Unit 2: Calories (2 weeks)

- General Description: Detailed exploration of the concept of calories.
- Student Learning Objective: Understand what a calorie is, how to estimate calories, and measure one's daily calorie expenditure.
 - Defining a Calorie
 - Estimating Calories
 - Calorimetry and Calculating the Calorie Content of Various Foods
 - Measuring One's Daily Calorie Expenditure (RMR)

Unit 3: Carbohydrates (3 weeks)

- General Description: Comprehensive study of carbohydrates and their effects on blood sugar.
- Student Learning Objective: Understand the types of carbohydrates, glycemic index, blood sugar, diabetes, sugar alternatives, and dietary fiber.
 - Types of Carbohydrates
 - The Glycemic Index and the Impact of Foods on Blood Sugar / Insulin Response
 - Blood Sugar and Diabetes
 - Comparing and Contrasting Sugar Alternatives
 - Dietary Fiber

Unit 4: Proteins (3 weeks)

- General Description: Detailed analysis of proteins and their role in muscle growth.
- Student Learning Objective: Understand the classification of proteins, protein quality, and the

relationship between protein and muscle growth.

- Classifying Proteins
- Determining Protein Quality
- The Relationship Between Protein and Muscle Growth

Unit 5: Fats (2 weeks)

- General Description: Examination of the different types of fats and their role in our diet.
- Student Learning Objective: Understand the classification of fats, benefits and drawbacks of dietary fat, relationship between dietary and body fat, and dietary cholesterol.
 - Classifying Fats
 - The Benefits and Drawbacks of Dietary Fat
 - The Relationship Between Dietary Fat and Body Fat
 - Dietary Cholesterol

Unit 6: Diet Science (3 weeks)

- General Description: Study of the principles underlying diet and its efficacy.
- Student Learning Objective: Understand how to measure the efficacy of a diet.
 - Measuring the Efficacy of a Diet

Unit 7: The Food Industry (1 week)

- General Description: Exploration of the modern food industrial complex.
- Student Learning Objective: Identify the shortcomings of the modern food industrial complex.
 - Identifying Shortcomings of Modern Food Industrial Complex

Unit 8: Scientific Research (1 week)

- General Description: Introduction to scientific research in the fields of food and exercise science.
- Student Learning Objective: Develop an understanding of research principles and practices in food science and exercise science.
 - Food Science
 - Exercise Science

Course Essential Standards

1.1 | PHA and Goal Setting: "I can collect and analyze health data to make SMART goals that will improve my diet and fitness."

Scale Score	Description
1	I can collect and record relevant health data as it pertains to my dietary and fitness well-being.

2	Additionally, I can use the data I've collected to provide a basic analysis of what the data means and how I can use it to establish a basic method of improvement.
3	Additionally, I can create a S.M.A.R.T. Goal using the data collected that, when followed, will help me improve my dietary and physical well-being.

1.2 | PHA Goal Reflection: "I can provide evidence to show my progress toward achieving my health goals, and reflect on my success or failure."

Scale Score	Description
1	I can collect and record relevant health data as it pertains to my dietary and fitness well-being.
2	Additionally, I can use the data I've collected to measure whether or not I've been successful in reaching my goal.
3	Additionally, I can alliterate the reasons that I either did or did not succeed at reaching my SMART Goals.

2.1 | Calories: "I can explain how food energy is measured and how this energy is converted within the body to allow the body to do work."

Scale Score	Description
1	I can identify how food energy is measured, providing the definition of a food Calorie.
2	Additionally, I can differentiate between food Calories and ATP, the actual energy currency of our body's cells.
3	Additionally, I can explain the process by which energy is transferred from food to the body's cells to be used to do work.

2.2 | Lab—Calorimetry: "I can measure the calorie contents in different foods in a laboratory setting."

Scale Score	Description
1	I can collect calorie data appropriately and record the data for subsequent analysis, following the basic mathematical steps required to convert my data in Calories/gram.
2	Additionally, all my data in the data table has appropriate units, giving the data context, and my analysis includes all of the appropriate units, giving the data context. I also graphed the final results of my analysis, using an appropriate graph <u>title</u> , <u>axes labels</u> , and a <u>key or legend</u> , if necessary.

3	Additionally, all the data appears to have been consistently measured—following the proper protocol laid out in the procedure. Because of this, my graph properly illustrates the accurate rank-order of all 4 foods tested, from least to most Calories per gram.
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3.1 | Glycemic Index: “I can describe why some carbohydrates are digested more slowly than others, and why this matters, as it pertains to hunger and risk of developing diabetes.”

Scale Score	Description
1	I can provide the basic nutrition information for 100-gram servings of each of the foods I am tasked to compare, such as: total calories, total carbohydrates, and total dietary fiber.
2	Additionally, I can provide information about the Glycemic Load of each food and explain the impact that my assigned foods have on blood sugar levels.
3	Additionally, I can correctly identify which food is actually the “nutritional champ” by providing a short snippet explaining why it is healthier than the alternative.

3.2 | Classifying Sugar Substitutes: “I can distinguish amongst various sugar substitutes based on calorie content, sweetness, and their effects on the body.”

Scale Score	Description
1	I can demonstrate beginning levels of proficiency when it comes to identifying sugar substitutes based on calorie content, sweetness, and their effects on the body.
2	Additionally, I can increase my proficiency level to at least 60%.
3	Additionally, I can further increase my proficiency level to at least 80%.

3.2 | Sugar Substitute Science: “I can present claims, introduce evidence, and provide sound reasoning to support a conclusion as to whether or not a particular sugar alternative is healthier than table sugar for the average person.”

Scale Score	Description
1	I can compare a particular sugar substitute to sucrose, noting similarities or differences in price, sweetness, source, etc.
2	Additionally, I can provide tangible evidence (based on controlled studies, not just speculation and anecdotes) that supports the health claims that I am making about a particular sugar substitute.
3	Additionally, I can rely on evidence I’ve collected to come to a reasonable conclusion as to whether or not my assigned sweetener is actually healthier for most people when compared to sugar; making a recommendation one way or the other as to its consumption.

3.3 | Sugar Substitute Glycemic Response: “I can collect and/or interpret glycemic response data for a particular sugar substitute, comparing it to sucrose.”

Scale Score	Description
1	I can design and execute an experiment or utilize shared data or online resources, comparing the glycemic response to sucrose and a chosen sugar substitute.
2	Additionally, I can graphically depict my findings or data obtained from peers or online, showing the comparison between sucrose and my selected sugar substitute.
3	Additionally, I can analyze and reflect on the results, demonstrating understanding of glycemic response and its effects on insulin levels and hunger, using either my data or sourced information.

3.5 | Dietary Fiber: “I can differentiate between soluble and insoluble fiber, and explain their role in maintaining proper health.”

Scale Score	Description
1	I can describe what “fiber” is, and explain how it is different from other types of polysaccharides such as starch or glycogen.
2	Additionally, I can differentiate between soluble and insoluble fiber.
3	Additionally, I can describe the benefits of dietary fiber as I explain their role in maintaining proper health.

4.1 | Protein: “I can articulate the many roles that protein plays in the human body.”

Scale Score	Description
1	I can match protein types to their correct function.
2	Additionally, I can identify and differentiate between different methods of determining protein quality.
3	Additionally, I can identify the important structures of a muscle, as well as explain how both exercise and diet result in muscle growth.

5.1 | Dietary Fat: “I can explain the health benefits and drawbacks of dietary fat consumption.”

Scale Score	Description
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1	I can list and describe the major types of fats.
2	Additionally, I can describe how different levels of fats impact the absorption of other important nutrients in the human body, as well as describe the health consequences of consuming too much or too little fat.
3	Additionally, I can map the 10 “fattest” and 10 “leanest” cities in America, and make logical and reasonable inferences to explain any trends in the data.

5.2 | Cholesterol: "I can analyze blood cholesterol's impact on health, conduct cholesterol level tests, devise health plans based on results, and explain cholesterol's role in human health."

Scale Score	Description
1	I can explain what cholesterol is and describe the role that cholesterol plays in the body.
2	Additionally, I can collect data on the cholesterol levels of various patients and use the data to make health recommendations, if necessary.
3	Additionally, I can examine additional cholesterol measurements, and reflect on contributing factors that result in hypercholesterolemia.

6.1 | Diet Science: "I can present claims, introduce evidence (both anecdotally on a personal level and in a broader sense), and provide sound reasoning to support a conclusion as to whether or not a certain diet is effective at helping one maintain a healthier weight, blood pressure, etc."

Scale Score	Description
1	While demonstrating the research, I can present various claims about my assigned diet as to whether or not it is effective or not at losing weight and improving other health metrics (like blood pressure).
2	Additionally, I can summarize evidence (both done by the greater scientific community, but also based on my own anecdotal experiences and personal results over the 5-day diet) that supports OR refutes the claims presented.
3	Additionally, I can reason rationally, drawing conclusions as to whether or not the evidence actually supports the initial claim(s).

7.1 | Food Industry: "I can identify a problem that exists in the current food industry and propose a solution on how to fix it."

Scale Score	Description
1	I can identify a problem that exists in the current food industry.

2	Additionally, I can propose solutions on how we can address the problem.
3	Additionally, I can use evidence to persuade people toward my point of view, citing credible sources of information and engaging in intelligent and considered reasoning.

8.1 | Research Presentation - Food Science: "I can present claims and introduce supporting evidence about the supposed health benefits of a particular food, as well as prepare a recipe that highlights the food that can be shared with my peers."

Scale Score	Description
1	I can create a presentation that is visually-appealing, and present to the class in a way that demonstrates pride, poise and professionalism.
2	Additionally, I can present a number of health claims that promote my chosen superfood.
3	Additionally, I can provide at least 4 pieces of scientific evidence (with associated studies) that proves the health claims that I have made about my chosen superfood, ensuring to validate the conclusions of the studies by discussing the experimental design of each.

8.2 | Research Presentation - Recipe and Quiz: "I can develop a summative quiz and an original recipe that features my selected superfood."

Scale Score	Description
1	I can create a simple, 5-question quiz (using the template provided by Mr. Rankin) with appropriate questions that can be answered by my peers as they follow along with my research presentation.
2	Additionally, I can format the quiz properly, making sure it has an accurate answer key to provide feedback to students once submitted.
3	Additionally, I can turn in the quiz to Google Classroom by attaching an "Add Collaborator" link <u>no fewer than 3 days prior to my assigned research presentation</u> so that Mr. Rankin can schedule the quiz to be posted on the correct date.

8.3 | Research Presentation - Food Science Quizzes: "I can demonstrate my understanding of the health benefits of various whole foods studied this semester by successfully completing regular quizzes created by my peers."

Scale Score	Description
1	I can demonstrate a beginning level understanding of the health benefits of various whole foods studied this semester by successfully completing regular quizzes created by my peers, meaning that my average score on all quizzes is <60% proficiency.

2	Additionally, I can increase my proficiency level to <u>at least 60%</u> .
3	Additionally, I can further increase my proficiency level to <u>at least 80%</u> .

9.1 | Exercise Science: "I can present claims and introduce supporting evidence about the supposed health benefits associated with a particular type of exercise, as well as demonstrate how to properly perform these exercises with pride, poise and professionalism."

Scale Score	Description
1	I can create a presentation that is visually-appealing, and present to the class in a way that demonstrates pride, poise and professionalism.
2	Additionally, I can present a number of health claims that promote a particular type of exercise.
3	Additionally, I can provide at least 4 pieces of scientific evidence (with associated studies) that proves the health claims that I have made about a particular type of exercise, ensuring to validate the conclusions of the studies by discussing the experimental design of each.

9.2 | Research Presentation - Workout Routine: "I can create a comprehensive workout guide or video to demonstrate an exercise routine that reflects a specific type of exercise."

Scale Score	Description
1	I can create a basic workout guide or video that showcases a particular type of exercise.
2	Additionally, I can include photos of me or my teammates performing each exercise, demonstrating proper form.
3	Additionally, I can add instructions on how to perform each exercise correctly, while predicting and accommodating for common mistakes.

9.3 | Research Presentation - Workout Participation: "I can actively engage in and contribute to the various workouts conducted by my classmates."

Scale Score	Description
1	I can actively participate in classmates' workouts, dressing appropriately for the physical activity.
2	Additionally, I can contribute effectively during workouts, demonstrating respect and support for the presenters while maintaining active engagement.

3	I can fully commit to each workout, optimizing my performance, providing constructive feedback, and deeply understanding the goals and execution of the exercises presented.
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CROSS-CUTTING CONCEPT / SKILL STANDARDS:

STEM.Skill.1 | Research: “I can identify sources of information that are credible, using a variety of criteria to determine the legitimacy of the information I am consuming.”

Scale Score	Description
1	I can identify credible and reliable sources of information.
2	Additionally, I can summarize the specific criteria that legitimize the sources I have chosen to rely on for information, focusing on accuracy, authority, objectivity, currency and coverage.
3	Additionally, I can properly cite the sources I’ve relied on for my research in APA format, both in-text and within a bibliography, if necessary.

STEM.Skill.2 | CERCA: “I can think critically about a scientific topic or phenomenon, by identifying claims, summarizing evidence, proposing counter arguments, and providing sound reasoning to support a conclusion.”

Scale Score	Description
1	I can provide or identify claims about a particular phenomenon.
2	Additionally, I can identify or provide multiple pieces of evidence that support the claim being made.
3	Additionally, I can think critically about the evidence at hand, identifying potential counter-arguments, and ultimately coming to a reasoned conclusion as to whether or not the claim is sufficiently substantiated.

STEM.Skill.3 | Writing: “I can express my mastery of science content or skills in written form, while being detailed yet concise, using appropriate grammar.”

Scale Score	Description
1	I can write coherently about a scientific topic.
2	Additionally, my writing is well organized, structured in a logical manner. Sentences flow nicely and ideas are concise but not redundant.

3	Additionally, I can write with proper conventions, demonstrating very minor grammatical errors, such as spelling mishaps or incorrect punctuation.
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STEM.Skill.4 | Presentation: “I can create a presentation on a specific scientific topic or phenomenon and communicate the information to my peers.”

Scale Score	Description
1	I can create a presentation that is rich with visuals or other multimedia, which help convey a particular scientific topic or phenomenon.
2	Additionally, I can share my presentation with the class in a way where it is evident that I am knowledgeable about the topic and that I’ve prepared.
3	Additionally, I can communicate with pride, poise and professionalism, since I am the expert on this topic. This includes answering any questions that my peers or instructor may have on the given topic.

STEM.Skill.5 | Dissection: “I can demonstrate understanding of anatomical structures and functions through hands-on dissections.”

Scale Score	Description
1	I can follow safety procedures while in the laboratory setting, limiting risk to myself and/or my dissection partners.
2	Additionally, I can rely on my dissection specimen to correctly identify anatomical structures.
3	Additionally, I can demonstrate physiological understanding of anatomical structures in a dissections setting.

STEM.Skill.6 | Practicum: “I can apply content learned in a laboratory setting.”

Scale Score	Description
1	I can show beginning levels of understanding of the content being learned in a laboratory setting.
2	Additionally, I can show emerging levels of understanding of the content being learned in a laboratory setting.
3	Additionally, I can show proficient or advanced levels of understanding of the content being learned in a laboratory setting.

ACT.1 | Data Representation: “I can manipulate and analyze scientific data presented in tables, graphs, and diagrams.”

Scale Score	Description
1	I can identify a passage that illustrates data representation.
2	Additionally, manipulate and analyze scientific data presented in tables, graphs, and diagrams.
3	Additionally, I can achieve the level 2 scale at 80% proficiency or greater.

ACT.2 | Research Summaries: “I can understand experimental tools, procedures, and design.”

Scale Score	Description
1	I can identify a passage that illustrates research summaries.
2	Additionally, I can understand experimental tools, procedures, and design.
3	Additionally, I can achieve the level 2 scale at 80% proficiency or greater.

ACT.3 | Conflicting Viewpoints: “I can judge the validity of scientific information and formulate conclusions and predictions based on that information.”

Scale Score	Description
1	I can identify a passage that demonstrates conflicting viewpoints.
2	Additionally, I can judge the validity of scientific information and formulate conclusions and predictions based on that information.
3	Additionally, I can achieve the level 2 scale at 80% proficiency or greater.

