

**Lewis and Clark College Graduate School of Education and Counseling**  
**Center for Community Engagement**  
**Continuing Education Course Syllabus**  
*Updated: April 23, 2016*

**1. COURSE TITLE:**     **Physical Science Essentials for Grades 5-9**

**2. CREDITS:**             **1 Graduate Level Credit**

**3. BACKGROUND:**

*Note: Most middle schools are grades 6, 7, and 8. This workshop is designed for teachers of the “Middle Grades,” which we are defining here as 5<sup>th</sup> grade through 9<sup>th</sup> grade, inclusive. We have found that 5<sup>th</sup> and 9<sup>th</sup> grade science are important transition years. These transition years will be covered and highlighted in this workshop.*

Middle grades science teachers have an extremely wonderful, but daunting task set before them. There are at least five unique challenges they face.

1. Middle grades science teachers often teach all fields of science from anatomy to astronomy, from physics to zoology. Science is a dynamic, rapidly changing field. It is hard to keep up in a single topic, much less across the spectrum of science. Even the most enthusiastic, best-trained middle grades science teacher is often lacking in background and skills.
2. The middle grades are perhaps the age where hands-on, inquiry-based explorations are most important. Yet, middle grades teachers often have the fewest and least useful supplies and work spaces.
3. Students in the middle grades are a unique breed. Part wide-eyed, eager investigator and part jaded, cynical “this is dumb, I saw something really cool on *Mythbusters*.” The middle grades science teacher needs to challenge, dazzle, and inspire a generation that has seen it all on a little screen. They need to *make it real*.
4. Safety is a paramount. In elementary school we just don’t do anything that could be at all dangerous. At high school the teachers have special equipment, spaces, and training to be safe. The middle grades science teacher has to make it big and keep it safe.
5. The standards just changed *again*. Yes, indeed, the Next Generation Science Standards are upon us. Reading, understanding, unpacking, and making the standards come alive in the classroom will be an enormous challenge in one scientific discipline, much less all of them.

**4. COURSE OBJECTIVES:**

1. To providing a crash course on the key ideas in physical science at the middle grades.
2. To provide a sample essential equipment list and training. We will create the “essential box of middle grades physical science teaching supplies.”
3. We will model and practice at least three captivating physical science experiments that every teacher can do.

4. Participants will take part in a safety training that focuses on prevention, but also leaves teachers knowing how to deal effectively and professionally with common physical science accidents.
5. We will address the Next Generation Science Standards. Participants will know how to use these new guidelines upon completion of the workshop.

## 5. COURSE OUTLINE:

This course will meet for two long days. Each day we will address each of the five challenges with a schedule that will look like this:

### Day 1

8:00 – 9:00 a.m.	Morning Demonstration Extravaganza
9:00 – 10:00 a.m.	Standards Lesson
10:00 – 11:00 a.m.	Safety Lesson
11:00 – Noon	Key Ideas in Physical Science Lecture, Part 1
Noon – 1:00 p.m.	Lunch with optional discussion on advanced topics
1:00 – 2:00 p.m.	Experiment #1 modeled by the instructor
2:00 – 3:30 p.m.	Grades 5 - 9 student development and characteristics
3:30 – 5:00 p.m.	Experiment #2 modeled by the instructor

### Day 2

8:00 – 9:30 a.m.	Experiment #3 modeled by the instructor
9:30 – 10:30 a.m.	Key Ideas in Physical Science Lecture, Part 2
10:30 - Noon	Participant Presentations, Part 1
Noon – 1:00 p.m.	Lunch with optional discussion on advanced topics
1:00 – 2:30 p.m.	Participant Presentations, Part 2
2:30 – 4:00 p.m.	Closure, “Science Success for all Students”

Notes:

(1) A *demonstration* is a short, usually qualitative, physical science activity that the instructor does in front of the class. Demos are designed to be introductory, high profile, exciting, and fun. The students are mostly passive. Middle grades physical science teachers should have a demonstration for every class where there is not an experiment.

(2) An *experiment* is a longer, usually qualitative and quantitative, physical science investigation that students do themselves. Experiments are typically harder for students, and sometimes less engaging than demonstrations. The students are very active, both mentally and physically. In this workshop we will explore experiments across the *inquiry spectrum*.

(3) The *inquiry spectrum* is a phrase coined by the author of this course. This concept plays a starring role in the workshop. At one end of the spectrum is highly guided *instructor-led inquiry*. The students do the experimentation, but it is designed by and driven by the instructor. At the other end of the spectrum is full *student-led inquiry*. In this case the instructor’s role is mostly limited to helping students secure supplies and ensuring safety. It takes years to train students for

this latter inquiry. A major goal of this workshop is to illustrate how to take students from one end of the spectrum to the other during the course of the middle grades.

(4) At least three times each day we will have “Diversity Interludes” where the instructor will present a five-minute biography of a diverse physical scientist. The final session will bring this all together with a lesson titled, “Science Success for all Students.”

## **6. FORMAT:**

About one-third of the class will be in “classroom mode.” The other two-thirds will be “hands-on mode.” Classroom mode is broken down, roughly equally into (1) Instructor presentation including lecture and demonstration; (2) Participant presentation; (3) Full group and small group discussion.

### *Participant Presentations*

Each participant in the workshop will prepare and model a favorite lesson to share with the other participants.

## **7. REQUIRED READING:**

There is very little required reading. No one ever learned to teach science by reading about it. We are going to spend our time *doing* science.

## **8. COURSE REQUIREMENTS/EVALUATION:**

Following are the course requirements weighted for determining the granting of university credit. I require 75% or better to issue credit.

1. Attendance and active participation at all class sessions. (50%)
2. Development of one science activity and associated curriculum for use with the participant’s students. This project should use the information and insight gained in the course. It should help the participant’s students better understand a particular concept through questions and activities. We will discuss how to do this during class time and have question-and-answer troubleshooting sessions. However, some of the work for this project will be done outside of class. Each participant will present his/her activity on the second day. The activity will not likely be completed at this time. The presentation is a time to share with the others and get constructive feedback. (50%)

## **9. GRADES:**

Grading will be Credit/No Credit.

## **10. BIBLIOGRAPHY:**

Carin, A.A., Bass, J.E., & Contant, T.L. (2009). *Activities for Teaching Science as Inquiry*. Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Kwan, T., & Texley, J. (2002). *Exploring Science Safely*. Washington, DC: NSTA.

“Next Generation Science Standards,” <http://www.nextgenscience.org/next-generation-science-standards>, retrieved February 10, 2016.

## **11. Supporting Diversity:**

The history of science has been dominated by wealthy, heteronormative, white, males as much or more than almost any area of human endeavor. Despite this there are many examples of inspiring scientists who do not fit this description in history and the present. At least three times each day we will have “Diversity Interludes” where the instructor will present a five minute biography of a diverse physical scientist. At the end of the second day, during closure, a main focus will be on how to take what we have learned in this workshop and use it to help all students find success in physical science in the middle grades.

## **12. INSTRUCTOR:**

Joseph Minato, MTE  
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Biography and resume attached.

## **13. MATERIALS FEE:**

There is a \$25.00 fee for supplies used during this course.

## **14. SPECIAL COMMENTS:**

### *The Binder and the Flash Drive*

Every demonstration and experiment will be provided in both hard copy and digital format. Each participant will leave the workshop with a three-ring binder packed with demonstrations and experiments that they have seen performed by the instructor and have performed themselves. This will be supplemented by participant experiments.

### *Participants from High Needs Schools*

Special effort will be made to recruit middle grades science teachers from high needs schools from around the State of Oregon.