

# Strategies for Middle School Science Teachers™ Online

**S**trategies for Middle School Science Teacher Online examines the methods, strategies, and curriculum of the successful middle school science classroom. After exploring the unique characteristics of the middle school learner, participants will discover techniques to involve those students in a meaningful educational experience in science. This course focuses on designing effective lesson plans, integrating appropriate technology to enhance learning and monitor student progress, managing and organizing the classroom, developing appropriate formal and informal assessments, questioning and communication strategies, meeting the needs of diverse learners, and connecting the science classroom to the real world.

To the right are the key areas of focus for the eight-week online asynchronous course. For more information, refer to the syllabus, which provides a detailed outline of the course material as well as a bibliography of research on which the course is based.

## In this course, participants will

- ▶ Design, organize, and plan for a successful middle school science program.
- ▶ Incorporate scientific theory and establish realistic goals connected to national science standards.
- ▶ Differentiate instruction and adapt lessons to meet the needs of all middle school learners.
- ▶ Prepare meaningful homework, laboratory exercises, and assessments to enhance learning in the middle school science classroom.
- ▶ Integrate science subjects and other curricular areas into the classroom to connect science to all disciplines, the local community, and the real world.
- ▶ Actively engage students by incorporating effective questioning techniques, group activities, and inquiry-based activities.
- ▶ Support the emotional, physical, and mental growth of middle school science students while fostering a climate of community between teachers, families, and students.

# Strategies for Middle School Science Teachers™ Online

## Course Description

*Strategies for Middle School Science Teachers* examines the methods, strategies, and curriculum of the successful middle school science classroom. Participants will investigate the unique characteristics of middle school learners and become familiar with a variety of techniques to involve those students in a meaningful educational experience in science. Topics will include effective planning, integrating technology in science, managing and organizing the classroom, utilizing appropriate assessments, questioning and communication strategies, meeting the needs of diverse learners, and connecting the science classroom to the real world.

## Course Outcomes

Upon completion of this class, the learner is expected to be able to:

1. Design and organize a plan for a successful middle school science program.
2. Incorporate current scientific theory and instructional methods into the science program.
3. Adapt specific lessons to a variety of learning styles.
4. Prepare meaningful homework and laboratory exercises for the middle school student.
5. Integrate appropriate technologies into the science classroom for data collection, analysis, communication, and evaluation of student progress.
6. Utilize successful, research-based questioning techniques to enhance learning.
7. Connect the middle school science program to the real world.
8. Differentiate instruction to meet the needs of diverse learners.
9. Establish realistic goals connected to national science standards.
10. Formulate a variety of effective formal and informal assessments to monitor student progress.
11. Analyze student data and modify instruction as necessary to ensure that all students are given the opportunity to succeed.
12. Actively engage students in critical thinking and problem solving.
13. Develop motivating, inquiry-based activities to stimulate student interest.
14. Communicate and foster relationships with colleagues, families, and the community.
15. Integrate required and appropriate science subjects into the middle school classroom.
16. Evaluate methods to prepare students for standardized tests as required by district, state, or national regulations.
17. Develop several strategies that will prepare the middle school science student for a successful high school science experience.
18. Describe physical and emotional characteristics of middle school learners.
19. Develop cross-curricular lessons to connect science with other subject areas.
20. Evaluate various methods of incorporating meaningful group activities into the classroom.

## Required Text

Jorgenson, O., Cleveland, J., & Vanosdall, R. (2004). *Doing good science in middle school: A practical guide to inquiry-based instruction*. Arlington, VA: NSTA Press.

## Required Software

Microsoft Excel or OpenOffice Calc AND Microsoft PowerPoint. OpenOffice Calc can be downloaded for free from the OpenOffice site: <http://www.openoffice.org/>.

Instructors and learners will also use instructor-generated materials, learner-generated materials, and Web-based resources to facilitate learning.

## Topical Outline

## List of Concepts

### Characteristics of Middle School Learners

Physical and physiological development; intellectual development; emotional and social development; gender differences; the effects of peer, parental, and academic pressure in middle school

### Planning for Success

Moving from long-term to short-term planning; aligning lesson plans to district, state, and national standards; creating a daily lesson plan; pacing and sequencing; monitoring and adjusting plans

### Learning Styles and Diversity

Multiple intelligences and learning styles; differentiating assignments and instruction; adapting lessons for different learning styles; ways to engage all students in science, including inquiry-based science and cooperative learning; diversity in the science classroom

### Classroom Management and Communication

Teaching strategies for personality types; seeking student input; communication with families and community; utilizing questioning techniques to engage students; formulating a variety of questions over a specified subject area; bell activities and lesson closure; motivating students; analyzing time lost in the classroom

### Integrating Technology

Data collection devices; effective multimedia and presentations; whiteboard technology; using technology for collaboration; data analysis of experimental results using spreadsheet programs; online sources of scientific data; pros and cons of data collection technologies, including Vernier, Pasco, Onset, TI; using technology for cross-curricular and global collaboration

### Assessing Progress and Using Data

Analyzing data to drive instruction; reviewing standardized test results in science from a middle school; correlation between learning and grades; analyzing differences in performance between different student subgroups

### Conquering Curriculum

Review current middle school science standards; vertical and horizontal alignment of curriculum; “teaching to the test”; effective inquiry in science; common misconceptions about inquiry; designing an inquiry-based lab activity; continuous improvement and quality tools for education; effective homework assignments

**Connecting the Dots**      Preparing a “skills ladder” that depicts the skills necessary for a student to be successful in science from elementary through high school; professional learning communities; changes in education; elemiddle schools; mission statements

**Course Assessments and Links to Course Outcomes**

Throughout the course, the learner will be assessed and evaluated on the completion of the following assessments. Learning activities include large- and small-group discussions and assessments for a total of 921 points.

<b>Modules</b>	<b>Topics of Modules</b>	<b>Points</b>	<b>Correlation With Course Outcomes</b>
Module 1:	Characteristics of Middle School Learners	121	2, 3, 8, 12, 18
Module 2:	Planning for Success	123	1, 2, 4, 7, 9, 12, 13, 15, 19, 20
Module 3:	Learning Styles and Diversity	121	2, 3, 4, 6, 8, 9, 11, 12, 13, 20
Module 4:	Classroom Management and Communication	105	1, 2, 4, 5, 6, 7, 12, 13, 14, 19, 20
Module 5:	Integrating Technology	87	2, 4, 5, 7, 12, 13, 15, 19, 20
Module 6:	Assessing Progress and Using Data	116	2, 5, 7, 8, 10, 11, 16, 17
Module 7:	Conquering Curriculum	141	4, 6, 7, 9, 12, 13, 14, 15, 19, 20
Module 8:	Connecting the Dots	107	1, 2, 7, 9, 14, 17, 20
<b>Total</b>		<b>921</b>	

Criteria specific to each assessment will be explained in conjunction with the instructional activities.

**Instructional Methodology**

The instructional methodology of this course focuses on developing, enhancing, and improving the instructional expertise and pedagogical knowledge base of practicing educators. Strategies include presentation of new content through online readings, active construction of knowledge through practice and problem solving, collaborative group work, personal reflection, structured small-group or whole-class discussion, analysis of assigned reading, and the application of course content and skills to participant’s individual grade level, subject area(s), and classroom.

**Grading Scale**

The course facilitator will post the grading scale.

**Performance Learning Systems’ Late Policy**

There will be a 10% deduction of points per day for all posts and submitted assignments which are late. Replies posted after the due date will earn no points. In rare cases,

partially or poorly completed assignments may be resubmitted for partial credit at the discretion of the instructor. The following exceptions apply:

- If a participant is sick/hospitalized or has a death in the family, the timing of makeup work may be arranged with the course facilitator. No points will be deducted if the work is completed according to the agreement.
- If a participant is on vacation/traveling/etc., the participant must contact the course facilitator ahead of time to avoid a penalty. This type of absence may occur only once during a course. All posts should be submitted for the missed module before leaving.
- If a participant has difficulty completing everything in a week, an extension can be granted if the participant contacts the facilitator during the week (not at the last minute).

### **Performance Learning Systems' Participant Drop Policy**

- Participants are eligible to receive a refund if they attend class for one week or less. This means participants must withdraw by the end of Module 1 to receive a refund.
- Refunds of the balance of tuition paid will be given, minus the \$50 deposit.

### **Performance Learning Systems' Academic Integrity Policy**

Performance Learning Systems expects absolute academic honesty and integrity from every course participant. The specific Academic Integrity and Honor Code policies of our partner colleges and universities are embraced and enforced by PLS instructors. The following are considered to be serious violations:

- Plagiarism: the use of another's ideas, data, or words without proper acknowledgment.
- Fabrication: the use of invented information or the falsification of research or other findings with the intent to deceive.
- Collusion: improper collaboration with another in preparing assignments or projects.
- Cheating: an act of deception by which a student misrepresents that he or she has mastered information on an academic exercise that he or she has not mastered.
- Academic Misconduct: tampering with grades, or taking part in obtaining or distributing any part of student work that is not his or her own.

Violation(s) or suspected violation(s) will be investigated and pursued according to specific college/university procedures.

### **Identity Authentication**

The college/university, Performance Learning Systems (PLS), and students share a joint responsibility to ensure that each student's contribution in an online course activity comes from that student alone. For the student, this responsibility has two parts:

1. Students are responsible for positively ensuring that every contribution to an online course created with the students' computer account is made by the student alone. Contributions covered under this policy include: written assignments; quiz and exam submissions; discussion forum postings; live participation in text-based chat sessions, phone conferences, and videoconferences. If a student allows another person to write or make any kind of submission to an online activity in the student's name, then this constitutes cheating and will be treated as a violation of academic honesty.

2. Students are responsible for ensuring the integrity of their computer account security by following the actions required of them by the PLS Acceptable Use Policy. These actions include keeping passcodes private, updating passcodes when required by Performance Learning Systems, and reporting breaches of the security policy to the IT Helpdesk.

### **Course Evaluation**

The evaluation of learner work will be based on the defined criteria for learner assessments. The criteria for learner assessments will be outlined for students prior to instructional activities and engagement with student learning targets (outcomes). Grading is based solely on the evaluation of student learning targets and defined criteria for learner assessments.

Formative assessment of learning outcomes is conducted throughout the course, using a variety of means that include the following: completion of assessments; constructive contributions to class discussions (whole-class as well as small-group); sharing of valuable, pertinent, and/or applicable ideas and experiences; and active participation in online interactions. It is expected that each participant will contribute to the academic quality of the course.

Summative assessment includes the completion of weekly learning activities and assignments for which the participant will need to synthesize class content, apply it to his or her own practice, and complete a plan for implementing the major components of content and skill acquired during the course.

## Course Outcome Correlations With INTASC Standards for Teachers

	Course Outcomes
<b>Standard 1: Subject Matter</b> The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.	<b>1, 2, 4, 5, 6, 7, 9, 12, 13, 20</b>
<b>Standard 2: Student Learning</b> The teacher understands how children and youth learn and develop, and can provide learning opportunities that support their intellectual, social and personal development.	<b>2, 7, 17, 18, 20</b>
<b>Standard 3: Diverse Learners</b> The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.	<b>2, 3, 4, 5, 8, 13</b>
<b>Standard 4: Instructional Strategies</b> The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.	<b>3, 4, 6, 12, 13</b>
<b>Standard 5: Learning Environment</b> The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	<b>4, 5, 7, 8, 11, 12, 13, 20</b>
<b>Standard 6: Communication</b> The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	<b>1, 2, 4, 5, 6, 8, 11, 12, 13, 20</b>
<b>Standard 7: Planning Instruction</b> The teacher plans and manages instruction based upon knowledge of subject matter, students, the community, and curriculum goals.	<b>1, 3, 8, 12, 14, 16</b>
<b>Standard 8: Assessment</b> The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.	<b>2, 4, 6, 10, 11, 15, 16</b>
<b>Standard 9: Reflection and Professional Development</b> The teacher is a reflective practitioner who continually evaluates the effects of her/his choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.	<b>2, 7, 11, 13, 14, 17</b>
<b>Standard 10: Collaboration, Ethics, and Relationships</b> The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.	<b>5, 6, 7, 14, 19</b>

The Interstate New Teacher Assessment and the Support for Consortium (INTASC) standards were developed by the Council of the Chief State School Officers and member states. Copies may be downloaded from the Council's website at <http://www.ccsso.org>.

© Council of Chief State School Officers. (1992) Model standards for beginning teacher licensing, assessment, and development: A resource for state dialogue. Washington, DC: Author. <http://www.ccsso.org/content/pdfs/corestrd.pdf>.

## Course Outcome Correlations With National Board for Professional Teaching (NBPTS) Propositions and Standards

<b>Proposition 1: Teachers are Committed to Students and Their Learning.</b>	<b>Course Outcomes</b>
NBCTs are dedicated to making knowledge accessible to all students. They believe all students can learn.	<b>3, 8, 11</b>
They treat students equitably. They recognize the individual differences that distinguish their students from one another and they take account for these differences in their practice.	<b>3, 8, 11, 18, 20</b>
NBCTs understand how students develop and learn.	<b>2, 3, 6, 8, 18</b>
They respect the cultural and family differences students bring to their classroom.	<b>14</b>
They are concerned with their students' self-concept, their motivation and the effects of learning on peer relationships.	<b>13, 18</b>
NBCTs are also concerned with the development of character and civic responsibility.	<b>14</b>
<b>Proposition 2: Teachers Know the Subjects They Teach and How to Teach Those Subjects to Students.</b>	
NBCTs have mastery over the subject(s) they teach. They have a deep understanding of the history, structure and real-world applications of the subject.	<b>1, 2, 5, 6, 7, 9, 13, 15, 16, 17, 19</b>
They have skill and experience in teaching it, and they are very familiar with the skills gaps and preconceptions students may bring to the subject.	<b>1, 2, 5, 6, 7, 9, 13, 15, 16, 17, 19</b>
They are able to use diverse instructional strategies to teach for understanding.	<b>2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 17, 19, 20</b>
<b>Proposition 3: Teachers are Responsible for Managing and Monitoring Student Learning.</b>	
NBCTs deliver effective instruction. They move fluently through a range of instructional techniques, keeping students motivated, engaged and focused.	<b>2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 17, 19, 20</b>
They know how to engage students to ensure a disciplined learning environment, and how to organize instruction to meet instructional goals.	<b>3, 4, 6, 7, 8, 9, 12, 13, 15, 16, 17</b>
NBCTs know how to assess the progress of individual students as well as the class as a whole.	<b>4, 10, 11</b>
They use multiple methods for measuring student growth and understanding, and they can clearly explain student performance to parents.	<b>3, 4, 8, 10, 11, 14</b>
<b>Proposition 4: Teachers Think Systematically about Their Practice and Learn from Experience.</b>	
NBCTs model what it means to be an educated person – they read, they question, they create and they are willing to try new things.	<b>2, 6, 14</b>
They are familiar with learning theories and instructional strategies and stay abreast of current issues in American education.	<b>2, 5, 6, 13, 14</b>
They critically examine their practice on a regular basis to deepen knowledge, expand their repertoire of skills, and incorporate new findings into their practice.	<b>14</b>

**Proposition 5: Teachers are Members of Learning Communities.**

NBCTs collaborate with others to improve student learning.	<b>14</b>
They are leaders and actively know how to seek and build partnerships with community groups and businesses.	<b>14</b>
They work with other professionals on instructional policy, curriculum development and staff development.	<b>14</b>
They can evaluate school progress and the allocation of resources in order to meet state and local education objectives.	<b>11</b>
They know how to work collaboratively with parents to engage them productively in the work of the school.	<b>14</b>

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