

# Science Education for Middle Level Students

### Introduction

NSTA recommends a strong emphasis on middle level science education, which can be achieved by staffing middle schools with teachers who are qualified to teach science and are trained and dedicated to working with students at this important period in their lives. Science concepts must be presented in an age-appropriate, engaging way so students can build on their prior knowledge and attain the necessary background to participate successfully and responsibly in our highly scientific and technological society.

The middle school years, grades 5 through 9, are a time of tremendous physical, emotional, and cognitive changes for students. It also is a pivotal time in their understanding of and enthusiasm for science.

### Declarations

#### NSTA recommends teachers of middle level science

- be fully qualified to teach science in their state and have a strong knowledge of science content;
- attain a high level of knowledge about educational research on how middle level students learn, best practices, and effective instructional strategies for middle level students, and be able to use this knowledge in the classroom;
- embrace three-dimensional learning as set forth in *A Framework for K–12 Science Education* and the *Next Generation Science Standards (NGSS; NGSS Lead States 2013)*;
- deal positively with the variability of behavior patterns of emerging adolescents;
- support diverse learners effectively, deal with gender/equity issues, model a multidisciplinary approach to learning, and exhibit a desire to be a lifelong learner;
- create a safe environment in which students can engage in science and engineering practices in the classroom, in

the laboratory, and in field settings described in the NSTA position statement *Safety and School Science Instruction* (NSTA 2015); and

- stay abreast of current advancements in instructional technology and seek new ways to incorporate technology in their teaching.

#### NSTA recommends the curriculum of middle level science programs

- be aligned with the disciplinary core ideas, crosscutting concepts, and science and engineering practices outlined in *A Framework for K–12 Science Education*;
- nurture curiosity about the natural world and include opportunities to engage in science and engineering practices;
- foster the development of a scientific mindset and an understanding of the nature of science;
- engage students in multiple laboratory investigations every week as specified in the NSTA position statement on laboratory science (NSTA 2007);
- incorporate independent and cooperative group learning experiences during the study of science, and integrate science with other curriculum subjects in a multidisciplinary approach, such as through theme-based learning; and
- encourage the development of critical thinking and communication skills and the sharing of ideas and results with peers.

#### NSTA recommends that the curriculum offer links to the real world by

- focusing instructional units on subject matter that is relevant to students' lives, interests, and experiences;
- applying content and skills learned in science class to explain phenomena, create models, and design solutions



to real-world problems;

- connecting the classroom to the community through place-based learning opportunities such as field trips, inspiring speakers, and local partnerships;
- providing students with real-life experiences (e.g., mentoring and apprenticeships) that enable them to develop an awareness of science-based careers and an understanding of how science is relevant to their lives;
- providing opportunities for critical thinking and decision-making activities (e.g., evidence-based argumentation, analysis of authentic data) for involvement in community-based problems; and
- promoting societal goals for scientific, engineering, and technological literacy.

#### NSTA recommends that the assessment strategies used in middle level science programs

- include a variety of formative and summative assessment methods that can be used to evaluate overall student achievement and guide decisions about instruction and practices;
- be continuous and embedded in the instructional materials;
- capture the interest of students to better engage them in the assessment process;
- occur frequently and allow for differentiation, modification, enrichment, and remediation;
- include questions that are sensitive to gender and varied cultures and life experiences; and
- be three-dimensional in nature.

#### NSTA recommends that middle level administrators support the science program by

- gaining an understanding of the vision of science education set forth by *A Framework for K–12 Science Education* and helping to align practices and policies to support this vision;
- providing numerous opportunities for professional development experiences to bolster teachers' knowledge of science content and current technologies, and to enhance their skills in working with the middle level age group;

- working to make school environments as safe as possible by complying with local, state, or federal safety requirements and adhering to NSTA safety recommendations (NSTA 2015);
- proactively planning for expanding and updating technology infrastructure;
- setting aside time for teachers to plan and strategize with colleagues in their own school as well as with those at the elementary and high school levels;
- cultivating a dedicated team of teachers with a demonstrated expertise and interest in students of this age group, placing these teachers in the school system's middle schools, and permitting them to remain in their assignments so that they can develop their expertise;
- supporting the recommended time allotted for middle level laboratory investigations; and
- providing necessary funding for laboratory investigations, and science materials and resources.

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#### References

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