Five Guiding Principles
Science Instruction and Systems Thinking

As the West Des Moines Community School District journeys into the twenty-first century, the science committee embraces the message and concepts of systems thinking and the five guiding principles of "Building a Learning Community for the 21st Century." A truly dynamic science curriculum is more than textbooks, facts and basic skills. Rather, it is an organized commitment to inquiring, active learning, self-reflection, and construction of conceptual understanding.

The following material is drawn from the document entitled "Building a Learning Community for the 21st Century" and is expanded to embrace science curriculum development and the science program implementation of West Des Moines Community Schools.

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Guiding Principle: *Optimum Use of Human Resources*
"People contribute to the district by sharing their talents. Students, staff and community work with one another in the learning process. The district allocates its resources to provide the best opportunities for all learners."

Students, teachers, parents and the community will assist in the commitment necessary to produce quality learning. Students can serve not only as receivers of knowledge, but also as resources of knowledge. To meet the needs of all students, teachers work with support staff, community members, business and administrators. Teachers and students communicate and share information freely and openly, developing close and trusting relationships. Science personnel continuously seek and expand the potential for additional science resources in order to achieve and maintain high levels of learning.

Guiding Principle: *Integration*
"The coordination of resources, programs and services are interrelated. Subjects in the curriculum are integrated. Learning takes place in classrooms with multi-age/multi-ability groups. Technology continues to be an important instructional tool. Involvement of all stakeholders in the development of curriculum is encouraged."

Teachers and students share the connection that science skills and concepts are essential for personal growth and societal progress. The construction of linkages, connections and relationships between the earth, life, physical, environmental and health sciences are established to develop a more realistic and holistic view of the world. Thematic and/or interdisciplinary units between science and other disciplines are developed and strengthened. Topics and skills common to multiple content areas are utilized in order to develop and reinforce process skills and problem solving skills.

Guiding Principle: *Continuous Improvement*

"Quality is a design consideration in all decision making. Ongoing feedback provides students, staff, and community with vital information. Students, staff, and parents are accountable for student learning, and the district continuously develops more ways to measure and assess the quality of its educational programming."

Students will be introduced to the tools necessary for development of science skills and concepts. Students will be provided consistent feedback throughout the learning process, and will have opportunities for self-evaluation. Teachers and students are involved in a continuous dialogue about individual strengths, needs and development. Students are encouraged to act as risk takers. Teachers and students take advantage of new innovative strategies as well as successful proven instructional strategies. Dynamic long-term vitality and growth of students is maintained through active participation of science activities. The science program continuously reviews the use and application of its resources, while systemically seeking out new resources and strategies.

Guiding Principle: *Personalized Learning*

"Meaningful learning for each individual is the emphasis. Appropriate educational experiences are provided for all students. Learning as a lifelong activity is encouraged. All stakeholders, including students, are resources as a true learning organization develops."

The science curriculum is meaningful and authentic with an emphasis on the relevant and developmentally appropriate issues and topics of the student. Students will understand the purposes of their learning, and are engaged in making decisions about what and how they learn. Teachers will consistently and constructively support and promote quality student work. Time for research and hands-on investigation is critical of this science program. Students and assessed and evaluated through a wide variety of assessment strategies. Technology is incorporated to allow students to expand areas of interest and aptitude.

Guiding Principle: *Diversity*

"We value differences in others and find ways to share and appreciate those differences. Curricula and relationships reflect this belief. A wide variety of new and diverse resources are pursued. Seeking out many perspectives before decisions are made is important."

The diversity of interests, aptitudes, learning styles of all students is addressed through the broad-based science skills and concepts built into the science curriculum. Teachers and students share information freely, and value all perspectives in making decisions and solving problems. Students are encouraged to take risks conclusive to personal growth and intellectual development. Students and teachers work interdependently, valuing each other and the contribution each makes to learning. The science curriculum promotes understanding of and sensitivity toward religious, racial, gender, cultural and other differences among people.

The following are Belief Statements

and implications regarding the science curriculum
of the West Des Moines Community Schools,
framed by the document entitled
"Building a Learning Community for the 21st Century."

Science Curriculum CONTENT should:

1. be meaningful and authentic
2. emphasize communication, collaboration and problem-solving skills
3. promote creativity and generative learning
4. encourage the investigation of complex and ambiguous realities
5. explore values and promote personal development
6. contain rich information which promotes skilled performance and deep understanding

Belief Statement #1
The science curriculum content should be meaningful and authentic.

Implications for the Science Curriculum
A. Students should understand the purposes of their learning.
B. The science curriculum should provide learners with a sound and meaningful knowledge base for future growth.
C. The science curriculum should promote self-propelled learning -- offering students opportunities to engage in learning of their own design.
D. Learning should include an emphasis on real-life issues such as the world of work, families, the environment, and local, national and international issues.
E. Students should be immersed in learning themes and ideas which both challenge and interest them.
F. Educators should continually re-examine the relevancy and quality of the science curriculum.
G. Technology which effectively incorporates up-to-date information and which allows students to explore areas of interest should be a part of the science curriculum.
H. The science curriculum should help students appreciate information by understanding its context.

Belief Statement #2
The science curriculum content should emphasize communication, collaboration and problem-solving skills.

Implications for the Science Curriculum
A. Reading, Writing, Speaking and Listening skills should be integrated into the science curriculum.
B. The science curriculum should emphasize the skills of identifying, analyzing and solving problems.

C. Specific problem-solving strategies should be presented and opportunities for students to practice them should be provided.
D. Student research should focus on addressing problems and communicating possible solutions to those problems.

E. The science curriculum should examine the essence of conflict and conflict resolution.
F. Students should be taught and encouraged to respectfully encourage or question the positions of others.

Belief Statement #3

The science curriculum content should promote creativity and generative learning.

Implications for the Science Curriculum

A. The science curriculum should emphasize generative learning (i.e., students building their own knowledge bases through exploration, practice and experiences).
B. Teachers should assist students in constructing meaning from information and in organizing and internalizing meaningful information.
C. Students should be encouraged to tackle new experiences and educators should model creative endeavors.
D. Teachers should address the importance of learning through failures as well as successes.
E. Students should be encouraged to develop new models and patterns as well as to replicate existing models and patterns.
F. Educators should emphasize and model the joy of learning.
G. The science curriculum should help students become rooted in tradition while remaining open to new ideas.

Belief Statement #4

The science curriculum content should encourage the investigation of complex and ambiguous realities.

Implications for the Science Curriculum

A. Students and educators should devote time to analyzing and discussing issues which are not easily understood and which may be viewed from a variety of perspectives.
B. Students should learn to work with data which is rapidly changing and which presents complex and contradictory information.
C. The science curriculum should emphasize that many questions have more than one "right" answer.
D. Students should appreciate the role of process in understanding complex and ambiguous realities.

Belief Statement #5

The science curriculum content should explore values and promote personal development.

Implications for the Science Curriculum

A. The science curriculum should include a process to practice developing informed and responsible actions.
B. The relationship between academic knowledge and informed social action should be made clear.
C. The value of service to others through competent caring should be promoted and modeled; and service opportunities for all learners should be provided.
D. The importance of taking personal responsibility for altering one's environment should be addressed.
E. Caring for oneself and others should be emphasized throughout the science curriculum.
F. The ethics of science investigation should be explored and communicated.

Belief Statement #6

Science curriculum content should contain rich information which promotes skilled performance and deep understanding.

Implications for the Science Curriculum

A. The development of basic skilled performance should be implicit at all grade levels.
B. The science curriculum should educate for understanding, which is defined as having a sufficient grasp of concepts, principles and skills so that students can bring them to bear on new problems and situations.
C. High-level cognitive thinking (i.e., analyzing, creating, and problem-solving) should be emphasized and assessed.
D. When possible, the information presented should be connected to other disciplines and other situations, in order for students to develop broader and deeper understandings.
E. Multiple resources and a variety of concrete experiences should be utilized in order for students to benefit from a varied perspectives and approaches to topics.
F. Thought-provoking materials of high quality should be utilized in the science curriculum.

SCIENCE CURRICULUM IMPLEMENTATION

Science curriculum PRACTICES should:

1. be inquiry-based and flexible enough to accommodate learners' individual and collaborative explorations.
2. be broad enough to accommodate the successful involvement of learners with diverse interests and abilities.
3. make connections between the disciplines in order for students to develop a more realistic view of the world.
4. incorporate assessment activities which are on-going, involve student self-assessment and are based on students' application of knowledge and their reflections on materials studied.
5. include assessment of individual student development as well as normative group assessment.

6. promote disciplined work habits.
7. incorporate technology as a source of rich information and interactive learning.

Belief Statement #1

Science curriculum practices should be inquiry-based and flexible enough to accommodate learners' individual and collaborative explorations.

Implications for the Science Curriculum

A. Students should be taught to ask and seek answers to meaningful questions.
B. Time should be devoted to student inquiry --both in the school and in the community.
C. The science curriculum should be flexible enough to accommodate students' own research.
D. Teachers should model inquiry skills and respond constructively to student research.
E. Teachers should provide students with the following elements -
    1. Time: Adequate time to investigate questions and research materials--activities inherent in meaningful learning.
    2. Choice: Significant choices about what and how they will learn--decisions which are valuable in engaging students in their own learning.
    3. Response: Constructive teacher response to student work -- essential in promoting quality work by all students.
F. Active learning, in which students construct and use knowledge, should be utilized more often than passive learning, in which students memorize and regurgitate facts.
G. Interactive skills should be modeled, developed and utilized in all classrooms.

Belief Statement #2

Science curriculum practices should be broad enough to accommodate the successful involvement of learners with diverse interests and abilities.

Implications for the Science Curriculum

A. Learning should be personalized -- engaging students in making decisions about what and how they learn and providing attention to interests and learning styles.
B. Opportunities for both enrichment and rethinking should be available to all.
C. A variety of student materials should be utilized, in place of a single source such as a textbook, in order to accommodate the diverse interests and abilities of students.
D. Technology which allows students to personalize their learning should be part of the curriculum.
E. All students should be served in heterogeneous classrooms to the maximum extent possible.
F. Through the use of a rich and broad curriculum, gifted and disabled students' needs should be met as much as possible within the context of the general curriculum.
G. Collaboration between general and specialized educators should be expanded in order to meet the diverse needs of learners.

Belief Statement #3

Science curriculum practices should make connections between the disciplines in order for students to develop a more realistic view of the world.

Implications for the Science Curriculum

A. Interdisciplinary units of study should be developed at all levels.
B. Students should be immersed in experiences and encounters in which they may naturally make learning connections.
C. Technology which assists students in making connections in their learning should be a part of the science curriculum.
D. Collaboration between teachers in various disciplines should be expanded in order to develop curricular connections.
E. Team planning opportunities should be expanded, in order to develop curricular connections.
F. Alternatives to the traditional school day and year should be examined in order to accommodate learning.
G. All students should be involved in experiences outside the school with adult mentors.

Belief Statement #4

Science curriculum practices should incorporate assessment activities which are on-going, involve student self-assessment, and are based on students' application of knowledge and their reflections on materials studied.

Implications for the Science Curriculum

A. Assessment should be based on application of knowledge, problem-solving, and the development of meaningful products rather than the recall of isolated facts.
B. Assessment should provide continuous feedback throughout the learning process.
C. Students should be involved in establishing goals and evaluating their progress toward those goals.
D. Assessment should involve students' analysis of and reflections on information studied using formats such as journals, learning logs, discussions, think-alouds, etc.
E. Assessment practices should involve students in using their knowledge in novel ways.

Belief Statement #5

Science curriculum practices should include assessment of individual student development as well as normative group assessment.

Implications for the Science Curriculum

A. Students, teachers, and parents should be involved in an on-going dialogue about each student's strengths, needs and development.
B. Students should be involved in establishing their learning and behavior goals and in discussing their progress toward those goals.
C. Comparative data should be utilized to assist students rather than to judge them.
D. The science curriculum should not be driven by standardized tests.
E. The district should not overemphasize the results or value of standardized tests.

Belief Statement #6
Science curriculum practices should promote disciplined work habits.

Implications for the Science Curriculum
A. Educators, families and the community should assist students in developing the commitment and patience necessary to produce quality work.
B. Study skills which support meaningful learning should be taught.
C. Educators should emphasize and model the ability to focus on a task and to stay with it until it is well executed.

Belief Statement #7
Science curriculum practices should incorporate technology as a source of rich information and as a vehicle for interactive learning.

Implications for the Science Curriculum
A. The science program should provide the resources and training necessary to support the use of technology.
B. Technology should be used throughout the science curriculum.
C. Students should be provided with appropriate experiences with new technology.
D. Students should learn to access complex data through the use of technology.