

2009
Saskatchewan Curriculum

Science

9



Science 9

ISBN 978-1-926631-10-3

1. Study and teaching (Middle school) - Saskatchewan - Curricula. 2. Competency-based education - Saskatchewan.

Saskatchewan. Ministry of Education. Curriculum and E-Learning. Science and Technology Unit.

All rights are reserved by the original copyright owners.

Acknowledgements

The Ministry of Education wishes to acknowledge the professional contributions and advice of the provincial curriculum reference committee members:

Glen Aikenhead, Professor Emeritus
College of Education
University of Saskatchewan

Janet McVittie, Assistant Professor
College of Education
University of Saskatchewan

Wayne Clark, Teacher
Good Spirit School Division
Saskatchewan Teachers' Federation

Herman Michell, Assistant Professor
Department of Science
First Nations University of Canada

Laura Connors, Teacher
Prairie South School Division
Saskatchewan Teachers' Federation

Devona Putland, Teacher
South East Cornerstone School Division
Saskatchewan Teachers' Federation

Aimee Corriveau
Meath Park School
Student

Josée Roberge-Dyck, Teacher
Christ the Teacher School Division
Saskatchewan Teachers' Federation

Michala Hegi, Teacher
Regina Roman Catholic School Division
Saskatchewan Teachers' Federation

Patty Serwotki, Teacher
Living Sky School Division
Saskatchewan Teachers' Federation

Ji Xia, Assistant Professor
Faculty of Education
University of Regina

Sheryl Siemens, Teacher
Chinook School Division
Saskatchewan Teachers' Federation

Duane Johnson, Principal
Prairie Valley School Division
Saskatchewan Teachers' Federation

Lori Slater, Program Manager
Education and Training Secretariat
Federation of Saskatchewan Indian Nations

Pattie Lysyk, Teacher
Saskatchewan Rivers School Division
Saskatchewan Teachers' Federation

Warren Wessel, Associate Professor
Faculty of Education
University of Regina

Brien Maguire, Professor
Computer Science Department
University of Regina

Ruth Wilson, Teacher
Sun West School Division
Saskatchewan Teachers' Federation

Larry McCallum, Consultant
Greater Saskatoon Catholic School Division
Saskatchewan Teachers' Federation

Matthew Zelenski
Meath Park School
Student

The Ministry of Education also wishes to thank many others who contributed to the development of this curriculum:

- former Science Reference Committee members
- First Nations Elders and teachers
- university faculty members
- other educators and reviewers.

Outcomes and Indicators

Life Science – Reproduction and Human Development (RE)

RE9.1 Examine the process of and influences on the transfer of genetic information and the impact of that understanding on society past and present.

RE9.2 Observe and describe the significance of cellular reproductive processes, including mitosis and meiosis.

RE9.3 Describe the processes and implications of sexual and asexual reproduction in plants and animals.

RE9.4 Analyze the process of human reproduction, including the influence of reproductive and contraceptive technologies.

Physical Science – Atoms and Elements (AE)

AE9.1 Distinguish between physical and chemical properties of common substances, including those found in household, commercial, industrial, and agricultural applications.

AE9.2 Analyze historical explanations of the structure of matter up to and including:

- Dalton model
- Thomson model
- Rutherford model
- Bohr model of the atom.

AE9.3 Demonstrate an understanding of the classification of pure substances (elements and compounds), including the development and nature of the Periodic Table.

Physical Science – Characteristics of Electricity (CE)

CE9.1 Demonstrate and analyze characteristics of static electric charge and current electricity, including historical and cultural understanding.

CE9.2 Analyze the relationships that exist among voltage, current, and resistance in series and parallel circuits.

CE9.3 Assess operating principles, costs, and efficiencies of devices that produce or use electrical energy.

CE9.4 Critique impacts of past, current, and possible future methods of small and large scale electrical energy production and distribution in Saskatchewan.

Earth and Space Science – Exploring our Universe (EU)

EU9.1 Inquire into the motion and characteristics of astronomical bodies in our solar system and the universe.

EU9.2 Analyze scientific explanations of the formation and evolution of our solar system and the universe.

EU9.3 Examine how various cultures, past and present, including First Nations and Métis, understand and represent astronomical phenomenon.

EU9.4 Analyze human capabilities for exploring and understanding the universe, including technologies and programs that support such exploration.

Life Science: Reproduction and Human Development (RE)

All outcomes in this unit contribute to the development of all K-12 science goals.

Outcomes

RE9.1 Examine the process of and influences on the transfer of genetic information and the impact of that understanding on society past and present.

[CP, DM]

RE9.2 Observe and describe the significance of cellular reproductive processes, including mitosis and meiosis.

[CP, SI]

Indicators

- a. Identify questions to investigate related to genetics.
 - b. Provide examples of genetic conditions whose causes and cures are not understood according to current scientific and technological knowledge (e.g., some causes of male infertility, cystic fibrosis, Down's syndrome, and muscular dystrophy).
 - c. Recognize that the nucleus of a cell contains genetic information and identify the relationship among chromosomes, genes, and DNA in transmitting genetic information.
 - d. Identify examples of dominant and recessive traits in humans and other living things.
 - e. Observe, collect, and analyze class and/or family data of human traits that may be inherited from parents (e.g., eye colour, chin shape, ear lobes, and tongue rolling).
 - f. Discuss environmental factors and personal choices that may lead to changes in a cell's genetic information (e.g., toxins, carcinogens, pesticides, smoking, overexposure to sunlight, and alcohol abuse).
 - g. Provide examples of Saskatchewan and Canadian contributions to the science and technology of genetics and reproductive biology in plants and animals.
 - h. Select and synthesize information from various sources to illustrate how developments in genetics, including gene therapy and genetic engineering, have had an impact on global and local food production, populations, the spread of disease, and the environment.
 - i. Describe careers in Saskatchewan or Canada that require an understanding of genetics or reproductive biology.
- a. Observe and describe cell division (e.g., binary fission, mitosis, and meiosis) using microscopes, prepared slides, and/or videos.
 - b. Construct a visual, dramatic, or other representation of the basic process of cell division as part of the cell cycle, including what happens to the cell membrane and the contents of the nucleus.

Outcomes

RE9.2 continued

RE9.3 Describe the processes and implications of sexual and asexual reproduction in plants and animals.

[SI]

Indicators

- c. Recognize that the nucleus of a cell determines cellular processes.
 - d. Identify major shifts in scientific understanding of cell growth and division, including the role of microscopes and related technologies.
 - e. Explain how the cell theory accounts for cell division.
 - f. Compare binary fission, mitosis, and meiosis, and distinguish between cell division processes during meiosis and mitosis including the creation of diploid and haploid cells.
 - g. Relate cancer to cellular processes.
-
- a. Identify questions to investigate about sexual and asexual reproduction in plants.
 - b. Compare advantages and disadvantages of sexual and asexual reproduction for individual plants and animals, and for populations.
 - c. Describe various methods of asexual reproduction in plant species (e.g., budding, grafting, binary fission, spore production, fragmentation, and vegetative reproduction) and list specific examples.
 - d. Describe various methods of asexual reproduction in animal species (e.g., budding, parthenogenesis) and list specific examples (e.g., hydra, aphids, and hammerhead shark).
 - e. Investigate and describe applications of asexual reproduction knowledge and techniques in the Saskatchewan agricultural and/or forestry sector.
 - f. Describe the process of sexual reproduction in seed plant species, including methods of pollination.
 - g. Describe examples of sexual reproduction in animal species, including hermaphroditic species (e.g., Clownfish, wrasses, snails, and earthworms).