Unit 2: 3rd-6th Grade STEM T&G

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Belleville Public Schools

Curriculum Guide

Unit 2: T&G STEAMM Curriculum

Superb Science

3rd-6th Grade

Belleville Board of Education

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Unit Overview

BELLEVILLE SCHOOL DISTRICT

PHILOSOPHY

The philosophy of the Talented & Gifted Program for Belleville Public Schools is to recognize the unique talents and cabilities of all students. Students who demonstrate exceptional abilities require a challenging and a differentiated curriculum. We recognize that students learn in different ways and posses different experiences and levels of understanding. Students deserve an educational environment that is challenging, stimulating, individualized, and learner driven. The curriculum has been designed to maximize students' creative, cultural, and cognitive needs. The cornerstone belief of the Talented & Gifted program is that children learn best when they are actively engaged in the quest for knowledge.

PURPOSE

The purpose of the Belleville School District Talented & Gifted Program:

- Provides students with learning experiences to increase their cognitive and affective abilities through frequent applications of creative thinking, problem solving, critical thinking, exploration, discovery, and experimentation.
- This program will provide educational opportunities and activities to every student in his/her personal learning style, to include visual-spatial, musical, naturalist, bodily kinesthetic, interpersonal, intrapersonal, linguistic, verb-linguistic, and logical-mathematical.
- Students will be encouraged to develop and apply higher level thinking processes to become producers of information, as well as consumers of information.
- The program will enhance each student's level of understanding concepts, ideas, and issues in the areas of knowledge, comprehension, application, analysis, synthesis, and evaluation.
- The intellectual architecture of this unit will be fueled by teacher designed lessons that build upon identified students' strengths, interests, and talents.
- The program is designed to be student driven in which the teacher acts as a facilitator, guide, or resource for personal or small group inquiries and investigations.
- The three characteristics used for identifying students are above average ability, task commitment, and creativity.
- Provide a three-part model of learning activities which would include Tier One as whole group instruction in the classroom setting during the school day, Tier Two as small group instruction and planned activities in the classroom setting during the school day involving cross-curricular involvement, and Tier Three as an after school enrichment program for students in grades three through five who meet the established criteria.
- The students are identified based on unique talents, abilities, and interests to form a talent pool.

At the K-5 levels, enrichment is intended for all students. It will be available to encourage students, and give them additional opportunities to achieve their highest potential. An after-school program in grades three through five has been designed for those students who demonstrate exceptional ability, talent, and potential.

Students chosen to participate in this program will be rewuired to meet established acceptance criteria.

AFTER-SCHOOL PROGRAM GOALS

1. Provide a differentiated curriculum for students who demonstrate exceptional cabilities and potential.
2. Identify and support each student's personal style to promote academic, social, and emotional growth for potential success.
3. Provide opportunities for students to pursue long-term investigations of personal interests.
4. Provide activities that promote growth and stimulation in higher cognitive processes such interpretation, analysis, application, synthesis, and evaluation.
5. To engage students in rich academic experiences coupled with high expectations, which will afford them opportunities to make meaningful connections between their learning and the larger world.
6. Develop an understanding of their own talents and interests in order to select and pace learning experiences necessary to become more self-directed learners.

AFTER-SCHOOL PROGRAM OBJECTIVES

1. The student will participate in learning activities in which one or more of the following strategies for differentiated instruction will be employed: interest groups, independent projects, learning centers, and tiered assignments.
2. The students will be exposed to a personal interest survey to help them focus their questions for personal or small group inquiry and investigation in grades three through five.
3. The students will participate in analysis and synthesis of information facilitated by, but not limited to, real world problem solving, mentorship, product creation, presentation, and self-evaluation.
4. Students will select topics of personal interest that they will research, engage in problem solving, and create solutions that are tied to real world application.
5. The students will use technological resources to facilitate their investigations.

GUIDELINES FOR INSTRUCTIONAL ACTIVITIES

Activities will include but not be limited to:

1. Personal interest inventories, and investigations pursuing those interests.
2. Inquiry of questions related to or arising from regular classroom studies or those proposed by the instructor.
3. Exploratory activities.
4. Student opportunities to enage in new endeavors involving questioning and investigation to secure new knowledge.
5. Those that encourage students to question, make inferences, and find evidence to support generalizations.

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Talented & Gifted Program

UNIT TWO STEAMM OVERVIEW

Research in STEAMM (Science, Technology, Engineering, Art, Mathematics, and Music) learning over the past two decades has a lot to say about what makes for effective, engaging STEAMM education. Among the key factors: it capitalizes on students' early interests and experiences, identifies and builds on what they know, and provides opportunities to engage in the practices of science and mathematics to sustain their interest. In other words, throughout their schooling, students should learn to investigate questions about the world that they come across in daily life, in much the same way that scientists and mathematicians do.

This unit of study allows students to raise questions about the world around them and be willing to seek answers through observations, experimentation, and model-making.

Grade 3- Force & Motion

Grade 4- Electricity

Grade 5- Properties of Matter

New Jersey Student Learning Standards (NJSLS)

Please link all standards that apply in this section within the curriculum of the unit being written. Please include all Common Core and New Jersey Core Curriculum Standards.

SCI.3	Forces and Interactions
SCI.4	Energy
SCI.5	Structure and Properties of Matter
SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
SCI.3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
SCI.3-PS2-3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
SCI.3-PS2-2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
SCI.4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.
SCI.4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
SCI.4-PS3-1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
SCI.4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
SCI.4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
SCI.5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
SCI.5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
SCI.5-PS1-3	Make observations and measurements to identify materials based on their properties.
SCI.5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.

Exit Skills

By the end of this unit students will be independent thinkers and problem solvers utilizing the skills taught within the Enrichment Program.

Enduring Understanding

1. Students will understand the importance of becoming independent thinkers and problem solvers.

2. Students will understand that many solutions exist when solving a problem.

3. Students will understand that it is vital to use multiple resources when completing research.

4. Students will understand the importance of respect and collaboration when working with team members to solve problems.

Essential Questions

1. Why is it important to become an independent thinker?

2. How would the world be different if there weren't any problem solvers?

3. Why isn't there just one approach to solving a problem?

4. When completing research, why is it important to cross-reference different materials?

5. Why is collaboration necessary for effective problem solving?

Learning Objectives

Students will be able to refine and broaden

l. Divergent thinking (Core Standards: Reading: Informational Text; Reading Literature; Writing; Speaking and Listening; Language)

a. Creative thinking

b. Inventive thinking

2. Convergent thinking (Core Standards: Reading: Informational Text; Speaking and Listening)

a. Deductive thinking

b. Analytical thinking

c. Evaluative thinking

3. Interpretive thinking (Core Standards: Reading: Informational Text; Reading Literature; Writing; Speaking and Listening; Language, NJCCCS 5.2)

4. Problem solving (NJ CCCS 5.12, 6.6; Core Standards: Reading: Informational Text; Writing; Speaking and Listening)

5. Research Skills (Core Standards: Reading: Informational Text; Reading Literature; Writing; Speaking and Listening; Language)

In the area of divergent thinking students will:

a. use creative thinking to:

l. use fluent and flexible thinking to brainstorm ideas/solutions.

2. illustrate interpretations.

3. use the five-step writing process to write original pieces.

4. create and construct original designs with a variety of manipulatives and aft supplies.

b. use inventive thinking to:

l. use fluent and flexible thinking to brainstorm ideas/solutions.

2. invent to solve a problem.

3. adapt items to be used for an alternate purpose.

In the area of convergent thinking students will:

a. use deductive thinking to:

l. formulate predictions/hypothesis.

2. determine varied ways to reach the same solution.

3. organize clues and eliminate unrelated clues to determine a solution.

b. use analytical thinking to:

1. interpret visual representations.

2. use a variety of manipulatives and calculators to solve mathematical functions.

3. conclude results through the scientific method process.

c. use evaluative thinking to:

1. compare, rate, rank, revise, and eliminate information.

2. determine cause and effect.

3. make conclusions about given information.

4. defend and validate perspectives.

5. exercise metacognition through KWL charts and reflective writing.

6. decide assessment criteria in rubric form.

7. self-assess using set criteria.

In the area of interpretive thinking students will:

a. use shared inquiry to:

1. find and use supporting evidence for opinions.

2. present clear, persuasive arguments.

In the area of problem solving students will:

a. use the creative problem solving process to:

1. Fact Find - sort out what facts are relevant to the problem and what information is lacking.

2. Determine Problem - analyze the situation and define the "real problem."

3. Find Solutions - think of creative ways to solve the problem.

4. Select Criteria - generate criteria to help decide the best solution.

5. Judging Ideas - use criteria to select the best idea.

6. Determine Plan of Action - plan how to implement the selected solution.

In the area of research skills students will:

a. determine purpose, goals, and activities of self-selected independent study projects

b. access and select meaningful information using the Internet, books, videos, and other media.

c. use the five-step writing process of prewriting, drafting, editing, conferencing, and publishing for a variety of audiences and purposes.

d use a variety of computer software to record research.

e. synthesize knowledge of a topic into self-selected culminating activities.

f. cite references.

g. present/share research to others

Interdisciplinary Connections

The T&G Curriculum areas of divergent thinking, convergent thinking, visual/spatial perceptions, interpretive thinking, and problem

solving are integrated with Language Arts, Math, Science, and other content areas.

Alignment to 21st Century Skills & Technology

Key SUBJECTS AND 21st CENTURY THEMES

Mastery of key subjects and 21st century themes is essential for all students in the 21st century.

Key subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Science
- Geography
- History
- Government and Civics

21st Century/Interdisciplinary Themes

- Civic Literacy
- Environmental Literacy
- Global Awareness
- Health Literacy

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

Technology Infusion

- SMARTboards
- computers

- Microsoft 365 applications
- multimedia pressentations
- online resources

Differentiation

T&G students will be identified through multiple measurable assessments (DRA, Envision, teacher recommendation, etc.).

Tier 1- At this tier, ALL students are serviced. Enrichment opportunities will be offered through various classroom experiences.

Tier 2 - At this tier, flexible groups are formed based on concept mastery. Extended learning opportunities will be offered in order for students to transfer complex thinking processess to a higher level.

Tier 3- At this tier, identified students in Language Arts and/or Mathmatics will be engaged in culminating activities in an after school enrichment program. This guide addresses identified T&G students enrolled in this program.

Special Education

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- multi-sensory presentation

- preferential seating
- preview of content, concepts, and vocabulary
- secure attention before giving instruction/directions
- student working with an assigned partner

ELL

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- reducing or omitting lengthy outside reading assignments
- tutoring by peers
- using computer word processing spell check and grammar check features

Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Evidence of Student Learning-CFU's

Please list ways educators may effectively check for understanding in this secion.

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

Primary Resources

Please refer to the T&G resources provided for the enrichment program.

Ancillary Resources

readtheory.org

discoveryeducation.com

readinga-z.com

exquisite-minds.com

envisiongifted.com

davidsongifted.org