Block by Block

A Lego Building Experience for Grades 3 – 5 with an emphasis on gifted education

Students will study the basic concept of systems within the economic structure of a city, plan a building based on research, draw a map using the basic skills of cartography, and build a Lego structure based on the concept of scale and proportion.

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Section 2: Introduction

A. **Rationale:** Why are the skills, content and concepts important for gifted students?

i. **Skills:** The skills covered in this unit concentrate on the middle and highest levels of Costa's Levels of Questioning. Questions allow students to evaluate, hypothesize, synthesize, analyze and explain information gathered throughout the unit. Gifted students need to spend the majority of their learning time on challenging, in-depth material and discussion.

Skills include:

- Interpret proportion in relation to perspective
- Design a plan using area, perimeter and scale
- Interpret and design a map key
- Construct a map/plan of a building
- Calculate area and perimeter
- Determine and calculate scale in relation to a map
- Create a structure based on a design
- Interpret zoning laws of a given area
- Know and understand the jobs involved with a city planning board
- Analyze challenges involved in working with a group
- Problem solving in the context real world situations
- Apply the concept of proportion to the skills of cartography
- Synthesize information gathered from research of a given area (including economics, demographics and city planning)
- Revise building plans and design
- Know and understand the elements of design
- Summarize information gathered during the design, planning and construction phase of the unit
- Draw conclusions based on information gathered from the group study
- Evaluate the experience of designing, planning and constructing
- Support evidence of systems in relation to structure

ii. Content:

Vocabulary: city planner, cartographer, architect, zoning, civil engineer, space, matter, structure, proportion, scale, system

Math:

- Area and perimeter in real world situations
- Measurement of units within a smaller unit
- Scale as related to units/squares
- Reading and interpret charts and graphs
- Determine proportion as a ratio and a fraction
- Use multiplication to determine area
- Distributive property as it relates to area
- Word problems involving distance
- Represent measurement in terms of scale

Social Studies

- Entrepreneurs and their impact on the economy
- Systems in economics work together
- Map design and parts of a map
- City planning and its impact on systems and structures
- Zoning laws
- Economic principals/city planning
- Understand scarcity and choice in a market economy
- Understand the interactions of people, places and cultures

English/Language Arts

- Interpret information presented orally
- Interpret informational text
- Communicate with others
- Use reference materials to determine meanings of unknown words
- Use context clues in informational text to determine meaning
- Understand that decisions include the opinion of others

iii. Concept

- Structure shapes systems
- Proportion affects perspective of structures
- Systems exist in many areas of society
- Systems shape structures

The content, skills and concepts presented in this unit cover math, social studies, ELA and health standards as outlined in the North Carolina Common Core and standards curriculum. It is important for gifted students to know and understand how skills are used and be able to transfer these skills to real world situations. In this unit students use basic math skills to design, create and implement a plan for an actual structure using a simulation format. Students experience being a member of the planning board and the processes necessary to work together as a group to complete a building project. Students are highly engaged in an interesting and high level simulation while covering necessary standards.

B. Differentiation for Gifted Learners

Curriculum for the gifted student is rigorous and fast paced. In order to meet the needs of these students, various models of instruction are used in addition to differentiation for content, process, product and learning environment within each model. Varying models and teaching strategies allow gifted students to study complex material in an in-depth manner with high levels of engagement and interest. In this unit, students will engage in high-level content using the Bruner Learning Theory Model, Visual Thinking Strategies Model as well as a Simulation using creative problem solving.

Bruner Learning Theory: Lesson 1

Teachers present students with a discipline (city planner) and through inquiry and problem solving students explore new ideas while practicing the discipline.

Content:

- Extend basic area and perimeter skills are extended to a real world situation
- Students explore in-depth and challenging vocabulary related to city planning, design and construction
- Social studies standards are accelerated to include in-depth topics such as cartography, economic principals and proportion as related to map design and design elements
- Perspective is applied to proportion, systems and structures

Process:

- Students are able to practice and construct new knowledge based on prior knowledge through inquiry and problem solving
- Students acquire new knowledge while practicing a real world discipline
- Learning is the responsibility of the student
- Format encourages all students to be actively engaged and motivated

Product:

- Students produce a map design based on area and perimeter
- Students design a store front based on research of a given area-can be created individually or with a partner
- Students are able to summarize their learning experience using scrapbook pages, Power Point, Prezi or other media
- Students produce a 3 dimensional model based on their design and plan in a small group format

Learning Environment:

- Students work individually (based on his/her job on the planning board)

- Students work in groups as a part of the board using creativity and problem solving skills to create a design and plan

Visual Thinking Strategies Model: Lesson 2

Students use a visual image to think about and discuss content knowledge

Content:

- Higher level thinking skills and accelerated curriculum are used to study perspective, proportion and scale
- Students relate scale to proportion and perspective based on a visual image
- Challenging thinking skills transfer to other lesson content
- Promotes complex oral and written language skills as students discuss perspective in relation to proportion
- Problem solving skills are used with in –depth discussions

Process:

- Teacher facilitates an in-depth discussion of a selected visual image
- Students transfer knowledge to find other images highlighting proportion and perspective
- Promotes collaborative interactions among students

Product:

- Students use creativity and problem solving skills to find further images that demonstrate the concept of proportion as related to perspective and structure

Learning Environment:

- Collaborative interactions among students with the teacher serving as facilitator provides a creative and challenging format for discussion

Simulation: Lesson 3 and 4

Students become members of a city planning board. Working together, students must design, plan and construct a city building based on given criteria.

Content:

- Basic content standards in math, social studies and ELA are presented in a complex, real world simulation of a city planning board.

Process:

- Students must work in collaborative groups using problem solving skills, in-depth discussion and accelerated topics to plan, design and construct a building.

Product:

- Students may differentiate their final products (summary) using a scrapbook, Power Point, Prezi or other form of media

Learning Environment:

- Students use small group format, partner work and individual research in order to produce a complex and challenging business proposal.

Section 3: Goals and Outcomes

Content Goals and Outcomes

- **Goal 1:** Student will know area and perimeter as attributes of plane figures and understand the concept of area as applied to scale and unit squares.

Student will be able to…..

- A. Know area and perimeter and its relationship to scale units
- B. Understand area in terms of multiplication and addition as it relates to proportion
- C. Find area and perimeter in the context of solving real world mathematical problems
- D. Know relative sizes of measurement within one system of units as related to proportion and scale

Goal 2: Students will identify human and physical characteristics of a given location and understand how the basic concepts of a market economy apply to business within the community within the context of city planning.

Student will be able to…..

- A. Compare and contrast human and physical characteristics of places
- B. Describe the interactions of various people and places in terms of modifications to the environment
- C. Understand how choices in a market economy impact business decisions
- D. Define unknown words in the context of city planning and cartography.
- E. Learn the basic elements of cartography
- F. Know the basic jobs involved in city planning and define their roles in the building process

Process Goals and Outcomes

- **Goal 3:** To analyze and interpret information using problem solving techniques.

Student will be able to…..

- A. Apply given information to a real world situation
- B. Effectively communicate within a small group
- C. Use creative problem solving to interpret complex information and design a model
- D. Calculate area and perimeter and be able to convert units to scale
- E. Synthesize information gathered from various sources
- F. Construct a model based on design and plans

Concept Goals and Outcomes

- **Goal 4:** To understand the concept of systems as it relates to structure

Students will be able to….

- A. Use systems information to effectively design and build a structure
- B. Support evidences of systems in design and construction decisions
- C. Predict the impact of human interaction on systems as it relates to structure
- D. Justify design and construction decisions and their impact on the overall system
- E. Validate student roles and evaluate their impact on the overall system and structure

Section 4: Assessment Plan

Lesson 1 Assessments

Charlotte City Planning Zoning Guidelines Day 1.docx

(hyperlink)

(This defines the zoning rules and regulations and provides guidelines for the zoning commissioner…one of the student city planning positions….to follow. Students take notes while teacher observes how well guidelines are being followed.)

Day 1 Design Investigation.docx

(hyperlink)

(This defines the city plan and gives the students parameters for research and design planning. Teacher observes and facilitates as students discuss and take notes)

Day 1 Map Design.docx

(hyperlink)

(This provides guidelines and parameters for students map design. Teacher will observe and facilitate as students begin to design their structure. Teacher will note how well students incorporate the guidelines into his/her plans)

Map Design Rubric Day 1.docx

(hyperlink)

(Students use the rubric to self -assess his/her map design. Teachers can also use the rubric as a formative assessment.)

T-Chart Systems and Structures

(Throughout the unit teacher will need to keep a running list of student responses to systems and structures. At the end of the unit this chart provides a summative assessment and discussion tool to orally assess students understanding of the overall concepts covered in the unit.)

Lesson 2 Assessments

Performance Task Block by Block Revision.docx

(hyperlink)

(Students will be presented with the performance task during lesson 1 or 2 depending on pacing. Students will use their role on the city planning board to guide his/her decisions throughout the unit. The goal is to construct a building based on his/her plan and design.)

Lesson 3 Assessments

Lego Building and Planning Discussion Guide Lesson 3 Day 3.docx

(hyperlink)

(This assessment allows students to evaluate their group work in the middle of the lesson. Students decide what is working well, what improvements need to be made, if the guidelines are being followed, etc. Teachers can use these anecdotal records to monitor student understanding of the city planning roles, how the system relates to the overall structure and how students own decisions affect the overall success of the product.)

Lego Building Evaluation Guide Day 3 Revisions.docx

(hyperlink)

(This evaluation is also an anecdotal record of the students work on the construction aspect of the performance task. Teachers may use this in lesson 3 or 4 depending on student progress. Anecdotal records give the teacher a real grasp of student

understanding of vocabulary and the concept of structure, system, proportion and perspective and how each relates to their product.)

Lesson 4 Assessments/Final Product

Block by Block Final Project Day 4 revisions.docx

(hyperlink)

(This is the final summative product for the unit. Students may present their work using a Power Point presentation, Scrapbook page, or other media format. Students will use pictures taken throughout the unit to summarize their experience as a member of the planning board. Sections for their product may be organized as planning, design and construction. Teachers will get an overall summative view of students understanding of the concepts of systems and the roles students play.)

Block By Block Reflection Day 4.docx

(hyperlink)

(This is a reflection for students to think about their work during the unit. Students will have a chance to pull together all components of the unit and relate the content learned back to the concepts of systems as it relates to structure. Teachers will be able to use this anecdotal feedback as a way to assess students understanding of complex material in a real world setting.)

Final Building Project, Map design and notes. (see student work samples attached)

(Teachers may collect these or have students put them into their scrapbooks or Power Point presentations. Student work samples provide evidence of student learning and understanding of the content and concepts covered throughout the unit. Teachers will need to compare the students' final building to their design and map design to determine if guidelines were followed, scale is accurate and design was implemented correctly.)

Student Work Samples

Student Work Samples.docx

(Work samples document is hyperlinked to this document)

Section 5: Lesson Plans and Power Point Presentation

Lesson 1: Understanding the relationship between structure and proportion

Block by Block Day 1 Revisions.docx

(hyperlink)

Lesson 2: Proportion as related to cartography and structure

Block by Block Day 2 Revisions (3).docx

(hyperlink)

Lesson 3: Building a 3 dimensional model based on the concepts of structure, proportion, systems and design

Block by Block Day 3 revisions.docx

(hyperlink)

Lesson 4: Reflect on the map design of the city block and all of its elements

Block by Block Day 4 Revisions.docx

(hyperlink)

Power Point Presentation

This is a presentation that follows each lesson. It is designed to use as a teaching tool and guide students learning goals and outcomes.

Block by Block Powerpoint STEPS camp day 1.pptx

(This is a hyperlink to this document)

Section 6: Unit Resources

Lesson 1

Teacher Resources

- House plan examples (see lesson 1)
- https://www.youtube.com/watch?v=k1X-dILSqOQ
  (This video shows an example of cartography and map making in the 1950's. Students can see how the system of planning works to build a highway without the use of sophisticated technology.)
- https://www.youtube.com/watch?v=eeqL0VIBOyE

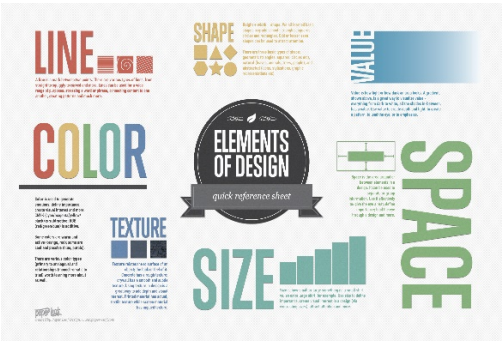
(This video shows an engineer/cartographer reading a drawing blueprints. It gives the students an up close look at real world examples of a design)

Student Resources

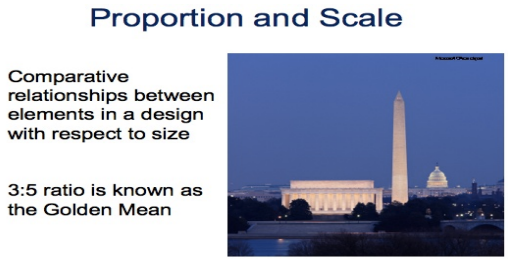
- **Maps**: these can be acquired from travel offices like AAA, rest areas, airports, etc. Many city magazines have maps included. Get as many examples of maps as possible in order for the students to see real world examples of maps and how they are used.

Lesson 2

Teacher Resources



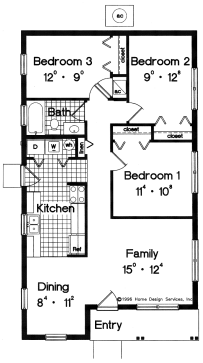
Elements of design image to used to discuss the basic elements of design before the students begin to design and build



This image is used for discussion of proportion and perspective. Students can research using a search engine and find other images of the Washington Monument in relationship to the

Lincoln Memorial and the Capitol Building that really show the distance between these structures. Use these images to compare perspective.

Student Resources

- **Copies of House plans**
- **Maps: City maps, Road maps, maps of theme parks and other various types of maps (gathered from airports, AAA, gas stations, etc.)**
- 

(Students use real world examples of house plans to discover how doors, walls, etc. are represented as well as using proportion and scale)

Lesson 3

Teacher Resources

- **Video:** https://www.youtube.com/watch?v=1K0T0L4ZVGc
- **(**This video is an expert Lego House Builder constructing a 2 story house from the ground …base plate… up. It is intended to be used in increments throughout the lesson in order to stop for discussion. This should be used before the students start to build.)

Lesson 4

Teacher Resources

- **Video** https://www.youtube.com/watch?v=uXFV3mVm3j0
- (This is an animation of someone building a lego house set to music. It is a great culminating video before the students reflect on their product and the performance task)