Zoo Atlanta

Exhibit Redevelopment & App Design Challenge

STEM PBL # 3: Task A

With the Engineering Design Process as your guide, use the architectural modeling program SketchUp, TinkerCAD, OnShape, or any other program of your choosing to create a digital 3-D rendering of your chosen animal's redesigned exhibit, being certain to consider your answers to the questions in the addendum to this Task (i.e. species-specific needs and tendencies, exhibit maintenance requirements, enrichment, signage, flooring, viewing areas for zoo patrons, safety, and both budgetary and spatial constraints. SEE *Task A Addendum*).

Deliverable: Completed 3-D rendering.

Deliverable: Typed, complete answers to *Task A Addendum*.

STEM PBL # 3: Task B

It's time to check the bottom line (and yes that rhymed). As with everything else in life, this project requires you to work under constant and often changing constraints. This reality is especially evident and hardship-inducing when budgetary concerns arise. Throughout this PBL, the overall budget (materials-cost only) may be manipulated by Zoo Atlanta staff in an attempt to mimic real-world experiences many exhibit designers face….and you can bet the budget won't go up! Using Microsoft Excel, your group must keep track of, and record accurately, a detailed list of materials cost, being sure to always stay within budget, even if/when it requires modifications to your exhibit's initial redesign.

See *Task B Addendum* for more specifics!

Deliverable: Exhaustive item-analysis of materials cost INCLUDING edits made when the overall budget is manipulated.

STEM PBL # 3: Task C

Story time! In this task, we get to see just how much creative juice is flowing through those veins of yours…by writing an adventure story! This story, which you can create using the typical short story format or any other creative delivery method you can think of (just be sure you get the A-OK from one of your teachers if you're going another route), must involve some sort of chase or race involving your group's chosen animal escaping or being stolen from Zoo Atlanta. You have tons of creative freedom here…so have fun! However, you are NOT allowed to kill or injure any of your classmates, teachers, family members, etc. in the story EXCEPT for Mr. Williams and/or Mr. Medeiros.

… Seriously! …it's ok for us to meet our demise in the imaginary world of your fictional storyline. Just be sure the entire story is school-appropriate…REMEMBER…you'll be presenting yours to the class…and it's an essential task in this PBL.

How is this task relevant?? Good question! We want to make sure standards across all content areas are covered in this PBL! Don't forget, this is your THIRD big challenge this year, with each one progressively more difficult and more comprehensive. So, for this task, we're adding content standards from both Social Studies & Language Arts!

Now for a few specifics:

• The storyline must take the characters on a journey across <u>five</u> or more distinct biomes. When traveling through each biome, the biome should NOT be identified by name. Rather, each should be identified through character interaction/experience. Specifically, your storyline should involve the climate, flora, and fauna characteristic of each biome (think —> "a plane crash-lands on a treeless plain…survivors are greeted with freezing temperatures and one hungry polar bear" NOT "a plane crashed in the Tundra").

• The storyline must include content-relevant physical and cultural features of Africa, Southeastern Asia, and the Middle East. Unlike with the biomes, name dropping is A-OK to address this part of the task. Wanna take your story down the Nile River? Go for it!? Does Mr. Medeiros hiding in a Buddhist temple with your stolen animals have a place in your story? Sweet! Also, believable! Just be sure you create descriptive, creative prose that demonstrates your mastery of the relevant content standards!

• The finished product must demonstrate mastery of the relevant ELA standards listed in the *Appendix* to this document.

Deliverable: Adventure story completed and presented to the STEM team.

STEM PBL # 3: Task D

Time to put your IT skillzzzz to work! Zoo Atlanta wants (needs!?) a mobile app that patrons can download (for free99) and use during their visit! Defining scope here will be extremely important, as we've received little guidance from the Zoo itself. Spend some time imagining being at the Zoo using the new app! What functions/capabilities are built into the app? What does it look like? What's the user experience like? Since it's free, will there be room for advertisers? Remember the feedback you received from your Market Day app build? That was a little warm-up. Now it's GO time!

Deliverable: Functional, value-added Zoo Atlanta Mobile Application!

STEM PBL # 3: Task E

Your last task! After all your hard work, it's almost time to present your work to your teachers…and more importantly, to Zoo Atlanta! In an effort to make sure your ideas shine bright (*like a diamond?*), your group needs to create a brief (3-5 minute), impactful pitch aimed at convincing us to choose YOUR exhibit redesign and mobile app! What this looks like is up to you: it's your group's unique, creative way of communicating all of the hard work you've done throughout this PBL. Most importantly…it's your group's opportunity to convince Zoo Atlanta of just how awesome your exhibit redesign and mobile app are. If your pitch isn't impressive…and we mean knock-you-off-your-feet impressive…your overall PBL isn't (think about books you've read with horribly disappointing endings). Finish strong!

Deliverable: Pitch.

Appendix

Targeted Georgia Standards of Excellence

Math

- **7.PAR.4**

Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations.

- o 7.PAR.4.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units presented in realistic problems.

- o 7.PAR.4.2 Determine the unit rate (constant of proportionality) in tables, graphs (1, r), equations, diagrams, and verbal descriptions of proportional relationships to solve realistic problems.

- o 7.PAR.4.3 Determine whether two quantities presented in authentic problems are in a proportional relationship.

- o 7.PAR.4.4 Identify, represent, and use proportional relationships.

- o 7.PAR.4.5 Use context to explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

- o 7.PAR.4.6 Solve everyday problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

- o 7.PAR.4.7 Use similar triangles to explain why the slope, m, is the same between any two distinct points on a nonvertical line in the coordinate plane.

- o 7.PAR.4.8 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

- o 7.PAR.4.9 Use proportional relationships to solve multi-step ratio and percent problems presented in applicable situations.

- o 7.PAR.4.10 Predict characteristics of a population by examining the characteristics of a representative sample. Recognize the potential limitations and scope of the sample to the population.

- o 7.PAR.4.11 Analyze sampling methods and conclude that random sampling produces and supports valid inferences.

- o 7.PAR.4.12 Use data from repeated random samples to evaluate how much a sample mean is expected to vary from a population mean. Simulate multiple samples of the same size.

<u>Science</u>

- **S7L4** Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.

    - S7L4.a Construct an explanation for the patterns of interactions observed in different ecosystems in terms of the relationships among and between organisms and abiotic components of the ecosystem.

    - S7L4.b Develop a model to describe the cycling of matter and the flow of energy among biotic and abiotic components of an ecosystem.

    - S7L4.c Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems.

    - S7L4.d Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rain forest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine).

<u>Technology</u>

- **MS-ENGR-II-4** Demonstrate an understanding of the Engineering Design Process through various problem-solving activities.

- 4.1 Describe the steps of the Engineering Design Process

- 4.2 Construct a simple technological system.

- 4.3 Explain how your technological system operates.

- 4.4 Reverse engineer a consumer product.

- 4.5 Utilize an Engineering Design Notebook as a record of process.

<u>Social Studies</u>

- **SS7G1** Locate selected features of Africa.

    - SS7G1.a Locate on a world and regional political-physical map: Sahara, Sahel, savanna, tropical rain forest, Congo River, Niger River, Nile River, Lake Victoria, Great Rift Valley, Mt. Kilimanjaro, Atlas Mountains, and Kalahari Desert.

    - SS7G1.b Locate on a world and regional political-physical map the countries of Democratic Republic of the Congo, Egypt, Kenya, Nigeria, South Africa, and Sudan.

- **SS7G3** Explain the impact of location, climate, and physical characteristics on population distribution in Africa.

    - SS7G3.a Explain how the characteristics in the Sahara, Sahel, savanna, and tropical rain forest impact trade and affect where people live.

- **SS7G5** Locate selected features in Southwest Asia (Middle East).

    - SS7G5.aLocate on a world and regional political-physical map: Euphrates River, Jordan River, Tigris River, Suez Canal, Persian Gulf, Strait of Hormuz, Arabian Sea, and Red Sea.

    - SS7G5.bLocate on a world and regional political-physical map: Afghanistan, Iran, Iraq, Israel, Kuwait, Saudi Arabia, Syria, Turkey, Gaza Strip, and West Bank.

    SS7G9 Locate selected features in Southern and Eastern Asia.

    - SS7G9.a Locate on a world and regional political-physical map: Ganges River, Huang He (Yellow River), Chang Jiang (Yangtze) River, Bay of Bengal, Indian Ocean, Sea of Japan, South China Sea, Yellow Sea, Gobi Desert, Taklimakan Desert, Himalayan Mountains, and Korean Peninsula.

    - SS7G9.b Locate on a world and regional political-physical map the countries of China, India, Japan, North Korea, South Korea, and Vietnam.

<u>Language Arts</u>

ELAGSE7L1: Demonstrate command of the conventions of standard English grammar and usage when writing or
speaking.
  a. Explain the function of phrases and clauses in general and their function in specific sentences.
  b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.

ELAGSE7L2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
Use a comma to separate coordinate adjectives (e.g., It was a fascinating, enjoyable movie but not He wore an old[,] green shirt).
Spell correctly.

ELAGSE7L3: Use knowledge of language and its conventions when writing, speaking, reading, or listening.
Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and
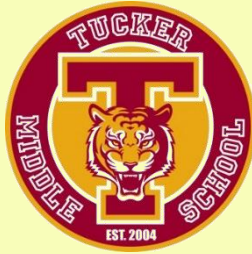redundancy.

ELACC7W3: Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-
structured event sequences.
  a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event
      sequence that unfolds naturally and logically.
  b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.

ELACC7W4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
(Grade-specific expectations for writing types are defined in standards 1–3 above.)

This is your third PBL of the school-year STEM students: Aim to impress having learned from the previous

PBLs!

7th Grade STEM: Tucker Middle School

7ᵀᴴ Grade Cohort S.T.E.M. PBL # 3 Grading Rubric

Group Members _____

CATEGORY	0	-1%	-2%	-3%
Teamwork, Formation & Documentation	Team identifies and utilizes each member's skill set. Team breaks PBL into sub-tasks with milestones and deadlines. Team members hold each other accountable for progress toward end goal. The team's deliverables are integrated and cohesive. Team roles are clearly documented.	Team breaks PBL into sub-tasks with milestones and deadlines. Team members hold each other somewhat accountable for progress toward the end goal. The team's deliverables are integrated and cohesive. Team roles are clearly documented.	Team breaks PBL into sub-tasks with milestones and deadlines. Team members hold each other accountable for progress toward the end goal. Team's deliverables are somewhat integrated but incomprehensive or repetitive. Team roles are clearly documented.	No effort is made to identify or utilize each team member's skill set. Team members deflect any constructive criticism. Team member roles are unclear and/or not clearly documented. Deliverables are not integrated and are incomprehensive.
CATEGORY	4	3	2	0
Task A: 3-D Rendering & Addendum Responses (35%)	The rendering is highly detailed with strong creative elements. It accurately utilizes existing physical space. Work demonstrates mastery of basic rendering skills. Rendering exhibits appropriate scaling. Responses to Addendum A are comprehensive.	The rendering is moderately detailed. Creativity is evident. It accurately utilizes existing physical space. Work demonstrates proficiency in rendering skills. Rendering exhibits appropriate scaling. Responses to Addendum A are mostly comprehensive.	Rendering shows few details. Design shows little creativity. It accurately utilizes existing physical space. Work demonstrates partial proficiency in rendering skills. Rendering exhibits some scaling. Responses to Addendum A are somewhat comprehensive.	No details—simple shapes only. Rendering lacks proportion and is not representative of physical space. Work demonstrates little or no proficiency in rendering. Little or no scaling evident. Responses to Addendum A demonstrate little or no thought.
Task B: Budget (17.5%)	The presented budget is clearly organized. All information is both current and accurate. Sufficient details are present. All costs are supported by quotes from suppliers or taken from other reliable sources.	The presented budget is clearly organized. Most information is current and accurate. Most costs are supported by quotes from suppliers or taken from other reliable sources.	The presented budget is adequately organized. Some information is outdated and/or inaccurate. Costs are NOT adequately supported.	The presented budget is unorganized or non-existent. Most or all the information is inaccurate. Costs are not supported.
Task C: Biome Adventure Story (7.5%)	Writing demonstrates mastery of content. All biomes are described in detail. Writing flows smoothly from scene to scene. Creative elements are found throughout the story.	Writing demonstrates proficient understanding of content. Most biomes are described in detail. Sentences are well structured, and words are chosen to communicate ideas clearly. Some creativity is evident.	Writing demonstrates familiarity with content. Some biomes described in detail. Sentence structure and/or word choice sometimes interfere with clarity. Little creativity is evident.	Writing demonstrates limited knowledge of content. Few or no biomes are described in detail. Sentence structure, word choice, make reading and understanding difficult. No original or creative elements are evident.
Task D: Zoo Atlanta App (30%)	Original app satisfies demands of Zoo Atlanta. Program executes correctly with no runtime or display irregularities. App is logically and stylistically strong. Care and effort are evident. App has a bunch of functionalities.	Original app satisfies demands of Zoo Atlanta. Program executes correctly with no runtime or display irregularities. App is somewhat logical with some stylistic attributes. Some care and effort are evident. App has 2-3 functionalities.	Original app is functional but represents only a partial solution for Zoo Atlanta. Program executes correctly with no runtime or display irregularities. Some care and effort evident. App has a singular function.	App executes incorrectly.
Task E: Pitch (10%)	BOOM! Creativity, professionalism, teamwork, and content knowledge are all evident. Seamless.	Presentation effectively accomplishes goals but fails to WOW. Teamwork is evident. Somewhat seamless.	A lack of teamwork and preparation is evident. Transitions are awkward or time inefficient. Mediocre elocution.	Unfortunate ☹. Lack of preparation and content knowledge evident. Very little or no evidence of creativity, professionalism, and/or teamwork.

Extra Credit Up to 4 extra points! (discretion of teacher)	**Teamwork, Formation & Documentation SCORE**		

Task/% of Total Points	Total % Points	Final Grade
A/35		
B/17.5		
C/7.5		
D/30		
E/10		

Notes: