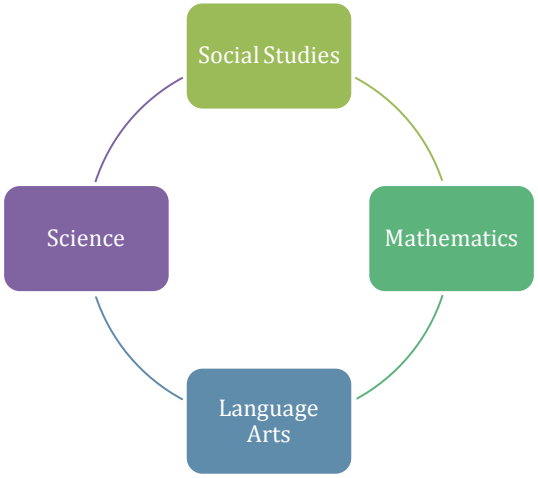
STEM School Chattanooga
10th Grade PBL
Unit Plan Template

Unit 1: Hunter Museum Partnership – Innovating Art



Learning Target Topics

Algebra II: Graph functions

Geometry: Use Euclidean and Transformational Geometry

English II: Write an argument in defense of artistic value

Chemistry: Describe models of compounds

U.S. History: Present an oral argument in defense of artistic value

Grade Level	10th Grade	Unit Length	9 Weeks
Unit Overview	Students will research two or more art pieces from the Hunter Museum of Art in Chattanooga, TN. They will compare and contrast the historical time periods and influences on the artists and art pieces. They will select one of the researched art pieces to create an original digital or 3-D printed piece. Students will use algebraic functions to draw a draft of their original piece. Their selected work will include an assessment of the electron arrangement and shape of colors in the original or innovative piece of art. Students will also write an explanatory or narrative text detailing the process of their innovation.		
Unit Essential Issue	**Problem**: *Redesign a current work of art into a digital or 3-D printed innovative piece.*		
Kick Off, Midterm Events, and Groups	**Kick Off – August 12th** 10th grade students and teachers visit the Hunter Museum from 10am to 12pm. Hunter Museum staff provide a tour of the museum. This tour provides students with a basic understanding of the different genres in the museum as well as models the type of discussion/interaction expected of a docent. After the tour, student teams will then move around the museum identifying art pieces they want to use for the PBL. **Practice Run – September 25th** 10th grade students and teachers visit the Hunter Museum from 10am to 12pm. Student teams set up at their art piece location. This is practice for the first free Sunday in October to make sure students are ready to communicate professionally and meaningfully with the public. STEM teachers and museum staff will walk around the museum in order to provide feedback to each team. **Student Teams** Students will work in teams of 3-4. The students will choose teams and every team must have at least one Algebra I and one Geometry student.		

Culminating Events	**Deadline Day – October 3rd** The following items are due to the appropriate content area teacher: • Algebra II: Students will use multiple forms of functions to draw (by hand or digitally) a draft of their innovative piece of art. • Geometry: Students will create a geometric art piece from the digitally produced draft of the Algebra II functions. • Chemistry: Students will construct and present in chemistry class models of ionic compounds using the Quantum Mechanical Model to explain their structure. A written summary of models will be submitted before presentation. • English II: Groups will turn in a 3-4 page argumentative essay that establishes and defends the artistic value of their selected and innovated art pieces. **Docent Day – October 5th** Student teams will come to the Hunter Museum of Art on the first free Sunday in October. Student teams will set up their innovative piece next to the original art piece in the museum. Teams will stay with these art pieces and act as docents for visitors to the museum. Teams will stay for one hour. U.S. History: Students will research two or more art pieces, comparing and contrasting their historical settings and influences. Teams will design an argument for the value of their selected art piece and how their interpretation represents that value. The US History teacher will visit each team for team's US History presentation. A 3-5 minute oral presentation should be ready for US History requirements.
Common Assessment	

STEM School Chattanooga

STEM PBL Rubric

PBL Unit: #1 – Hunter Museum
Student: _____
Date: _____

	Advanced	Proficient	Needs Improvement
Math Components: **Algebra II**	✓ Section 1: Hand/digitally graph a picture related to your chosen art piece from the Hunter Museum that contains at least 30 equations/inequalities. ✓ Section 2: Equations/inequalities should be listed separately from picture. ✓ Section 3: Include a photo of your chosen art piece.	✓ Section 1: Hand/digitally graph a picture related to your chosen art piece from the Hunter Museum that contains at least 18 equations/inequalities. ✓ Section 2: Equations/inequalities should be listed separately from picture. o Number the equations/inequalities. ✓ Section 3: Include a photo of your chosen art piece.	
Math Components: **Geometry**	✓ Research and select an artist known for geometric design. o Choose two pieces ▪ Analyze the geometric forms used in the pieces of ort. ▪ Critique the artist's use of those geometric forms. ✓ Compare and contrast your own piece of art to the two chosen from the more widely known artist. ✓ Critique your own work in relation to the two pieces chosen above.	✓ Construct a piece of art that utilizes points, lines, planes, segments and angles (see the Geometry vocabulary list 1-4 for all elements that should be included in the art piece). ✓ Explain each of the elements in the piece of art and how they are utilized (see the Geometry vocabulary list 1-4 for all elements that should be included in the explanations). ✓ Piece must be capable of being displayed at school.	
Science Components: **Chemistry**	✓ A third compound is chosen that must contain a polyatomic ion. ✓ Discuss in a second paragraph for **each** model periodic trends of the cation and anion with respect to: o atomic size o ionization energy o electronegativity ✓ Explain how a polyatomic ion can be a covalently bonded particle but still be electrically charged.	✓ Identify two binary ionic compounds relating to two different colors used in the redesigned art piece. Cations should be a main-group element. ✓ Interpret the periodic table to describe the atomic makeup of each element in the ionic compounds. ✓ Develop the Lewis electron-dot structures and the molecular shape for each color ionic compound. ✓ Design and construct models of each of your color ionic compounds. ✓ Write a one-paragraph explanation for **each** model summarizing the following:	

			○ electron distribution ○ lone and shared pair distribution using orbital diagrams ○ valence electrons and their influence on bonding	
	Language Arts Components: **English II**	✓ Establishes and maintains a substantive and credible claim or proposal. ✓ Accurately and effectively presents important details from reading materials to develop argument or claim. ✓ Presents thorough and detailed information to effectively support and develop the focus, controlling idea, or claim. ✓ Maintains an organizational structure that intentionally and effectively enhances the presentation of information as required by the specific prompt. Structure enhances development of the reasoning and logic of the argument.	✓ Establishes a credible claim. ✓ Accurately presents details from reading materials relevant to the purpose of the prompt to develop argument or claim. ✓ Presents appropriate and sufficient details to support and develop the focus, controlling idea, or claim. ✓ Maintains an appropriate organizational structure to address specific requirements of the prompt. Structure reveals the reasoning and logic of the argument.	
	Social Studies Components: **U.S. History**	✓ Thesis is clear and establishes the argument which is fully supported by claims within the argument ✓ The opposing view is stated and considered with full explanation of how the counter-claim falls short ✓ Relevant data from different high-level sources is used to support the thesis. ✓ The student uses formal language throughout and presents a concise and flowing argument. ✓ The conclusion establishes a wrap-up of the argument but puts the argument into a larger picture in a socio-economic, political, or cultural aspect.	✓ Thesis is present and establishes the argument. Claims are present. ✓ Opposing view is present but not fully integrated into the argument. You have given the opposing view but it stands alone without any interaction with your viewpoint. ✓ Sources are present, yet are present just for the sake of the requirement and do not enhance the information presented. ✓ Formal language is used however the student slips into informal language. ✓ Conclusion wraps up argument.	
	Minimum Requirement Components: **Must be included to be graded**	Algebra II: ✓ Put all group members' names in the upper right hand corner of the work ✓ Clearly label each section Chemistry: ✓ Oral explanation of one model ✓ Models of two ionic compounds ✓ Written paragraph for each model English II: ✓ 3-4 page paper ✓ MLA format ✓ Include research of two art pieces, comparing and contrasting their historical settings and influences. U.S. History: ✓ Presentation must take place at Hunter Museum ✓ Presentation must be a minimum of three minute; maximum of five ✓ All group members must speak ✓ All group members must be prepared to answer questions		

Unit Learning Targets	Algebra II: • I can graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (CCSS.HSF-IF.C.7). Geometry: • I can define angle, circle, perpendicular line, parallel line, and line segment. (CC CC.9-12.G.CO.1). • I can define and use rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. (CC.9-12.G.CO.4) Chemistry: • I can represent an atom's electron arrangement in terms of orbital notation, electron configuration notation, and electron dot notation. • I can describe how the quantum mechanical model helps predict the shapes of molecules. English: • I can craft an argument to support claims, analyzing complex texts or topics.

	• I can support my argument with sound reasoning and evidence that is both appropriate and adequate. • I can examine the viewpoints of those who disagree with me and skillfully refute their claims. History: • I can orally introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. • I can orally develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. • I can use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • I can establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. • I can provide a concluding statement or section that follows from or supports the argument presented.
Vocabulary	

Math: Algebra II	1. Parent Function 2. Transformation 3. Vertical/Horizontal Stretches 4. Vertical/Horizontal Shifts 5. Vertical/Horizontal Compressions 6. Vertical/Horizontal Stretches
Math: Geometry	1. Point 2. Line 3. Plane 4. Segment 5. Endpoint 6. Ray 7. Opposite Rays 8. Angle 9. Vertex 10. Congruent 11. Angle Bisector 12. Adjacent 13. Linear Pair 14. Complementary 15. Supplementary 16. Transformations 17. Translations 18. Reflections 19. Rotations 20. Compositions of Transformations
Science: Chemistry	1. Anion 2. Cation 3. Electronegativity 4. Hybrid Orbital 5. Ionic Compound 6. Ionization Energy 7. Lone Pair 8. Molecular Shape 9. Quantum Mechanical Model 10. Shared Pair 11. Valence Electrons

	Language Arts: English II	1. Argument 2. Biases 3. Claim 4. Cohesion 5. Concluding Statement 6. Evidence 7. Reasoning
	Social Studies: U.S. History	1. Thesis 2. Opposing viewpoint 3. Logos 4. Logical fallacies 5. Ethos 6. Pathos