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STEAME ACADEMY
TEACHING FACILITATION LEARNING & CREATIVITY PLAN (L&C PLAN) - LEVEL 2
STUDENT TEACHERS: Discovering Antoni Gaudi

1. Overview

Title	Discovering Antoni Gaudi
Driving Question or Topic	1. How does the architectural style of Antoni Gaudí reflect his deep understanding and incorporation of mathematical principles? 2. What innovative engineering techniques did Gaudí employ to overcome structural challenges in his iconic buildings such as the Sagrada Familia and Park Güell? 3. In what ways did Gaudí's artistic vision and appreciation for nature influence his architectural designs, and how does this intersection of art and science continue to inspire contemporary architects?
Ages, Grades, …	secondary (15-19) 9th to 10th grade
Duration, Timeline, Activities	10 learning hours ten 45 minute class periods At least 10
Curriculum Alignment	Science, technology, mathematics, art, engineering
Contributors, Partners	
Abstract - Synopsis	Students delve into Antoni Gaudí's architectural wonders, merging mathematics, technology, engineering, art, and science. Through interactive sessions, they uncover the mathematical intricacies underlying Gaudí's designs, utilizing digital tools to dissect his structures. They analyze the engineering feats behind his creations, appreciating his innovative techniques. Exploring artistic movements like Art Nouveau, they create Gaudí-inspired artworks, blending art with scientific understanding. Discussions deepen comprehension, fostering critical thinking. By the lesson's end, students grasp the fusion of disciplines in Gaudí's work, igniting a newfound admiration for the harmonious interplay of mathematics, technology, engineering, art, and science.
References, Acknowledgements	

2. STEAME ACADEMY Framework*

Teachers' Cooperation	Teacher 1 and Teacher 2 collaborate seamlessly to integrate elements from two different disciplines into the learning experience, fostering a multidisciplinary approach. In the case of mentoring by service teachers for student teachers, the collaboration follows a structured work plan with clear goals and activities to ensure effective support and professional development.

	1. Goal Setting: Teacher 1 and Teacher 2 establish clear learning objectives that integrate concepts from both disciplines, ensuring alignment with curriculum standards and student learning outcomes. 2. Planning and Preparation: They develop a comprehensive work plan outlining specific activities and tasks for both service and student teachers. This includes designing lessons, creating learning materials, and identifying opportunities for interdisciplinary connections. 3. Collaboration Meetings: Regular collaboration meetings are scheduled to discuss progress, share ideas, and troubleshoot any challenges that arise. Teacher 1 provides guidance and mentorship to the student teacher, offering insights and feedback based on their experience and expertise. 4. Co-Teaching and Observation: Teacher 1 and Teacher 2 engage in co-teaching sessions where they model effective instructional strategies and facilitate learning experiences together. Service teachers observe and provide feedback to student teachers, offering guidance on lesson delivery and classroom management. 5. Reflection and Feedback: Throughout the collaboration, service teachers and student teachers engage in reflective practices to evaluate their progress and identify areas for growth. Teacher 1 provides constructive feedback and support to help student teachers develop their teaching skills and confidence. By following this collaborative approach, Teacher 1 and Teacher 2 create a supportive environment where service teachers mentor student teachers effectively, promoting professional growth and enhancing the learning experience for all involved.
STEAME in Life (SiL) Organization	*Meeting with business representatives/Applications in real world Entrepreneurship – STEAME in Life (SiL) Days*
Action Plan Formulation	STAGE I. Preparatory Work of the Teacher: a. Research and Planning: - Conduct research on Antoni Gaudí's life, works, and architectural style, focusing on the mathematical, technological, artistic, and engineering aspects. - Develop a detailed workshop plan outlining objectives, activities, materials needed, and the schedule. b. Gather Resources: - Collect images, videos, and informational materials about Gaudí's architectural masterpieces, including the Sagrada Familia, Park Güell, and Casa Batlló. - Acquire art supplies, geometric tools, digital design software, and engineering kits for hands-on activities. c. Design Activities: - Create interactive activities and demonstrations that highlight the mathematical principles, artistic techniques, technological innovations, and engineering feats present in Gaudí's work. - Develop age-appropriate art projects, mathematical puzzles, and engineering challenges that engage primary school students. STAGE II. Workshop Activities: a. Introduction to Antoni Gaudí: - Provide an overview of Gaudí's life and contributions to architecture, emphasizing his innovative approach and multidisciplinary influences. - Show images and videos of Gaudí's iconic buildings, sparking curiosity and excitement among students. b. Mathematical Exploration: - Engage students in hands-on activities to explore mathematical concepts inspired by Gaudí's work, such as tessellations, symmetry, and geometric shapes. - Guide students in creating geometric patterns and designs using art supplies and geometric tools. c. Technological Integration:

	- Introduce students to digital design software or apps that allow them to digitally manipulate and recreate Gaudí's architectural elements. - Facilitate virtual tours or interactive simulations of Gaudí's buildings, providing insights into their design and construction. d. Artistic Expression: - Encourage students to express their creativity by creating their own Gaudí-inspired artworks using various art mediums and techniques. - Provide guidance and support as students experiment with colors, textures, and forms to capture the essence of Gaudí's style. e. Engineering Challenges: - Present engineering challenges inspired by Gaudí's structures, such as building stable structures using unconventional materials or designing innovative façades. - Foster teamwork and problem-solving skills as students collaborate to overcome engineering challenges. STAGE III. Reflection and Wrap-Up: - Facilitate a reflection session where students share their experiences, insights, and discoveries from the workshop. - Encourage students to consider the connections between mathematics, technology, art, and engineering in Gaudí's achievements. - Provide resources and suggestions for further exploration of Gaudí's work and its interdisciplinary influences.

[*] *under development the final elements of the framework*

3. Objectives and Methodologies

Learning Goals and Objectives	Learning Goals: 1. Understand the interdisciplinary nature of Antoni Gaudí's architectural designs. 2. Explore the mathematical principles underlying Gaudí's works. 3. Investigate the engineering challenges and solutions in Gaudí's constructions. 4. Analyze the artistic elements and influences present in Gaudí's creations. 5. Utilize technology to deconstruct and reconstruct Gaudí's designs. 6. Foster critical thinking and creativity through collaborative activities and discussions. Learning Objectives: 1. Identify key aspects of Antoni Gaudí's life and architectural style. 2. Apply geometric and mathematical concepts to analyze Gaudí's designs, such as symmetry, fractals, and geometry. 3. Evaluate the engineering techniques employed by Gaudí to address structural challenges in his buildings. 4. Examine the influence of artistic movements like Art Nouveau on Gaudí's work. 5. Utilize digital tools to explore and manipulate Gaudí's architectural designs. 6. Create original artworks inspired by Gaudí's style, incorporating elements of mathematics, engineering, and art. 7. Engage in discussions to deepen understanding and appreciation of the interdisciplinary connections present in Gaudí's work. 8. Reflect on the significance of interdisciplinary collaboration in architecture and other fields.
Learning Outcomes and expected Results	Learning Outcomes: 1. Students will demonstrate an understanding of the interdisciplinary nature of Antoni Gaudí's architectural designs. 2. Students will be able to apply mathematical principles to analyze and interpret Gaudí's works, including concepts of geometry, symmetry, and fractals. 3. Students will evaluate the engineering techniques utilized by Gaudí to overcome structural challenges in his buildings.

	4. Students will recognize the artistic influences and movements reflected in Gaudí's architectural designs. 5. Students will demonstrate proficiency in using technology to explore and manipulate Gaudí's architectural creations. 6. Students will showcase their creativity by producing original artworks inspired by Gaudí's style, integrating elements of mathematics, engineering, and art. 7. Students will engage in collaborative discussions to deepen their understanding of the interdisciplinary connections present in Gaudí's work. Expected Results: 1. Increased appreciation for the harmonious integration of mathematics, technology, engineering, art, and science in architectural design. 2. Improved critical thinking skills demonstrated through the analysis and evaluation of Gaudí's architectural techniques and influences. 3. Enhanced understanding of the historical and cultural context surrounding Gaudí's work and its significance in the field of architecture. 4. Development of digital literacy skills through the utilization of technology to explore and interact with Gaudí's designs. 5. Heightened creativity and self-expression through the creation of original artworks inspired by Gaudí's style. 6. Strengthened communication and collaboration skills through group discussions and collaborative activities. 7. Increased motivation and interest in further exploration of interdisciplinary topics and careers in architecture, engineering, art, and mathematics.
Prior Knowledge and Prerequisites	Prior Knowledge and Prerequisites: 1. Basic understanding of geometry: Students should have a foundational understanding of geometric concepts such as shapes, angles, symmetry, and patterns. 2. Familiarity with mathematical principles: Students should have knowledge of mathematical concepts such as addition, subtraction, multiplication, division, and basic algebraic operations. 3. Basic comprehension of technology: Students should be comfortable using digital tools and software for educational purposes, such as computers, tablets, or smartphones. 4. Awareness of artistic movements: Students should have some awareness of art history and artistic movements, particularly those prevalent during the late 19th and early 20th centuries, such as Art Nouveau. 5. Critical thinking skills: Students should possess the ability to analyze and evaluate information, make connections between different concepts, and engage in collaborative discussions. 6. Interest in architecture and design: Students should have a curiosity about architectural design and an interest in exploring the intersection of mathematics, technology, engineering, art, and science in architectural masterpieces. 7. Openness to interdisciplinary learning: Students should be open-minded and willing to explore connections between different subject areas, understanding that this lesson will integrate concepts from mathematics, technology, engineering, art, and science.
Motivation, Methodology, Strategies, Scaffolds	1. Project-Based Inquiry: Introduce the lesson by presenting an overarching project or inquiry question that frames the students' exploration of Gaudí's work. This inquiry-based approach encourages students to actively engage in problem-solving and critical thinking throughout the lesson. 2. Collaborative Learning: Facilitate collaborative learning experiences where students work in groups to investigate different aspects of Gaudí's architecture. Encourage students to share their findings, discuss their interpretations, and collaborate on project tasks, fostering teamwork and communication skills.

	3. Hands-On Activities: Incorporate hands-on activities that allow students to explore mathematical concepts through tangible experiences. For example, students could create geometric models inspired by Gaudí's designs using building blocks or craft materials, reinforcing their understanding of geometry and symmetry. 4. Technology Integration: Utilize technology tools and resources to enhance students' exploration of Gaudí's architecture. Provide access to digital simulations, virtual tours, and multimedia presentations that allow students to visualize and interact with Gaudí's designs in a virtual environment. 5. Authentic Assessments: Design authentic assessment tasks that require students to apply their learning to real-world challenges. For example, students could collaborate to design and present their own architectural models inspired by Gaudí's style, demonstrating their understanding of mathematical principles, engineering techniques, and artistic concepts. 6. Reflection and Feedback: Build in opportunities for students to reflect on their learning and receive feedback throughout the project. Encourage students to document their progress, reflect on their problem-solving strategies, and consider how their understanding of Gaudí's architecture has evolved over time. 7. Scaffolded Support: Provide scaffolding and support to help students navigate complex concepts and tasks. Break down the project into manageable steps, offer guidance and resources as needed, and provide opportunities for students to seek clarification and assistance from peers and teachers.

4. Preparation and Means

Preparation, Space Setting, *Troubleshooting Tips*	Procedures: Rotate between interactive presentations, hands-on activities, and group discussions. Utilize classroom for presentations and art projects, outdoor spaces for architectural observations, and computer lab for digital design simulations. Prepare art supplies, geometric tools, digital devices, and reference materials..
Resources, Tools, Material, Attachments, Equipment *Health and Safety*	Instructional sources and digital material with the related references needed for the implementation of the learning plan

5. Implementation

Instructional Activities, Procedures, Reflections	1. Creative Activities and Tasks: - Individual: Students create sketches or digital renderings of Gaudí-inspired architectural designs, applying mathematical principles and artistic elements. - Team: In groups, students collaborate to construct physical models of Gaudí's structures using recycled materials, focusing on engineering challenges and design aesthetics. - Classroom: The class collectively participates in a virtual tour of Gaudí's masterpieces, followed by a group discussion on the mathematical, technological, and artistic aspects observed. 2. Engagement and Active Participation: - Hands-On Practices: Students engage in hands-on activities such as building geometric structures with manipulatives, experimenting with symmetry, and exploring tessellations through art-making. - Interactive Simulations: Utilizing digital simulations and interactive apps, students actively explore mathematical concepts related to Gaudí's architecture, such as fractals and spatial geometry.

	3. Feedback and Reflection: - Peer Review: Students provide constructive feedback to peers during collaborative activities, focusing on strengths, areas for improvement, and insights gained. - Self-Reflection: Through journaling or online reflections, students document their learning process, challenges faced, and strategies employed, fostering metacognitive awareness. 4. Monitoring Students' Learning and Progress Evaluation: - Formative Assessment: Teachers monitor students' understanding through ongoing formative assessments, including observations, quizzes, and discussions, adjusting instruction accordingly. - Performance Tasks: Students demonstrate their understanding through performance tasks such as presenting their architectural models, explaining design choices, and showcasing mathematical concepts applied. - Rubrics and Checklists: Rubrics and checklists are used to assess students' creativity, critical thinking, collaboration, and mastery of learning objectives, providing clear criteria for evaluation.
Assessment - Evaluation	1. Formative Assessment: - Ongoing checks for understanding during class discussions, hands-on activities, and group work. - Regular feedback provided to students to guide their learning and address misconceptions. - Quick quizzes or exit tickets to gauge comprehension of key concepts and skills. - Peer and self-assessment opportunities where students reflect on their own progress and provide feedback to classmates. 2. Summative Assessment: - Culminating project where students design and present their own Gaudí-inspired architectural models, incorporating mathematical, engineering, and artistic principles. - Written reflections or essays where students analyze the interdisciplinary connections present in Gaudí's work and their own creative process. - Presentations or exhibitions where students showcase their artwork and explain the mathematical and technological concepts applied.
Presentation - Reporting - Sharing	1. PowerPoint Presentation: Create a visually appealing PowerPoint presentation by organizing content into slides, incorporating graphics and visuals, and delivering a clear narrative during the presentation. Share the PowerPoint file with your audience via email or a file-sharing platform after the presentation for reference. 2. Written Report: Prepare a written report by structuring information into sections with headings and subheadings, providing detailed analysis, and supporting findings with evidence and data. Share the report electronically or in print format with stakeholders via email or through a document-sharing platform. 3. Virtual Meeting: Conduct a virtual meeting using video conferencing software, where you present slides or documents in real-time to remote participants. Share the meeting link with attendees in advance and encourage active participation through Q&A sessions and discussions. 4. Interactive Dashboard: Create an interactive dashboard or data visualization tool to present complex information or analytics in a user-friendly format. Share the dashboard with stakeholders via a web link or embed it into a presentation or report for easy access and exploration. 5. Team Collaboration Platform: Utilize a team collaboration platform such as Microsoft Teams or Google Workspace to create and share presentations, reports, and documents collaboratively. Invite team members to contribute, review, and provide feedback in real-time, fostering collaboration and efficiency.

STEAME ACADEMY Prototype/Guide for Learning & Creativity Approach
Action Plan Formulation

Major steps in the STEAME learning approach:

STAGE I: Preparation by one or more teachers

1. Formulating initial thoughts on the thematic sectors/areas to be covered
2. Engaging the world of the wider environment / work / business / parents / society / environment/ ethics
3. Target Age Group of Students - Associating with the Official Curriculum - Setting Goals and Objectives
4. Organization of the tasks of the parties involved - Designation of Coordinator - Workplaces etc.

STAGE II: Action Plan Formulation (Steps 1-18)

Preparation (by teachers)

1. Relation to the Real World – Reflection
2. Incentive – Motivation
3. Formulation of a problem (possibly in stages or phases) resulting from the above

Development (by students) – Guidance & Evaluation (in 9-11, by teachers)

4. Background Creation - Search / Gather Information
5. Simplify the issue - Configure the problem with a limited number of requirements
6. Case Making - Designing - identifying materials for building / development / creation
7. Construction - Workflow - Implementation of projects
8. Observation-Experimentation - Initial Conclusions
9. Documentation - Searching Thematic Areas (AI fields) related to the subject under study – Explanation based on Existing Theories and / or Empirical Results
10. Gathering of results / information based on points 7, 8, 9
11. First group presentation by students

Configuration & Results (by students) – Guidance & Evaluation (by teachers)

12. Configure STEAME models to describe / represent / illustrate the results
13. Studying the results in 9 and drawing conclusions, using 12
14. Applications in Everyday Life - Suggestions for Developing 9 (Entrepreneurship - SIL Days)

Review (by teachers)

15. Review the problem and review it under more demanding conditions

Project Completion (by students) – Guidance & Evaluation (by teachers)

16. Repeat steps 5 through 11 with additional or new requirements as formulated in 15
17. Investigation - Case Studies - Expansion - New Theories - Testing New Conclusions
18. Presentation of Conclusions - Communication Tactics.

STAGE III: STEAME ACADEMY Actions and Cooperation in Creative Projects for school students

Title of Project: _____
Brief Description/Outline of Organizational Arrangements / Responsibilities for Action

STAGE	**Activities/Steps** Teacher 1(T1) Cooperation with T2 and student guidance	**Activities /Steps** **By Students** Age Group: ____	**Activities /Steps** Teacher 2 (T2) Cooperation with T1 and student guidance
A	Preparation of steps 1,2,3		Cooperation in step 3
B	Guidance in step 9	4,5,6,7,8,9,10	Support guidance in step 9
C	Creative Evaluation	11	Creative Evaluation
D	Guidance	12	Guidance
E	Guidance	13 (9+12)	Guidance
F	Organization (SIL) STEAME in Life	14 Meeting with Business representatives	Organization (SIL) STEAME in Life
G	Preparation of step 15		Cooperation in step 15
H	Guidance	16 (repetition 5-11)	Support Guidance
I	Guidance	17	Support Guidance
K	Creative Evaluation	18	Creative Evaluation