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STEAME ACADEMY
TEACHING FACILITATION LEARNING & CREATIVITY PLAN (L&C PLAN) - LEVEL 2
SERVICE TEACHERS: Finding science and mathematics in arts of Salvatore Dali

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1. Overview

Title	Finding science and mathematics in arts of Salvatore Dali
Driving Question or Topic	1. How does Salvador Dalí's use of geometric shapes and patterns in his artwork reflect mathematical concepts such as symmetry and fractals? 2. What scientific principles or theories are represented in Dalí's surrealistic depictions of natural phenomena, such as melting clocks or distorted landscapes? 3. How does Dalí's exploration of the subconscious mind and dream imagery intersect with psychological theories and mathematical symbolism, offering insights into the relationship between art, science, and human cognition?
Ages, Grades, …	secondary (15-19) 9th to 12th grades
Duration, Timeline, Activities	10 learning hours ten 45 minute class At least 10 periods
Curriculum Alignment	Science, mathematics, art
Contributors, Partners	
Abstract - Synopsis	In this interdisciplinary lesson, students delve into the surrealistic masterpieces of Salvador Dalí, uncovering the hidden connections between mathematics, art, and science within his iconic paintings. Through engaging activities and discussions, students explore the mathematical concepts of symmetry, fractals, and geometric shapes present in Dalí's artworks. They analyze the scientific principles depicted in his surrealistic interpretations of natural phenomena, such as melting clocks and distorted perspectives, linking them to concepts from physics and psychology. Utilizing art supplies and geometric tools, students engage in hands-on activities to recreate Dalí's artistic techniques, experimenting with visual illusions and perspective distortions. They also delve into the psychological aspects of Dalí's work, exploring the intersection of art and the human mind. Throughout the lesson, students develop critical thinking skills as they analyze and interpret Dalí's artwork through the lens of mathematics and science. By the end of the lesson, students gain a deeper appreciation for the interdisciplinary nature of art and its profound connections to mathematics and science, inspired by the surrealistic genius of Salvador Dalí.
References, Acknowledgements	

2. STEAME ACADEMY Framework*

Teachers' Cooperation	Activities for the Mathematics Teacher:

	1. Research Dalí's artworks to identify mathematical concepts embedded in his work, such as symmetry, geometry, and optical illusions. 2. Develop hands-on activities that demonstrate mathematical principles inspired by Dalí's artworks, such as creating geometric tessellations or exploring perspective and proportion. 3. Prepare mathematical puzzles or challenges related to Dalí's themes or motifs to engage students in problem-solving and critical thinking. 4. Gather mathematical tools and materials needed for activities, such as rulers, protractors, and geometric manipulatives. 5. Collaborate with the art teacher to integrate mathematical concepts seamlessly into art projects inspired by Dalí's techniques. Activities for the Art Teacher: 1. Research Dalí's artistic style, techniques, and visual elements, such as surrealism, symbolism, and metamorphosis. 2. Develop art projects that allow students to explore Dalí's artistic techniques, such as creating surrealist compositions, experimenting with mixed media, or replicating Dalí's iconic motifs. 3. Gather art supplies and materials needed for art activities, such as paints, brushes, canvas, and found objects. 4. Provide examples of Dalí's artwork to inspire students and stimulate their creativity. 5. Collaborate with the mathematics teacher to integrate art and mathematics seamlessly, ensuring that art projects incorporate mathematical concepts in a meaningful way.
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 Phase: - Research Salvador Dalí's life, artworks, and influences in mathematics and art. - Identify key mathematical concepts present in Dalí's works, such as geometry, symmetry, and perspective. - Gather art supplies, mathematical tools, and multimedia resources for hands-on activities and presentations. Stage II. Workshop Structure: a. Introduction to Salvador Dalí: - Present an overview of Dalí's life, artistic style, and contributions to surrealism. - Discuss the integration of mathematics and art in Dalí's works, highlighting key examples. b. Mathematical Exploration: - Engage students in hands-on activities exploring mathematical concepts in Dalí's art, such as tessellations, golden ratio, and perspective. - Facilitate discussions on the mathematical principles behind Dalí's surrealistic imagery. c. Artistic Expression: - Guide students in creating their own surrealistic artworks inspired by Dalí's style, using various mediums and techniques. - Encourage experimentation with symbolism, dream imagery, and visual storytelling. d. Interdisciplinary Connections: - Explore the interdisciplinary connections between mathematics, art, and psychology in Dalí's works.

	- Facilitate discussions on the role of creativity, imagination, and innovation in art and mathematics. e. Culminating Projects: - Assign students to collaborative projects integrating mathematics and art, such as designing surrealistic landscapes, creating optical illusions, or constructing geometric sculptures. - Provide time for students to work on their projects, incorporating feedback and guidance from facilitators. Stage III. Evaluation and Reflection: - Assess students' understanding and application of mathematical concepts through project-based assessments, presentations, and written reflections. - Encourage students to reflect on their learning experiences, highlighting connections between mathematics and art in Dalí's works. - Provide opportunities for students to share their projects and reflections with peers and receive feedback. Follow-Up Activities: - Organize a gallery exhibition or virtual showcase of students' artworks and projects, inviting parents, teachers, and the community to attend. - Offer resources and suggestions for further exploration of Salvador Dalí's achievements and the integration of mathematics and art in other contexts. By following this action plan, the workshop aims to inspire secondary school students to explore the fascinating intersection of mathematics, art, and surrealism in the works of Salvador Dalí, fostering creativity, critical thinking, and interdisciplinary understanding.

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

3. Objectives and Methodologies

Learning Goals and Objectives	1. Understand the artistic style and techniques employed by Salvador Dalí. - Objective: Students will analyze Dalí's use of surrealism, symbolism, and visual metaphors in his artwork. 2. Explore the interdisciplinary connections between art, mathematics, and science in Dalí's works. - Objective: Students will identify mathematical and scientific elements depicted in Dalí's paintings and sculptures. 3. Develop critical thinking skills through the interpretation and analysis of Dalí's artwork. - Objective: Students will interpret the meaning and symbolism behind Dalí's surrealistic imagery, considering historical context and personal influences. 4. Foster creativity and self-expression through hands-on art activities inspired by Dalí's techniques. - Objective: Students will create their own artwork inspired by Dalí's style, experimenting with surrealistic imagery, symbolism, and visual storytelling. 5. Gain an appreciation for the cultural and historical significance of Dalí's contributions to the art world. - Objective: Students will explore the impact of Dalí's work on art movements and contemporary culture, reflecting on its enduring influence and legacy.
Learning Outcomes and expected Results	1. Increased Understanding of Artistic Techniques: - Outcome: Participants will gain a deeper understanding of Salvador Dalí's artistic style, techniques, and visual elements, including surrealism, symbolism, and optical illusions. 2. Recognition of Interdisciplinary Connections:

	- Outcome: Participants will recognize and appreciate the interdisciplinary connections between art, mathematics, and psychology in Dalí's works, fostering a holistic understanding of his artistic process and influences. 3. Enhanced Critical Thinking Skills: - Outcome: Participants will develop critical thinking skills through the interpretation and analysis of Dalí's artwork, examining the meaning, symbolism, and historical context behind his surrealistic imagery. 4. Increased Creativity and Self-Expression: - Outcome: Participants will cultivate creativity and self-expression through hands-on art activities inspired by Dalí's techniques, allowing them to experiment with surrealistic imagery, symbolism, and visual storytelling. 5. Appreciation of Cultural and Artistic Significance: - Outcome: Participants will gain a deeper appreciation for the cultural and artistic significance of Dalí's contributions to the art world, recognizing his enduring impact on art movements and contemporary culture.
Prior Knowledge and Prerequisites	1. Basic Understanding of Art History: - Learners should have a basic understanding of art history, particularly the Surrealist movement and its key figures, including Salvador Dalí. 2. Familiarity with Salvador Dalí's Artworks: - Learners should be familiar with Salvador Dalí's iconic artworks, such as "The Persistence of Memory," "The Elephants," and "The Dream Caused by the Flight of a Bee Around a Pomegranate a Second Before Awakening." 3. Fundamental Mathematical Concepts: - Some familiarity with fundamental mathematical concepts, such as geometry, symmetry, and perspective, will be beneficial for understanding the mathematical elements present in Dalí's artwork. 4. Critical Thinking Skills: - Learners should possess critical thinking skills to analyze and interpret Dalí's artwork, exploring the symbolism, themes, and artistic techniques employed by the artist. 5. Open-mindedness and Creativity: - Learners should approach the workshop with an open mind and a willingness to explore new ideas and perspectives. Creativity will be encouraged in interpreting and responding to Dalí's surrealistic imagery. 6. Basic Artistic Skills (for Hands-On Activities): - For workshops involving hands-on art activities, learners should have basic artistic skills, such as drawing, painting, and sculpting, to actively participate in creating their own artwork inspired by Dalí's techniques.
Motivation, Methodology, Strategies, Scaffolds	1. Artistic Interpretation Projects: - Assign participants to small groups and task them with selecting a specific Dalí artwork to analyze and interpret. They must research the background, symbolism, and techniques used by Dalí and present their findings in a creative format, such as a visual poster, multimedia presentation, or dramatic performance. 2. Surrealist Collaborative Art Project: - Collaboratively create a surrealistic art installation inspired by Dalí's works. Participants work together to brainstorm ideas, design elements, and construct the installation using a variety of art materials. This project encourages teamwork, creativity, and problem-solving skills. 3. Mathematical Analysis of Dalí's Art: - Challenge participants to explore the mathematical elements present in Dalí's artwork, such as geometric shapes, symmetry, and perspective. They can investigate mathematical concepts through hands-on activities, mathematical modeling, or digital design projects inspired by Dalí's artistic techniques. 4. Psychological Exploration Project:

	- Investigate the psychological themes and symbolism depicted in Dalí's artwork. Participants can explore concepts related to dreams, the subconscious mind, and Freudian psychology, creating multimedia presentations, written analyses, or artistic representations of their interpretations. 5. Exhibition Planning and Curation: - Task participants with planning and curating an exhibition showcasing Salvador Dalí's artwork. They must select a theme, choose specific artworks, design the layout, and create interpretive materials such as exhibit labels or audio guides. This project allows participants to engage in real-world museum practices while deepening their understanding of Dalí's work. 6. Dalí-Inspired Community Project: - Engage participants in a community-focused project inspired by Dalí's artistic vision. This could involve creating public art installations, organizing community art workshops, or collaborating with local organizations to raise awareness of social or environmental issues through art. This project promotes civic engagement, creativity, and social responsibility. By incorporating Project-Based Learning (PBL) strategies into workshops on Salvador Dalí's work, participants are actively engaged in meaningful, hands-on projects that foster creativity, critical thinking, collaboration, and interdisciplinary connections.

4. Preparation and Means

Preparation, Space Setting, *Troubleshooting Tips*	The workshop will utilize various spaces including the classroom for presentations and discussions, outdoor areas for observational activities, and a computer lab for digital art creation. Materials will include art supplies such as paints and brushes, mathematical tools like rulers and compasses, and multimedia resources for presentations. Procedures will involve introducing workshop objectives, engaging in activities across different spaces, facilitating collaboration, monitoring progress, and concluding with a reflection session to summarize key learnings. This approach ensures a dynamic and engaging learning environment conducive to exploration and creativity.
Resources, Tools, Material, Attachments, Equipment *Health and Safety*	- Art supplies: Paints, brushes, canvases, and clay. - Mathematical tools: Rulers, protractors, and graph paper. - Multimedia resources: Computers, projectors, and speakers. - Reference materials: Books, articles, and images of Dalí's artworks. - Safety equipment: Aprons, ventilation, and protective gear.

5. Implementation

Instructional Activities, Procedures, Reflections	1. Art Analysis: - Participants individually analyze selected Dalí artworks, identifying themes and artistic techniques. - Facilitators guide discussions on symbolism, surrealism, and visual elements depicted in Dalí's work. 2. Collaborative Projects: - Participants form small groups to work on collaborative projects, such as creating surrealist artworks or multimedia presentations. - Facilitators provide guidance and support as groups brainstorm ideas, plan, and execute their projects. 3. Classroom Workshops:

	- Facilitators lead hands-on workshops, including art-making sessions, mathematical explorations of Dalí's patterns, and discussions on psychological themes. - Participants actively engage in activities, experiments, and discussions to deepen their understanding of Dalí's art. Reflections: 1. Peer Critique: - Groups provide constructive feedback to each other, discussing strengths, weaknesses, and areas for improvement in their projects. - Participants reflect on feedback received and consider how to incorporate it into their work. 2. Self-Reflection: - Participants engage in individual reflection, journaling about their learning process, challenges faced, and personal insights gained. - Reflection prompts encourage participants to think critically about connections between Dalí's art and their own experiences. 3. Facilitator Feedback: - Facilitators offer feedback and guidance throughout the workshop, encouraging participants to think deeply and make connections between concepts. - Facilitators prompt participants to reflect on their learning journey, highlighting key takeaways and areas for further exploration. Through these instructional activities, procedures, and reflections, participants actively engage with Salvador Dalí's works, fostering deep understanding, critical thinking, and interdisciplinary connections.
Assessment - Evaluation	1. Artwork Evaluation: - Assessing creativity, technique, and interpretation of Dalí's style and symbolism. 2. Project Presentation: - Evaluating content knowledge, presentation skills, and creativity demonstrated. 3. Reflection and Self-Assessment: - Analyzing critical thinking, ability to make connections, and personal growth shown in reflections and self-assessment.
Presentation - Reporting - Sharing	1. Presentation: - Participants showcase their artwork, projects, and findings through interactive presentations, group discussions, and multimedia displays. - Facilitators guide presentations, encouraging participants to articulate their ideas, insights, and interpretations of Salvador Dalí's works. 2. Reporting: - Participants compile their reflections, analyses, and project outcomes into written reports, digital portfolios, or multimedia presentations. - Facilitators review and provide feedback on reports, highlighting strengths and areas for improvement. 3. Sharing: - Participants share their work with peers, educators, and the broader community through exhibitions, online platforms, or public events. - Facilitators facilitate opportunities for participants to engage in dialogue, receive feedback, and gain recognition for their contributions.
Extensions - Other Information	

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