

LEAP
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When Art and Science Tango

Providing K-12 teachers with the tools and knowledge needed to be confident, innovative, and creative in teaching science and art.

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When Art and Science Tango

Table of Contents

1. Project Description	2
2. Target Audience for the Project	3
3. Key Offices, Group, and Components	3
4. Mission Statement	4
5. Vision Statement	4
6. Core Values and Motivations	5
7. SMART Project Objectives/Evaluations	5
8. SWOT Analysis	7
9. Timeline	9
10. Budget	12
11. Research	12
12. Conclusion	14
Appendix A	16

When Art and Science Tango

“Scientists and artists use common tools for thinking such as intuition and imaginative processes. Every good scientist is an artist at heart: science is the tool and art is the process.”

- Nina Munteanu

1. Project Description

“When Art and Science Tango” is a series of six distinct one-week workshops designed to train current K-12 educators. Training will encompass K-12 curriculum in art, basic skills, mathematics, science and technology, specifically in areas where these subjects intersect. Each week-long workshop would be a stand-alone segment with a specific theme. Educators would have the option of taking all six or any combination of the available workshop segments.

Educators involved in the summer workshops would leave each workshop with specific concept knowledge of that week’s topics, examples of hands-on activities and a set of ready-to-use lesson plans for implementation into their own classroom, as well as the confidence needed to teach them. Additionally, many educators may be able to use these workshops towards their own continuing education requirements and/or salary advancement.

The implications of this project are far-reaching and multi-faceted. Most importantly, these workshops will affect the quality of instruction given to our elementary-aged children in the community, instilling in them an inherent understanding of art and science infused with basic skills and mathematics, designed to increase critical thinking.



These workshops will also serve to initiate collaboration among secondary educators and promote critical thinking as subject areas are combined. Workshops will adhere to common core standards as these standards develop. Ultimately, this will have positive impacts on College of the Canyons, as it will ensure that these young people arriving to our campus as enrolled students are more confident in their abilities in art and the sciences as well as better equipped learners. Furthermore, students will be better prepared to transfer with common core standards

When Art and Science Tango

and critical thinking skills achieved. This series of workshops also demonstrates a strong level of community involvement and support to those families living in the District.

2. Target Audience for the Project

Participants in “When Art and Science Tango” workshops will be K-12 educators currently employed in various Santa Clarita Valley districts. During the pilot program of the workshops, participation will focus on K-6 educators who are responsible for multi-subject instruction. During later iterations of the program, workshops for grades 7-12 educators will be added which focus on collaboration as a critical thinking tool.

Specifically, the target participant is an educator feeling underprepared or uncomfortable teaching certain art and science concepts, or who would like to “marry” multiple subjects in coherent lesson plans. These workshops, whether taken individually or as a whole, will impart these educators with the confidence, skillset and curriculum tools necessary to begin earnestly and enthusiastically implementing these essential concepts into their own classrooms.

3. Key Offices, Groups and Components

There are multiple groups and offices that will prove essential in the development and implementation of the workshops, both within College of the Canyons and the community. Internally, the following offices and people will have key involvement:

- Office of Instruction
- Public Information Office
- Facilities
- Reprographics
- Switchboard
- Art; Biological Sciences; Chemistry; Earth, Space, and Environmental Sciences; Photography; and Physics Departments and Faculty
- Campus Safety Office
- Grants Development Office

When Art and Science Tango

Additionally, the following external groups have been identified as primary stakeholders in the execution of the workshops (* indicates group identified for pilot program):

- Acton/Aqua Dulce Unified School District
- Castaic Union School District
- Newhall School District
- Santa Clarita Valley International Charter School*
- Saugus Union School District*
- Sulphur Springs School District*
- William S. Hart Union High School District

4. Mission Statement

The mission of “When Art and Science Tango” is to establish, promote and sustain a series of summer workshops for K-12 educators in the content areas of the arts and sciences, infused with basic skills and mathematics, to promote a holistic approach to education. These workshops will provide educator training resulting in outstanding instruction and empowerment of both teacher and student.



5. Vision Statement

The workshops designed for this project, “When Art and Science Tango,” seek to provide K-12 educators with the tools and breadth of knowledge needed to feel confident, innovative and creative in teaching topics in the sciences and arts. We make this possible through a three-prong approach:

- Inquiry-based learning activities to gain experience and confidence;
- Examples of hands-on activities and creative student extensions; and
- A full set of ready-to-use lesson plans for easy implementation.

When Art and Science Tango

As secondary education de-emphasizes kinesthetic activities in the arts and sciences due to reduced funding, our students are becoming more underprepared and insecure in these areas. The College of the Canyons summer workshops address these dangerous, long-term consequences and aspire to meet the challenge of re-energizing how these subjects are approached by K-12 educators and subsequently taught to our youth.

6. Core Values and Motivations

- Provide non-intimidating instruction without sacrificing its quality;
- Emphasis on teaching others *how to teach* the content;
- Demonstrate the many ways science and art may co-exist;
- Consumer-driven: meeting the voiced needs of our area educators;
- Reinforce the reputation that College of the Canyons continues to support creative initiatives that address our community's K-12 educational needs;
- "Bigger-Picture" vision: creating an overall paradigm shift in K-12 education.

7. SMART Project Objectives/Evaluation

Specific

The summer workshops will have a list of target topics for implementation in the pilot program. These topics will be subject to change, perhaps even rotate and be determined primarily from potential participants' survey results. Topics may include, but are not limited to, the following:

- Electricity, Magnetism and Abstract Art
- Stars, Solar Systems and Painting
- Faces of the Periodic Table
- Matter and Art Mediums
- Electromagnetic Radiation, Light and Photography
- Paper, Fiber, Dyes, Colorants and Painting
- Magnetic fields and sketching

When Art and Science Tango

Measurable

The success and effectiveness of the summer workshops can be easily determined through simple surveys and participant follow-up. Possible forms of evaluation could be:

- Anonymous online surveys sent to workshop participants immediately after completion for feedback on that week's strengths and weaknesses (to measure consumer-satisfaction);
- Additional surveys after three and/or six months to determine ease of implementation and success as determined by students' performance (to measure effectiveness of our workshop-curricula in meeting its ultimate goal);
- Select surveys and/or interviews with participants after 6 months to ascertain additional topic needs and any recommended changes for the workshops; and
- Working with school districts to procure overall CST scores in an effort to determine potential impact of enhanced instruction as related to student performance.

Achievable

The "When Art and Science Tango" workshops have a reasonable timeline for implementation, which can be seen in detail in the following Timeline section. Once the initial pilot program focused on K-6 educators is launched, yearly assessment, revision and expansion of the topics



and content to 7-12 will be necessary. Workshops will continue to be offered during the summer months and will benefit from the on-going rounds of new implementations based on assessment. Many of the resources that these workshops will demand are already on the College of the Canyons campus or easily acquired.

Realistic/Relevant

As a community college, our fundamental mission must remain to meet the needs of our community. As research has shown, the decline of art and science curricula, primarily

When Art and Science Tango

in grades K-6 education, is widespread across the nation and has negative impacts on many areas of education and higher learning¹, and the Santa Clarita Valley is no exception. There is a real need for this critical resource to be available to our K-12 educators, and College of the Canyons is already equipped to be that resource, making this project attainable and realistic. Our state-of-the-art equipment, top-tier facilities, and expert faculty make this college the prime location to carry out the solution to a critical community need.

Timely

As stated above, current research shows that art and science education is continually at risk for being cut or at the very least, under- emphasized. This trend is not helped by the general lack of exposure, confidence and resources available to our K-12 educators. As the United States continues to fight for its ranking against other counties in educational success, the need has never been greater to intervene and try to make a change. Closer-to-home, schools in the Santa Clarita Valley rank among the top 10% in California.² Providing this resource to our already-superior educators would further set us apart from other school districts and create a model for state-wide, and perhaps nationwide, K-12 curricula.

8. SWOT Analysis

Strengths

- As the only Community College in the Santa Clarita Valley, College of the Canyons has a unique opportunity to meet an obvious need within the community with no competition.
- Increases community awareness of our college and serves to further our already positive-reputation within the community.
- Aligns readily with Strategic Goals of the college, such as:
 - Work cooperatively and strategically with other areas of the college to coordinate and complement efforts and increase participation rates from local high schools;

When Art and Science Tango

- Develop and implement project-based activities with community-based partners;
- Develop collaborative training options with businesses, other districts and/or community based organizations; and
- Add short-term training institutes in subjects where demand is evident.
- The caliber of science and art facilities on campus are the best in the Santa Clarita Valley; in some cases, better than most community colleges in LA County;
- We have at our disposal the highest quality faculty to teach the workshops.

Weaknesses

- Currently lacking financial and personnel resources to move from planning phases into implementation of pilot program;
- Requires cross-departmental collaboration throughout planning (writing curriculum) and implementation phases;
- Will need multiple faculty to work during off-contract summer months.

Opportunities

- Offers the opportunity to again set College of the Canyons apart as a leader in community colleges, and one that is constantly attuned to the needs of its communities;
- Provides local educators with the resources they *need* to be successful;
- Increases awareness of our college and what it offers, as well as opens up relationships to area elementary, junior high and high schools from where we ultimately draw our own student population;
- Creates a cohort of students who are more equipped, confident and ready for higher education opportunities; and



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When Art and Science Tango

- Provides a holistic approach to education, where the arts and sciences are no longer taught as opposing subject matter.

Threats

- Cost-prohibitive: upfront costs to the college without direct revenue;
- Volunteer dependent: area educators would need to be willing to give up their personal time to participate in the summer workshops; and
- Differences in content, delivery and restrictions between K-6 and 7-12 curriculums could make development of effective curriculum on *our* end difficult.

9. Timeline

Phase I: Curriculum Development and Logistics Planning (8-10 months)

During this phase, the goal is to determine the content areas for which training is most needed, as determined from surveys sent to target schools/districts. While some data has already been collected (see Research), the idea will be to increase the scope of this survey to include 7-12 and all K-12 schools in the SCV. Survey data will be used to determine both pilot and future topics to be incorporated into curriculum for the summer workshops.

Additionally, during this phase we will attend a Math, Science, and Engineering and an Art Division meetings to educate faculty on the upcoming workshops and to form a committee of faculty who wish to be involved. While any interested faculty will be welcomed, extra care will be taken to ensure that there are experts in each of the curriculum content areas represented on the committee. This committee will look over the results of the surveys, decide the content for each of the one-week workshops (with a goal of 3-4 one week workshops offered for the pilot program), and work together to write the corresponding curriculum. Ideally, the K-6 pilot workshops will be offered in summer 2014.

When Art and Science Tango

It is only at this point that the budget for the project could truly be finalized, as the particular laboratory and art supplies required won't be identified until the curriculum is written.

In the pilot program of the "When Art and Science Tango" workshops, the emphasis will be on K-6 educators and curricula, as the multi-subject instruction mode of elementary school allows an easier implementation of the holistic workshop material. In future versions of the summer workshops, curricula and content will be expanded to serve the single-subject delivery mode of 7-12.

Phase II: Trial Implementation with Selected Teachers

Either during the last months of Phase I, or immediately after, a few selected teachers who have expressed a strong interest in promoting these workshops in their schools, will be asked to attend a half day workshop and provide feedback on the content and the delivery techniques. Strengths and weaknesses will be discussed, and teacher feedback will be utilized to make necessary changes. This will give immediate feedback about the simplicity, ease of implementation and clarity of our lesson plans plus hands-on activities, as well as allow a trial run that will point out any "bugs" needed to be addressed.



Once it is determined that the curriculum and activities are successful, the Public Information Office would be asked to promote the workshops. Registration for the Summer 2014 pilot program would be limited to K-6 SCV teachers with a target cohort size of 12-15 participants per workshop and a maximum of 24 students per workshop (as deemed by our campus laboratory safety guidelines).

Phase III: Launch of "When Art and Science Tango" Pilot Program (3-6 weeks)

Sometime during the summer of 2014, College of the Canyons would launch its pilot program of "When Art and Science Tango" workshops, which would last 3-6 weeks depending on the finalized curriculum and teacher interest. The actual logistics of this

When Art and Science Tango

phase would have been clearly defined during Phase I, but a general itinerary may look something like this:

- Each workshop would last for one week, Monday – Friday;
- Each session could run from 9:00 am – 2:00 pm, with the bulk of the instruction and the inquiry-based learning activities in the morning and time to work in groups on developing their *own* curriculum after lunch;
- After lunch on the final day of the workshop, each group would supply a set of lesson plans to be distributed to each person in the workshop for immediate implementation in the participants' classrooms. Each teacher will leave with a variety of completed lesson plans and/or project-based curricula to utilize in their classroom. Certificates of completion with the number of college units earned would be presented at the close of this final day.

10. Budget

An accurate budget would be determined after Phase I. It is anticipated that we will need the following budgetary items. Exact amounts will be calculated and entered into the appropriate budget box after Phase I.

- Art supplies and science lab supplies;
- Summer salaries for faculty and staff at current hourly rates;
- T-shirts for faculty and K-12 participants;
- Revenue from grants awarded
- Alternatively, the workshops could be offered through Community Extension, allowing for fees to be charged to the participants to cover the exact cost of that workshop

When Art and Science Tango

Expenditure Breakdown			
Funding Source B: Start Up Grant	Budget	Actuals	Variance
Grant Funds	-\$50,000		
Misc Instructional Supplies	\$1,200		
Misc Non-Instructional Supplies (T-shirts, Administrative, Advertising, Water, etc)	\$4,100		
Adult Hourly Non-Instructional Salary (Part-time Lab Tech)	\$4,500		
Instructors (Full and Part-Time Faculty)	\$18,000		
Total	\$27,800.00	\$0.00	\$0.00
Art Track / Vendor Name			
Dick Blick Art Materials	\$3,000		
Discount School Supplies	\$2,000		
Amazon.com	\$2,000		
Total	\$7,000.00	\$0.00	\$0.00
Chemistry Track / Vendor Name			
Fisher Scientific	\$2,500		
Sigma-Aldrich	\$1,500		
Total	\$4,000.00	\$0.00	\$0.00
Physical Science & Astronomy Track / Vendor Name			
Edmund Scientific	\$1,000		
Sargent Welch	\$1,000		
Other Vendors	\$3,000		
Total	\$5,000.00	\$0.00	\$0.00
GRAND TOTAL EXPENDITURES (Instructional and Non)	\$43,800.00	\$0.00	\$0.00
Projected Total Revenue	\$50,000		
Projected Expenses	\$ 43,800		
Balance	\$6200		

11. Research

This dream began with observations in the field of K-12 practices and College of the Canyons science students. One of the writers of this plan volunteered in three different local elementary schools for 12 years, has taught science classes at the college for 11 years and is currently raising two children who have been educated in the local public school system. It was consistently observed that K-6 teachers avoid art and sciences, relying on simplified textbooks to do the teaching for them. The local elementary

When Art and Science Tango

schools observed included Rosedell, Bouquet and James Foster, where the teachers admitted that they did not have adequate training to teach science and that they did not feel capable of teaching art.

Furthermore, the lack of adequate training continues in junior high and high schools. Students are told to choose the answer presented in the text, even if the answer is wrong, verifying that teachers still rely on the textbook to do the teaching, when lacking training, at these high levels of 7-12 education. Finally, there are particular misconceptions which arise each semester at College of the Canyons that students acquired during their K-12 education. These misconceptions correlate well with what was observed in the K-6 classrooms and with what was taught in local junior high and high school science classes.

This problem, with both the sciences and arts, is not unique to the Santa Clarita Valley in any way, but is a well-documented nationwide problem. As far back as the year 2000, the Department of Education reported that while our society is increasingly dependent on science and technology, there has been a decline in science proficiency and effectiveness in math instruction in the United States (<http://www2.ed.gov>). Most recently, it was stated in President Obama's Committee on Arts & The Humanities that, "Not only is arts education indispensable for success in a rapidly changing, high skill, information economy, but studies show that arts education raises test scores in other subject areas as well." (www.art-for-a-change.com)

Arts and science integration has already been successfully implemented locally at SCVI by providing a project-based approach to learning. Research indicates that project-based learning has a positive effect on student content knowledge, and the development of skills such as collaboration, critical thinking, and problem solving; and it benefits students by increasing their motivation and engagement (<http://cell.uindy.edu>). The project-based learning approach utilized by SCVI incorporates many disciplines in the process, showing that integrating art, science, math, and basic skills can work.

In order to assess the overall needs of educators in the SCV, as well as gain information regarding the most pressing art and science needs of local K-6 teachers

When Art and Science Tango

who would potentially participate in the workshops, a survey was developed and distributed to target schools and is included in Appendix A.

- SCVI
- James Foster
- Sulphur Spring District Schools

The survey results greatly supported the need for this type of training here in our community. Of those surveyed (n = 52), 77% indicated that they have a medium to high interest in attending summer workshops which would provide integrated training in science, math and art. The most impressive result was that a remarkable 95% expressed that they would be willing to integrate the arts into their math and science classes *if* provided the curriculum training.

The survey indicated above average interest in several of the integrated art and science workshops proposed: “Stars, Solar System, & Painting”, “Cave Painting – integrating earth science, chemistry, art, and history”, and “Matter and Art Mediums”. Teachers indicated need for training in many science areas, with the greatest need being training in electricity and magnetism. Several math topics were listed as most difficult to teach in our survey, including everything from addition and fractions to high level math for physics and chemistry. When listing areas most difficult to teach for art, the most common responses involved performing arts or art techniques.

Clearly, there is an undeniable need for this service to our community.

12. Conclusion

Our LEAP team’s research and personal experience suggest that there is a serious lack in both the time and quality of instruction given to topics in art and science in the K-12 classroom. Furthermore, there is little or no collaboration between disciplines at the 7-12 level. This is creating a generation of students who, by the time they reach college, are woefully underprepared in the subject matter, who are carrying misconceptions about science and art, and who are generally fearful of anything for which they did not

When Art and Science Tango

receive good training prior to arriving at college. In particular, they lack appreciation and application of art and they are fearful of math and science.

Educating those responsible for the crucial first-exposure to these topics is of utmost importance. The “When Art and Science Tango” summer workshop series gives College of the Canyons the opportunity, once again, to set the standard for excellence in community college education; a model that other community colleges will likely follow.

Not only are art and science key elements for understanding the world around us, but the two are intimately related. For example, musical scales demonstrate mathematical relationships, a child’s kaleidoscope displays geometric principles and the DNA helical form, whether represented in illustrations, sculptural models or visualization software, is critical to understanding its genetic function.

- Susana Maria Halpine (founder, STArt: Teaching Science Through Art Program)

Appendix A

K-12 Science/Math/Art Summer Workshops

Needs Assessment

1. Do you currently integrate the arts (visual/performance) into any of your core subjects (math, science, language, or history)? If so which subjects have you integrated the arts?
2. Do you currently integrate math and science units that relate to one another?
3. Would you be more willing to integrate the arts into your math and science classes if given curriculum or training?
4. What is your interest level in a one-week summer workshop that integrates science, math, and art? a. high b. medium c. low
5. List the areas of science, math and art which are the most difficult for you to teach.

Science

1. _____
2. _____
3. _____

Math

1. _____
2. _____
3. _____

Art

1. _____
2. _____
3. _____

When Art and Science Tango

6. Do any of these workshop titles appeal to you? (Circle all that interest you)
- A. "Electricity, magnetism, & Abstract Art"
 - B. **"Stars, solar system, & Painting"** – Integrating astronomy, earth science, visual art, and optionally the language arts, learners study the solar system and what is required to create life and shape environments on a planet and what life could develop in certain environments ...
 - C. **"My Chemical Identity"** - Integrating chemistry, the arts and language arts, learners are assigned an element from the periodic table to research focusing on its properties and characteristics and how it bonds with other elements. They will then create a plaster mask designed around their element. Learners also turn their element into a fictional character and write a story about that character. What are the traits of this character and how is its actions influenced by other characters.
 - D. **"Chemistry and Art restoration"** – Integrating chemistry and visual art.
 - E. **"Cave Painting"** – integrating earth science, chemistry, visual arts and history, learners study ancient storytelling prior to written language being common, the cave paintings, and how paint was made using materials found in the local area. Learners will make their own paint and create their own cave painting.
 - F. "Matter & Art Mediums"
 - G. Other: _____