Utilizing Digital Autoethnography for STEAM Education and Leadership Nurturing

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Introduction

Employing a variety of visually stimulating interactive strategies through a digital platform is a contemporary approach for eliciting reader and learner interests. The utilization of educational technologies provides opportunities to immerse educators with authentic Science, Technology, Engineering, Art, and Mathematics (STEAM) exemplars and educational leadership artifacts for motivating interests in leading programmatic development. In an effort to provide a forum to present STEAM curricular materials, contemporary STEAM research and laboratory design artifacts, and educational leadership exemplars, the researcher employed autoethnography methodology and developed a digital, online environment for nurturing leadership (portraitureeducation.com). The researcher assembled authentic career exemplars over the course of a 27-year span to illustrate STEAM and educational leadership in an interactive, digital environment for pervasive learning. The researcher employs the digital environment for students to utilize in higher education courses and during internships while earning educational licensure. The digital environment was based on the researcher's ten years of experience as a high school science teacher (biology, chemistry, and physics) followed by seventeen years as an administrator, principal, and community school district superintendent leading the development and implementation of STEAM programmatic offerings and classroom space redesigns.

Digital Graffiti

Autoethnography is grounded in both narrative and ethnographic research methodologies and employs an expressive description of phenomena blended with arts-based investigative approaches (Cooper & Lilyea, 2022). Autoethnography is a wonderful research methodology that provides a researcher with opportunities to connect personal experiences for understanding (Ngunjiri et al., 2010). This particular methodology also allows creativity in providing descriptors related to phenomena, which is in line with the researcher's personal and professional interests in designing creative, innovative STEAM programmatic offerings. Given the researcher's past decades of experiences as both a science educator, principal, and superintendent leading STEAM programmatic development and implementation, the researcher utilized autoethnography as a methodological approach for narrating and immersing the self in descriptions to create an embodied experience for the reader (Chang, 2016; Ngunjiri et al., 2010). The exemplars explored in this chapter are presented as textured, lived experiences to evoke imaginative understandings and self-interests of each reader regarding a variety of interdisciplinary STEAM programs that were developed, why they were developed, and how they were implemented. Each section of the chapter concludes with "Perspective-Taking and Considerations" regarding the digital exemplar and implications for employing the exemplar in nurturing leadership in students in higher education.

Visual Graffiti

A unique aspect of utilizing technology through an arts-based narrative, methodological approach is the digital platform the researcher created is an authentic product of STEAM philosophy in motion. The digital environment is a blending of self-portrayed STEAM programmatic offerings via digital autoethnography. The site serves as a digital storyteller's canvas for providing authentic artifacts that detail curricular instructional design, classroom composition, programmatic implementation, community engagement, connecting with stakeholders, and leading for all. Employing digital autoethnography provides a nontraditional approach for creating an interactive, online environment for leadership nurturing. The chapter is arranged into three sections: (1) Girls in Engineering, Math, and Science (GEMS), (2) Art in Mathematics, and (3) The Chemistry of Art. Each section provides an immersed perspective for the creation of innovative STEAM programs and learning spaces that inspire learners to learn and for teachers and educational leaders to support the lived experiences of students.

Girls in Engineering Math, and Science (GEMS)

Mystical Graffiti

In the United States today, females only represent fifteen percent of the workforce for electronics engineering and twelve percent for computer science (González-Pérez et al., 2020). In addition, only seventeen percent of registered architects are women with just 25 percent of women earning a degree as a physicist, which is the lowest amongst all the physical sciences (American Immigration Council, 2022; González-Pérez et al., 2020). Occupations in Science, Technology, Engineering, and Mathematics (STEM) are projected to grow fifteen percent through 2031 while the number of students in the United States electing to earn an undergraduate STEM-related degree is decreasing (American Immigration Council, 2022; Brooks, 2023). All the while, females remain underrepresented in the STEM workforce with an increasing demand for degrees and employees to fill important, needed roles. Consequently, the United States seeks workers from outside the country to fill much-needed STEM-related positions (especially in areas of engineering). This phenomenon, however, is not new. Since the 1990s the number of foreign-born STEM workers in the United States has increased with one-fifth to one quarter of the STEM workforce being represented by foreign-born employees (American Immigration Council, 2022; Brooks, 2023; González-Pérez et al., 2020).

While these statistics create pause in terms of challenges impacting STEM education and the workforce, they have been increasing over the past two decades. Female underrepresentation in STEM, the increasing demand for STEM-related careers coupled with decreasing undergraduate degree conferral, and the need to look outside the country to employ STEM workers within the United States are phenomena educators and employers continue to address and confront. The researcher partnered and collaborated with dynamic STEM and STEAM educators throughout his career to create solutions for increasing the numbers of disproportionately underrepresented student subgroups in STEM courses. A good portion of this work relied on including teachers, students, parents, and stakeholders and creating an atmosphere of collegiality to identify instructional practices, address mindset, and close school wide gaps for attending to deficiencies (Shahali & Halim, 2023).

Visible Graffiti

Rather than simply telling teachers what was observed school wide and within classrooms, the researcher created opportunities to construct professional dialogue between educators to empower them to identify areas for improvement firsthand. Non-evaluative opportunities for professional discussions via collegial coaching were provided to facilitate these conversations along with our observations (Røkenes, 2022; Shahali & Halim, 2023). Collegial coaching was utilized to provide a construct for colleagues to observe one another and further collaborate by employing a process for guiding professional discussions and self-reflection (Dantonio, 2001). Collegial discussions were utilized as a strategy for engaging STEAM teachers and creating authentic dialogue for leading and coaching. Collegial coaching provides a non-evaluative setting to facilitate interaction, collaboration, and dialogue. The organic nature of the coaching processes is participatory and reciprocal, which facilitates professional discourse (Dantonio & Lynch, 2005; Røkenes, 2022).

In some instances, collegial coaching created difficult, yet fruitful, conversations (Harris & Jones, 2019). These conversations included colleagues observing, for example, that female students in physics were called upon with significantly less frequency than their male counterparts. This was not isolated to just one classroom and warranted professional self-reflection regarding beliefs, values, and professional practice (Shahali & Halim, 2023). In the most difficult, yet courageous conversation, a female teacher developed awareness of her own inherent bias in terms of infrequent interactions with her own female students. The professional practices of the teacher were, of course, surprising to her but created meaningful self-reflection. As a result of the collegial coaching process, she was empowered to reflect on her practice and made a concerted effort to call on and check for understanding with female students to better engage all learners. Creating a forum to discuss instructional practice in a non-confrontational manner ultimately facilitates improved relationships between teachers and students, resulting in leadership development in teachers (Harris & Jones, 2019; Røkenes, 2022; Shahali & Halim, 2023). Coaching and teacher leadership leads to improved curricular delivery, instructional practice, and evaluation of students (Shen et al., 2020).

In addition to creating professional discourse with regard to unintentional bias and professional habits of mind, the need to better encourage and support female students to consider professions in STEM-related fields was also identified. Discourse was important for professional development, as well as observed and self-perceived teaching practices in an effort to collectively own outcomes (Esterhazy et al., 2021; Kaufmann & Ryve, 2019). A school wide concerted effort, structure, and process was needed to reach students throughout the school and not just within STEM-related departments. As a result, the researcher established a Girls in Engineering, Math, and Science (GEMS) program to address the gender gap in STEM-related fields. GEMS was founded to build capacity in young women entering the fields of math, science, and engineering. A large portion of efforts centered on educating girls on how to be successful in these fields by accessing female experts through field trips, guest-speakers, research with universities and organizational partners, and through service learning efforts. What began with just a dozen female students grew to 70 and then doubled in size to 140 student participants in the period of one year. Within another two years, the program had over 300 female students participating.

Perspective-Taking and Considerations

Effective school leaders are able to guide the learning organization through continuous change and improvement for all learners (Kiral, 2020; Shields & Hesbol 2020). The inclusion of the development of the GEMS program affords digital site visitors opportunities to reflect on practice as a result of viewing additional authentic artifacts. Oftentimes, change is not simply developing innovative, creative programmatic offerings, but rather, deconstructing practices and habits of mind to construct new STEAM teaching and learning opportunities via digital leadership (Sheninger, 2019). Throughout this continuous process, school leaders will encounter change and the indistinguishable counterforce of resistance (Sasson et al., 2022). An analogy can be made between change and resistance and Newton's Third Law, which states that for every action there is an equal reaction. Similar to this principle, change and resistance are intertwined forces commonplace within learning organizations (Hubbart, 2023). The degrees and intensity of change and resistance may fluctuate, but they are constants that all teachers and school leaders must be capable of embracing to ensure the continuous success of the learning organization (Sasson et al., 2022; Shields & Hesbol 2020). This particular autoethnographic narrative provides deep discussions with prospective students in higher education related to considering the backgrounds of all students and that all learners are provided access to curricular and extracurricular offerings.

In Arte Mathematica

Integral Graffiti

Over the course of many years as an educational leader, the researcher experienced a great deal of success in affording students with creative ways to approach mathematics. Oftentimes, students are intimidated in terms of enrolling in mathematics courses at the high school level and only choose to enroll in mathematics electives if they are required to do so or only if they are genuinely interested in mathematics. In addition, freshman and sophomore off-track data tends to reflect students struggling the greatest in terms of high school mathematics coursework at the ninth and tenth grade levels as opposed to the other content areas (Schmidt, 2012; Son & Stigler, 2023). These challenges are compounded further when students who fail or earn a “D” (an academic “F”) in freshman algebra are nonetheless automatically enrolled into the next semester or even the next year’s sophomore-level geometry or algebra II course. Educators must consider if we are unintentionally creating a conveyor belt, systemic milieu that contributes to an inherent dislike for mathematics in high school students (Springer et al., 2007). Furthermore, this structural setting reinforces negative student perceptions regarding mathematics and contributes to off-track student predictors at the onset of high school, impacting the likelihood of high school graduation (Schmidt, 2012). As a result, there are very few mathematics electives students will choose to enroll in unless they are forced to do so or are intrinsically motivated to learn mathematics. However, developing creative programs that employ active, participatory learning reduces poor mathematics performance for students of all backgrounds and prepares learners as they transition to higher education STEM coursework (Theobald et al., 2020).

Quizzical Graffiti

A course the researcher has offered students as a mathematics STEAM elective is Art in Mathematics. The researcher has afforded students the opportunity to enroll in Art in Mathematics in a variety of high school environments, ranging from a selective enrollment college preparatory high school setting to a therapeutic day school learning environment for special needs students. The researcher has observed students flourish across a spectrum of rigorous settings and thrive as a result of taking this particular course. As a result, students exit the course with a greater love and appreciation for the world of mathematics surrounding each of us daily. Providing all students with access to meaningful, hands-on STEM experiential learning acts as a catalyst in motivating students to further engage in STEM learning (Kolb, 2014; Maiorca, 2021).

Employing a creative, innovative approach towards learning mathematics via interdisciplinary teaching and learning results in a deeper appreciation for the subject matter and affords opportunities for teachers to engage in cross-curricular instruction. Interdisciplinary and cross-curricular learning positively impact student achievement in both mathematics and science learning and connect domains of STEM offerings (Cotic, 2021; Serpe, 2022). The following is an overview of digital autoethnographic content for readers and higher education students that not only includes STEAM-related curricula in Art in Mathematics, but also incorporates social constructs and cultural units of study within this interdisciplinary framework. The inclusion of socio-cultural contexts is valuable for providing perspective regarding the social, emotional needs of all learners and students and for ensuring social constructs are in place to support student motivation, needs, and cognitive choices for all learners (Eccles & Wigfield, 2020).

Golden Ratio

Students are introduced to Art in Mathematics curricula by developing an understanding of the golden ratio in art and architecture as well as the occurrence of the golden ratio in nature. These approaches include learning patterns in Fibonacci numbers (sequence) and related artwork students observe and create to reflect understanding. The concepts of patterns, proportions, and symmetry are introduced with respect to how they occur in nature and in artistic and architectural design (Figure 1). Students create mathematical sequences for art via Euclid's study of the golden ratio and its appearance in some patterns in nature (for example the spiral arrangement of leaves and/or plant organs and structures).

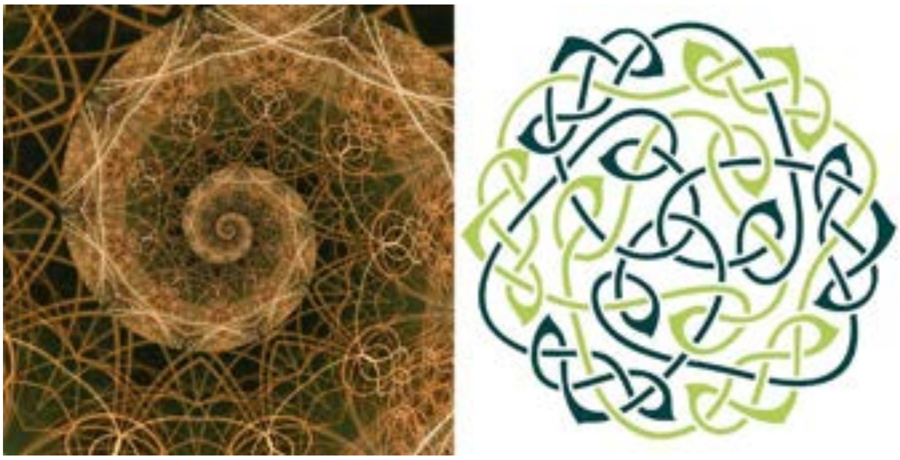

Figure 1. Fibonacci sequence and celtic knot

Proportions and Perspective

Students are provided a mathematics and artistic review of proportions in the human body and the history of anatomical research throughout time. Students learn about the Renaissance and human proportions reflected in art, proportions in architecture (in both a historical and cultural context), and proportions of the Egyptian pyramids for an introduction to geometric learning (Figure 2). Students explore the historical use of perspective in paintings and the diverse (and complex) employment of perspective during the Renaissance and Chinese art.

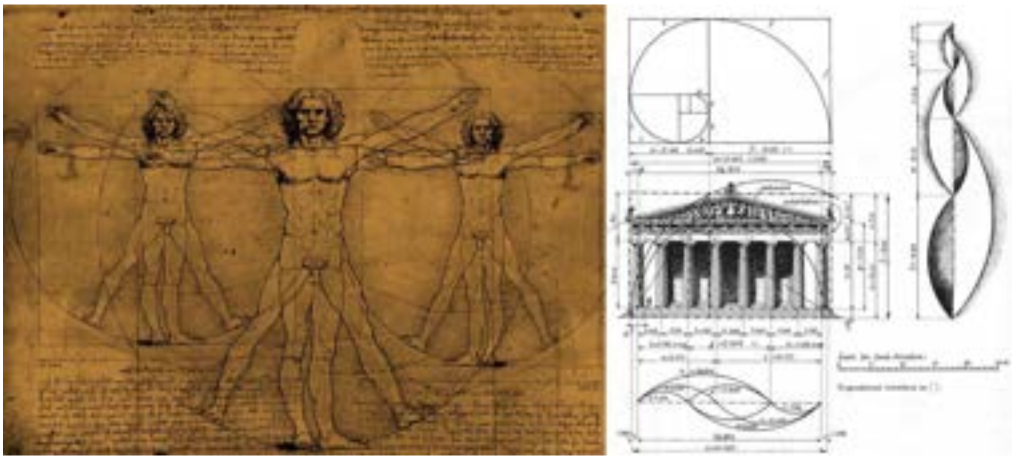

Figure 2. Proportions of the human body and architecture

Symmetry and Patterns

Introduction to mathematical and artistic constructs of symmetry (beginning with demos on the complex beauty and nature of soap bubbles) consist of patterns with an inclusion of the cultural, artistic and mathematical constructs of Asian, Islamic, and Celtic art. Concepts include symmetrical patterns in Asian art, patterns in Islamic art and architecture, and ornamental symmetry in Singaporean architecture. Students learn the seventeen wallpaper patterns at Alhambra and how knowledge of these seventeen wallpaper patterns may have been learned and employed in Chinese art. Patterns in Celtic knots, textile design, tilings, Penrose tilings (Penrose's two different rhombi shapes and two different quadrilateral kites and darts) and tangrams (seven flat polygons dissection puzzle) are explored. Students manipulate polygons and examine symmetry via five-fold rotational symmetry, reflection symmetry, and translational symmetry. Tessellations (reflection, rotation, translation, glide reflection) in nature and the art and geometry of Origami paper folding in Japanese culture are investigated (Figure 3).

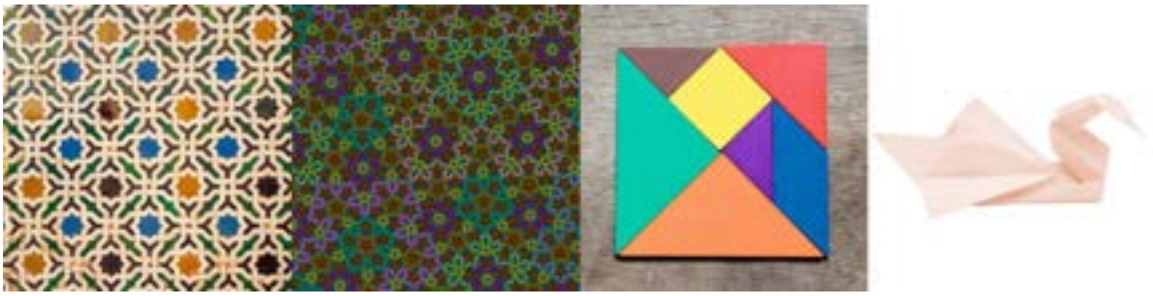

Figure 3. L-R alhambra, penrose, tangram, and origami

Geometry and Architecture

Students explore mazes, labyrinths, and the fourth dimension. These explorations segue into mathematical, artistic optical illusions and the engineering of kaleidoscopes (angles for creating stars). Students are provided an integrated STEAM approach for learning about Polyhedrons (geometry and angles) and stellations in nature and as geometric structures in architecture and design engineering (and a review of Origami). Students discover historical geometric design concepts in fortresses and various cultures utilizing pentagon design constructs, the design engineering of arches (especially in terms of their strength), as well as the geometry of war. Students study the architectural, visual illusions in the Parthenon and the architecture of domes and geodesic domes from both a geometric and cultural perspective. Figure 4 illustrates the geometry of a kaleidoscope, polyhedron, fortress pentagon, and a geodesic dome.

Figure 4. Geometry and architecture

Historical and Cultural Contributions to Mathematics by Artists

The German Renaissance artist Albrecht Dürer's Melencolia I: Exploration of number appearance and numerology in his work (rows, columns, Dürer's use of numbers for his second signature, initials, age, etc.). Students learn about historical and cultural beliefs concerning magical/astrological association at the time between magic squares and planets (Saturn and Jupiter 3x3 and 4×4 magic squares).

The mathematically inspired works of the Dutch graphic artist Maurits Cornelis Escher: Exploration of Escher's woodcuts, lithographs, drawings, and sketches of symmetry and impossible spaces. Review of the geometry of the wall and floor mosaics in the Alhambra and Escher's fantasy-inspired architectural, perspective illustrations.

German painter Hans Holbein the Younger's "The Ambassadors'' painting with anamorphic perspective: Students review mathematics perspectives and view the skull in the bottom center of the composition and render the form via an accurate perspective. Students examine the art of perspective within the portrait and identify items depicted and their cultural, historical relevance (scientific instruments, terrestrial and celestial globes, a shepherd's dial, a quadrant, a torquetum, a polyhedral sundial, an oriental carpet, and various textiles including the floor mosaic).

Students complete Art in Mathematics coursework through a capstone project on the contributions of the Italian Renaissance artist and engineer, Leonardo da Vinci: Discussions/explorations include da Vinci's influence on culture, science, technology, engineering, art, and mathematics. Students explore the many facets of STEAM by Leonardo da Vinci and complete a culminating research project on his contributions to modern day culture and living.

Perspective-Taking and Considerations

Mathematics is an incredibly important foundational content area. It does not have to be a course with merely right or wrong answers or designed and perceived as sterile in aim. Mathematics can be an incredibly creative, exciting interdisciplinary course that excites and inspires students to learn more about the world around them through experiential immersion and constructivism (Kolb et al., 1984; Maiorca, 2021). There are a variety of other STEAM-related, cultural and historical interdisciplinary content areas that can be interwoven into Art in Mathematics (fractal art via computer science and mathematics, architecture of the Taj Mahal, parabolic, ellipsoid and spherical geometry of the Sydney Opera House, etc.). Providing a digital autoethnographic environment for delving into the Art of Mathematics provides students in higher education with cultural perspective-taking regarding the social engagements of students in narratives, which is an incredible benefit of interdisciplinary STEAM curricula (Hall et al., 2021; Wolgast & Oyserman, 2020). Embracing creative STEAM design content that incorporates (or at least embraces) discovery learning at all grade levels supports the acquisition of knowledge through constructivist learning (Dewey, 1933; Piaget, J. 1972; Vygotsky, 1978). If the intent of mathematics is to facilitate logical reasoning in students, the impact of mathematical curricular design must be to provide logical reasons for students to be interested in the learning.

The Chemistry of Art or the Art of Chemistry?

Throughout the years, the researcher has provided leadership supports for cross-curricular *art of chemistry* and *chemistry of art* learning opportunities with students in a variety of schools. Some of these learning experiences require just a couple of days of team teaching (and/or swapping classes) while others take on the form of long term, project-based learning that affords students with a much greater depth and breadth of STEAM learning (Diana & Sukma, 2021). These real world *chemistry of art* and *art of chemistry* experiences provide creative, cross-curricular instruction for chemistry learners to make connections to art and for art students to learn the science behind their creations. Cross-curricular instruction is a powerful tool for STEAM, as it facilitates critical thinking in learners that can be utilized for a lifetime of learning (Ross & Gray, 2011).

Raku Glazing

Interdisciplinary ceramics students create beautiful pieces of art all the while learning the beauty of chemistry within their art. Likewise, chemistry students engaged in ceramics-based lessons and raku firing (Figure 5) observe, firsthand, the physical and chemical changes that take place during raku pottery making. In addition, chemistry and art students learned about the historical and cultural origins of traditional Japanese raku firing for creating pottery through a blended, interdisciplinary lens. Raku firing is a method of pottery making that includes students removing pottery from a kiln (while it is still extremely hot) and then placing the pottery into containers for combustion reactions followed by oxygen reduction. There is quite a bit of chemistry occurring during raku firing as well as the process of glazing, which makes this a wonderful project-based learning experience (Diana & Sukma, 2021; Treacy & O'Donoghue, 2014).

During raku firing, students learn about the porous, chemical composition of clay and the physical chemistry that takes place when clay is glazed and heated to temperatures reaching upwards of approximately 980° Celsius. Art and Chemistry lessons include the processes of combustion and reduction. Students engage in the practice of placing clay in a combustible metal chamber with combustible materials (usually paper) where the atmosphere changes and oxygen is reduced out of the chamber. Students observe the science that takes place when combustibles burst into flame and reduce the oxygen as well as crystallization from the thermal shock of metallic glazes (copper, cobalt, etc.) that form metallic colors, such as red, blue, and green.

Students also learn about the minerals of clay (alkali and alkaline earth metals) and the importance of oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium for raku firing. The authentic chemistry and art knowledge students develop provides a valuable opportunity for students to observe the physical changes and transformations of clay during the formation of the pottery they create. In addition, students are able to observe chemistry in motion and learn firsthand about the important, resulting kaolinite structures from raku firing.

Throughout this project-based experience, chemistry and art students are exposed to cross-curricular, co-taught content with respect to the art and chemistry of the ceramics they create. Students also learn about liquid glazes and their composition. Raku firing and glazing of silicon dioxide and aluminum oxide are examined for exploring the physical and chemical properties of silicates that influence the different qualities and atomic structures impacting color, opacity, and texture.

Figure 5. Roku firing

UV Sensitive Fabric Cyanotype

Students in chemistry collaborate with fashion design, printmaking, and art students in studying and exploring UV sensitive materials for cyanotype printmaking. During these chemistry and art experiences, students work with light activated reactions for creating artwork on clothing and fabrics as well as photosensitive paper for display.

Cyanotype is a 170-year-old photographic printing process that uses chemicals to create prints. This process originally became popular due to its ability to easily create duplicated prints (thus the interwoven historical/cultural lessons!). The word cyan comes from Greek, meaning “dark blue substance.” Student works of art reflect a distinct blue (cyan) color. Students in art and chemistry learn about the reaction of ferrous ions to the photo reduction of ferric ammonium citrate in combination with potassium ferricyanide for cyanotype printmaking.

Chemistry and art students are also afforded historical lessons and engineering printmaking background with respect to the process of cyanotype printmaking. Students learn about Sir John Herschel’s work in inventing the process, which was originally intended for reproducing and distributing written records. Students then learn about botanist Anna Atkins’ research in using photosensitive paper (a process is called a photogram) for creating cyanotype prints. Anna Atkins’ work included placing organisms, such as plants, on treated paper. Cyanotype print can also be used with transparent, translucent, or opaque objects to make cyanotype photos. The photos can be made on cloth or paper, thus worn or displayed (Figure 6).

Students duplicate Atkins’ work by placing plants or other transparent, translucent, or opaque objects on photosensitive paper and then placing the items in sunlight for exposure. The results are prints that capture images of the organisms or items placed on the paper that appear as greenish-blue photographic images. This particular experience provides artistic prints that art and chemistry students create. This experience also enables students to examine the physical chemistry of UV sensitive fabrics for cyanotype printmaking. Exploring cyanotype printing serves as a great cross-curricular project between art and science for students to learn about the chemistry of creating sensitizing solutions from ferric ammonium citrate and potassium ferricyanide to create “scientific” works of art.

Figure 6. UV sensitive fabric cyanotype

Tie-Dying and Covalent Bonding

Students can also be provided cross-curricular lessons on the chemical history and artistic use(s) of dyes and how dyes adhere (bond) to fabric. These types of experiences work nicely for interdisciplinary learning between fashion classes and chemistry classes. It also works well with physics (optics) classes when learning about the light spectrum and color absorption and reflection (color absorption and reflection is also covered in biology during photosynthesis). Everyone has owned, seen, or perhaps made a tie-dyed piece of clothing at some point in his or her life, which makes this a fun interdisciplinary STEAM lesson. In addition, learning the science behind tie-dying provides an enjoyable platform for students to create an artistic product they can wear while learning the history and science behind tie-dying.

Students are provided a background on cotton production (biology and economics) and its use for clothing. Students are also provided background on clothing made out of rayon, bamboo, Tencel (wood pulp), hemp, linen and other natural fibers. Students learn about reactive dyes and their propensity to permanently attach to cellulose fibers through covalent bonding. Covalent bonding is a very common type of bonding that occurs when molecules share electrons.

As a side note, whenever the researcher taught chemistry or biochemistry he would have students repeat aloud, “Happiness is a covalent bond!” or “A happy atom is a covalently bonded atom!” for teaching the basics of sharing electrons to complete energy levels for simplistic introductory understanding of chemistry. Tie-dying art lessons provide opportunities for students to develop an authentic understanding of pH, the role of soda ash with dyes, and the role of catalysts in chemical reactions (with respect to the soda ash). Tie-dying and covalent bonding (for a happy atom!) provides opportunities for art and chemistry students to observe the sharing of electrons in motion and create artwork in the form of tie-dyed clothing (Figure 7).

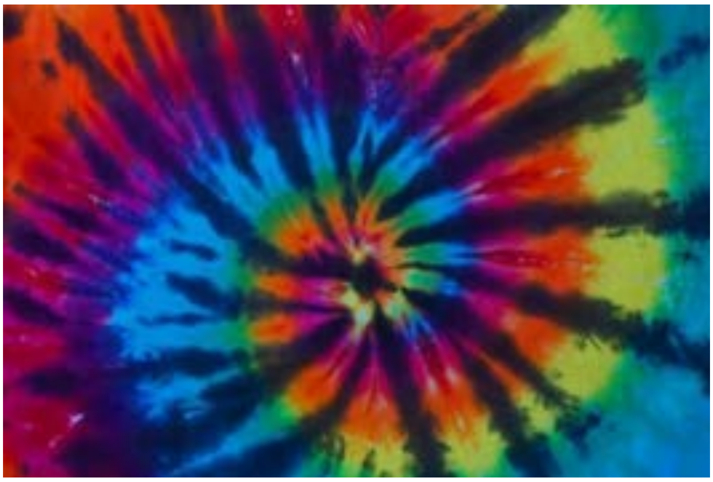

Figure 7. Tie-dye fabric

Chemistry Cubes and Art Computer Design

Art, chemistry, and computer science students engage in cross-curricular lessons using the periodic table, Adobe software, and 3D printers for producing etched cubes (Figure 8) reflecting information from each element on the periodic table. Each side of the cube is produced from a 2” x 2” template (six different templates in all). Students research periodic trends for each element (for example, atomic size, electron affinity, Z-effective, etc.) from the periodic table. Students then make the cubes and build a truly interactive three-dimensional periodic table. Art, chemistry, and computer science students can physically manipulate the cubes to learn/observe trends via a real life, interactive, piece of art. This experiential, cross-curricular project makes learning the periodic table and information about each element much more memorable and relevant to learners of all backgrounds as a result of employing active learning (Cotic et al., 2021; Kolb 2014; Theobald et al., 2020). Students sometimes tend to have difficulty remembering specifics from the periodic table and this project provides an opportunity to build interactive, three-dimensional flashcards using a modern approach for developing problem-solving and critical-thinking skills (Hacioglu & Gulhan, 2021).

Figure 8. Chemistry cube

Perspective-Taking and Considerations

The blending of art and chemistry presents learners with opportunities to view each content area from unexpected lenses. When students engage in project-based learning, they are providing opportunities to employ problem-solving skills and prolonged collaboration. Collaborative interactions provide opportunities to also develop social skills and pro-social relationships (Mahoney et al., 2021; Osher et al., 2018). In addition, cross-curricular lessons afford opportunities for both teachers and students to pool resources, act as a team via discovery learning, and utilize creativity for innovative outcomes. Likewise, employing a technology-based, digital environment with meaningful STEAM teaching and learning narratives, provides students in higher education pursuing degrees in education with an immersive experiential learning space. Prospective, future educators are able to explore real life accounts with autoethnographic narrations regarding what is possible when creatively constructing curricula. The ability to implement creative, team-building curricula promotes relationship building for transferable learning in life (Darling-Hammond et al., 2020). In addition, the utilization of a digital autoethnographic environment provides exemplars of leading education for nurturing leadership in future educators.

Conclusion

The researcher’s use of digital autoethnography provides students in higher education seeking careers in education with authentic exemplars regarding the development and implementation of interdisciplinary, cross-curricular STEM and STEAM programmatic offerings. While the exemplars reviewed in the chapter provide valuable insight with respect to the programs reviewed (and implications of immersing prospective educators in autoethnographic narratives) the utilization of technology enables content viewers to delve into layers upon layers of relevant interrelated themes. In addition, the combined power of technology, STEAM, and autoethnography positively impacts and influences a multitude of content areas and educational qualities aside from the acronym of STEAM. These impacts and influences beyond STEAM include sociology, history, geography, culture, language, special needs, social-emotional skills, and perspective-taking.

Principal Graffiti

Creatively employing educational technologies provides an innovative, contemporary approach for presenting authentic educational experiences for teachers, leaders, and education students in higher education. The utilization of digital autoethnography provides authentic perspective for eliciting and nurturing pervasive learning in digital environment site content readers and students. Utilizing a digital autoethnographic methodological technique creates an interactive, ongoing research forum for presenting the shared journeys of STEAM curricular development and meaningful educational experiences of learning communities.

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