Art Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uare20

3D Printed Iron Gates: Celebrating an African American Artist Through a Transdisciplinary Lesson

Tracey Hunter-Doniger, Nenad Radakovic, William Ian O'Byrne, Britnee Adams, Emma Gourdie, Christian Heckman & Dillan Smith

To cite this article: Tracey Hunter-Doniger, Nenad Radakovic, William Ian O'Byrne, Britnee Adams, Emma Gourdie, Christian Heckman & Dillan Smith (2022) 3D Printed Iron Gates: Celebrating an African American Artist Through a Transdisciplinary Lesson, Art Education, 75:4, 33-38, DOI: 10.1080/00043125.2022.2053463

To link to this article: https://doi.org/10.1080/00043125.2022.2053463

Published online: 06 Jul 2022.

Anything in the world can be turned into art, even gates.
—Student participant, age 8

3D Printed Iron Gates:
Celebrating an African American Artist Through a Transdisciplinary Lesson

Tracey Hunter-Doniger, Nenad Radakovic, William Ian O'Byrne, Britnee Adams, Emma Gourdie, Christian Heckman, and Dillan Smith

Throughout Charleston, South Carolina, there is a distinctive style of iron gates and fences that frame the entryways of this historic city's homes, schools, and restaurants. This is the artwork of an African American man named Philip Simmons, born and raised in this area. I am relatively new to Charleston and was surprised that not everyone I taught in preservice education classes was familiar with the artist. Sure, they had seen the gates peppered throughout the city, but they did not know who the artist was, or the painstaking work it took to create these works of art.

Noticing this lack of knowledge, in the summer of 2019, two colleagues and I, along with four preservice teachers, decided to create a transdisciplinary science, technology, engineering, art, and mathematics (STEAM) lesson for children focused on Philip Simmons and his work. As a team, we were researching STEAM at a summer STEAM camp with a group of 10 children, ages 8 to 10. We focused on this group because that is when local history is introduced in the schools. The lesson was designed to focus on the craftsmanship of Simmons's artwork, drawing connections to STEAM education through a transdisciplinary experience.

With careful attention to detail, we designed a transdisciplinary visual arts lesson that focused on STEAM and taught about the art of Philip Simmons, as well as symbolism, mathematics, the process of 3D printing, and some history of Charleston. The results were some original 3D printed, Simmons-inspired gates that made connections to several disciplines in the curriculum. More importantly, this lesson gave proper respect to Philip Simmons, the iron-gate artisan. This article begins with an introduction to the artist and his work, followed by a discussion of culturally relevant pedagogy (CRP) and the importance of inclusion in the classroom. Then we examine the history and nuances of transdisciplinary and STEAM education. The details of the lesson are highlighted, along with a discussion of the outcomes of a transdisciplinary lesson that celebrates the African American artist Philip Simmons.

The Artist: Philip Simmons

Philip Simmons lived in Charleston for his whole life, from 1912 to 2009. As a child, he attended Buist Elementary School in downtown Charleston, when it was an all–African American school during segregation. On his way to school, he would pass the nearby carriage houses and stables and marvel at the ironworkers making horseshoes and tools for the city's residents (Bergey & Pich, 2017). When he was older, he became a blacksmith apprentice and learned to make horseshoes and repair ironwork. Early in his career, he was asked to make a gate for the back of a clothing store. He learned that making a gate uses the same process as making horseshoes (Lyons, 1997). From then on, Simmons created gates, balcony rails, and fences; through trial and error, he mastered the designs and swirls found in his symmetrical gates (Bergey & Pich, 2017).

Before long, wealthy patrons requested that Simmons make gates and include images within the design that represented their families, such as a palm tree, birds, hearts, or crosses. Simmons's gates are known for the intricate detail he put into his designs, especially in the handmade scrollwork and the symmetry and precision as if done by a machine. This attention to detail helped to make his work aesthetically pleasing and gain popularity. Figure 1 demonstrates his unique style and craftsmanship of a gate he created for his church, St. John's Reformed Episcopal Church. The precision of the symmetry and the organic nature of the swirls give the appearance that his work was alive. During his 77 years as a

Figure 1. Philip Simmons Gate located outside of St. John's Reformed Episcopal Church in downtown Charleston, South Carolina.

blacksmith, Simmons designed, created, and/or repaired more than 600 pieces of ironwork. His work became so synonymous with Charleston that the logo for the international airport gives a nod to his art (Figure 2). There are even three schools named after him in the tri-county area, and samples of his works are on display in the South Carolina State Museum and the Smithsonian Museum. Despite the popularity of Simmons's artwork and ubiquity within the city, most children and college-age students are unfamiliar with who he was. As such, we felt it was important to utilize CRP.

Figure 2. The Charleston International Airport logo gives a nod to the work of Philip Simmons's ironwork gates.

«»

On his way to school, he would pass the nearby carriage houses and stables and marvel at the ironworkers making horseshoes and tools for the city's residents.

«»

Culturally Relevant Pedagogy

CRP is a way of teaching intended to empower students academically, socially, and emotionally by using student learning, cultural competence, and critical consciousness to ignite understanding (Ladson-Billings, 2009). As stated by Ladson-Billings (1995), CRP is based on the foundation of three ideas: "(a) Students must experience academic success; (b) students must develop and/or maintain cultural competence; and (c) students must develop a critical consciousness through which they challenge the status quo of the current social order" (p. 160). In addition, CRP for art teachers must respect the cultural backgrounds of all their students to be effective educators in the art room (Acuff et al., 2012). Philip Simmons's artwork had an impact on Charleston. We felt it was important that these symbolic gates of the city were known as Simmons's gates to our students and not just the fancy gates at the affluent homes. Because 30% of the children at the camp were from predominantly African American schools, we thought CRP should be applied. We wanted all students to take pride in knowing who Simmons was and what he did to contribute to the city's beauty.

As we researched Simmons and his work, we wondered why many people did not know him by name. Indeed, in certain circles, such as the wealthy, Philip Simmons's work was recognized and celebrated; however, his work was overlooked among those of low to middle socioeconomic status. Is his work marginalized because it is a functional work of art, or could it be because he was a person of color creating art during the Jim Crow era of the United States? This is why CRP is so important to this lesson. We did not want to gloss over the fact that Simmons grew up during segregation and the hardships he must have faced. Kraehe and Acuff (2013) argued that art education is deeply implicated in the production and maintenance of social inequalities. CRP gave us a platform to help all the students learn about the artist's history, the gates, his influence on Charleston, and how his art encompasses multiple disciplines in one transdisciplinary lesson.

While we discussed the contributions of Simmons and situating his work within the time in which he lived, we were aware that talking about contributions of a Black artist "absent

any consideration of the social and structural realities faced by marginalized students outside of school and the ways that… opportunities are situated in those larger realities" is not only problematic but also unethical (Martin, 2003, p. 7). When addressing racism, it is important to acknowledge critical race theory's perspective that racism is a permanent and defining feature of the United States (Larnell et al., 2016). For example, racial disparities in Charleston are persistent (Radakovic, 2018), and Buist Elementary School, which Simmons attended, is now predominantly White due to de facto segregation. As a part of the lesson-planning process, we discussed the permanence of racism with the preservice teachers in the study as it relates to the educational system.

Simmons's artwork embodies STEAM and transdisciplinarity creating its own scientific and mathematical language via concepts of symmetry, property of materials, and design. This work is a part of African diasporic cultures and traditions in the United States. The African diaspora is the mass dispersion of people from the Transatlantic Slave Trade. As a result, the traditions and cultural resources that came from Western and Central Africa have helped some artists incorporate their way of making sense of the world.

Transdisciplinary Education

Transdisciplinary education explores knowledge as it connects subject areas, creating a deeper understanding of content. The dominant theme in the current literature regarding transdisciplinary education surrounds the issues of a fast-changing world, in which we must prepare students for the new reality where rapid technological advancement is the norm. To do so, we as art educators must incorporate an approach that combines several fields of study so that students can develop a set of skills that can be utilized in many different contexts.

Liao (2016) contended that the primary goal of transdisciplinary learning should be to foster an innovative society that goes beyond any one discipline or subject, challenging the traditional teaching model of lectures and rote memory. Her approach calls for an arts-integrated STEM pedagogy with two or more STEM subjects interwoven together, which is integrated into real-world applications with skills learned that can be generalized in future employment and other problem-solving settings (Liao, 2016).

«»

Is his work marginalized because it is a functional work of art, or could it be because he was a person of color creating art during the Jim Crow era of the United States?

«»

Henriksen (2014) believes that STEAM education has become an essential paradigm for artistically infused teaching in STEM disciplines. Her study looked at several National Teacher of the Year recipients, finding that a common thread was comfort and familiarity with incorporating STEAM practices into regular classroom instruction. She contends that the goal of implementing STEAM is to have students understand nonart processes better and have them become critical and creative thinkers in a wide variety of disciplines (Henriksen, 2014). Notably, classrooms that infuse the arts into other subject areas create an educational environment that embraces visual arts as an essential subject equal to the other academic disciplines (Hunter-Doniger, 2018b). Additionally, a STEAM lesson can present students with a real-life problem and then allow them to use skills and knowledge from all disciplines to design a solution (Hunter-Doniger, 2018a). As such, transdisciplinary education broadens students' thoughts and perspectives, resulting in higher academic achievement and an increase of skills and knowledge.

Bringing It All Together

Transdisciplinary lessons have demonstrated that the subject areas and divergent thinking, creativity, and play may all have a key role in meaning-making (Hunter-Doniger, 2018a). This transdisciplinary lesson went beyond STEAM, as it also included content related to the history and culture of the city. There were 10 children from the STEAM camp who participated in this lesson. Seven of the children were from families of the faculty and staff members of the university, and three children attended a nearby elementary school and participated in the camp with the support of scholarship funding. Two children were male, and eight were female. Below, we deconstruct the lesson to highlight its key components. Because this was a transdisciplinary lesson, it had several layers. Therefore, we also discuss the importance of how each discipline was interconnected.

History: Gates of Charleston

We began with a foundation of the history of the gates. We asked the children if they had seen these gates throughout Charleston to initiate engagement. Of course, the students had, so there was an instant connection. As we discussed the gates, we shared the history and life of the artist, Philip Simmons. The children thought it was interesting that he went to school in Charleston and was responsible for creating the many gates in the city. The children were apprehensive at first to consider the gates as works of art. They just considered them part of a fence—nothing more, nothing less. However, as the lesson went on, a child made the connection and stated, "Anything in the world can be turned into art, even gates."

Math: Symmetry

Before we let the children start creating their gates, we needed to discuss the structure and design of the gates. Simmons's ironwork used mathematical components, such as patterning and symmetry (e.g., the gate from St. John's Reformed Episcopal Church from Figure 1). At first, the children were skeptical about the concept of math in art. We placed various images of the gates on the

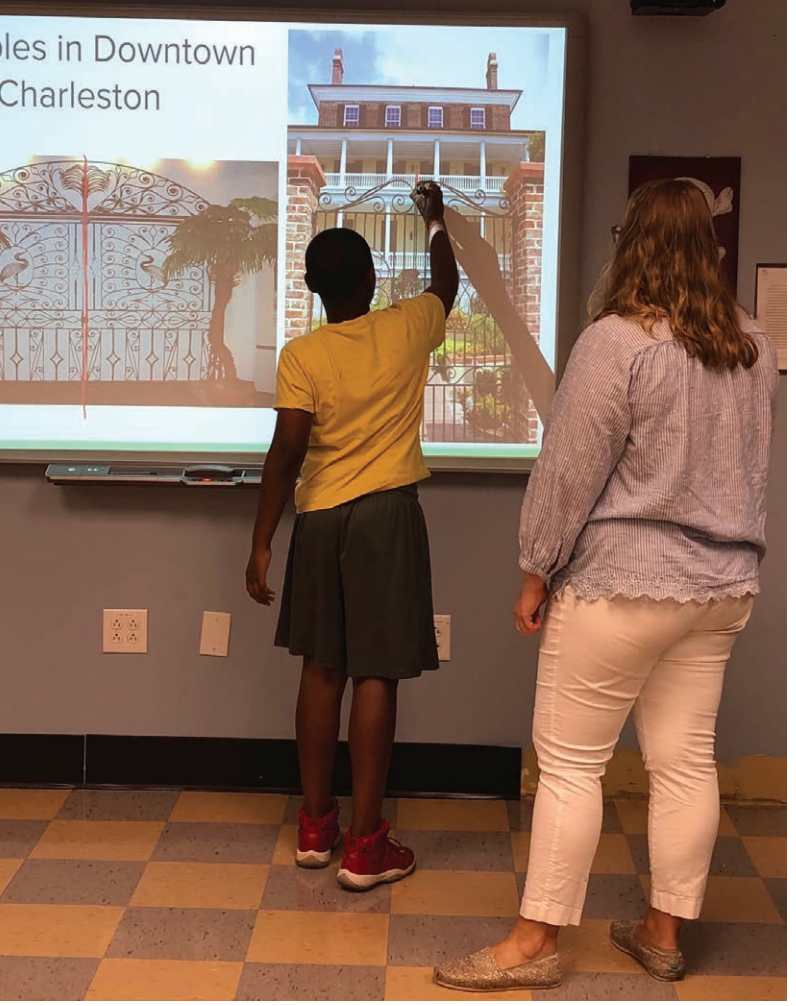

Figure 3. Child drawing the line of symmetry on a Simmons gate on an interactive whiteboard as the instructor coaches him along.

interactive whiteboard and had some children draw the line of symmetry down the center (Figure 3). They also traced some of the swirls, and they noticed that on either side, the swirls were the same size, but they were a mirror image of the other side. In math terms, the image *flipped*. Then, the children one-by-one began to remember transformation in math class, where they learned about how to *flip*, *slide*, and *turn*. In mathematical terms, these are the different ways a shape can move without changing its dimensions. The children seemed excited to put this mathematical concept into action. Math was very helpful because when they embedded their symbols into their gate design, they could visualize the symbol flipped like a mirror image to create an accurately symmetrical design.

Engineering: Designing a Symbol

The engineering and design process was put into play throughout creating the artwork. This process (Figure 4) began with a question or problem; children conducted research and imagined a solution, made a plan, then created an item. Once it was created, they could test it by seeing if it looked right or functioned the way they intended. At that point, the item could be improved on. In creating art, this happens multiple times during the process. We pointed out to the children that all artists have the autonomy to alter their work as they go.

The discussion then turned to the embedded symbols in Simmons's ironwork. He used symbols, such as a palmetto tree, an

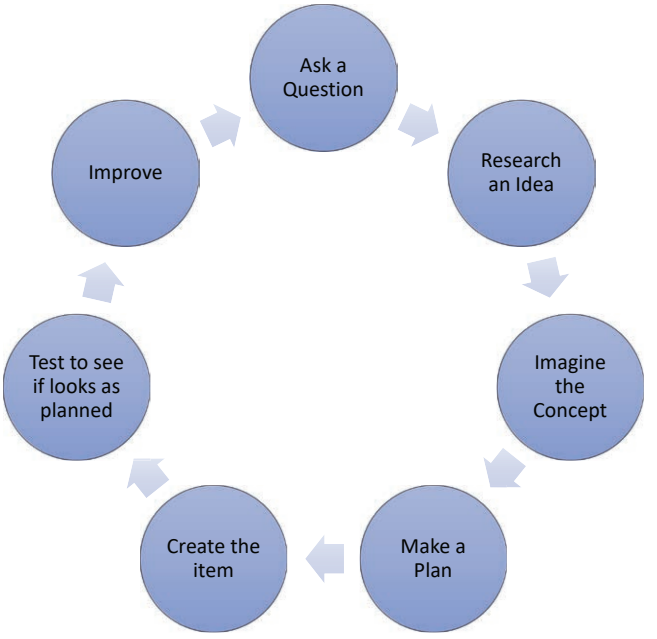

Figure 4. The design process used in engineering and creating art. During this process, the children were able to research, imagine, plan, and create. Then they tested their idea and made improvements.

egret, or a pineapple, which all represented items that were well-known to the region. We posed the question to the children: If they were to have a gate in the front of their home, what symbol would they have? They took some time to consider a symbol that best represented themselves and shared it with the group. One student stated that pizza was his favorite food, so his symbol would have to be a slice of pizza. Another said she loved her family so much that she felt her gate design must incorporate a heart. Once they had the design in mind, they were ready to create their gates.

Art: Creating the Gates

In recent years, tablets have been shown to serve as incredible teaching and artistic tools in classrooms worldwide (O'Byrne et al., 2018). They have been used in stop motion animation, sketches, and through specialized apps. For this project, students began with a concept and drew initial sketches on paper of their imagined gates, complete with symmetry, designs, and a symbol representing themselves. The children then transferred their pencil drawings to a table using an app that translates designs into 3D, printable images. The children took a digital photo of their drawing and traced and enhanced the original sketch using their fingers or a stylus (Figure 5). Once it was complete, they saved the image, and it was ready for printing. As the students reflected on this process,

«»

If they were to have a gate in the front of their home, what symbol would they have?

«»

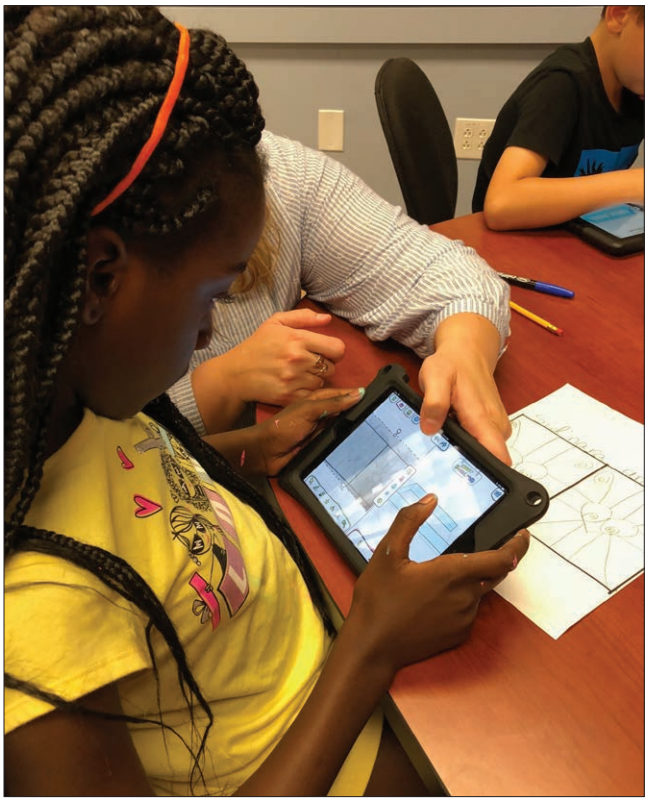

Figure 5. Student using the tablet to take an image of the original sketch, preparing to add details using the app.

one stated, "We can learn about the artist, we can see how hard it is to make a gate, and we can demonstrate our own gate to see how it feels."

Technology: 3D Printing

The students knew the result of their artwork would be a 3D printed gate that they designed themselves, but we felt it was important to include some background knowledge of how a 3D printer works. We discussed how the printer uses very thin layers of photopolymers to build the surface of the object, and how 3D printing allows objects that may or may not have existed previously to be made with ease (Figure 6). Therefore, students became a part of a hands-on process in which they imagined, designed, created,

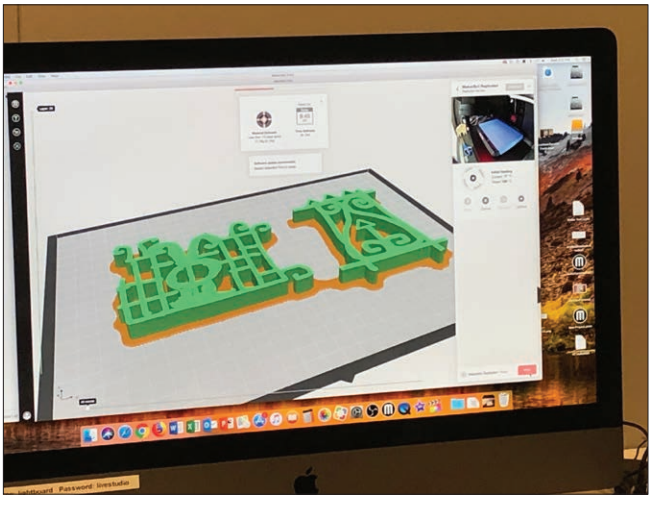

Figure 6. Digital image of the gates prior to 3D printing.

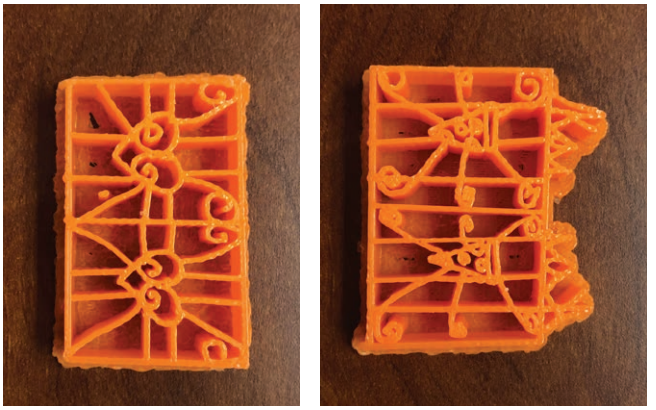

Figure 7 *(left)*. A 3D printed gate with a heart design motif.
Figure 8 *(right)*. A 3D printed gate with a pizza design, representing the artist's love for pizza.

and modified—as such, learning activities with 3D printers can significantly enhance students' practice of visual–spatial skills (Verner & Merksamer, 2015). Figures 7 and 8 are examples of the students' end products. In this learning environment, the students perceive, mentally process, and visualize significantly more complex objects than in a conventional 2D one.

Closing

In one lesson, the children learned about symmetry, history, engineering, 3D printing, technology, and artmaking—all while celebrating the work of an African American artist. The children were proud of the result. However, to me, the most important aspect of this lesson was that the gates were given a name. Ultimately, the gates were given back to Simmons because they would not be called the millionaires' gates or the fancy gates; they were now and would forever be Philip Simmons's gates, as they had always been—and rightfully so. When we asked the students, "Why do you think we wanted to teach you this lesson?," the importance of CRP was evidenced. One student responded, "To teach us about the history of Philip Simmons because [his art] is a big part of downtown and all of South Carolina." She continued, "He is part of the history of the gates we have had here for a long time in this area." Another child added, "I think he [Philip Simmons] is important to our culture."

Granted, these students will not soon forget who Philip Simmons was and the gates he created, but it does make one wonder: Would they ever have known who he was or the significance of his artwork without this experience? One can only hope that there will come a time that his name will be synonymous with Charleston and be celebrated by everyone. Whether Philip Simmons's work and name have been marginalized because his artwork is functional or an unconscious product of segregation, we as art teachers need to consider the artwork in plain sight and ask, who made it? Then, teach about it. While we cannot undo what has or has not been taught in schools or at home, we can work toward a richer view of art and history in the United States. We can make a conscious effort to educate others and celebrate the art of marginalized people. It is up to us to pass on knowledge so that generations to come will know what foundational artists and

craftspeople of all races and genders have meant to this country. This is the importance of teaching art, teaching transdisciplinarily, teaching STEAM, and teaching using CRP. ■

ORCID

Tracey Hunter-Doniger
http://orcid.org/0000-0003-1425-8590

Author Note

All participants' parents gave written permission for student artwork and photographs, according to the Institutional Review Board.

Tracey Hunter-Doniger, Associate Professor, Teacher Education, College of Charleston in Charleston, South Carolina. Email: hunterdonigertl@cofc.edu.

Nenad Radakovic, Assistant Professor, Teacher Education, College of Charleston in Charleston, South Carolina.

William Ian O'Byrne, Assistant Professor, Teacher Education, College of Charleston in Charleston, South Carolina.

Britnee Adams, Student–Researcher, Teacher Education, College of Charleston in Charleston, South Carolina.

Emma Gourdie, Student–Researcher, Teacher Education, College of Charleston in Charleston, South Carolina.

Christian Heckman, Student–Researcher, Teacher Education, College of Charleston in Charleston, South Carolina.

Dillan Smith, Student–Researcher, Teacher Education, College of Charleston in Charleston, South Carolina.

References

Acuff, J. B., Hirak, B., & Nangah, M. (2012). Dismantling a master narrative: Using culturally responsive pedagogy to teach the history of art education. *Art Education*, *65*(5), 6–10.

Bergey, B., & Pich, T. (2017). *Folk masters: A portrait of America*. Indiana University Press.

Henriksen, D. (2014). Full STEAM ahead: Creativity in excellent STEM teaching practices. *STEAM Journal*, *1*(2), Article 15.

Hunter-Doniger, T. (2018a). Art infusion: Ideal conditions for STEAM. *Art Education*, *71*(2), 22–27.

Hunter-Doniger, T. (2018b). Project-based learning: Utilizing artistic pedagogies for educational leadership. *Art Education*, *71*(2), 46–51.

Kraehe, A. M., & Acuff, J. B. (2013). Theoretical considerations for art education research with and about "underserved populations." *Studies in Art Education*, *54*(4), 294–309.

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory Into Practice*, *34*(3), 159–165.

Ladson-Billings, G. (2009). *The dreamkeepers: Successful teachers of African American children* (2nd ed.). Jossey-Bass.

Larnell, G. V., Bullock, E. C., & Jett, C. C. (2016). Rethinking teaching and learning mathematics for social justice from a critical race perspective. *Journal of Education*, *196*(1), 19–29.

Liao, C. (2016). From interdisciplinary to transdisciplinary: An arts-integrated approach to STEAM education. *Art Education*, *69*(6), 44–49.

Lyons, M. E. (1997). *Catching the fire: Philip Simmons, blacksmith* (M. Garcia, Illus.). Houghton Mifflin.

Martin, D. B. (2003). Hidden assumptions and unaddressed questions in *Mathematics for All* rhetoric. *Mathematics Educator*, *13*(2), 7–21.

O'Byrne, W. I., Radakovic, N., Hunter-Doniger, T., Fox, M., Kern, R., & Parnell, S. (2018). Designing spaces for creativity and divergent thinking: Pre-service teachers creating stop motion animation on tablets. *International Journal of Education in Math, Science and Technology*, *6*(2), 182–199.

Radakovic, N. (2018). Teaching and learning risk in the context of mathematics education: From the deficit theory to critical pedagogy of risk. In P. P. Trifonas & S. Jagger (Eds.), *Handbook of cultural studies and education* (pp. 42–51). Routledge.

Verner, I., & Merksamer, A. (2015). Digital design and 3D printing in technology teacher education. *Procedia CIRP*, *36*, 182–186.

Art Education is the official journal of the National Art Education Association (NAEA). Manuscripts are welcome at all times on any aspect of art education. Please submit double-spaced files, in accordance with the *Publication Manual of the American Psychological Association*, 7th edition, to the journal's Editorial Manager site: www.editorialmanager.com/uare/default.aspx. For other correspondence, write to Ami Kantawala, Senior Editor, *Art Education*, at arteducationjournal@gmail.com.

Authors are encouraged to submit 4–6 photographs with their manuscripts. To facilitate the process of anonymous review, the author's name, title, affiliation, mailing address, and phone number should be in a separate one-page file, and not on the manuscript file itself.

Art Education is indexed in the Education Index, and available on microfilm from University Microfilms, Inc., 300 North Zeeb Road, Ann Arbor, MI 48106.

Art Education (ISSN 0004-3125) is published bimonthly in January, March, May, July, September, and November by Taylor & Francis Group, LLC, 530 Walnut Street, Suite 850, Philadelphia, PA 19106, on behalf of NAEA, 901 Prince Street, Alexandria, VA 22314. Phone: (703) 860-8000; www.arteducators.org

Production and Advertising Offices: Taylor & Francis Group, LLC, 530 Walnut Street, Suite 850, Philadelphia, PA 19106. Phone: (215) 625-8900. Production Editor: Nathan Clark.

Subscription Offices, USA/North America: Taylor & Francis Group, LLC, 530 Walnut Street, Suite 850, Philadelphia, PA 19106. Phone: (215) 625-8900. Periodicals postage is paid at Alexandria, VA, and at additional mailing offices. Printed in the USA. More information can be found online at www.tandfonline.com/uare.

Subscription Information: For information and subscription rates, please email subscriptions@tandf.co.uk or visit www.tandfonline.com/pricing/journal/uare. This journal is available via a traditional institutional subscription (either print with online access, or online only at a discount) or as part of our libraries, subject collections, or archives. For more information on our sales packages, please visit www.tandfonline.com/page/librarians. All current institutional subscriptions include online access for any number of concurrent users across a local area network to a selected backfile and articles posted online ahead of publication. Subscriptions purchased at the personal rate may not include online access and are strictly for personal, non-commercial use only. The reselling of personal subscriptions is prohibited. Personal subscriptions must be purchased with a personal check or credit card. Proof of personal status may be requested.

NAEA membership includes subscriptions to *Art Education* and *NAEA News*. See www.arteducators.org or call (800) 299-8321 for membership information.

US Postmaster: Please send address changes to *Art Education*, c/o The Sheridan Press, PO Box 465, Hanover, PA 17331.