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Experimental Approaches to Student Success

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An undergraduate student who hopes to secure meaningful work or pursue graduate studies needs to have excellent grades. This is true for all disciplines, but especially for niche fields like archaeology. Grades alone, however, are rarely enough. Employers and graduate schools seek candidates that are not only 'book smart' but who have life experiences that cultivate strength, perspective and perseverance. Thus, the undergraduate student who is looking beyond graduation must strive to gain these experiences and differentiate themselves from their peers.

> This project helped move knowledge beyond the purview of the professor and into the hands of the students. Instead of written exams to assess learning in this context, the professor can base assessment on the student's ability to distill and disseminate the course information to the public. These skills are highly translatable to employers and prospective graduate school programs.

The following essay highlights the role experimental and experiential archaeology (hereby referred to as EA) can play in helping students make the most of their university education and prepare themselves for the challenges beyond university. Over the past several years working as an archaeology professor at the State University of New York at Potsdam (USA), I have noticed that our most successful graduates are those who actively engage in archaeological learning experiences both in and outside of the regular coursework. These added experiences are the basis of a not-so-secret formula for success: G.R.I.T. – Grades, Research, Involvement and Teaching experience (or public outreach). The following essay explores the importance of EA in generating student enthusiasm, providing them with G.R.I.T. and preparing them for future success.

Scholars have long recognized the pedagogical value of experimental archaeology. Eren (2009) highlights the synergy of EA in archaeological education. His essay explores the ways EA makes students better archaeologists as they learn the "what" and "why" of material culture. Schindler (2016) describes his use of experimental/experiential archaeology in the classroom and the power of "Soul Authorship" to transform student's lives. According to Schindler, this pedagogical strategy challenges students to learn using all their senses as they learn by doing. Clarkson and Shipton (2015) highlight how this pedagogical approach results in high impact learning as students develop their analytical skills while gaining a greater understanding of the subject matter. Many of the insights these scholars put forth are reflected in this essay. The following draws on these works while providing insight into the value of EA in university curriculum as it is applied at the State University of New York at Potsdam (USA).

Grades

Nearly a half century after Paulo Freire's (1968) critique of traditional pedagogy, many universities and educators still rely on (to some degree) "the banking model of education." By this, Friere refers to the one-directional exchange between students (the empty vessels sitting in their seats awaiting deposits of knowledge) and the teacher (the individual with knowledge standing in front of the class). According to Freire, this approach to education fails to reach students and it reinforces an unequal power dynamic within the classroom. As a result, many students tend to struggle and remain uninspired.

Perhaps in response to Freire's pointed critique, the last few decades have brought alternative approaches to education. Today, terms and techniques such as "applied learning" and "experiential education" describe some of these new ways of teaching. According to the State University of New York (2018), *applied learning* involves:

1. learning by doing;
2. having learning objectives that relate to employment; and
3. development of real-world skills.

Proponents of applied learning argue that learning by doing provides a deeper understanding of the subject matter. At the same time, students obtain marketable skills. Furthermore, this approach involves students collaborating as equal participants in the creation and exchange of knowledge.

EA is applied learning at its best. In the classroom, EA enables students to engage with the subject through hands-on activities focused on improving problem solving and critical thinking while providing 'real-world' skills. These activities can take students out of the classroom so that they can actually apply the skills, theories and models presented in traditional lectures.

EA can be deployed in a variety of different pedagogical contexts. By scaling activities accordingly, professors can develop lessons encompassed within a single class or an entire semester. For instance, I teach an "Archaeology of the Eastern North America" seminar, which meets once a week for 2.5 hours. Doing so allows time to introduce the topic and discuss the reading during one week while using extended hands-on activities to reinforce the thematic focus during the following week. For example, conversations about ancient cooking strategies are complemented by a lesson in stone boiling. Students develop hypotheses about the efficacy of different types of stones and the length of time needed to boil. They then test their hypotheses by cooking an extra-large pumpkin utilizing this technology (See Figure 1). Additionally, students must assess the archaeological signature of the activity. This in-depth and highly effective activity, which enables students to deeply understand the subtleties of ancient cooking technologies, takes place within the time frame of a *single* class period. Subsequent essays written outside of class enables students to reinforce what they've learned in class.

On the opposite end of the spectrum, the hands-on/skills based pedagogy can occur over the course of an entire semester. I teach an upper division course in Experimental Archaeology, whereby we explore a specific topic as a means to introduce students to the scientific method and to a range of ancient tool manufacturing techniques. During one semester, the course was centered on the creation of a dugout canoe. Students learned how to conduct a research project using experimental archaeology while participating in a study exploring the amount of fuel wood needed to burn out a 16ft. white pine log-boat. On the last day of the semester, the

students launched and paddled the canoe. Beyond boat-building, the students gained experience testing the limits of ground stone tools and fire for shaping wood. They also learned to overcome adversity as this project required them to work in close proximity to fire in the summer heat and rain.

In both of these examples, EA provided a way for students to engage with course materials using an applied learning approach. Students seem to more easily absorb and enjoy information presented in this manner. For many students, this leads to improved performance and higher grade-point averages on labs and tests.

Research

Honours theses and independent studies provide added value to a university education. These high impact learning experiences demonstrate to a graduate admissions committee that the applicant is ready to take on the rigors of graduate school. EA provides a way for students to fully navigate the research process. These steps include:

1. formulating a research question,
2. developing a methodology,
3. collecting data,
4. interpreting findings,
5. articulating conclusions, and
6. the dissemination of findings.

Students interested in conducting independent research are encouraged to choose a topic that intrigues them. Through consultation with faculty, students then work towards developing a valid research question. For instance, Julia was interested in human osteology and ancient crematory practices. Her work intended to identify which types of bone have the greatest potential to survive the cremation process and in what ways does cremation affect bone morphology? EA then enabled this student to develop a methodology which allowed her to answer these questions. Using two 100lb fully intact pigs (*Sus scrofa domesticus*) as proxy, Julia established two funerary pyres according to techniques common amongst traditional societies in the northern latitudes (See Figure 2). Once the bodies were fully consumed and the coals cooled, Julia and several student volunteers, excavated 100% of the residuum from both pyres. The data collection portion of the study involved identifying, measuring and weighing the calcined bone in each pyre. She then compared findings from each pyre to arrive at her conclusions.

Dissemination of findings is the final step in the research process. This step provides students with a sense of accomplishment and an impressive entry on their resume. Moreover, it also gives them important professional experience, including attending and delivering

presentations at professional conferences. In the case of Julia's cremation study, she presented her work at the undergraduate research fair in Spokane, Washington and the annual meetings of the Northeast Anthropological Association. Students should also seek out opportunities to publish their work.

Involvement

Here, 'involvement' refers to the development of an interest. Students need experience volunteering with experts and learning about different topics and technologies. At the same time, unstructured 'play', or experiential archaeology, provides them with the ability to familiarize themselves with a topic, technology or time period.

For example, SUNY Potsdam's Department of Anthropology has an intercollegiate atlatl team. Every fall, 20-30 students attend practice twice a week as they gear up for the annual Atlatl Battle. This activity builds community in our student population. It also serves as a way to reinforce topics presented in class. But most importantly, the students have fun. Being involved with the atlatl team also has intellectual benefits. Many students exchange different questions and ideas about how, when and why different ancient people used this ancient weapons system.

Involvement increases one's comfort level which can lead to proficiency. As a student learns, they are then able to identify potential questions to pursue as part of a research agenda. Experiential approaches also provide insight into how best to structure controlled experiments needed to answer rigorous research oriented questions.

Teaching (public outreach)

The dissemination of information is critical to archaeological practice. As undergraduates, students need experience engaging the public in and out of the classroom. EA has an unparalleled ability to connect the past with the present, the public with academics, and teachers with students. The following details two different approaches designed to provide students with different types of teaching experience.

Teaching Assistants

Archaeological Studies majors need to take Introduction to Archaeology. Each year faculty invite several of our advanced undergraduate students to serve as teaching assistants for this course. The teaching assistant experience is intended to instruct these students on pedagogical strategies that they then apply on a weekly basis. Part of the TA's responsibilities include developing a lab that highlights the utility of experimental archaeology. In doing so, the TA's learn how to navigate the research process and, by extension, they and their students experience the value of experimental archaeology for learning about the past.

Developing TA labs usually takes most of the semester. During weekly meetings, we first discuss formulating learning outcomes. For example, one TA, interested in historical archaeology, wanted her students to assess whether or not the damage present on 19th century ceramic sherds could be identified and linked to a specific behavior (i.e. dropped, trampled or burned). Once a research question was established, the TAs then needed to develop a methodology which will allow their students to test the hypothesis. In the example above, the TA formulated three different stations where her students broke/damaged ceramics in historically accurate ways. The first station involved students dropping saucers and cups from waist height onto a stone floor. At the trampling station, several saucers and plates were buried in a loose matrix of sediment. The students then walked across the surface for a standard length of time. At the third post, students repeatedly heated tea cups at 400 degrees Fahrenheit and then submerged them in ice-water.

Student's participating in these labs gain first-hand experience producing knowledge. The activities/methods the TAs develop result in a tangible dataset that the students then analyze and interpret. In regards to the 19th century ceramic taphonomy lab, after working at each station, the students are charged with describing the damage to each assemblage. Using this information, the students attempted to classify an assemblage of unknown archaeological specimens. The students quickly realize that they can, with a fair degree of confidence, identify some of the unknowns but other specimens require more work.

The final step in this process involves establishing assessment tools. The TA determines the sorts of questions or assignments which will best assess student learning. Often these involve essay responses, presentations and drawings. After the lab, the TA then grades the student labs. This process allows them to evaluate learning, and it also forces them to critically assess their own work and how to improve their activities and assessment tools. At the end of term, each TA must deliver a critical evaluation of their lab along with recommendations for improvement.

The TA lab has proven a successful assignment for advanced undergraduate students. First, it provides a way for the TAs to gain experience in all aspects of developing an effective hands-on applied learning lesson plan. It also demonstrates the value of experimental archaeology to their students. Lastly, as discussed above, it provides the students with an engaging pedagogical approach.

Public Outreach

Knowledge created in the classroom need not stay in the classroom. In fact, by sharing the results of their EA research, students gain valuable experience working with the public. In return, the public often enjoys hearing and learning of these projects. For this reason, museums often incorporate EA practitioners into their displays. Educators can work with local

museums and historical societies to establish a context/venue through which students can gain similar experiences engaging the public.

The upper division Experimental Archaeology course, discussed above, exemplifies this approach. This class culminates in a thematically focused class project that changes each semester. In years past, the students launched the dugout canoe they built during the semester (See Figure 3). Most recently, we examined the popular belief that the Adirondack mountains of northern New York were largely uninhabited prior to European colonization due to limited food availability. Proponents of this belief cite the name of the region as proof – 'Adirondack', an Iroquoian term meaning "bark eater" (Sulavik 2005). The students taking EA formulated a hypothesis that contrary to popular belief, hunting and gathering people likely found sufficient food available in the upland forests, rivers, and lakes. Through extensive background research the students found support for their hypothesis. They then set forth to apply their knowledge of the past in a modern context. Meaning, they hosted an "Adirondack pancake breakfast" at a local museum (TAUNY) (See Figure 4). Twelve students cooked pancakes seasoned with the cambium of white pine trees (i.e. bark), local blueberries and maple syrup (prepared by the students from maple trees on campus). Twenty-five members of the public enjoyed the pine bark pancakes. The students also presented their research as part of the event.

This project helped move knowledge beyond the purview of the professor and into the hands of the students. Instead of written exams to assess learning in this context, the professor can base assessment on the student's ability to distill and disseminate the course information to the public. These skills are highly translatable to employers and prospective graduate school programs.

Conclusions: To succeed in archaeology a student needs GRIT (Grades, Research, Involvement and Teaching). As scholars and educators, we can work to cultivate enthusiasm, engagement and high-impact learning. Experimental Archaeology has proven a successful pedagogical approach that allows students to navigate GRIT in meaningful ways. The culmination of these experiences not only results in an impressive resume, but also a disposition and drive needed for future success. In doing so, these experiences and opportunities help make well-rounded archaeologists.

Keywords education
teaching

Country USA

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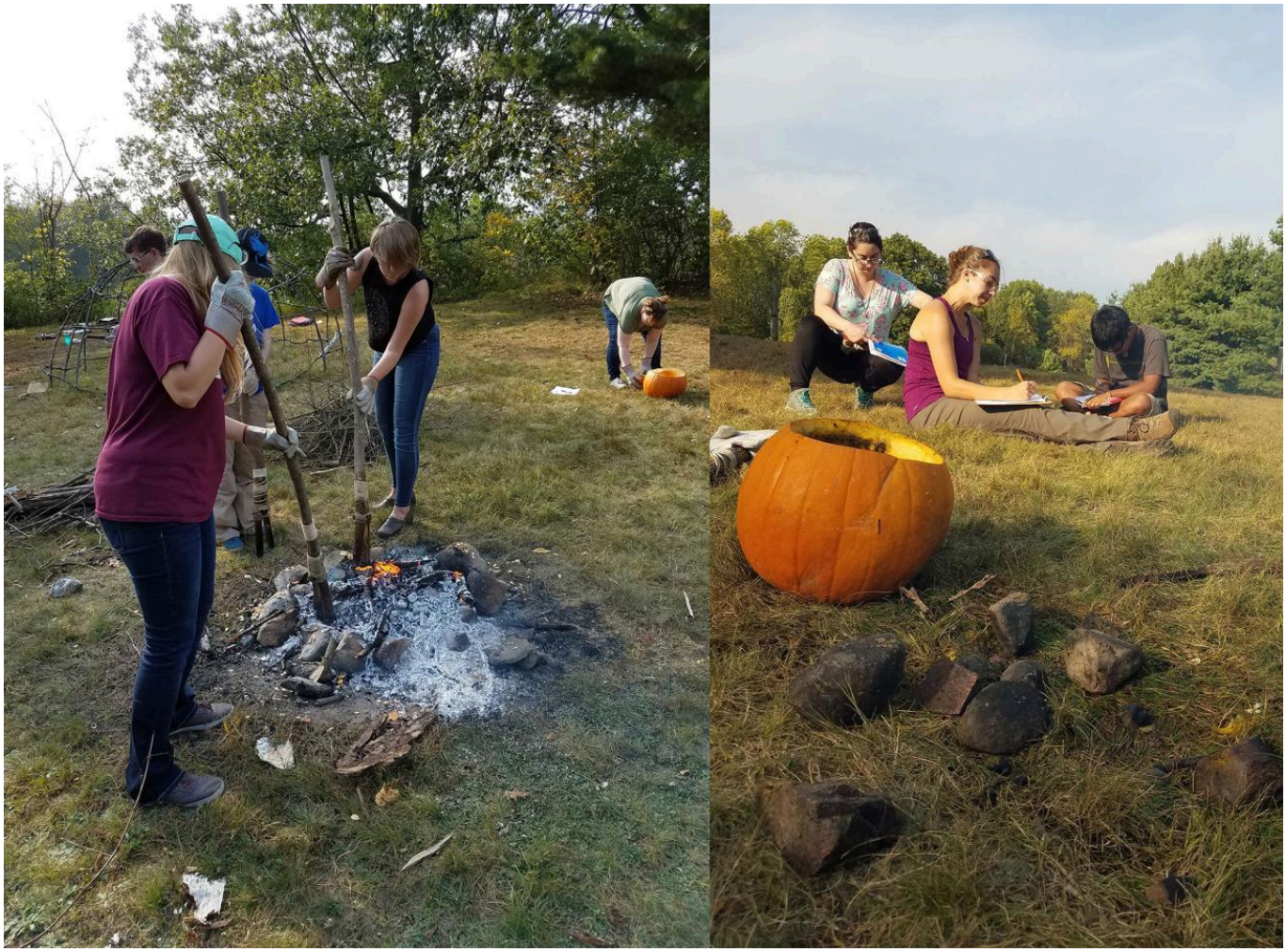

FIG 1. STUDENTS LEARN THE PRINCIPLES OF HYPOTHESIS TESTING THROUGH HANDS ON CLASSROOM ACTIVITIES. HERE STUDENTS ARE TESTING THE EFFICACY AND ARCHAEOLOGICAL VISIBILITY OF STONE BOILING WITHIN A LARGE PUMPKIN (CUCURBITA PEPO). COPYRIGHT: TIM MESSNER

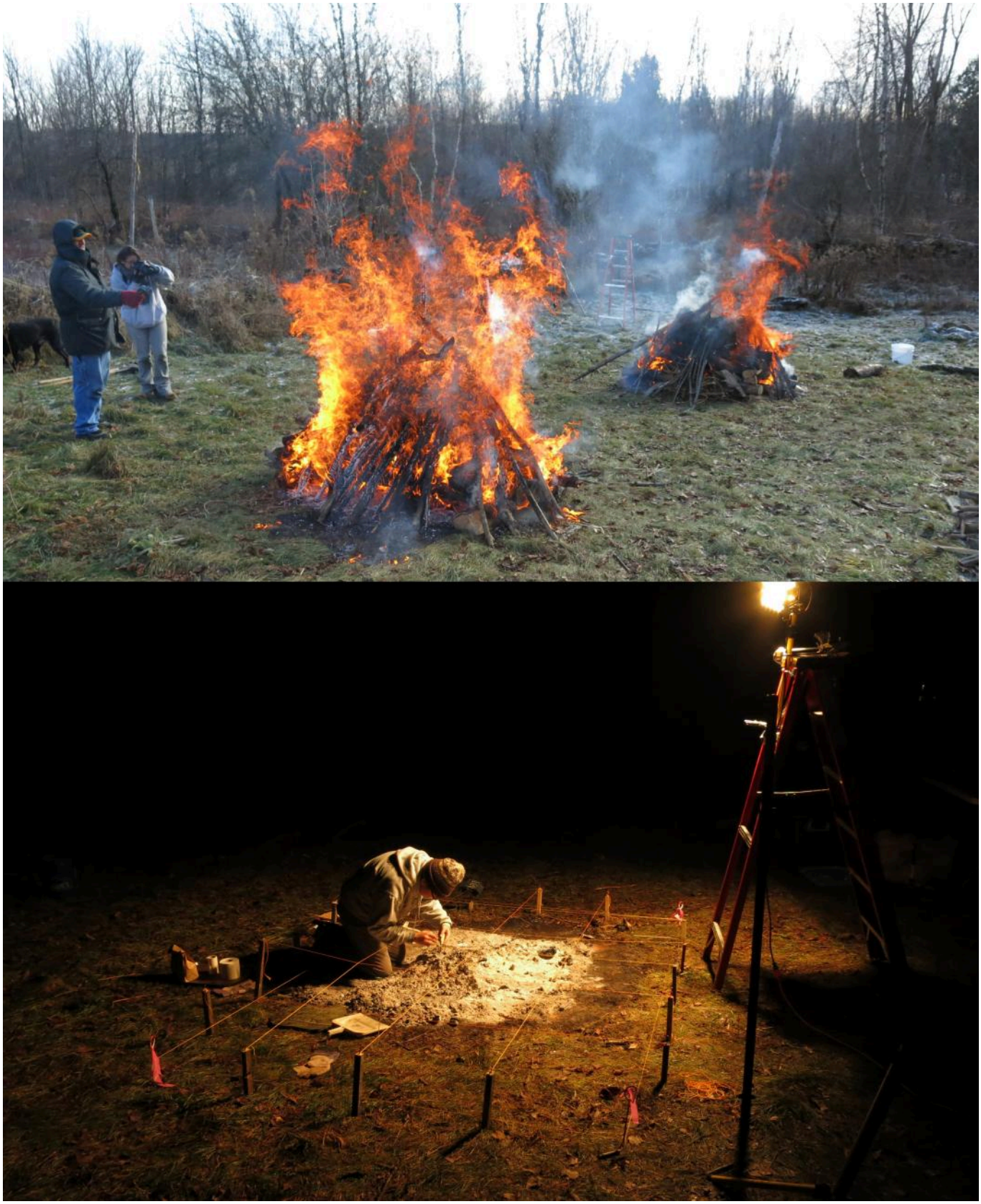

FIG 2. INDEPENDENT STUDIES AND HONORS THESES GROUNDED IN EXPERIMENTAL ARCHAEOLOGY PROVIDE STUDENTS WITH THE ABILITY TO NAVIGATE THE ENTIRE RESEARCH PROCESS. HERE A STUDENT IS STUDYING THE OUTCOME OF OPEN-AIR CREMATION BY UTILIZING PIGS (SUS DOMESTICUS) IN SUBSTITUTE FOR PEOPLE. 100% OF ALL REMAINS WERE RECOVERED AND ANALYZED. COPYRIGHT: TIM MESSNER

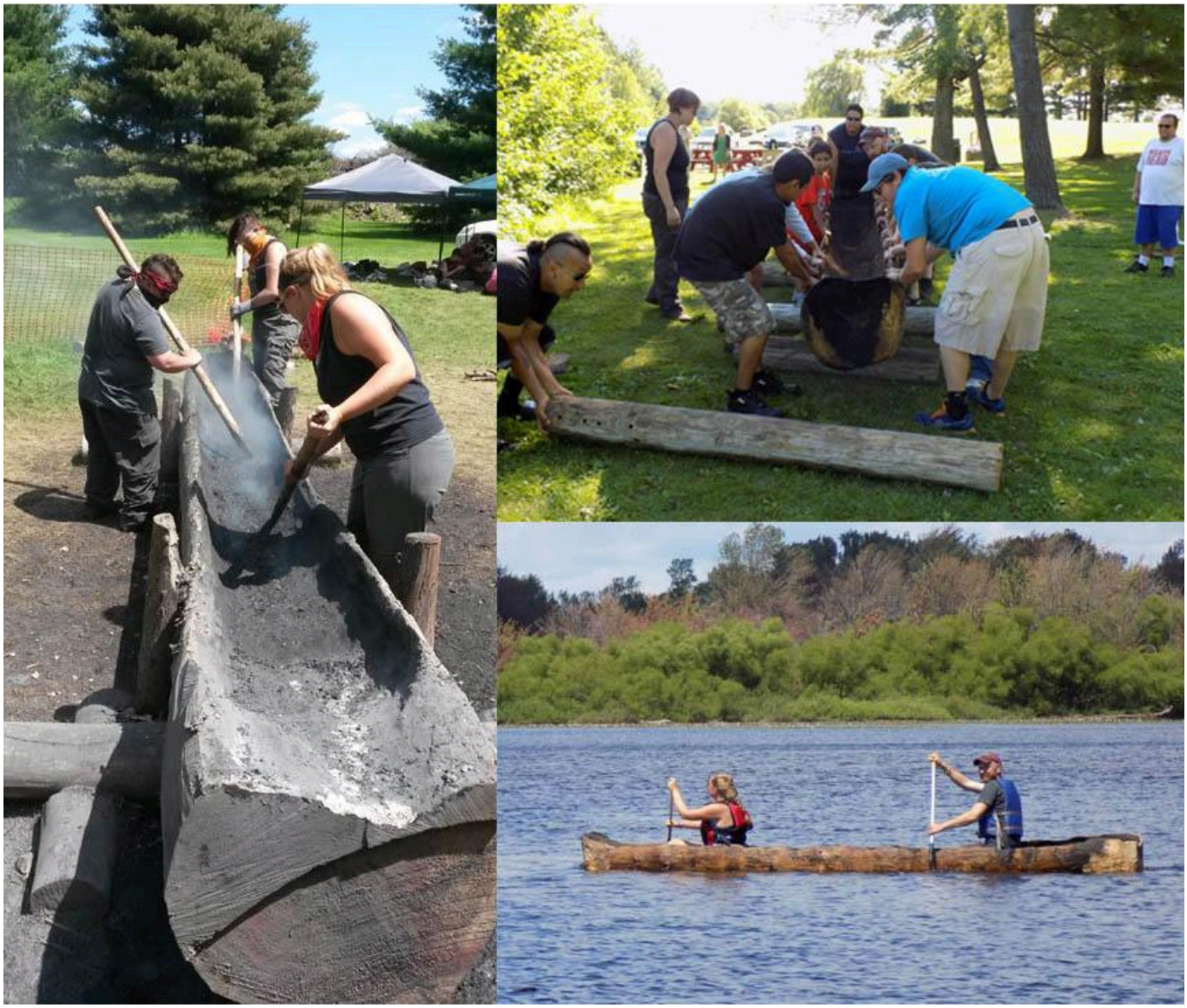

FIG 3. WHEN TEACHING EXPERIMENTAL ARCHAEOLOGY, THE CLASS IS CENTERED AROUND A COMMON THEME. FOR INSTANCE, ONE PROJECT FOCUSED ON BUILDING A STONE-AGE DUGOUT CANOE. COPYRIGHT: TIM MESSNER

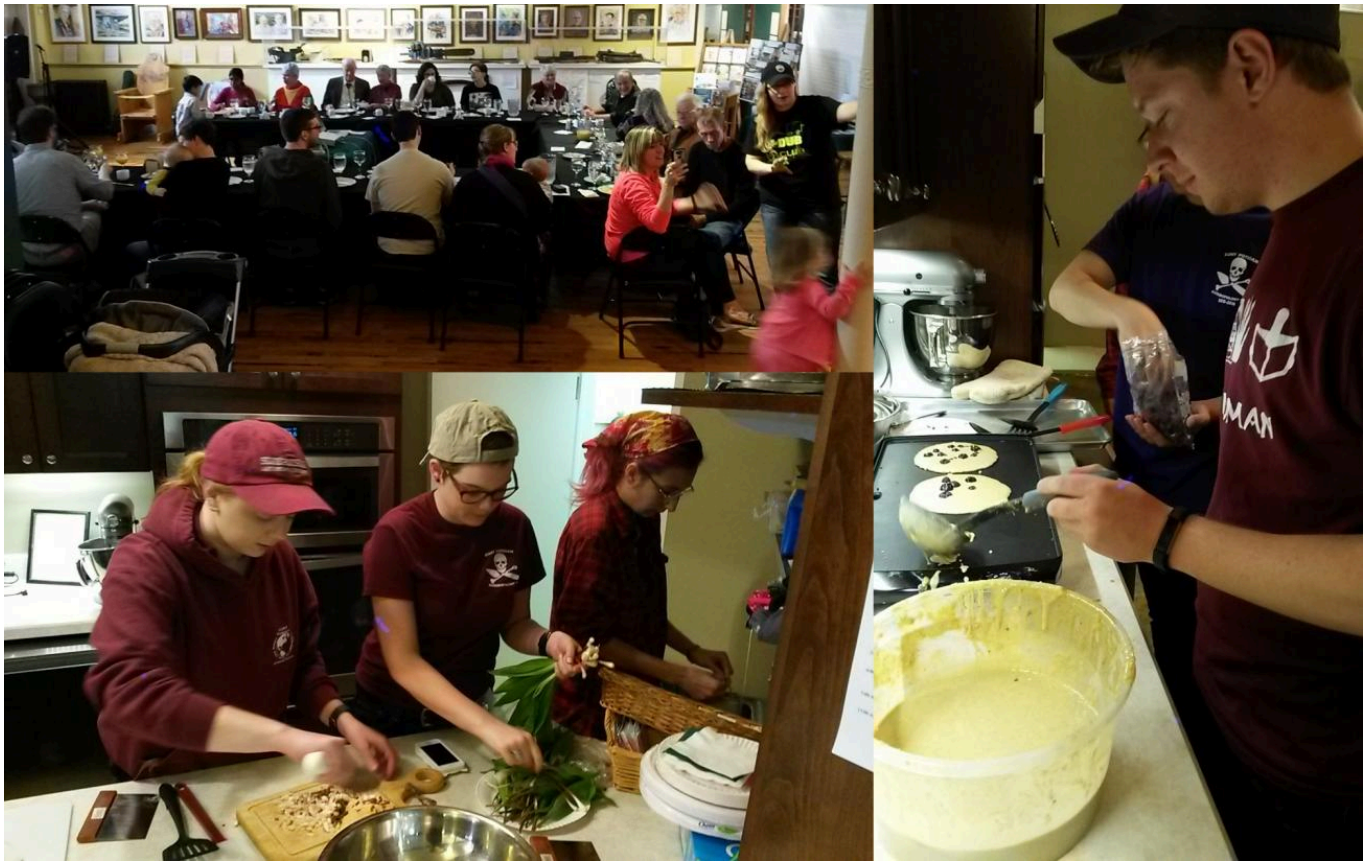

FIG 4. STUDENT'S TAKING EXPERIMENTAL ARCHAEOLOGY PARTNERED WITH A LOCAL MUSEUM TO HOST A TRADITIONAL BREAKFAST WHICH INCLUDED PINE BARK (PINUS SP.) PANCAKES COVERED IN STUDENT MADE MAPLE SYRUP. COPYRIGHT: TIM MESSNER