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"Measuring bones": A cross-disciplinary experiential learning event to increase awareness that math is everywhere

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Community colleges serve a substantial percentage of college-age students in the United States, many of whom arrive with negative attitudes toward mathematics, despite there being many STEM-related fields available to community college graduates. The current paper summarizes the creation of a day-long activity that assists students in developing applied mathematical skills in a format that aligns with the experiential learning theory. Students at a community college in Texas are learning math by engaging with a popular topic, crime scene investigation, through an annual event, established in 2017, called NVCsi. Students interact with hands-on activities that combine forensics, mathematics, and other disciplines. The implementation of the event is described so that other colleges can develop their own experiential learning event. Planned data collection for future event cycles are described, as are limitations and constraints of the NVCsi event with a discussion of planned modifications.

KEYWORDS

experiential learning, student activities, STEM, higher education, career exploration, cross-discipline, forensics

Introduction

Students at Northwest Vista College's (NVC) campus are engaging with a popular topic, forensic science, through the NVCsi event. The day-long activity assists students in developing applied mathematical skills in an experiential learning (EL) way that aims to increase awareness of the cross disciplinary application of mathematics as well as increase interest in mathematics and science fields. The current paper will summarize the rationale and theory behind the creation of the NVCsi event as well as describe the implementation of the event.

There is a consensus that the demand for STEM (science, technology, engineering, and mathematics) graduates outpaces the number of qualified individuals entering the workforce and there is a need to attract greater numbers of students to these fields (Osborne et al., 2003; Olson and Riordan, 2012; Mujtaba et al., 2014; Reiss and Mujtaba, 2017; Baran et al., 2019; Sánchez et al., 2019; US Department of Education, 2023). A common explanation is that an understanding of and appreciation for the relevance of mathematics to a range of careers (and daily life) varies dramatically and is often lacking (Ashcraft, 2002;

Brown et al., 2008; Mujtaba et al., 2014; Weinberg et al., 2015; Baran et al., 2019; Commodari and La Rosa, 2021; Fitzmaurice et al., 2021). Linking mathematics to career choices can increase motivation to study mathematics which relates to increased interest and attainment in mathematics classes (Mujtaba et al., 2014, 2015; Fitzmaurice et al., 2021). Negative attitudes toward mathematics, mathematics anxiety (MA), mathematics avoidance, and lower mathematics skills can limit career options, career interest, and advancement (Hembree, 1990; Chipman et al., 1992; Ashcraft, 2002; Brown et al., 2008; Mujtaba et al., 2014; Dowker et al., 2016; Eidlin Levy et al., 2021).

"The number of STEM jobs is growing twice as fast as non-STEM careers … the STEM fields that are expected to see the most growth … include statistics (35.4% growth), information security (33.3%), epidemiology (29.6%), and computer science (21.9%)" (Adecco, 2023, para. 3). The number of new positions for forensic science technicians has a projected growth of 13% between 2022 to 2032, which is higher than that of other occupations (U.S. Bureau of Labor Statistics, 2024).To meet workforce demands, we must improve attitudes toward mathematics and increase students' awareness of the application of mathematics. Making STEM learning, with a focus on mathematics, relevant and applicable to career fields has been demonstrated to increase interest in and attitudes toward mathematics, and STEM fields more broadly (Mujtaba et al., 2014; Weinberg et al., 2015; Baran et al., 2019; Mutmainah and Indriayu, 2019; Venkatraman et al., 2019; Fitzmaurice et al., 2021; Kong, 2021; Uyen et al., 2022; Connolly et al., 2023).

Pedagogical principles

According to Kolb (2015), EL is "the process whereby knowledge is created through the transformation of experience" (The Process of Experiential Learning). EL is a high-impact pedagogical practice that has been gaining momentum (Kolb and Kolb, 2017). EL theory describes learning as a four-stage learning cycle where the learner plays an active role in the acquisition and construction of knowledge (Kolb, 2015; Kolb and Kolb, 2017). Learning is viewed as a process to engage in rather than an outcome to arrive at.

EL is a pedagogical framework that can increase the learning of content (Hammer, 2000; Mutmainah and Indriayu, 2019; Venkatraman et al., 2019) and improve self-efficacy (Weinberg et al., 2015), engagement, motivation and attitudes toward learning (Weinberg et al., 2015; Venkatraman et al., 2019; Kong, 2021; Uyen et al., 2022), creativity (Chesimet et al., 2016), and student success (Groves et al., 2013). Learning guided by EL theory has been used to engage learners and improve learning outcomes in a diverse learning settings (Kolb and Kolb, 2017), from elementary (e.g., Mutmainah and Indriayu, 2019; Connolly et al., 2023) though middle and high school (e.g., Weinberg et al., 2015; Chesimet et al., 2016; Uyen et al., 2022), and in higher education (Hammer, 2000; Groves et al., 2013; Sánchez et al., 2019; Venkatraman et al., 2019; Kang et al., 2022). One mechanism by which EL results in these outcomes is by making obvious the connections between the material being learned and real-world and workforce skills (Efstratia, 2014; Venkatraman et al., 2019; Kang et al., 2022).

EL has been applied to the task of increasing engagement with mathematics and science (Venkatraman et al., 2019; Connolly et al., 2023), improving attitudes toward mathematics and science content and careers (Weinberg et al., 2015; Venkatraman et al., 2019; Fitzmaurice et al., 2021; Uyen et al., 2022), as well as improving mathematics achievement and creativity (Chesimet et al., 2016; Mutmainah and Indriayu, 2019; Venkatraman et al., 2019; Uyen et al., 2022).

What we created: NVCsi

In the current paper we describe an EL event composed of multiple hands-on activities, hereafter termed exhibits. The focus is to engage college students with mathematic concepts in a way that makes explicit the link between mathematics and other disciplines. In this way our EL was like that described by Weinberg et al. (2015), except that ours was a single day event targeting college students rather than a multiweek camp targeting middle school students. At each exhibit mathematics was linked to an area of popular interest, forensics. In most cases, the exhibits also linked to another discipline. We named our event NVCsi, the first part is the abbreviation of the name of our college (NVC) and the second part is a link to forensics (crime scene investigation, CSI).

Our EL event allows separate disciplines to build an exhibit around the central theme of math and forensics. These individually created discipline specific, EL exhibits aid students in understanding the real-world applications of their favorite subjects and expose them to new and surprising applications for subjects they were not as familiar with, thus supporting the idea above that EL increases engagement and attitudes of students regarding math and science content and careers.

Setting

NVC is a public community college in the Alamo Community Colleges District (ACCD) located in San Antonio, Texas. In Fall 2023 enrollment was just over 18,800 and graduation rates for the past 5 years have ranged between 2,644 and 3,239. NVC is designated as a Hispanic Serving Institution and it serves many first time in college students and military veterans. Most students are enrolled part time, and it is a commuter campus (all students live off campus and commute to the school daily or attend online).

At NVC students can earn Associates degrees (33 two-year degrees), Certificates (12 certificate programs), Marketable Skill Achievement awards, transferable academic credits, and continuing education credits. Students can earn an Associates of Arts or Science in a variety of STEM-related disciplines from Biology and Chemistry to Psychology and Engineering. Beginning in the fall of 2024 students will also be able to earn a Bachelor of Applied Technology in Cloud Computing.

The college's recent completed quality enhancement plan focused on "equip[ing] students with information literacy skills that [will] show them how to find, ethically use, synthesize, and evaluate information in their classes and their co-curricular programs" (Northwest Vista College, 2023, para. 1). NVCsi aligned with the quality enhancement plan, as well as with other college initiatives focused on student engagement, achievement, and semester to semester retention.

Learning objectives

The inaugural NVCsi event occurred in 2017 and has been repeated annually (most recently in 2023) with interruptions only occurring in response to the global pandemic. The learning objectives are to increase engagement with mathematics, encourage cross-discipline synthesis of learning, increase critical thinking skills, and decrease MA. Assessment of these learning goals is a work in progress and is the focus of our efforts now that the event has become established. It is our belief and experience that NVCsi has had a substantial positive impact on students at our college. Another focus is to encourage other campuses to create a similar event.

Community colleges and STEM education

Enrollment in higher education is recovering following the global pandemic, and enrollment at community colleges is leading growth nationwide. There was a 2.6% increase of students in the fall of 2023 (Whissemore, 2024). This increase is reflected in Texas, where enrollment at community colleges has increased 4.25% relative to 2021, though the numbers are still not at pre-pandemic levels. Locally, the ACCD has experienced an increase of approximately 3% from Fall 2020 to 2023.

Community colleges have open access enrollment, which results in the admission of many underprepared students (Pratt, 2017). Trends in Texas reflect those at the national level (Bailey et al., 2010; Meiselman and Schudde, 2022). In Texas in 2019, 39% of first time in college (FTIC) students entered underprepared, this increased to 58% when considering only students enrolling at a community college (Texas Higher Education Coordinating Board, 2021). In 2019, statewide 64% of FTIC students were underprepared in mathematics. This poses a dilemma since students who enter college underprepared are less likely to graduate (Pratt, 2017).

Attitudes toward mathematics strongly influences student's performance (Dogbey, 2010; Mazana et al., 2019; Ortiz, 2023). A positive attitude can improve learning, and a negative attitude can hinder learning (Mazana et al., 2019). Furthermore, the more that students recognize the usefulness of mathematics, the greater their motivation to study mathematics (Mazana et al., 2019). Overall students tend to have a positive attitude toward mathematics; however, attitudes are indifferent or mixed in relation to confidence, anxiety, and motivation (Dogbey, 2010). Community college students in Texas enrolled in developmental mathematics courses tended to report a negative attitude toward mathematics (Ortiz, 2023).

Given that mathematics is increasingly being needed in many careers available and of interest to community college graduates, combined with the need to bring many of students up to and successful in college level math, NVCsi uses EL activities to engage students in real-life scenarios, with a focus on forensic sciences. This helps students see the need for basic math skills in any field of study and for life and encourages students to see learning mathematics as both interesting and engaging. Through NVCsi, students see the advantage of pursuing an interest in STEM related fields, in particular forensic sciences.

Mathematics education in Texas

In Texas mathematics is taught through all years of education and graduation requires at least 4 high school level mathematics courses (Texas Education Agency, 2024a,b). It is beyond the scope of this paper to outline all the Texas Essential Knowledge and Skills (TEKS) associated with the high school mathematics courses, for that information we direct our readers to the Texas Education Agency website. To give a general sense of the topics covered, Algebra 2 includes TEKS that encompass quadratic functions, exponential functions, and systems equations.

In Texas the TEKS are assessed with the standardized assessments (Texas Education Agency, 2024c). Mathematics TEKS are assessed each year from grade 3 through grade 8, as well as at the completion of Algebra 1. End of course results for Algebra 1 in 2023 indicated that 45% of students met performance standards (with an additional 33% approaching meeting the standards; Texas Education Agency, 2023). Performance varies as a function of socio-economic status, with 36% of economically disadvantaged students meeting the Algebra 1 TEKS in contrast to 61% of non-economically disadvantaged students. Performance results are also available as a function of ethnicity. Thirty-nine percent of Hispanic students met the Algebra 1 TEKS. Performance is improving but has not yet returned to pre-COVID levels.

In a typical Texas community college setting, many students attempt to fulfill their core math curriculum requirement for their selected major. In most cases a freshman level 3-to-4-h math course is required such as College Algebra (either Calculus or non-Calculus based), Statistics or Contemporary Math (Quantitative Reasoning). For students wishing to pursue a degree in a STEM related field, upper-level mathematics courses are offered. However, as stated previously, many of the students who attend community college are underprepared and thus must take a developmental math course.

Learning environment

Participants

NVCsi is an annual day-long, multidisciplinary event, with student, staff, and faculty participation as well as community partnerships. The event has grown in participation each year. The inaugural event involved five disciplines (Accounting, Anthropology, Biology, Mathematics, and Psychology) as well as one campus partnership (Alamo Colleges Police Department (ACPD)). That year there were seven interactive exhibits, each linked to both mathematics and forensics. An effort is made to have several exhibits connected to each other, such as having students take photographs (Fine Arts department) and measurements (Mathematics department) of a crime scene grid (ACPD) as well as interview "witnesses" (Speech department) at the crime scene and write up the information into a report (English department). The most recent event, held in 2023, involved 10 disciplines (Anthropology, Fine Arts, Biology, Criminal Justice, Mathematics, Engineering, English, Psychology, and Speech), three campus partnerships (ACPD, Risk Management, and Library Sciences), and six community partnerships. In 2023 NVCsi there were over 25 interactive exhibits, each one with a link to both mathematics and forensics.

Planning and coordination of the event

As with most large-scale campus events, NVCsi has become what it is through careful and systematic growth. Each event cycle ends, and the next one begins, with reflection on what went well and should be repeated in future events, as well as a reflection on what did not go well and should be revised. The growth of the event happens as faculty and campus partners see the event itself, get inspiration for their own exhibits, and understand the time commitment that will be required of them. It has been our observation that the presenters' experience is overwhelmingly positive, and many presenters return to present at the event year after year.

Our event has always occurred in the spring semester, and we have settled upon mid-March as the ideal time. This timing works well with the timing of funding applications at our college, the timing of the necessary planning meetings, and the weather is amenable to an outdoor event. When faculty return in the fall, it is approximately 7 to 8 months out from the event. Planning increases in January, when faculty return from winter break. Our event is designed for students, rather than community engagement, therefore we schedule the event during the week because NVC does not currently offer many evening or weekend classes. Typically, the event runs for 5–6 h, starting between 9 and 10 am and ending between 3 and 4 pm. This timing coincides with when most classes are scheduled which maximizes foot traffic at the event.

One year before the event

Preparations start at least a year before the event occurs, because depending on institutional policies and procedures, several decisions need to be made 11 to 12 months in advance. At NVC those early decisions include securing potential dates for the event as well as selecting and reserving the venue(s) that will be used. We choose to coordinate our event with another large-scale event at our campus whose topic dovetails well with our own. However, we avoid overlapping with other events to encourage student participation, increase presenter participation levels, and secure a venue on campus that encourages foot traffic and exposure. When securing the venue so far in advance, we often only have a general idea of the amount of space that we will require, so we err on the side of caution and reserve more space. This has allowed us to grow the event as interest has increased.

Another logistical consideration that needs to be made early in the planning cycle is the application for, and securing of, funding. This allows for the creation of a budget which impacts the types of exhibits that are possible as well as the purchase of supplies. It has been our experience that a budget for food and drinks is important as it results in a lot of initial foot traffic that then translates into students interacting with the exhibits.

7 to 8 months before the event

Approximately 7–8 months before the event we begin to plan more of the details for the event and the date for the event is finalized. We gage interest among past presenters and generate interest in new presenters, including inviting community partners to come to campus. In recent years we have started to invite student clubs and honor societies to participate in the event. As presenters commit to having an exhibit, we start to order the supplies they require. Many supplies can be reused, though some need to be repurchased and/or replenished. It is important to confirm with the institution when the last day to order supplies is so that important deadlines are met. Around this time, we start working with the public relations department to draft flyers and other documents that will be used to advertise the event (see Figure 1).

Final preparations

In the months before the event a lot has been planned, and now many things that need to be finalized. At this point the exhibits are finalized, and supplies distributed to the presenters. As the exhibits are finalized a passport (see Figure 2) is created to track participation (see planned assessments for further details). A map showing where each exhibit will be located is needed, to ensure that those who have specific needs (e.g., access to electricity) have access to them. The map should be shared at multiple meetings and via email to reduce the need for last-minute changes. Marketing and advertising for the event starts at least a few weeks before the event occurs.

In terms of logistical details, items such as food and drink purchases are finalized, IT requests are submitted, work orders for tables/chairs/canopies are submitted, and requests for volunteers are made. Partnerships and communication with the appropriate campus departments are critical for the smooth operation of these logistical details.

Venue and exhibits

The location of the event has a substantial impact on the success of the event as a large portion of the student participation comes from foot traffic. Advertising occurs at both the campus and course level in the form of in-class announcements, campus fliers, and college-wide emails targeting both faculty and students. At our campus we have chosen a central location for the event, with access to electricity since some exhibits require it. Our event occurs outside, which means that we need to provide shade and shelter for both presenters and participants. Depending on your climate and campus you may need to choose an indoor location.

Exhibits

The broad theme of NVCsi is that math is a part of everyday life, and that elements of math can be found in a wide variety of disciplines. As a result, each exhibit links to math in some way. A secondary theme is forensics; therefore most exhibits also link to forensics.

Faculty have been incredibly creative in finding ways to link less obvious disciplines to these themes. It has been our experience that all disciplines and campus departments have been able to participate, making this event good at building community and collaboration. At NVC individual instructors are responsible for the selection of assignments in their courses, therefore follow-up assignments to the

FIGURE 1
Flyer advertising event from the 2023 cycle.

NVCsi exhibits are at the discretion of the instructors. Some have chosen to have graded assignments, such as submitting evidence of attendance or writing a short statement about what they learned at the exhibits (see Supplementary materials 1). At present no systematic data has been collected on how many professors are including this type of assignment, nor has student feedback been collected. Both forms of data are planned for future event cycles since they will provide evidence of the second and third stages of the EL theory learning cycle (Kolb, 2015; Kolb and Kolb, 2017).

One of the centerpieces is a crime scene grid "Measuring Bones" that is designed and run by the ACPD. An area is marked out with stakes and string into a grid formation and pieces of evidence are distributed in the grid (see Figure 3). Student participants work together to measure the location of evidence relative to each other (see Supplementary materials 2) and plot the evidence on a grid, with scaled measurements and relative positions accurately represented. The various pieces of evidence are also labeled on the diagram. The evidence varies from year to year, but has included bones, receipts,

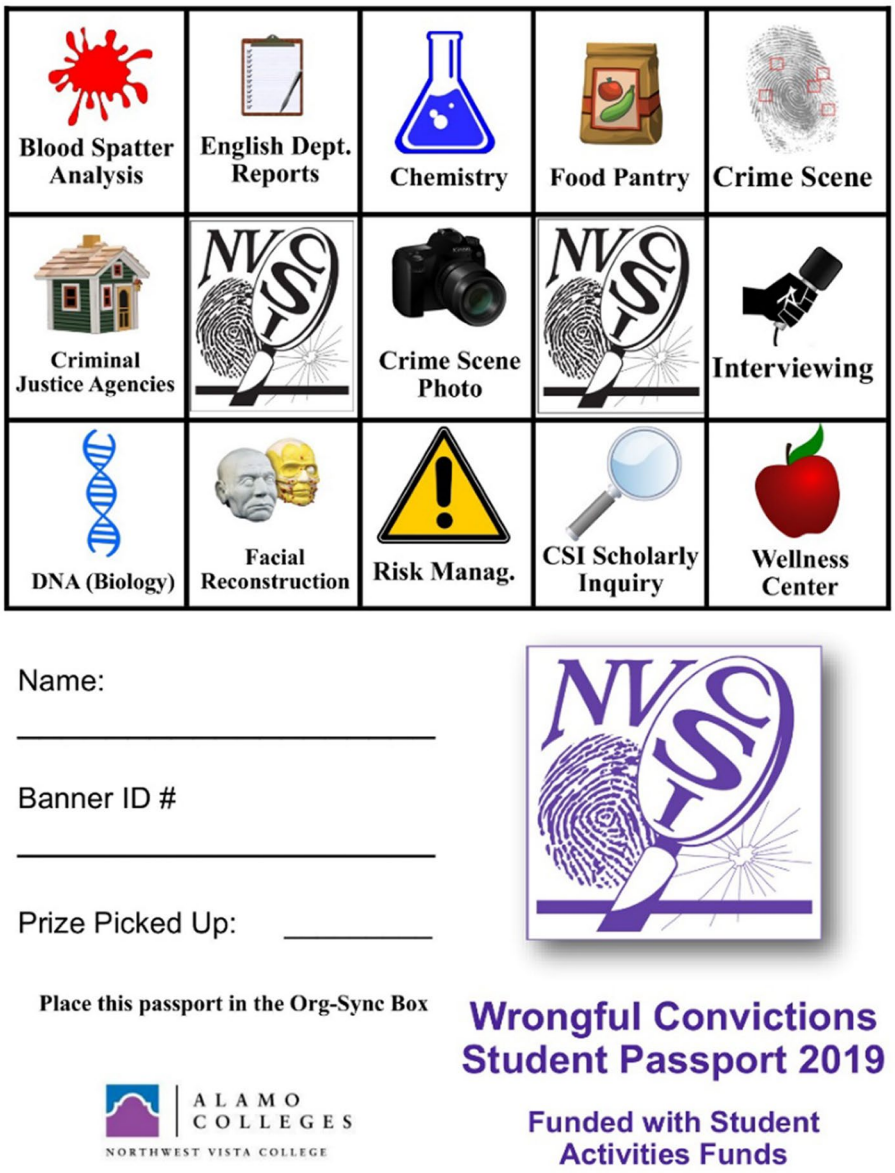

FIGURE 2
Passport engagement tracker from NVCsi event held in 2019.

and skid marks. At an exhibit presented by the English department students learn how to write up the information from the grid into a report. At an exhibit presented by the Fine Arts department students learn how to take photographs of the evidence and how to integrate them into their written report. At an exhibit by the speech department students learn how to interview a witness and use inductive reasoning to move from the specific evidence to a conclusion. Other departments could link into the crime scene grid by measuring the size of the bones that can be included in the grid to determine the sex of the victim.

Not all of the exhibits link to the crime scene grid, and some vary from one event cycle to another. All exhibits involve an interactive EL component. One exhibit that is regularly repeated is a facial reconstruction exhibit presented by the anthropology department (see Figure 4). This exhibit looks at measurements between facial elements and uses modeling clay to create the reconstruction. A blood spatter exhibit is presented by the mathematics department (see Figure 5). The exhibit looks at the trajectory of spatter to determine a likely point of origin. At the 2023 NVCsi event the psychology department partnered with Therapy Animals of San Antonio, a non-profit organization. Their volunteers brought therapy animals to campus to interact with students. Students learned about animal-assisted therapy, how therapy animals are used to help victims, and how the efficacy of animal-assisted therapy could be evaluated with the scientific method and statistical tests.

Formative assessment of the event

Results to date

Our primary goal has been to establish and grow this event from a small group of disciplines to a large established annual

FIGURE 3
Crime scene grid layout.

FIGURE 4
Facial reconstruction exhibit.

FIGURE 5
Blood spatter exhibit.

event. As mentioned previously, the event has grown from seven interactive elements in 2017 to over 25 interactive elements in 2023 and has grown over the same time frame from six to over 15 different collaborating groups involved in the planning and implementation of the event. Student attendance has also grown from an estimated 200–250 participants in 2017 to an estimated 300–350 participants in 2023, and additional growth is expected as activity on campus continues to grow following the global pandemic.

If NVCsi is to be replicated, the impact of the event needs to be formally assessed to convince stakeholders (students, administrators, and presenters) of the value added by the experiential learning event (Chan, 2023). Since the EL is not directly linked to a course, and instead aims to influence holistic competencies, the assessment should be formative rather than summative. This will also add to calls for empirical research on the use of formative assessments in higher education (Parmigiani et al., 2024).

Planned assessments

Now that the event has been established, we are turning our attention to measuring the impact of the event on both the presenters and participants. An engagement tracker termed a "passport" was implemented in 2018 (see Figure 2 for an example). After a student interacts with an exhibit a mark is made on a paper form that the students are given. When they have interacted with a set minimum of exhibits, which varies per event cycle as a function of the number of exhibits, they return their passport and are entered in a drawing for a prize. This allows the organizers to track the participants, and in the future may be used to identify student demographic characteristics (e.g., intended major and year of study). In 2023 300–350 passports were given to participants, and 141 passports were returned. Many students interacted with the EL activities but do not utilize the passport, so this is an underestimate of student participation.

The number of students participating will continue to be tracked with the physical passport system. Additional measures to assess the impact of the event on participants and presenters are planned for future event cycles. In terms of the participants, engagement will be assessed during the event by giving students the opportunity to express the impact that the event has had on them with physical and/or digital responses to question prompts. Participants will also be given the opportunity to provide event feedback through a digital post-event survey. In line with EL theory, questions on both assessments will be written to encourage reflection on the experience and to measure changes in attitudes.

In terms of the presenters, engagement and impact will be assessed through a digital post-event survey. The questions asked will aim to measure the time and effort dedicated to the event to give new presenters an accurate estimate of what will be expected of them.

Discussion

Lessons learned

The success of NVCsi has been made possible by the community of faculty and staff members at NVC. Having a large group of people involved has been valuable in terms of having a diverse set of skills and information, and in terms of diversity of ideas. Over the years the forms, processes, and guidelines have changed, but by having

representatives from a variety of departments we have always had someone who either knew what to do or who to ask when a question or issue arose.

The impact of NVCsi on students, staff, and faculty has increased as presenter engagement has grown. With each event cycle the exhibits attract attention and generate new ideas. Advertising about the event in multiple modalities is important, but a lot of the attendance is based on visibility. The location and timing of the event, when measured by attendance and engagement, has a substantial impact on the success of the event. Consistency in terms of the general date of the event is also important because it allows those involved to plan for this event around other obligations. Colleges interested in this activity should attempt to maintain consistent timing for the event to gain recognition and to aid in planning.

This event has been most successful when held in person rather than online. We are confident that others have successfully organized an online EL event, but our model did not translate well to an online platform. One event was hosted through our learning management platform because of the global pandemic. The engagement from both presenters and participants was low. The impact of the event did not warrant the organizational and planning that the event required. With a different team the result could be different, however we have decided not to repeat the event digitally.

Constraints

Two limitations bear discussion. The first relates to EL theory and the structure of the event. NVCsi is a single day campus-wide event, and as a result the event has been generally limited to the first stage of the EL theory cycle. Much of the focus has been on the organization and presentation of the exhibits, which is when the learner has a concrete experience (Kolb, 2015; Kolb and Kolb, 2017). It is possible that our learners engage in the other stages of the EL theory cycle but we do not have that data. Now that NVCsi is an annual event, we plan to assess whether instructors are taking the concrete experience that their students have had at NVCsi and expanding the learning experience into the other stages of EL theory. Once we have a sense of what is being done to encourage those stages then we can consider what can be done to increase the impact of the event. This could be in the format of ideas for activities that instructors could choose to integrate into their classrooms. Alternatively, it may be possible to create opportunities for stages three and four of EL theory that remain independent of the classroom structure.

The second limitation relates to assessment of the impact of NVCsi on the presenters and student learners. This event was in response to seeing a lack of understanding of the relevance of math to potential careers, the application of mathematics across disciplines, and resistance to mathematics in general. We combined these observations with the knowledge of how impactful EL can be, and the event was created. When the first NVCsi was organized, we did not realize that the event would occur more than once. As a result, the event was created without consideration of assessing the impact of the event. We have developed a method of more accurately measuring the number of participants. It is now important to find a way to gauge some of the impact that the event has on our learning community, both the presenters and the participants.

Conclusion

NVCsi is a multidisciplinary EL event that engages students, staff, and faculty in seeing the influence of mathematics on other disciplines, daily life, and future career options. The exhibits not only raise the awareness of the types of mathematics used in daily life and careers (Ashcraft, 2002; Brown et al., 2008; Mujtaba et al., 2014; Weinberg et al., 2015; Baran et al., 2019; Commodari and La Rosa, 2021; Fitzmaurice et al., 2021), but also help students realize that they can already do some of the mathematics that will be required in careers that interest them. Seeing mathematics applied to careers increases their enthusiasm for, and interest in, mathematics. Data will be collected at future events to establish whether these impressions are accurate. It is our impression that the event has a substantial impact on everyone involved, though more formalized measures of the impact are needed.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval was not required for the studies involving humans because the initial activity was not serving as a data collection activity. Therefore, no IRB approval was requested. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements because none of the data collected can be tied to a specific participant. IRB approval will be requested before data is collected in the next event cycle. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

CP: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. KL: Conceptualization, Funding acquisition, Project administration, Supervision, Writing – review & editing. MZ: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2024.1268313/full#supplementary-material

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