REVISITING DISTANCE LEARNING IN MUSEUMS THREE YEARS AFTER COVID-19 CLOSURES

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In 2020, 90% of museums worldwide closed due to COVID-19, and many museums transitioned their programs online. This descriptive study examines how museums engaged in online learning three years after COVID-19 closures. A survey was distributed through museum listservs and completed by 100 museum professionals facilitating distance learning programs in their museums. The results of this study are compared to those of studies conducted immediately before and after COVID-19 museum closures along with a study conducted one year after the closures to explore trends in the field. Survey respondents described many of the same issues related to implementing online programming that were identified in previous iterations of the survey: limited funding, staffing, time, and educational resources. Many respondents expressed interest in further training on technology use, designing culturally relevant programs, and engagement strategies. Additionally, this survey includes the respondents' self-reported levels of self-efficacy to engage in online programming. Similar to most self-efficacy studies, participants rated themselves highly in most areas. Areas where educators rated themselves less skillful included working with Pre-K students, working with groups with differing abilities, evaluating their programs, and evaluating their teaching. Many participants indicated a need for additional professional development to support their teaching online. Additional insights and recommendations from the participants and considerations for the future of museum-based online learning are also presented.

Keywords: Distance Learning; Online Learning; Virtual Programs; Museum Education; COVID-19; Museum Closures

INTRODUCTION

In 2020, 90% of museums worldwide closed due to COVID-19 and many museums transitioned their programs online (UNESCO, 2020). How museums shifted in response to the pandemic has been documented by several studies and reports (Association of Science and Technology Centers, 2022; Ciecko, 2023; Dumont et al., 2024; Ebbrecht-Hartmann, 2021;

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Ennes, 2021; Ennes et al., 2021; ICOM, 2020; Noehrer et al., 2021; UNESCO, 2020, 2021; Zollinger & DiCindio, 2021). Some reports described how museums responded globally and offered many statistics about where museums were closed and for how long (UNESCO, 2020, 2021). Others detailed ways museums could support community resilience (ICOM, 2020). The American Alliance of Museums compiled a report on how the COVID-19 pandemic caused museums to accelerate their digitization, including the use of social media and virtual experiences, and identified key themes related to museum responses including their adaptability, agility, and innovation (Ciecko, 2023). The Association of Science and Technology Centers suggested the future of museum digital engagement included hybrid experiences, agile programming, audience research, increased revenue from digital sources, and technological innovations (Association of Science and Technology Centers, 2022).

In addition to these reports, the *Journal of Museum Education* curated a special issue (Santos et al., 2021) that included a series of article documenting the wide range of impacts on museums including the loss of museum educators (Krantz & Downey, 2021; Rende et al., 2021), youth developed digital content (Silva, 2021), online museum tours (Kaplan, 2021), the digital divide (Zollinger & DiCindio, 2021), and how museums were engaging in online programming one year after closures (Ennes et al., 2021). More recently, Dumont and colleagues (2024) conducted interviews with twelve museum educators in Belgium to better understand museum educators' perspectives related to "digital museum education" (p., 4) post COVID-19 closures. Beyond the studies described above, how distance learning in museums has changed since the COVID-19 pandemic has not been well documented. Building upon previous research, this manuscript will give an overview of previous findings and compare them to the results of a study three years after closures to explore trends in online and distance learning in museums since 2020.

Online Programming in Museums Due to COVID-19

What constitutes an online program in museums has been defined differently over the years, and researchers set out to create a cohesive definition in 2019 (Gaylord-Opalewski & O'Leary, 2019). Their team codified definitions for several types of online learning in museums, including synchronous distance learning, asynchronous distance learning, interactive virtual learning, virtual museum educator, interactive virtual learning program, point-to-point connections, multi-point connections, and streaming (Gaylord-Opalewski & O'Leary, 2019). For this study, museum-based online learning was defined as programs that were facilitated via the internet to audiences not located within the physical museum (Ennes et al., 2021). In 2021, Ennes and Lee (2021) (c) conducted a scoping review to identify literature related to distance learning in museums. The findings detailed the barriers and benefits to museum-based online learning, the impacts of these programs on the educators facilitating them, and the importance of partnerships to support distance learning in museums (Ennes & Lee, 2021).

To learn more about distance learning in museums, a descriptive study was conducted to document museum-based online programming in February 2020 and then replicated to detail the transition to online programs after museum closures in March 2020 (Ennes, 2021). The study was then conducted again one year after closures (Ennes et al., 2021). Online programs offered before the pandemic (n = 74) mostly relied on teleconferencing software (such as Zoom) to teach school programs (Ennes, 2021). Programs were designed based on topics featured in the museums or to support the teaching of state or national standards (Ennes, 2021). Museum-based distance learning programs developed in the spring of 2020 after museum closures (n = 89) were primarily facilitated using teleconferencing software and museums' existing social media channels such as Facebook Live (Ennes, 2021). To quickly

respond to museum closures, museums developed new online programs based on their pre-existing onsite programs, current exhibits, or using state and national standards (Ennes, 2021.

One year after COVID-19 closures, almost all the respondents (n = 90) indicated they were using teleconferencing software rather than relying on their existing social media platforms as they did immediately after closures (Ennes et al., 2021). The survey responses one year after closures were more in line with the pre-closure survey responses (Ennes, 2021) which suggested that educators had time to plan for their programming rather than simply reacting to closures (Ennes et al., 2021). Documenting how museums continue to engage in distance learning programs can help researchers identify opportunities to engage in research related to these programs. The results may guide researchers, museums, and professional organizations as they seek to support museum-based distance learning.

As museums continue to respond to the changing educational landscape, this study explored how museums were engaging in online learning three years after global museum closures. This article describes the result of a descriptive study to explore the trends in museum-based online learning programs. One new area of interest in this study was museum educators' levels of self-efficacy to teach online.

Theoretical Framework

The beliefs educators hold related to their ability to teach is referred to as teaching self-efficacy (Morris et al., 2017) and is grounded in Bandura's (1977) social cognitive theory. Teaching self-efficacy has been shown to influence educators' effectiveness and student achievement (Morris et al., 2017). The research on student achievement because of educators' teaching self-efficacy for online classes has not been studied to the same degree as the impact of educators' teaching self-efficacy for in-person classes (Corry & Stella, 2018). However, the high levels of influence that educators' teaching self-efficacy in face-to-face classes has on supporting learner outcomes suggests a great need for additional research on the role teaching self-efficacy plays in distance learning (Corry & Stella, 2018). Educators with high levels of teaching self-efficacy have been shown to be more willing to test new methods of teaching, engage in more planning and organization, and are more likely to be persistent and resilient when faced with setbacks (Dolighan & Owen, 2021).

Teaching online is significantly different than teaching in person and requires a different approach to educator preparation (Barbour & Unger, 2014; Corry & Stella, 2018). This is particularly true in museums where online programming tends to be one-time experiences rather than sustained engagement over time which occurs in formal K–16 settings (Ennes et al., 2021). The sudden transition to teaching online, a new environment for many museum educators, may have been daunting and potentially influenced their beliefs about their teaching abilities (Dolighan & Owen, 2021). Dolighan and Owen's (2021) study of educators in Canada during the onset of COVID-19 found that neither teachers with more years of experience nor those who had previous experience teaching online reported higher levels of teaching self-efficacy when they transitioned online. However, the researchers did find a significant correlation between educators' teaching-self efficacy for teaching online and having participated in professional development related to online teaching (Dolighan & Owen, 2021).

In their review of online teaching self-efficacy, Corry and Stella (2018) found that the educational context, educational environment, the educational task specificity, and knowledge of educational technologies can all impact educators' beliefs about their ability to teach online. These findings suggested that transitioning from in-person to online teaching requires a specific pedagogical shift to ensure both educators and students are successful (Corry & Stella, 2018). Educators who transition from teaching in-person to teaching online indicated a need for more professional development

opportunities related to how online instruction should be designed and how to integrate their content with technology (Lin & Zheng, 2015). However, the results of Corry and Stella's review (2018) indicate that teaching self-efficacy for distance learning has not been well defined and needs additional research. Understanding how museum educators feel about their ability to teach online can offer insights for future professional development to support museum based online programming. Therefore, the following research questions guided this study:

1. How are museums engaging in online learning three years after COVID-19 closures?
2. What are museum educators' levels of self-efficacy for teaching online?

METHODS

To examine the state of museum-based distance learning three years after museum closures, a survey was distributed for one month between April and May 2023. This survey was based on the 2020 and 2021 survey which asked museums about how they were responding to the challenges of COVID-19 museum closures (Ennes, 2021; Ennes et al., 2021). The 2023 survey was sent through US professional listservs including the American Alliance of Museums (AAM), the Association of Children's Museums (ACM), the Association of Science-Technology Centers (ASTC), the Association of Zoos and Aquariums (AZA), the Museum Computer Network (MCN), and the International Society for Technology in Education's Interactive Videoconferencing Network. As the survey was anonymous and the listservs are private, the response rate is unknown. While the survey was sent through the same channels as the previous studies, due to high rates of turnover in the museum field (e.g., N-PASS Project, 2007), the exasperation of those turnover rates due to closures (e.g., Krantz & Downey, 2021; Rende et al., 2021), and the anonymity of this survey, this study is a comparison of snapshots in time and not intended to be treated as a longitudinal study. This irregular time series data collection is common in many types of real-world research including biology, climate science, healthcare, and education (Li & Marlin, 2020; Zhang et al., 2021).

The 2023 survey asked museum staff about their current online program offerings as compared to pre-COVID-19 closures. The survey also included 11 new Likert scale questions exploring museum educators' levels of self-efficacy for teaching online that were not included in the previous studies. These additional questions came from a new survey assessing science museum educators' levels of teaching self-efficacy (Ennes & Kamarkar, under review). Demographic questions were based on the American Alliance of Museums' (AAM) annual survey (C. Walls, personal communication, November 19, 2019). Questions included museum type, location, budget, and governance, as well as open- and closed-ended questions. Most questions were analyzed for descriptive statistics. The open-ended questions were coded thematically using consensus coding and negotiated agreement by both authors (Campbell et al., 2013). This study was reviewed by the university's IRB board and approved (IRB201903240).

RESULTS

One hundred museum professionals participated in the 2023 survey. Those results will be compared to the previous studies to examine trends in museum-based online learning since 2020. The results from the survey distributed before COVID-19 closures in February 2020 will be reported as Survey 1. The results of the survey distributed immediately after COVID-19 closures in March 2020 will be described as Survey 2. Survey 3 will refer to the survey distributed one year after COVID-19 closures in the spring of 2021. The results from this study will be described as Survey 4. Not all questions were asked on all four surveys so

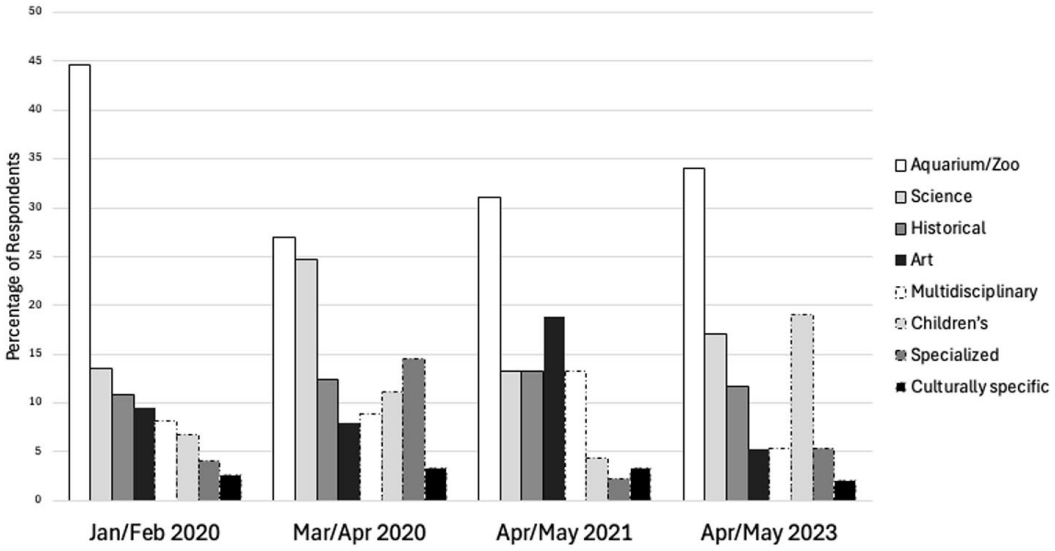

FIGURE 1

Change in percentage of museum types from Survey 1 to Survey 4.

some trends will only be compared for Surveys 1 and 4 or only reported for Survey 4.

Museum Demographics

Using the same methods as the initial studies, the museum types reported in this study were coded into eight categories: art, children's, cultural, historical, multidisciplinary, specialized, science, aquarium/botanical garden/zoo, and other (Figure 1). Approximately one-third of the participants were from zoos or aquariums (34%). Children's Museums were represented by 19.1% of participants. Science museums were represented by 17% of participants. The remaining participants were from history museums (11.7%), art museums (5.3%), multidisciplinary museums (5.3%), cultural museums (2.1%), and other types of museums (5.3%). Where percentages add up to more than 100, participants could select more than one option.

Survey 4 participants reported that 70.2% of their museums were in urban settings, 25.5% were suburban, and 4.3% were rural. Most of the museums were private, non-profit museums (72.3%, Table 1) and about half of the museums reported charging $10 to $20 in visitation fees (51.7%, Table 2).

Museum-Based Online Programs

Of the participants, 81 indicated they were currently offering distance learning programs at their museum. An additional 15 had offered online programs as a response to COVID-19 but were no longer offering them. For the 19 participants who said they did not offer online programs (including those who temporarily offered programs as a response to COVID-19), 78.9% indicated there was a limited demand for online programs, 57.9% preferred teaching in person, 52.6% lacked staff capacity, 26.3% lacked staff expertise, 15.8% lacked technological resources, and 15.8% lacked funding for distance learning programs.

For the 81 participants offering online programming on Survey 4, the average number of years these programs have existed was 5.95 with the median number of years being 3. Most programs (96.1%) were run by the museum's

TABLE 1
Museum Governance Types for Each Survey

	Survey 1 (n = 87)	*Survey 2 (n = 124)*	*Survey 3 (n = 104)*	*Survey 4 (n = 94)*
	Percent	*Percent*	*Percent*	*Percent*
Private non-profit	56.8	61.8	62.2	72.3
University	14.9	9.0	10.0	6.4
State	5.4	3.4	4.4	4.3
Public-private partnership	4.1	12.5	13.3	6.4
Municipal	4.1	4.5	8.8	6.4
Federal	4.1	1.1	1.1	2.1
Private for-profit	2.7	1.1	1.1	0.0
County/Regional	1.4	2.2	0.0	1.1
Other	5.4	1.1	0.0	1.1

Note. Percentages add to more than 100 as respondents could select multiple options.

education department and 5.2% were run by their marketing department.

Program Staffing

Most participants on Survey 4 reported that their programs were run by staff who had additional responsibilities beyond online programming (88.3%). The median number of people responsible for online programming was five but this ranged from 1–21 and included full-time, part-time, and volunteer staff. Respondents indicated their program staff had backgrounds in education (90.5%), a museum-specific subject (e.g., art, biology, history, 73%), museum studies (37.8%), communications (13.5%), technology (8.1%), and marketing (6.8%, Figure 2). When asked if their staffing had changed because of COVID-19, 44.1% said their staff had decreased, 25.8% said their staff had stayed the same, 8.6% saw a staff increase, and 21.5% had a wide range of staffing changes since COVID-19 closures.

When asked how they were advertising their programs, most participants were using their website (95.7%), while others were using email (65.2%), word of mouth (63.8%), and social media (56.5%). The survey asked participants to describe how they were facilitating their programs, and most museums were using teleconferencing software like Zoom (95.7%), but others were still facilitating their programs via social media (21.7%) or learning management systems (13.0%). Figure 3 shows the changes in technology used to facilitate programs from Survey 1 to 4. Participants of Survey 4 felt their systems were very (48.5%) or

TABLE 2
Museum Visitation Fees Reported on Surveys 1 and 4

	Survey 1 (n = 77)	*Survey 4 (n = 89)*
Fee	*Percent*	*Percent*
Free	22.2	9.0
Suggested donation	2.8	0
Less than $10	12.5	4.5
$10 to $20	38.8	51.7
More than $20	23.6	34.8

Note. Percentages add to more than 100 as respondents could select multiple options.

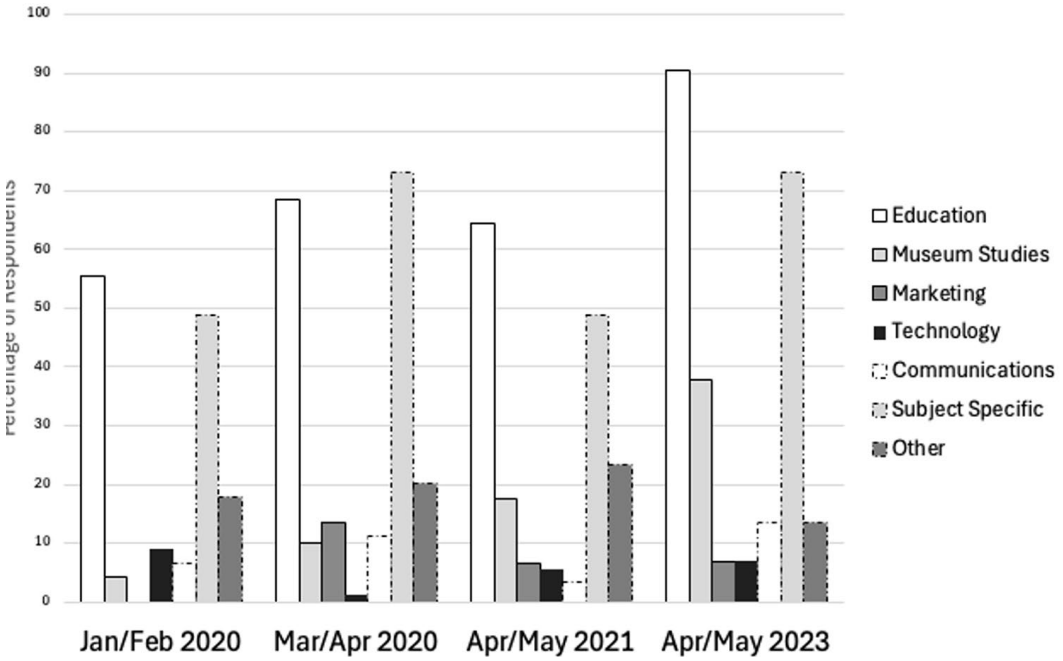

FIGURE 2

Educational background of staff facilitating online programs. Note. Percentages add to more than 100 as respondents could select multiple options.

somewhat (47.1%) user-friendly for the staff. This was similar to the perceptions on Survey 1 where more than half of participants felt their programs were easy to use (53.3%) or somewhat easy to use (44.4%).

Program Characteristics

When asked about the types of programs they offered, respondents indicated that their most common programs were school programs (89.9%) followed by virtual tours (50.7%), programs for adults or seniors (40.6%), pre-recorded lectures (23.2%), live conferences (21.7%), teacher professional development (20.3%), and Massive Open Online Courses (MOOCs, 1.4%). Figure 4 shows the change in program types from 2020–2023.

The primary audience for these programs were grades K–5 (88.4%), grades 6–8 (60.9%), grades 9–12 (42.0%), PreK (34.8%), the general public (31.9%), adults (30.4%), teachers (29.0%), and university students (14.5%). Figure 5 shows the audience trends from Survey 1 to Survey 4.

Respondents on Survey 4 indicated that the topics for their programs were decided based on museum-specific content (77.9%), the museum's mission (64.7%), state or national standards (63.2%), in-person programs that were transitioned online (52.9%), available topic experts (33.8%), or by participant request (55.9%). Figure 6 shows the trends in how topics were chosen over time.

Programs described on Survey 4 included live demonstrations (71.0%), artifacts/biofacts (63.8%), pre-recorded videos (62.3%), live animals (46.4%), and live tours (44.9%). Less than half of the participants (46.4%) indicated they sent materials to be used during the program, but more than two-thirds (68.7%) offered pre/post program materials for par-

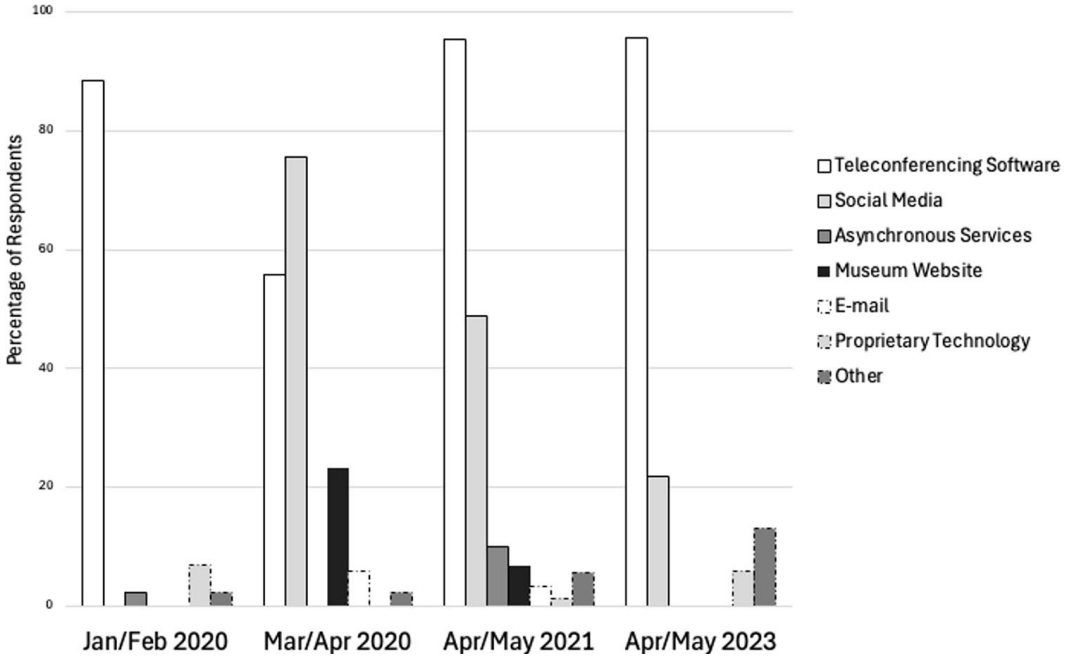

FIGURE 3

Trends in what technology was used to facilitate programming from Survey 1 to Survey 4. Note. Percentages add to more than 100 as respondents could select multiple options.

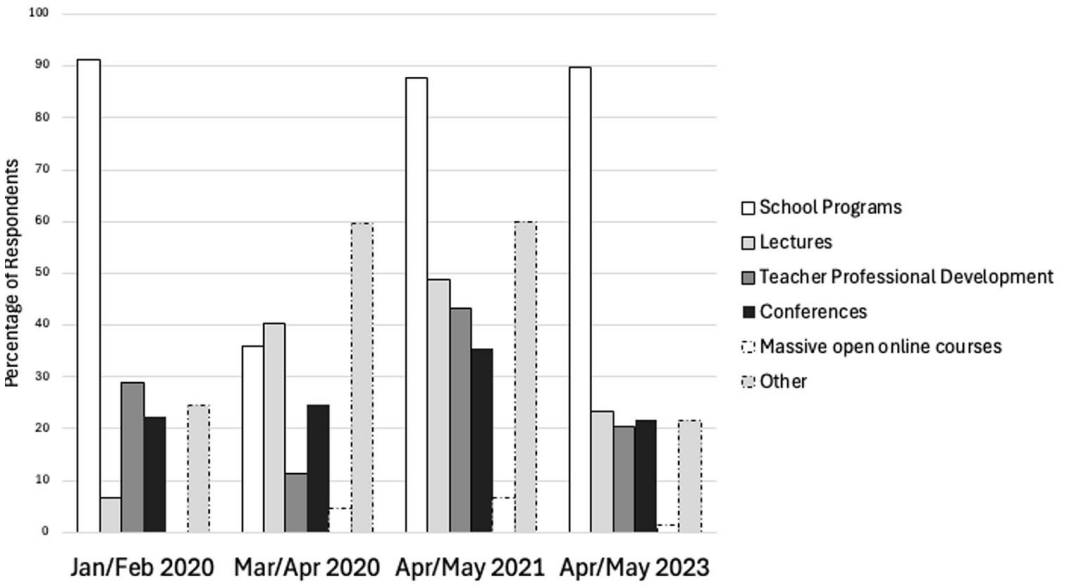

FIGURE 4

Change in types of programs offered by museums from Survey 1 to Survey 4. Note. Percentages add to more than 100 as respondents could select multiple options.

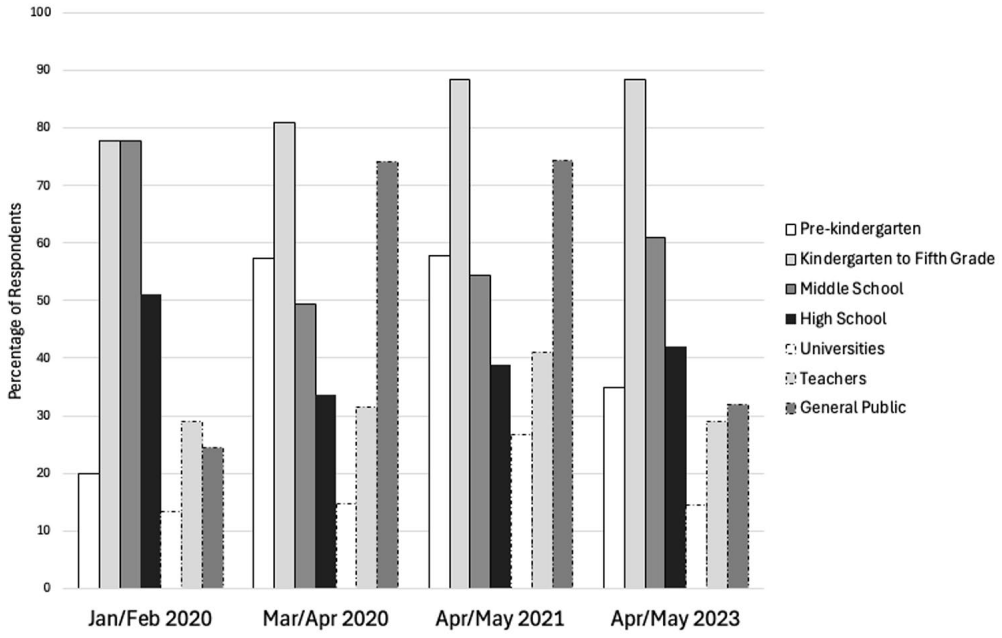

FIGURE 5

Change in target audiences for programs over time from Survey 1 to Survey 4. Note. Percentages add to more than 100 as respondents could select multiple options.

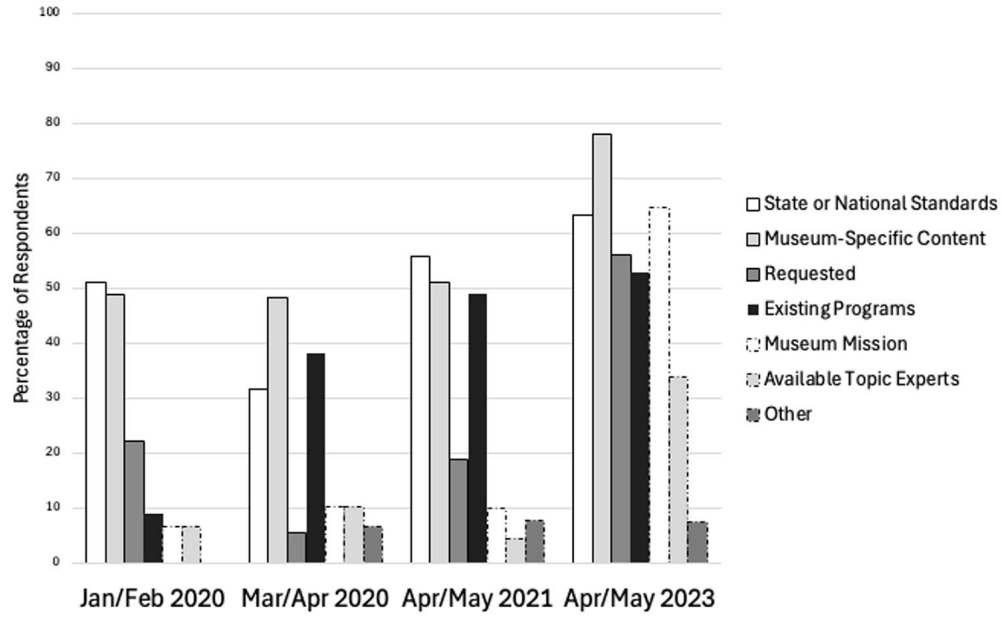

FIGURE 6

Change in how topics were chosen over time from Survey 1 to Survey 4. Note. Percentages add to more than 100 as respondents could select multiple options.

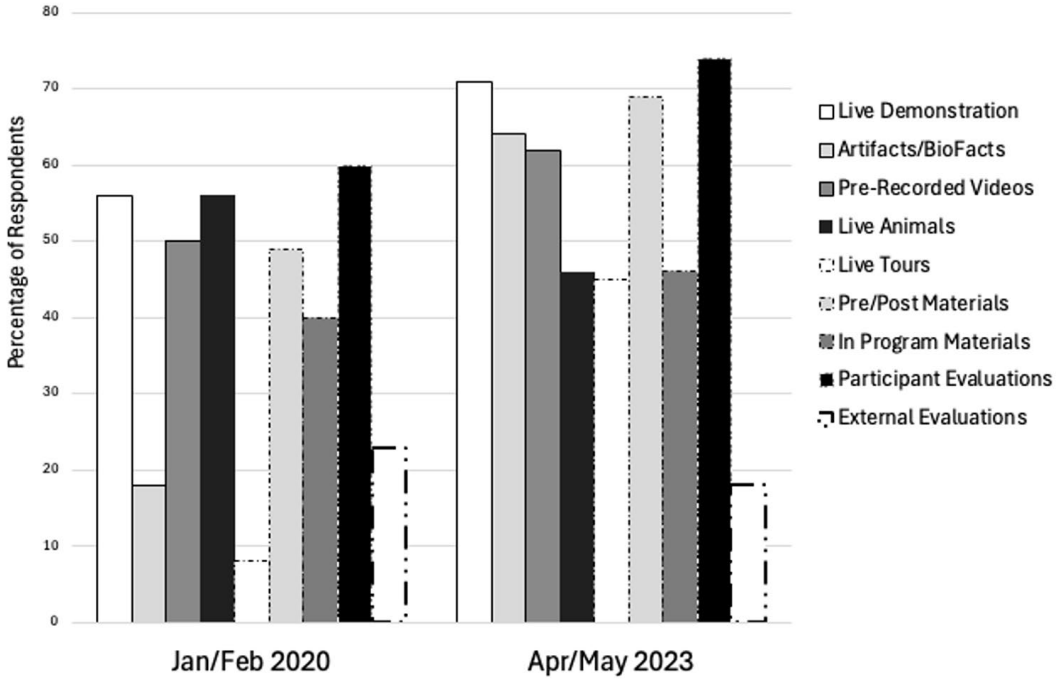

FIGURE 7

Change in program materials and evaluation between Survey 1 and Survey 4. Note. Percentages add to more than 100 as respondents could select multiple options.

ticipants. Almost three-quarters (74.2%) of programs had participants complete program evaluations but only 18.2% had conducted external evaluations of their online programs. Figure 7 shows the change in program materials over time.

Program Funding

When asked about funding, 75% of participants on Survey 4 indicated their programs were funded internally, 48.5% had grant funding, 14.7% were funded by a one-time donation, and 27.9% had alternative funding structures. These funding strategies were unchanged for 52.2% of participants since the onset of COVID-19. Participants' annual budgets for online programming had not changed since the onset of COVID-19 for 29.9% of participants. For 34.3%, their distance learning budget had increased, while 10.4% saw a decrease. The remaining 25.4% were unaware of whether their budget had changed since COVID-19 closures. Of the respondents, 68.1% of museums charged per class to participate, 50.7% offered their programs for free, 24.6% charged per person, and for 4.3% there was a suggested donation to participate. When asked about the cost to participate in their programs, 18.5% of participants said the cost of their programs increased due to the closures, 7.7% said the cost decreased, and 73.9% said the cost did not change. When asked whether the cost to participate in their online programs had changed since the initial closures, 75.4% said they had not changed, 20.0% said they have had to increase the cost for participating, and 4.6% had decreased the cost.

When asked on Survey 4 whether they had requested or received support for their distance learning programs from other organizations (e.g., AAM, ASTC, AMC, AZA, and other museums), 74.6% of participants indicated they

TABLE 3
Changes in Staff Training Between Surveys 1 and 4.

Training	*Survey 1 (n = 47)* *Percent*	*Survey 4 (n = 74)* *Percent*
Very little to none	20.0	13.5
On the job	60.0	93.2
Professional development	22.2	32.4
Conference workshops	4.4	13.5

Note. Percentages add to more than 100 as respondents could select multiple options.

had not. Those who had received support mentioned organizations such as the Center for Interactive Learning and Collaboration (CILC), grant agencies including the Institute of Museum and Library Services, their local school districts, and other museums.

Staff Training and Self-Efficacy

The majority of Survey 4 participants indicated their staff received on-the-job training (93.2%), some attended professional development opportunities (32.4%), a few attended conferences (13.5%), and others received very little to no training to engage in online programming (Table 3, 13.5%). When asked whether their training had changed since museum closures, 26 respondents (36.6%) indicated that their training plans had changed. Of these, 11 participants stated that they had not offered training to their staff when distance learning programs were first implemented, and an additional 11 participants reported having increased training for staff since distance learning programs were first implemented.

When Survey 4 participants were asked in what areas they would like more training, technology came up most frequently (36.5%) followed by inclusive and culturally relevant programming (25%) and how to make programs more engaging (25%). Other categories included how to market their programs, how to evaluate their programs, strategies for linking to standards, tailoring to specific audiences, additional education training, and two respondents said they want more training in "everything."

The 2023 survey included 11 new questions about participants' levels of self-efficacy to teach online. Participants were asked to rate their perceptions of their ability to engage in various aspects of online programs (Figure 8).

Additionally, participants were asked to rate their ability to work with various audiences in online programs (Figure 9).

Most participants agreed or strongly agreed they were skillful in all aspects of teaching online. However, fewer participants felt they were skillful in facilitating online programs for preschool children with 23.2% disagreeing or strongly disagreeing that they were skillful in this area. Other areas where some participants felt less than skillful were evaluating their online programs with 14.3% disagreeing or strongly disagreeing, assessing their own teaching with 12.8% disagreeing or strongly disagreeing, and working with groups of differing abilities with 11.8% disagreeing or strongly disagreeing they were skillful in this area.

The final question on Survey 4 asked whether any other supportive measures have helped or could help in the development or facilitation of their distance learning programs. More than half (54.6%) said yes, and of those, one-third indicated professional development was needed for the development of online programs. Others indicated the need for more staff, funding, and appropriate technology to support their programs. Those who felt successful mentioned strong partnerships as a key component of their success.

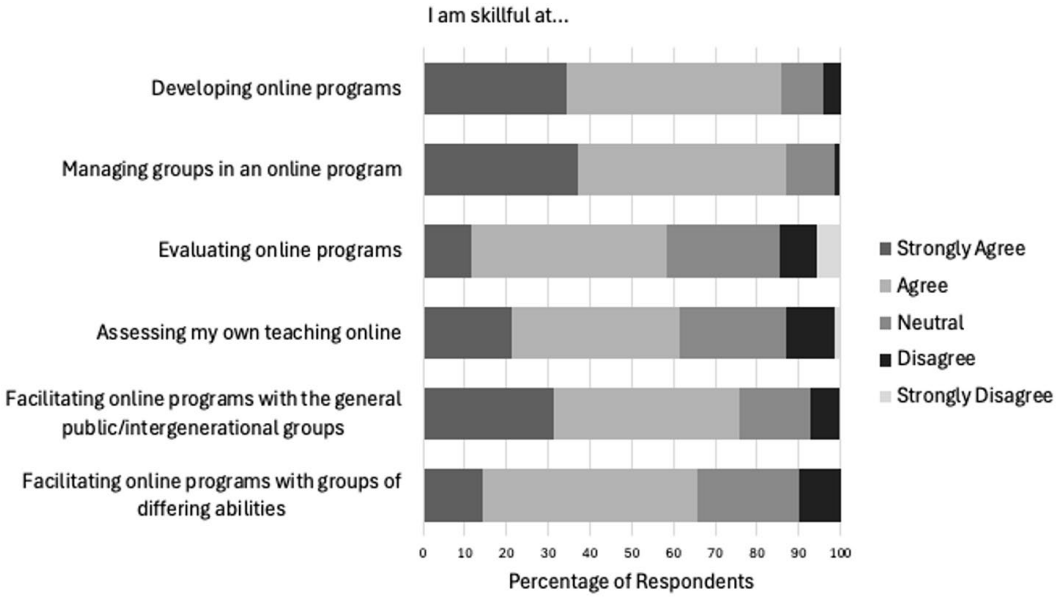

FIGURE 8

Educators' perceptions of their skillfulness in online programming (n = 70).

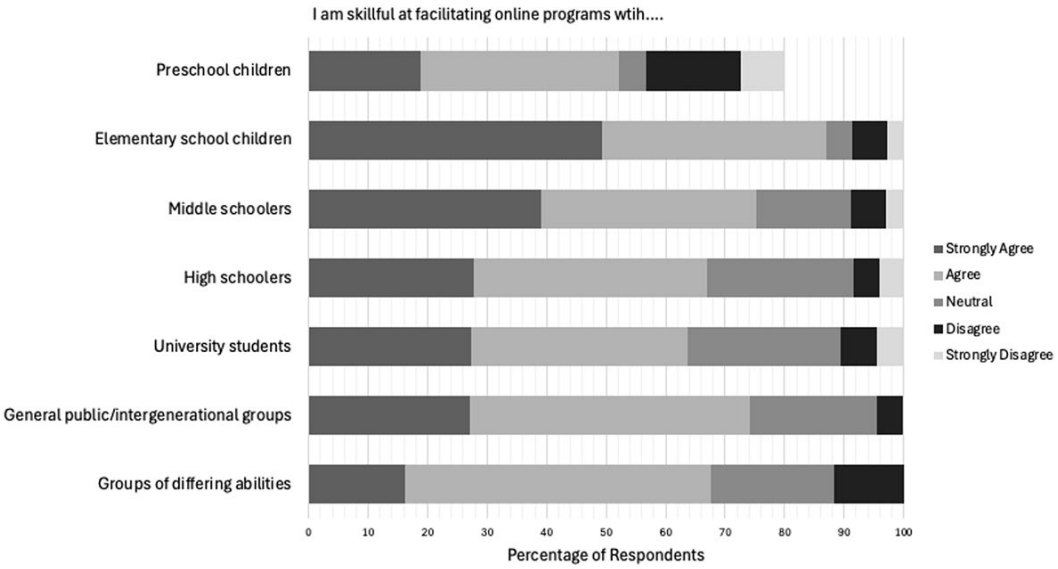

FIGURE 9

Educators' perceptions of their skillfulness in online program facilitation by audience (n = 70).

LIMITATIONS

While an effort was made to contact museums with known distance learning programs, it is unlikely that every program was included. This means care should be used when generalizing the results of this study. Additionally, as the survey is anonymous, it is unknown whether the same respondents participated in each survey. As such, claims cannot be made about how individual programs changed between the four studies. Rather this study examined the trends fieldwide over time. Furthermore, we cannot assume that all changes in distance learning programs were caused by COVID-19 closures.

DISCUSSION

Following up three years after COVID-19 closures allowed this descriptive study to look at the trends in museum-based online programming. The results suggest that museums have mostly returned to pre-closure operations as described by Ennes, 2021. New questions exploring additional components of museum-based online learning such as educator self-efficacy to lead these programs offer additional insights for researchers and practitioners.

While most participants in this study were currently engaging in online programming, a small number shared that their museum was not, or was no longer, offering these programs. Several participants indicated this was due to a lack of interest from the public in participating in online programs as well as a reluctance of staff to teach online. This preference for in person programs from both educators and learners was similar to responses found in Ennes et al. (2021). Additional challenges came from a lack of staff capacity, staff expertise, appropriate technology, and funding. These barriers were identified in all previous studies (Ennes, 2021; Ennes et al., 2021; Ennes & Lee, 2021), as well as studies conducted by others (Dolighan & Owen, 2021; Dumont et al., 2024). Dolighan and Owen (2021), specially highlighted the following behaviors: educators' lack of knowledge about pedagogical strategies for teaching online, issues with reliable technology, "the impersonal nature of online teaching, and a lack of institutional support" (p. 98).

Of the respondents who indicated they were offering programs, the median number of years the programs had been offered was three, suggesting they were a result of COVID-19 closures. These programs were mainly run by education departments rather than education and marketing departments, which was more common in early 2020 immediately after closures (Ennes, 2021). The museums indicated a decrease in the number of staff facilitating these programs or saw major fluctuations in the number of staff available. This decrease in staff may be related to the loss of education staff at a higher rate than many other museum roles due to the closures (AAM, 2020; Krantz & Downey, 2021; Rende et al., 2021). The staff who were facilitating online programs mostly had degrees in education or in a content field related to their museum which was consistent across all four surveys and other studies such as Ennes et al., 2020, Rende et al, 2021, and Busch and colleagues, 2023. These staff also indicated that they had increased responsibilities beyond online programming. An increase in educator responsibilities from museum closures was also identified by Krantz and Downey in their 2021 study. These additional responsibilities may have contributed to their concerns about staff capacity and time as Krantz and Downey (2021) found that educators were asked to take on additional responsibilities without additional resources. Similarly, Rende and colleagues (2021) found that educators in their study believed their work environment had become somewhat (57%) or extremely (20%) more challenging following pandemic closures. However, studies as early as 2006 have also shown that museum educators struggle with excessive responsibilities (Bailey, 2006).

When looking at the trends of how programs were facilitated, the results of this sur-

vey indicated that most museums in 2023 were using teleconferencing despite a major jump in 2020 to social media. Also, no participants on Survey 4 mentioned using asynchronous services, email, or their website to facilitate programing in this study, which was a response to closures in 2020 due to these resources' availability (Ennes, 2021).

Despite a drop in 2020 as both museums and schools closed (Ennes, 2021), school programs once again ranked as the most common program offered by participants at almost 90%. This was accompanied by a decline in all other types of programming including lectures, teacher professional development, conferences, and MOOCs despite an uptick in 2021. When asked how they were developing their programs, more respondents indicated they were creating content that was museum specific rather than based on standards for the first time since 2020. Respondents also indicated that they created many more programs based on requests, their museum's mission, and the topic experts they had available. All three of these strategies for developing programs were the highest they had been at any other time.

The respondents in this survey indicated they had increased the number of pre/post materials available to their participants including pre-recorded videos. There was also a major jump in the number of biofacts and artifacts used during the programs. However, this information was only collected in February of 2020 and on this survey. Live tours remained popular in 2023. Of the participants on this survey, three quarters indicated they had program evaluations they shared with their learners. However, only 18% percent were engaging in external evaluation which is lower than the number of museums engaging in external evaluation prior to museum closures. Evaluation is an important component of program development, and the field should explore ways to increase opportunities for external evaluation which can be quite costly. Three quarters of respondents shared that their programs were funded internally and almost half had grants. About half shared that their funding to support their programs was unchanged over the last three years. Most participants indicated that the cost of their individual programs had stayed the same or increased as a result of museum closures and three quarters indicated they had no external support from other organizations. However, for those who had external support, they felt that those partnerships were important to their success which was a common theme found in previous studies (Dumont et al., 2024; Ennes et al., 2021; Ennes & Lee, 2021).

Training and Preparation

When asked how they were prepared to teach online programs, almost all the participants shared that they received on-the-job training, which is very common in museums (Ennes, 2021; Ennes et al., 2021; Robinson, 2019; Tran et al., 2019). This result was much higher than the first study where 60% indicated they had on-the-job training, 20% indicated they had very little to no training, and the remaining participated in professional development and conference workshops (Ennes, 2021). New to this study was an exploration of educators' self-efficacy to teach online programs. Unsurprisingly, most participants rated themselves very highly, which is a common issue with self-reported data (Klayman et al., 1999). Areas where educators rated themselves less skillful included working with Pre-K students, working with groups with differing abilities, evaluating their programs, and evaluating their teaching. This further supports the need for professional development and evaluation. When asked what they wanted more training in, the respondents indicated they want to know how to use technology to facilitate learning, they want to learn how to make their programs more culturally responsive, and they want to learn how to be more engaging in the online setting. More than half of the participants wanted to attend professional development to increase their skills. However, opportunities to engage in professional learning related to these topics may be limited for educators because of a lack of funding for professional develop-

ment, the logistics of attending a workshop, or conflicts with educators 'schedules (Kristinsdóttir, 2017).

Future Research and Recommendations

There remains a need to engage in additional research around distance learning in museums. Identifying ways to offset the barriers to museum-based online programs such as a lack of staff, funding, time, and professional development, should be a priority for the field, as the literature suggests that online programs may be an avenue for reaching audiences who may not otherwise visit museums (Ennes & Lee, 2021; Gaylord-Opalewski & O'Leary, 2019). Understanding how museums engage in these programs can help researchers identify opportunities for further study and allow them to have a more realistic understanding of the types of interventions that may be feasible related to online programming in museums. Our previous research highlights the importance of research-practice partnerships in examining online programming in museums (Ennes, 2021; Ennes et al., 2021). By understanding how educators engage in online programs, researchers can identify points for collaboration in future research. This is an area of need as most studies on online learning in museums have been individual case studies with little generalizability across institutions (Ennes & Lee, 2021).

Respondents expressed a desire for more professional development around engaging online audiences, which was similar to the results of the survey administered before the pandemic (Ennes, 2021). There is a growing body of research exploring the professional development of museum educators (e.g., Ennes et al., 2020; Piqueras & Achiam, 2019; Tran et al., 2019), but the professional development needed to support museum educators in online programming is likely different than that which can support in-person programming. Museum education programs are typically one-off programs rather than facilitated with the same students over time so what strategies work for sustained online programs with the same learners may not have the same impact in this setting (Ennes, 2021). Education researchers interested in pedagogical strategies and pedagogical content knowledge have the opportunity to investigate the skills needed by museum educators to effectively teach online. One example of professional development for educators in cultural sectors is described in Zardini Lacedelli et al., 2019. There is also a need to examine whether traditional educational theories such as constructivism remain appropriate for these types of programs or whether there is a need to explore theories and frameworks specific to online learning such as E-learning theory (Aparicio et al., 2016), online pedagogy (Archambault et al., 2022), or heutagogy (Hase, 2009). Understanding what pedagogical strategies are best suited to museum-based online programs will be necessary to inform future professional development opportunities for museum educators. Additionally, evaluation for how these pedagogical strategies are implemented will be vital as well.

Based on this information, we recommend:

1. Research-practice partnerships should identify what pedagogical strategies are most appropriate for museum-based distance learning programs which tend to be one-time programs with participants from a wide range of ages.
2. Based on those pedagogical strategies, researchers and other agencies should develop professional learning opportunities to support museum educators facilitating distance learning programs.
3. Researchers, evaluators, and practitioners should come together to design evaluation strategies that can assess distance learning across the museum field rather than as individual case studies to improve generalizability across organizations. This would include implementing ongoing assessments to determine which pedagogical strategies are most effective and using feedback

from both educators and audiences to refine online learning approaches.

4. The results of these evaluations should be shared broadly and openly across the museum field so that all educators can apply the results to their distance learning programs- ensuring high quality programs for all learners.
5. Finally, the field should come together to investigate strategies to overcome barriers like staff limitations, funding, time, and lack of professional development.

CONCLUSION

This study built upon two previous studies (three surveys) to document how museums have engaged in online programming between 2020–2023. This study offers insights for researchers and practitioners interested in distance learning in museums. Having access to the experiences of others may provide insights for practitioners as they seek to improve, change, or begin online programs. Also, understanding the points where museums need assistance can provide researchers with opportunities to explore interventions to support museum online programming. While we acknowledge that not every museum has the interest or capacity for developing online programs, the findings from this study may help those who are seeking guidance on designing distance learning programming. As museums continue to respond to the changing educational landscape, this work offers researchers a glimpse into how museums have changed over time. Online programming will likely remain a part of museum programming across the world and with the limited research that has taken place, there are many opportunities for researchers to contribute to the literature surrounding this subject. Understanding how museums are choosing to engage in these programs can help researchers identify opportunities for further study and allow them to have a more realistic understanding of the types of interventions that may be necessary to support to online programming in museums.

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