

Museum-Based Distance Learning Programs: Current Practices and Future Research Opportunities

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Volume 22, numéro 2, mai 2021

URI : <https://id.erudit.org/iderudit/1078409ar>
DOI : <https://doi.org/10.19173/irrodl.v22i2.5225>

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Éditeur(s)

Athabasca University Press (AU Press)

ISSN

1492-3831 (numérique)

[Découvrir la revue](#)

Citer cet article

Ennes, M. (2021). Museum-Based Distance Learning Programs: Current Practices and Future Research Opportunities. *International Review of Research in Open and Distributed Learning*, 22(2), 242–260.
<https://doi.org/10.19173/irrodl.v22i2.5225>

Résumé de l'article

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May – 2021

Museum-Based Distance Learning Programs: Current Practices and Future Research Opportunities

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Abstract

Museums play an important role in out-of-school learning. Many museums have begun offering distance learning programs to increase their reach and the accessibility of their collections. These programs serve a wide range of audiences from pre-kindergarten to lifelong learners. This descriptive study examined the current practices in museum-based distance learning programs. Additional data was collected once museums began closing due to COVID-19 and transitioning to distance learning programs. The study found that museums offering programs before COVID-19 predominately offered school-based programs via teleconferencing software. Museums transitioning to distance learning programs following closures due to COVID-19 mainly utilized social media platforms to offer a wide range of programming for the general public. Additional information was gathered regarding how the programs were developed and who facilitated them. Museums are still determining how to respond to COVID-19 closures. This study described the current landscape and potential opportunities for research related to museum-based distance learning programs. These areas for research include establishing best practices, defining high-quality programs, opportunities to engage in instructional design, and professional development for the museum staff facilitating these programs.

Keywords: distance learning, online learning, museums, COVID-19

Introduction

The outbreak of the 2019 coronavirus (COVID-19) pandemic led to the closure of schools around the world. More than 72.4% of students in over 177 countries were impacted by closures (United Nations Educational Scientific and Cultural Organization [UNESCO], n.d.). These closures strained resources as schools pivoted to online learning. For example, the United States suddenly needed to support more than 55 million students online, up from almost 1 million before COVID-19 (Butcher, 2020). Schools were encouraged to use existing online educational resources from other organizations, such as museums (Butcher, 2020).

Museums “spend more than \$2 billion a year on education... [and] provide more than 18 million instructional hours for educational programs” in the United States alone (American Alliance of Museums, 2021). However, for many, access remains a barrier to visiting museums (Dilenschneider, 2019), whether due to distance, cost, or accessibility issues. To address this, many museums began offering distance learning programs (Gaylord-Opalewski & O’Leary, 2019). Globally, like schools, more than 90% of museums closed due to COVID-19 (UNESCO, 2020b) leading to an increase in museum-based online programming.

Museum-Based Distance Learning

Museum-based distance learning programs began in the mid-1990s (e.g., Bradford & Rice, 1996). A recent review of the literature found the research examining these programs was primarily evaluative case studies describing benefits and barriers, the importance of partnerships, and the changing roles of educators with the development of distance learning programs (Ennes & Lee, In Press). Some of the benefits included increased outreach opportunities (e.g., Gaylord-Opalewski & O’Leary, 2019), interest in physical visits (e.g., Hilton et al., 2019), and increased engagement with visitors (e.g., Mazzola, 2015). Some of the barriers included cost (e.g., Gaylord-Opalewski & O’Leary, 2019), time constraints (e.g., Sanger et al., 2015), a lack of staff capacity and the need for new training (e.g., Gaylord-Opalewski & O’Leary, 2019), and issues with technology (e.g., Hilton et al., 2019). Ennes and Lee (2021) have argued the need for further research beyond individual evaluative studies.

This descriptive study was conducted to establish a baseline understanding of how museum-based online programs are developed and implemented. A descriptive design was used to create a snapshot of the current practices in museum-based online learning and highlight information of interest to educators and other members of the museum community (Gall et al., 2003). The results of this study identified critical areas for future research and offered practitioners insight into strategies being used by other institutions. The following research questions guided this study:

1. How did museums develop and implement distance learning programs before COVID-19?
2. How did museums develop and implement distance learning programs following closures due to COVID-19?

Methods

A survey containing qualitative and quantitative questions was developed to answer our research questions. Demographic questions were based on the American Alliance of Museums' (AAM) annual survey (C. Walls, personal communication, November 19, 2019) including questions such as museum type, location, budget, and governance. Additional open- and closed-ended questions were included to gain more insight into the development and implementation of museum-based distance learning programs.

The survey was sent directly to individual museums that advertised distance learning programs on their Websites. These museums were identified by searching the institutional member lists of the AAM, Association of Academic Museums and Galleries (AAMG), Association of Children's Museums (ACM), Association of Science-Technology Centers (ASTC), and the Association of Zoos and Aquariums (AZA). Of the 1336 unique museums identified, 47 advertised distance learning programs on their Websites. This included 26 zoos/aquariums, 14 science museums, two art museums, and five other types of museums (multiple categories). These institutions were all located in the United States. An e-mail was sent directly to the address identified in the contact information for each program. The response rate was not measured as the surveys were anonymous. To reach more museums, an invitation to participate in the survey was sent out through professional listservs including AAM, AAMG, AMC, ASTC, AZA, the Museum Computer Network (MCN), and the International Society for Technology in Education's Interactive Videoconferencing Network. The initial survey was open for one month between February and March, 2020.

Just after access to the survey was closed, museums around the world began closing due to COVID-19. To capture information on how museums pivoted their education programs online, a shortened version of the survey was sent out through the same listservs as the first survey. Individuals were invited to participate if their museum had closed and was then offering distance learning programs. To prevent duplication of data, the solicitation asked participants not to take part in the second survey if they had completed the initial survey. The second survey was available for one month between March and April, 2020.

Ninety-one respondents completed the first survey. Participants who completed less than 90% of the survey were excluded ($n = 15$) for a total of 74 complete surveys. The second survey elicited 136 responses. Participants who completed less than 90% of the survey ($n = 41$) and respondents who answered *no* to all of the questions (including whether they offered a distance learning program) were removed ($n = 6$) for a total of 89 respondents to the second survey. Each participant was given a unique ID composed of a number and their museum category. For those who responded to the second survey, a C was added to the front of their ID number (e.g., C1, urban multidisciplinary).

AAM includes 20 classifications for museum type. However, due to the small number of responses from certain categories, the classifications were collapsed during coding into eight categories: (a) zoo/aquarium (aquarium, arboretum/botanical garden/public garden, zoo/animal park); (b) art (art museum/center/sculpture garden); (c) children's (children's or youth museum); (d) cultural (anthropology, ethnically/culturally/tribally specific museum); (e) historical (historic house/site/landscape, history museum/historical society, military museum/battlefield); (f) multidisciplinary (general or multidisciplinary, respondents indicating multiple types that did not fit in any other category); (g) specialized (hall of fame, presidential library, specialized museum, transportation museum); and (h)

science (nature center, natural history museum, planetarium, science/technology center/museum). Respondents who indicated they were a visitor center/interpretive center were coded by the other categories they selected.

Open coding (Strauss, & Corbin, 1990) was used for open-ended questions and for questions where *other* was selected. Each question was independently coded by two separate raters. Discrepancies were discussed until an agreement was reached. Frequencies and percentages were found for each theme that arose from the open coding. The remaining questions were analyzed for means or frequencies. The surveys and data analyzed in this study are available from the corresponding author upon reasonable request.

Participants

With the first survey, almost half (44.6%) of the museums were zoos/aquariums (Table 1), more than half (56.8%) identified as private, non-profit organizations (Table 2), and more than half were located in urban centers (59.5%). For many of the museums that responded to the first survey, there was no fee for entry (21.6%, Table 3). Respondents to the second survey did not report museum visitation costs.

Table 1

Frequency of Museum Types

| Museum type | Survey 1 (<i>n</i> = 74) | | Survey 2 (<i>n</i> = 89) | |
|---------------------|---------------------------|---------|---------------------------|---------|
| | Frequency | Percent | Frequency | Percent |
| Aquarium/Zoo | 33 | 44.6 | 24 | 27.0 |
| Science | 10 | 13.5 | 22 | 24.7 |
| Historical | 8 | 10.8 | 11 | 12.4 |
| Art | 7 | 9.5 | 7 | 7.9 |
| Multidisciplinary | 6 | 8.1 | 8 | 8.9 |
| Children's | 5 | 6.8 | 10 | 11.2 |
| Specialized | 3 | 4.1 | 4 | 4.5 |
| Culturally specific | 2 | 2.7 | 3 | 3.4 |

Table 2

Frequency of Museum Governance Types

| Type of governance | Survey 1 (<i>n</i> = 73) | | Survey 2 (<i>n</i> = 89) | |
|----------------------------|---------------------------|---------|---------------------------|---------|
| | Frequency | Percent | Frequency | Percent |
| Private non-profit | 42 | 56.8 | 55 | 61.8 |
| University | 11 | 14.9 | 8 | 9.0 |
| State | 4 | 5.4 | 3 | 3.4 |
| Public-private partnership | 3 | 4.1 | 12 | 12.5 |

| | | | | |
|--------------------|---|-----|---|-----|
| Municipal | 3 | 4.1 | 4 | 4.5 |
| Federal | 3 | 4.1 | 1 | 1.1 |
| Private for-profit | 2 | 2.7 | 1 | 1.1 |
| County/Regional | 1 | 1.4 | 2 | 2.2 |
| Other | 4 | 5.4 | 1 | 1.1 |

Table 3

Museum Visitation Fees (Survey 1; n = 72)

| Fee | Frequency | Percent |
|--------------------|-----------|---------|
| Free | 16 | 22.2 |
| Suggested donation | 2 | 2.8 |
| Less than \$10 | 9 | 12.5 |
| \$10 to \$20 | 28 | 38.8 |
| More than \$20 | 17 | 23.6 |

Approximately a quarter of the respondents to the second survey worked in a zoo/aquarium (27.0%) or a science museum (24.7%; Table 1). These were predominantly private, non-profit museums (61.8%; Table 2) and mostly located in urban areas (55.1%). The annual operating budgets for these museums can be found in Table 4.

Table 4

Museums' Annual Operating Budgets

| Operating budget | Survey 1 (n = 65) | | Survey 2 (n = 85) | |
|--------------------------------|-------------------|---------|-------------------|---------|
| | Frequency | Percent | Frequency | Percent |
| Up to \$350,000 | 8 | 12.3 | 8 | 9.4 |
| \$350,000 to \$499,999 | 3 | 4.6 | 3 | 3.5 |
| \$500,000 to \$999,999 | 1 | 1.5 | 14 | 16.5 |
| \$1 million to \$2.9 million | 13 | 20.0 | 27 | 31.8 |
| \$3 million to \$4.9 million | 6 | 9.2 | 10 | 11.8 |
| \$5 million to \$14.90 million | 13 | 20.0 | 15 | 17.6 |
| \$15 million and over | 21 | 32.3 | 8 | 9.4 |

With the initial survey, participants who reported annual attendance numbers indicated a wide range from 1,500 visitors a year to 4 million a year ($n = 61$; $M = 662,955.18$; $SD = 781,754.96$). Participants who reported annual attendance numbers on the second survey showed visitation ranging from 1,000 to 2.5 million visitors a year ($n = 82$; $M = 333,950.14$; $SD = 507,279.89$). For the first survey, the numbers of full-

time staff ranged from zero to 4,000 employees ($M = 168.17$, $SD = 495.36$) and part-time staff ranged from zero to 5,000 employees ($M = 186.15$, $SD = 647.09$). Staff numbers were not reported on the second survey.

Results

With the initial survey, 60.8% of participants indicated they offered distance learning programs ($n = 45$). Almost a quarter of the respondents (23%, $n = 17$) reported they would be offering online programs soon and 16.2% ($n = 12$) said they were not offering online programs.

Museums Without Online Programs

The 12 participants who reported they did not offer online programs on the first survey were asked to share the reasoning behind that decision. Four participants indicated they preferred in-person learning due to object-based teaching, wished to connect students to the content without using technology, or wanted to serve their local community. For example, “we focus on object-based learning in the museum and at schools” (20, suburban art). Another noted that they have “had discussions about the disconnect between wanting our visitors to experience nature without technology involved” (39, urban science). Three respondents referred to a lack of staff capacity to develop and implement the programs. “As a mid-size museum, we are cognizant of our staff capacity and want to ensure that we are providing the highest quality programming possible by not spreading ourselves too thin” (49, urban children’s).

Three respondents lacked the resources needed to successfully implement a distance learning program and two people discussed cost as being prohibitive. “We lack the knowledge on how to create a distance learning program and possibly the equipment that would be needed” (34, rural multidisciplinary). One participant mentioned that their museum previously had a distance learning program but it was cost-prohibitive and their local school system did not have the infrastructure needed to participate.

We used to run one but the costs to keep up with the equipment could not be covered by the income. Also, we are in a low-income city and most of the schools did not have the equipment at the time to link to us easily. (05, urban zoo/aquarium)

Finally, one respondent discussed constraints associated with working at a university museum, namely “we are on a college campus and online courses need to go through an approval process” (65, urban multidisciplinary).

Museum-Based Online Programs

Of the 45 participants in the initial survey who offered online programs, (a) 25 were from a zoo/aquarium (55.6%); (b) six were from a science center (13.3%); (c) five worked in a historical museum (11.1%); (d) three worked in an art museum (6.7%); (e) specialized museums and children’s museums accounted for two participants each (4.4%); and (f) multidisciplinary and cultural museums each had one participant (2.2%). The museums were primarily private non-profit institutions (64.4%) located in urban areas (62.2%), though suburban (22.2%) and rural areas (11.1%) were represented as well.

The longest-running program was 31 years old with the newest programs just a year old ($M = 7.81$, $SD = 6.71$). Almost all those who participated in the first survey reported their distance learning programs were run by their education department (95.6%) with single museums reporting it was run by their archives department or visitor experiences team. The number of staff involved in the distance learning programs ranged from one to nine people ($M = 2.58$, $SD = 1.82$) with 62.8% having only one or two people. Almost all of the programs reported having full-time staff who contributed to the programs (97.8%), 22.2% reported having part-time staff, and 4.4% had volunteers who also worked with the programs. These staff primarily held degrees in education (55.6%) or science (48.9%; Table 5).

Table 5

Museum Staff Education

| Academic discipline | Survey 1 | | Survey 2 | |
|---------------------|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| Education | 25 | 55.6 | 61 | 68.5 |
| Sciences | 22 | 48.9 | 47 | 52.8 |
| Technology | 4 | 8.9 | 1 | 1.1 |
| Communications | 3 | 6.7 | 10 | 11.2 |
| Museum education | 2 | 4.4 | 9 | 10.1 |
| Marketing | 0 | 0.0 | 12 | 13.5 |
| History | 0 | 0.0 | 18 | 20.2 |
| Other | 8 | 17.8 | 18 | 20.2 |

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

Participants in the first survey were also asked what kind of training they received to facilitate distance learning programs. Most indicated on-the-job training (60.0%) such as being trained by an experienced educator or observing programs and then teaching on their own (Table 6).

Table 6

Staff Training to Teach Distance Learning Programs

| Training | Frequency | Percent |
|--------------------------|-----------|---------|
| Very little to none | 9 | 20.0 |
| On the job | 27 | 60.0 |
| Professional development | 10 | 22.2 |
| Conference workshops | 2 | 4.4 |

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

Participants in the second survey reported that their new programs were primarily facilitated by their education (83.1%) or marketing (25.8%) departments with almost a quarter (23.6%) facilitated by both marketing and education. One participant shared the challenge related to this new collaboration as “we are dipping our toes in the water of connecting with audiences via social media which is a big shift for our marketing department who typically doesn’t allow us to post education programming in that format” (C61, urban specialized). Six respondents (6.7%) indicated that their programs were being run by members of their administration (e.g., directors).

In response to the second survey, reports of the number of staff running distance learning programs ranged from one to 100 people ($M = 7.27$, $SD = 11.22$) with 69.1% of institutions having six or fewer people. Almost all of the programs reported having full-time staff who contributed to the programs (95.5%), 36.0% reported part-time staff, and 5.6% had volunteers. These staff predominantly held degrees in education (68.5%) or science (52.8%; Table 5).

On the initial survey, 29 participants shared information about their budgets, which ranged from zero to \$100,000 ($M = \$11,901.72$; $SD = \$26,167.41$). Almost a third of the respondents (31.1%) did not have a budget. Nine participants indicated that their distance learning budgets were part of their overall education budget, as “it is part of the outreach budget, so it can’t be easily quantified” (11, urban zoo/aquarium). Five participants indicated they were supported by program partners or one-time grants. One shared that their department had “no specific budget. We were given a \$75,000 grant for distance learning and one other project” (18, rural zoo/aquarium). Two participants reported that they were funded by revenue brought in by the program. The cost of programs ranged from free to \$200 ($M = \59.65, $SD = \$62.35$) with 44.2% of the institutions offering their programs for free.

All respondents were asked what types of programs they offered. Programs on the first survey were overwhelmingly school-based (91.1%). Of the 11 respondents who noted they offered other types of programs, six (13.3%) indicated their programs were for adults and senior citizens (Table 7).

Table 7

Program Types

| Program | Survey 1 | | Survey 2 | |
|----------------------------------|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| School programs | 41 | 91.1 | 32 | 36.0 |
| Teacher professional development | 13 | 28.9 | 10 | 11.2 |
| Massive open online courses | 0 | 0.0 | 4 | 4.5 |
| Lectures | 3 | 6.7 | 36 | 40.4 |
| Conferences | 10 | 22.2 | 22 | 24.7 |
| Other | 11 | 24.4 | 53 | 59.6 |

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

With the second survey, programs mostly fell into the *other* category (59.6%), but lectures (40.4%) and school programs (36.0%) were commonly indicated as well (Table 7). When the open-ended responses in this category were coded, 10 participants indicated they were offering virtual tours. Nine described activities caregivers could do with their families, seven created videos, six offered printable activities, and five hosted story time sessions. Question and answer programs, blogs, and home-school programs were each identified by three participants. Two museums were offering training opportunities for their staff or volunteers. Uniquely, one respondent was offering virtual dance parties.

Respondents were asked to indicate how they facilitated their programs. Most of those who responded to the initial survey used free or paid teleconferencing software (86.7%, Table 8). More than half felt their programs were easy to use and implement from the facilitator’s perspective (53.3%), whereas 44.4% felt their programs were somewhat easy to implement, and one person (2.2%) felt the technology was not user-friendly for the facilitator.

Table 8

Technology Used to Deliver Programs

| Technology | Survey 1 | | Survey 2 | |
|------------------------------|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| Teleconferencing software | 39 | 86.7 | 48 | 53.9 |
| Proprietary technology | 3 | 6.7 | 0 | 0.0 |
| Asynchronous services | 1 | 2.2 | 0 | 0.0 |
| Learning management software | 1 | 2.2 | 2 | 2.2 |
| Social media | 0 | 0.0 | 65 | 73.0 |
| Museum Website | 0 | 0.0 | 20 | 22.5 |
| E-mail | 0 | 0.0 | 5 | 5.6 |

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

Almost three quarters (73.0%) of the respondents to the second survey indicated they used social media to facilitate their new programs. More than half (53.9%) used teleconferencing tools and almost a quarter (22.5%) facilitated programs on their institution’s Website (Table 8).

All respondents were asked to describe the audiences they served. With the first survey, the most common audiences were elementary (77.8%) and middle school (77.8%; Table 9). Respondents to the second survey indicated their most common target audiences were elementary school (80.9%) and the general public (74.2%; Table 9).

Table 9

Program Audiences

| Audience | Survey 1 | | Survey 2 | |
|-----------------------------|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| Pre-kindergarten | 9 | 20.0 | 51 | 57.3 |
| Kindergarten to fifth grade | 35 | 77.8 | 72 | 80.9 |
| Middle school | 35 | 77.8 | 44 | 49.4 |
| High school | 23 | 51.1 | 30 | 33.7 |
| Universities | 6 | 13.3 | 13 | 14.6 |
| Teachers | 13 | 28.9 | 28 | 31.5 |
| General public | 11 | 24.4 | 66 | 74.2 |

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

Participants were asked how they chose the topics for their programs. Respondents to the first survey chose their topics based on state or national standards (51.1%) or museum-specific content (48.9%). Respondents to the second survey chose topics related to their museum (48.3%), transitioning existing programs online (38.2%), or state or national standards (31.5%; Table 10).

Table 10

How Topics are Chosen

| Influencing factors | Survey 1 | | Survey 2 | |
|-----------------------------|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| State or national standards | 23 | 51.1 | 28 | 31.5 |
| Museum-specific content | 33 | 48.9 | 43 | 48.3 |
| Requested | 10 | 22.2 | 5 | 5.6 |
| Existing programs | 4 | 8.9 | 34 | 38.2 |
| Museum mission | 3 | 6.7 | 9 | 10.1 |
| Available topic experts | 3 | 6.7 | 9 | 10.1 |
| Other | 0 | 0.0 | 6 | 6.7 |

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

Programs Before COVID-19

Respondents to the first survey described a wide range of programs. A few indicated they only offered distance learning programs as a special event a couple of times a year ($n = 3$). Many described live programming from either classrooms or exhibits ($n = 14$) and virtual tours ($n = 9$).

Distance learning programs are studio and exhibit based. For more general DL [sic] programs, we utilize a studio. We also feature exhibit-based . . . programs [that] do not require sophisticated technology. We utilize tablets with a webcam over IP utilizing Zoom. (71, urban zoo/aquarium)

A few respondents indicated their museums offered professional development programs ($n = 4$). One shared that their programs were open access and always available. Other unique programs included one co-owned by the school system and the museum, one that engaged senior citizens over the phone, and another that engaged students from a rural, Native American community in a science, technology, engineering, and math club via teleconferencing.

To gain more insight into the programs, the first survey asked participants to indicate the types of materials they used during their programs. Participants indicated they used (a) hands-on demonstrations (57.8%), (b) live animals (55.6%), (c) videos (51.1%), (d) artifacts or biofacts (22.2%), (e) live tours (8.9%), and (f) an online photo gallery of art found in the museum (2.2%). Almost half (42.2%) indicated they sent materials to their participants to use during the program. These were primarily printable activities for students to complete during the program (42.1%) but also included online resources (15.8%) and physical kits that were mailed to participants (15.8%). Just over half (51.1%) of the respondents to the initial survey reported that they offered pre- and post-program materials including vocabulary worksheets (60.9%), teacher guides (26.1%), readings (8.7%), and videos (8.7%). Many respondents (62.2%) indicated they conducted participant evaluations and 24.4% had completed external evaluations of their programs.

Programs After COVID-19 Closures

Respondents to the second survey described a wide range of new programs. One respondent shared that their program “varies from day to day. Our big push is to keep connected with our audience through a variety of ways each day at a set time. We have done guided tours, drawing, and even songs” (C50, urban zoo/aquarium). Many respondents discussed the issues of short turnaround and lack of technology to develop new programs. This led many of the participants to discuss using social media as a ready-made platform ($n = 14$).

We have not been doing a program, but we intend to film our staff doing some tours and talks within the house. We thought we’d post them on our Facebook page since we don’t have any real technology set up for true “distance learning.” (C23, urban historical)

Participants discussed creating virtual tours ($n = 15$) and videos ($n = 12$) that could be shared online. Some respondents mentioned transitioning existing programs online as a quick way to create content ($n = 8$). Use of blogs ($n = 4$) and pre-recorded content ($n = 10$) were frequently mentioned. Seven respondents hosted virtual storytime and one had a virtual book club for members. Two museums offered activities to be picked up for use at home. Others discussed moving previously scheduled lectures and special events to online platforms. Many were still determining how to best transition to online ($n = 14$). One respondent noted that a program was still “non-existent, but plans are in place for neighborhood tours hosted virtually by staff and docents, and making some resources available for download” (C61, urban specialized).

Participants in the second survey were asked to share any other information they felt relevant. Several museums ($n = 6$) had been planning to offer distance learning programs soon but had to shorten their timelines due to the closures:

Fortunately, we have been investing in these tools for some time though we did not plan on rolling them out so quickly and extensively. While our staff has been super proactive, it has been a difficult transition since it had to happen very quickly. (C33, multidisciplinary)

Several respondents ($n = 11$) agreed that the transition to online programs had been very challenging. “We’ve never been so busy and had so many meetings—we are on overdrive trying to reach people who can’t reach us!” (C53, rural science). When developing these new programs, participants discussed the difficulty of collaborating with other departments; “it has been difficult balancing online education/learning based programs and the digital marketing team’s idea of online engagement” (C46, suburban multidisciplinary). Additionally, some respondents ($n = 7$) felt they did not have the skills, resources, or time to effectively transition their programs to online. One participant indicated that their transition has been “chaotic, not coordinated and [we are] discovering how inadequate our technology and staff skills are” (C67, urban science).

Funding was also discussed as a major challenge:

Our challenge is 1: little budget available to purchase high quality equipment to continue distance learning and 2: at this time, distance learning does not provide direct revenue to the education department, particularly since revenue is being lost due to closure; paying staff to produce a non-revenue generating program is a tough pill to swallow. (C63, urban zoo/aquarium).

More than one museum was struggling with whether to charge for their programs ($n = 5$). “We are also discussing fees vs. donations since we need revenue but many parents are out of work” (C74, suburban zoo/aquarium).

Seven participants discussed changes in staffing that made the transition more challenging. As one shared, “all full-time staff have been reduced to part-time” (C60, urban science). Another said, “we have spent the last few weeks trying to create content, but staff are being furloughed soon, so we hope to schedule some posts so that the content can continue for a while without paid staff” (C64, suburban children’s). However, another found opportunities to work around staffing issues. “Live distance learning has been impossible as education staff are not deemed ‘essential’ and therefore cannot work at the museum’s location. However, teachers are loving our prerecorded content because it is more flexible than scheduling live meetings” (C62, urban zoo/aquarium).

Two respondents shared their struggle with distance learning as a replacement for in-person programs. One person shared that this was an “exciting opportunity for us to offer a virtual classroom, but it seems less engaging to young learners than having the Outreach Educator and his/her materials in the actual classroom” (C81, suburban historical). Two other respondents were concerned with maintaining the same high-quality programming they typically offered.

Despite the challenges, five respondents were excited about the opportunity to explore programming that would not have been prioritized, typically. “Making the transition during this time of crisis allows for experimentation in a way that would feel more challenging at a time of stability” (C22, urban art). Another said, “we are currently in a period of experimentation, trying many ideas we have been wanting to do for a long time and building in space to refine and continue to evolve based on best practices” (C46, suburban multidisciplinary).

When developing new programs, six respondents focused on how to engage their audiences. One said “we have had great interest in these programs—over 100,000 views on some!” (C72, urban zoo/aquarium). Another respondent shared they had received an “amazing outpouring of support from [the] public for offering these and donations as a result” (C74, suburban zoo/aquarium). However, one respondent indicated they had to change directions with their programming; “we have found that many parents are overwhelmed with the sheer amount of resources at their disposal and that what they’re really looking for is some familiarity and consistency” (C80, urban children’s).

When thinking about how to transition to online, two respondents suggested leveraging existing materials as a quick way to transition. “Although we have never had online programming before, we’ve been able to take a lot of the things we would be doing normally and convert them to online tutorials” (C38, urban art). Another suggested that “partnering with other organizations seems to help a lot with engagement” (C49, suburban children’s). Ten respondents were still in the planning stages but one participant indicated that they had developed all of the content but could not implement it, saying they were “ready and willing but prevented” (C45, urban art).

Limitations

While an effort was made to contact museums with known distance learning programs, it is unlikely that every program was included. Additionally, the second survey was administered during a global pandemic when museums were closing. This added stress may have prevented participants from responding. Additionally, changes in employment may have prevented participants from receiving the survey if they no longer had access to their institutional e-mail. However, this study still offers insight into the state of museum-based distance learning programs.

Discussion

This study examined the current practices in museum-based distance learning before and after COVID-19 closures. Descriptive studies such as this set the stage for future research, and based on the findings, there are many opportunities for additional research in the field of museum-based distance learning.

When discussing the barriers to engaging in online programming, respondents described many of the same issues identified in the literature: cost, staffing, time, resources, and institutional barriers (Ennes & Lee, 2021). To help educators address the issues described in this study, researchers should examine ways to

offset the barriers (real or perceived) museums face when developing online learning opportunities. Resources, time, staffing, and cost can be offset by partnerships and grants as mentioned by several respondents, as well as in a recent report by International Council of Museums (ICOM, 2020) that offered strategies for museums to develop resilience during the pandemic. Choosing partnerships strategically can support a museum's ability to reach greater audiences through online learning (Kraybill & Din, 2015). Identifying potential partnerships and grants will remain a vital strategy for museums to develop and sustain online programs (Ennes & Lee, 2021).

In addition to the barriers described above, some educators viewed online pedagogy as a barrier. Several explained they believed in-person teaching was more effective than teaching online. This could be a result of a lack of training in effective online pedagogy. The range and types of technology available for teaching online will continue to change. Therefore, researchers will need to examine what pedagogical strategies are most appropriate for museum-based online programming; the strategies that are effective for online programs in formal education may not be appropriate in this setting. Education researchers interested in pedagogical strategies and pedagogical content knowledge should investigate the skills needed to effectively teach online in each of the types of programs described by participants in this study. Skills and tactics that are useful for a massive open online course may not be appropriate for a one-time synchronous program, and social media platforms may not allow for the same kind of interactivity available in other types of museum programs (Conrad, 2014). Additionally, there are opportunities to examine whether traditional educational theories such as constructivism remain appropriate or whether educators need to explore theories and frameworks specific to online learning such as cybergogy (e.g., Wang & Kang, 2006) or heutagogy (Hase, 2009).

Respondents discussed transitioning existing programs online following museum closures. While previous studies have discussed this strategy as a way to reduce the burden of developing online programs (e.g., Gaylord-Opaiewski & O'Leary, 2019), other studies caution against trying to directly translate programs to online offerings as the pedagogical strategies are different (Mazzola, 2015). For example, educators who rely on physical and verbal cues may find them lacking in the online setting and need different pedagogical strategies to teach effectively (Samuel, 2015). Additionally, online programs are accessible by learners from around the world and it is possible that without culturally responsive pedagogies, misunderstandings and other learning barriers may arise (Gunawardena, 2014). Studies should examine whether programs are culturally responsive and respectful of learners from broad geographic areas (Latchem, 2014).

There is also a need to engage in research to address the digital divide that has been exacerbated by the current global pandemic (UNESCO, 2020a). In a recent study, researchers found access to the internet was impacted by (a) geographic disparities (e.g., rural vs. urban); (b) competition, to help keep prices low; (c) profit-based discrimination, since companies may believe certain areas have a lower demand and will therefore avoid serving those regions; (d) cost to install new technology; and (e) socioeconomic differences, with geography and socioeconomic status having the highest impact on access (Reddick et al., 2020). A similar study in the European Union found that age, gender, education, and income significantly impacted internet access. Addressing the digital divide will need to be context specific as "it is a multidimensional phenomenon and different backgrounds ask for different measures, if the goal is to narrow digital discrepancies in an effective way" (Elena-Bucea et al., 2020, p. 11). Museums must consider how to best

reach individuals without digital access, and the strategies they choose will be dependent on their particular community as “each faces unique historical, political, financial and logistical challenges” (Reddick et al., 2020, p. 1). The research on museum-based distance learning programs is still growing, and there are many opportunities to better understand how these programs can be designed and facilitated so they can best reach underserved audiences (Ennes & Lee, 2021).

Several respondents to the second survey discussed the rise in collaboration between education departments and marketing. These new partnerships should be examined to identify best practices for facilitating such collaborations. Crow and Din (2011) highlight the importance of shared goals, responsibilities, leadership, and the ownership of successes and failures in any museum-based distance learning partnership, whether internal or external. Respondents indicated that partnerships brought new challenges and opportunities in developing online programming, particularly as they began using social media to facilitate programming.

Social media has its own sets of affordances and challenges and can influence the nature of interaction and communication in online programs (Conrad, 2014). The number of museums using social media platforms to host programs raises questions about how these platforms may change the interactivity of the programs. For example, researchers may want to examine how to interactively engage learners in programs hosted on Facebook Live. Tools such as learning analytics, network analyses, discourse analyses, and social network analyses may lead to insights into these types of questions (Zawacki-Richter & Anderson, 2014).

In addition to pedagogical studies, quality studies are an area of need for both formal and museum-based online learning (Zawacki-Richter & Anderson, 2014). Some respondents were not satisfied with the programming their institutions were developing. Therefore, museums have an opportunity to explore what constitutes high quality in museum-based online programs. Researchers in formal online learning have questioned whether there should be a consensus regarding what high-quality programs look like (Latchem, 2014) and this may be an area of interest for museums as well. One suggestion for assessing quality is for institutions to compare their practices and metrics with those of other institutions (Latchem, 2014). This will require studies to compare programs across institutions rather than the current trend of individual case studies (Ennes & Lee, 2021). Therefore, researchers should consider larger studies that examine similar programs across a wide range of institutions.

Museums have flexibility in program offerings and should leverage the creativity of their staff to explore and test new models (Gaylord-Opalewski & O’Leary, 2019; ICOM, 2020). However, previous studies recommended that museums should make use of “systematic instructional design that carefully considers the learners and the learning objectives, followed by the consideration of the best tools to meet those objectives” (Kraybill, 2015, p. 99). This raises questions about how instructional designers may be able to assist museums in developing these programs in ways that can be responsive to society as well as new technologies (Zawacki-Richter & Anderson, 2014). Instructional designers should consider collaborating with museum educators to develop online programming using appropriate pedagogical approaches and theoretical frameworks. This would open the door to research-practice partnerships and increased research grounded in theory.

Finally, participants in both surveys discussed the need for professional development to improve their skills. This is an area of need for museum education research broadly (Tran et al., 2019) and for museum-based online learning research in particular. Research on professional development for museum educators is growing (e.g., Ennes et al., 2020; Piqueras & Achiam, 2019; Tran et al., 2019). For example, in a study of museum educators' levels of self-efficacy related to their position, one of the biggest areas of need for professional development was that of onsite program facilitation (Ennes et al., 2020). Museum educators likely have similar reservations about their ability to effectively facilitate online learning. Research should assess museum educators' levels of self-efficacy regarding these new programs. Additionally, there is a need to examine the skills and preparation educators have to teach online (Zawacki-Richter & Anderson, 2014). These areas should also be considered when developing and examining the efficacy of professional development for museum educators engaged in online learning.

Conclusion

Distance learning programs offer museums the opportunity to engage a broad range of visitors with their collections (Gaylord-Opalewski & O'Leary, 2019). Before the COVID-19 outbreak, these programs predominantly focused on school groups and teacher professional development. Following the closure of museums, institutions began transitioning their in-person programming online to continue serving their educational missions. While challenging, this has offered museums the opportunity to think creatively about how they engage in education and who they are serving with their programming (ICOM, 2020). Museums have risen to the challenge of developing new resources to support their visitors despite experiencing closures due to a global pandemic.

This study offered an overview of the current landscape in museum-based distance learning programs as well as future directions for research. Museums are offering a broad range of programming to serve the needs of their visitors both in person and online. Many museums are using this time to develop creative new approaches to reaching their audiences through innovative programming. This offers researchers the opportunity to examine the impacts these programs have on learning, interest, engagement, and museum visitorship. It is likely there will be an increase in the number of museums offering distance learning programs as the situation surrounding COVID-19 remains unclear. Therefore, museum education researchers should form research-practice partnerships with museums to help establish best practices for effective programming, and to support educators as they explore what is, for many of them, a new frontier. High quality museum-based online programs may offer diverse types of visitors the opportunity to engage with collections in ways that increase their interests and knowledge even if they cannot physically visit an institution. As these types of programs will only gain in importance and popularity in the future, the research community must establish a better understanding of these programs through the strategies outlined in this study.

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