Defining Interactive Virtual Learning in Museum Education: A Shared Perspective

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Published online: 25 Jul 2019.

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Defining Interactive Virtual Learning in Museum Education: A Shared Perspective

Kasey Gaylord-Opalewski and Lynda O'Leary

ABSTRACT

The authors will discuss how all cultural institutions can benefit from a top-notch virtual learning program in terms of outreach, diversity, and promotion of collection. We'll provide ways to maintain an outstanding virtual program, and discuss data collected from museum educators from a wide range of diverse cultural centers to discuss the history and current state of Interactive Virtual Learning programming in informal and formal education.

Did you know that cultural institutions have long used video chat technology to deliver outreach lessons?

Interactive Virtual Learning (IVL) Programs can bring an ocean expert to a classroom in Indiana, it can connect college students studying art history in Philadelphia with a curator in Paris working at a museum that houses the largest collection of Monet, and it can allow adults living in a retirement home the chance to talk, in real-time, with an astronaut that is orbiting the Earth. IVL is not intended to replace the immensely valuable in-person visits to cultural institutions, rather these programs offer the opportunity to introduce or extend an on-site experience. The world of IVL is commonly viewed as an addendum to an onsite experience with cultural institutions such as zoos, museums, libraries, science centers, and the like. Through dedicated virtual educators trained to interpret collections using synchronous technology, IVL programs serve not just as an addendum to onsite experiences, but rather as a conduit for greater outreach and promotion to audiences that may never have the opportunity to visit the collections of a museum in person – due to budget, physical limitations, or distance. Like museum gallery lessons, IVL programs are designed to engage different types of learners, reinforce classroom units of study, and foster a lifelong love of cultural centers (Figure 1).

IVL programs offer exceptional educational experiences that encourage active learning meant to enhance the collections within the walls of a museum. Today, most global citizens are familiar with the power of video chat, technologies that allow individuals to connect with another for a face-to-face conversation via webcams or mobile devices. Thirty years ago, the idea that many people around the world would have access to the internet or would be carrying handheld computers in their pockets would have been
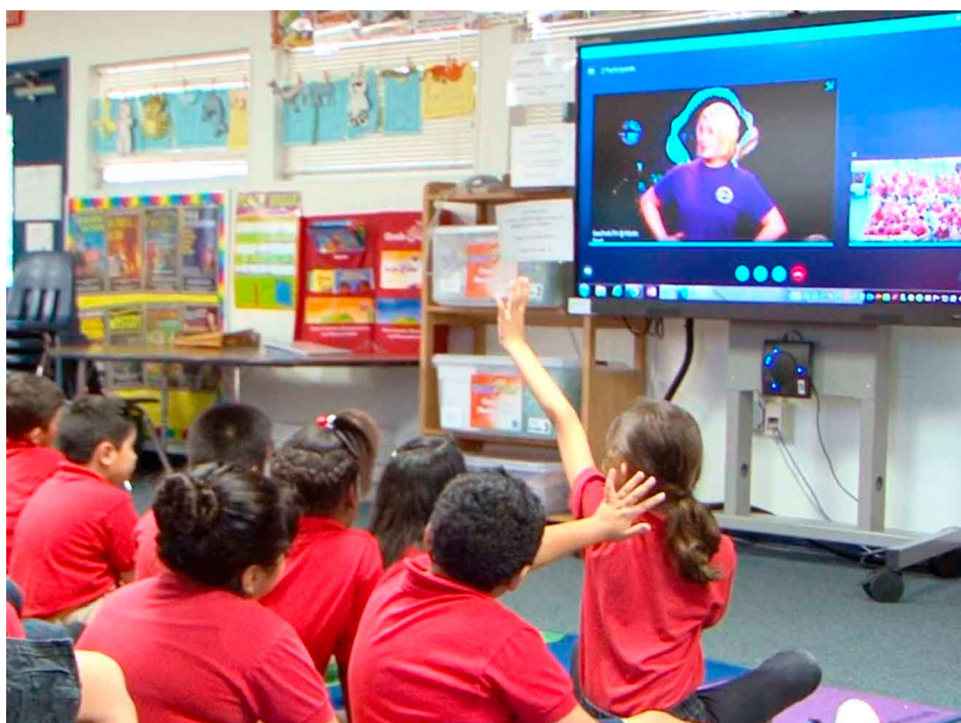
Figure 1. Students in a traditional K-5 classroom setting participating in an IVL program with SEA-trek.TV (credit: Mote Marine Laboratory / SEAtrek.TV).

viewed as ludicrous by most. However, when introduced as a learning tool in the 1990s, a small sect of museum educators recognized the power of digital resources and used the technology to create live IVL programs, then termed Distance Learning, for school-age students. With the advancements in technologies, IVL programs are growing in demand and are considered an important enhancement in the twenty-first century educational framework.[1]

With technology readily available, an individual can search a term at any given time, follow the journey of a friend traveling abroad, and video chat with a doctor, fitness instructor, or loved one in a separate geographical location all in real-time. Technology, becoming ever more accessible, offers a great deal of benefits and challenges for cultural institutions considering how to remain relevant in the digitally driven twenty-first century.[2] We strive to contribute to the scholarship[3] that addresses harnessing technology as tools to extend the reach of a cultural institution by conducting an examination on the current state of IVL within museum education – a field that has been growing for over 25 years.

How can we capture the history and current methodology of interactive virtual learning in museums?

To best fit the needs of the twenty-first century teacher and learner, we conducted an examination of the field to see how the evolution of technology utilized to deliver IVL

programs impacted museums. We were specifically interested in collecting data from our peers to further define the vocabulary associated with the field to distinguish IVL programs from ever growing asynchronous content, such as webinars, made available on websites and social media platforms. Along with considering how language should be redefined for the twenty-first century museum visitor and worker, we offer a close examination of the progression of IVL. To gain a deeper insight into the history of the field, surveys were administered to a group of IVL pioneers, defined as individuals that were first to implement and support IVL programs in cultural institutions and classrooms. Another set of surveys were administered to active virtual educators, defined as individuals responsible for coordinating IVL programming in cultural institutions from around the globe, to measure current challenges and best practices in the field. The survey results were then used to prompt in-depth discussion during five separate interviews with participants from the IVL Pioneer and Virtual Educator focus groups.

The following section highlights the data collected from the IVL pioneers focus group who generously shared their experiences to provide important historical origins of IVL. The subsequent sections reveal the data collected from active virtual museum educators and K-12 educators, to offer troubleshooting strategies to overcome potential challenges cultural institutions may face as they work to integrate or improve upon IVL programs as educational offerings.

How was it possible to provide museum outreach lessons through video chat before webcams?

IVL was integrated into cultural and K-12 educational realms as an experiment launched by Bell Laboratories in 1994.[4] This innovative program centered on using Bell Laboratories' then cutting-edge ISDN (Integrated Services Digital Network) technology to connect a handful of select K-12 schools to cultural organizations for a synchronous museum program. Massive codecs and telephone lines, also known as ISDN lines, provided the connection, and only educators in schools or in organizations that had dedicated ITV classrooms could participate.[5] ISDN technology was expensive, thus cost-prohibitive, which severely limited the reach to K-12 schools in the initial years. Members of the IVL pioneer focus group reminisced about setting up the hardware then patiently waiting for the sound of those trailblazing ISDN lines to ring and then finally seeing little green lights pop onto the screen to indicate they were indeed successfully connected to their audience hundreds to thousands of miles away.[6]

In the early 2000s, major technology companies began producing H.323 video conferencing units[7] that had hardware built with integrated software systems. These units offered a more manageable, stable, and (slightly) affordable video connections between cultural institutions from around the globe and K-12 classrooms. As years progressed, synchronous technology followed suit; advancing to IP-based videoconferencing systems, then to the cloud-based video chat technology. Today everything one needs to connect in the twenty-first century is built directly into most laptops: access to the Internet, a browser, a display, a high-resolution camera, decent speakers, and a microphone.[8]

With the rise of accessible and reliant technology, IVL programs have grown exponentially in recent years.[9] The IVL pioneer focus group explained learning to equip a dedicated broadcast environment, securing funding for the technology needed, and

appointing trained staff are some of the challenges many cultural institutions face when integrating new innovative programs into a department. However, those interviewed in the virtual educator focus group discussed the unforeseen challenges that arose as more museums began developing IVL programs that were accessible to a global audience.[10] Focus group participants specifically noted the difficulties they faced in developing IVL programs that met the needs of national audiences and aligned with their departmental metrics, all the while standing out amongst their increasing competitors.[11]

Both the virtual educator and the IVL pioneer focus groups mentioned seeking refuge with colleagues who they connected with through the Center for Interactive Learning and Collaboration (CILC).[12] They noted that CILC's professional development opportunities provided valuable training for virtual educators in cultural institutions. Both focus groups discussed the important role of joining and growing a professional learning community[13] that provides training specific to the needs of those tasked with coordinating IVL programs.[14]

Why is not there a universally used term for real-time virtual visits?

After sifting through survey data, we identified a common issue in the field: the lack of a unified vocabulary. We explored this finding by asking the focus group members, "what terms do you associate with this field?" All groups explained that the first wave of synchronous virtual programs was primarily termed as Distance Learning lessons, to then be interchanged with Interactive Videoconferencing (IVC) or Virtual Field Trips (VFT). However, the introduction of asynchronous, or user-controlled, online classes and accessible web-based content, substantially widened the term "Distance Learning." Participants further explained the term "Distance Learning" has become synonymous with asynchronous learning, and for those who have been in the field of IVL since the early years it evokes memories of yesteryear, when technology was expensive, cumbersome and came with a lot of wait time.[15]

The following vocabulary and definitions emerged from the data collected from both focus groups and is supported by the data collected from the initial surveys to best represent IVL in museums today:[16]

- Synchronous Distance Learning: Technology that allows for real-time interaction, between two groups or sites, through videoconferencing hardware or cloud-based applications.
- Asynchronous Distance Learning: Self-directed, web-based educational experience that allow individuals to set the pace and mode of knowledge transfer.
- IVL: Synchronous distance learning programs that are facilitated by content experts, such as virtual museum educators.
- Virtual Museum Educator: An individual with a strong digital skill set; trained to develop, produce, and facilitate IVL programs that align with the ambitions of a cultural institution.
- IVL Program: Live synchronous educational lessons facilitated by virtual museum educators who actively teach groups using the collections, interactive discussion, hands-on activities, and technology.[17]
- Point-to-Point Connections: IVL programs facilitated by one virtual museum educator that is delivered live to a single group at one time.

- Multi-Point Connections: IVL programs facilitated by one virtual museum educator that is broadcast live to multiple groups in different geographic locations at one time.
- Streaming: IVL experiences that activate the collections or research of an institution and occur only once in real time, typically with a passive audience.

Those interviewed specifically noted that webcasts and live streaming events are joining the IVL field as a means of delivering content to multiple audiences at one time. While these experiences can be somewhat interactive, perhaps with a small chat space provided, they are a passive mode of content delivery. These experiences can become even less interactive after they are initially recorded with a live audience and accessed by virtual visitors after the event has already come to pass.[18] Those interviewed urge cultural institutions to think critically about live streaming events, as these experiences are typically disseminated freely and intended to provide access to a large group. This distinction is critical, as IVL programs are designed to align with the same goals that drive on-site museum education experiences offered in cultural institutions. IVL programs are intended to link the virtual visitors with museum content as well as offer insight and personalization to meet the specific needs of those participating. As cultural institutions become increasingly more interested in offering live streaming events, it would behoove them to consider how the resources[19] can also be extended within their institution to meet the demands of requested IVL programs and utilize the digital skill set of virtual educators who can assist in the integration of unique live streaming events for a global virtual audience.[20] Virtual museum educators can build upon live streaming events to forge stronger connections between the institution and virtual visitors through live IVL programs.

Since video chat is so available and familiar now, why do not all cultural institutions create IVL programs?

Several participants in the virtual educator focus group reported facing an ongoing challenge of getting their administration to fully grasp the value of live IVL programs,[21] explaining they are often overlooked as a solution for schools unable to visit due to cost, lack of chaperones, or distance. While IVL programs do not typically boast high financial returns for a cultural institution; they do contribute to meeting departmental goals, such as: audience diversity and outreach numbers. Both focus groups explained, IVL programs serve as an excellent outreach option that extends the reach of the cultural institution with no restrictions of geographical boundaries.[22] The groups further stated, IVL programs offer an innovative way to extend the promotion of an institution and foster closer bonds with local, national, and global communities.[23]

Participants further noted that IVL programs are designed to be interactive like on-site programs, intended to engage different types of learning styles in hopes of instilling a passion for the arts, sciences, mathematics, and history that may have not been ignited within traditional learning environments. Focus groups stressed that it is important to cultivate relationships with participating schools and organizations, explaining the time spent with the individual coordinating the virtual visit – and the technology team when available – is a crucial component to growing a sustainable IVL program[24] and contributes to departmental metrics[25] (Figure 2).
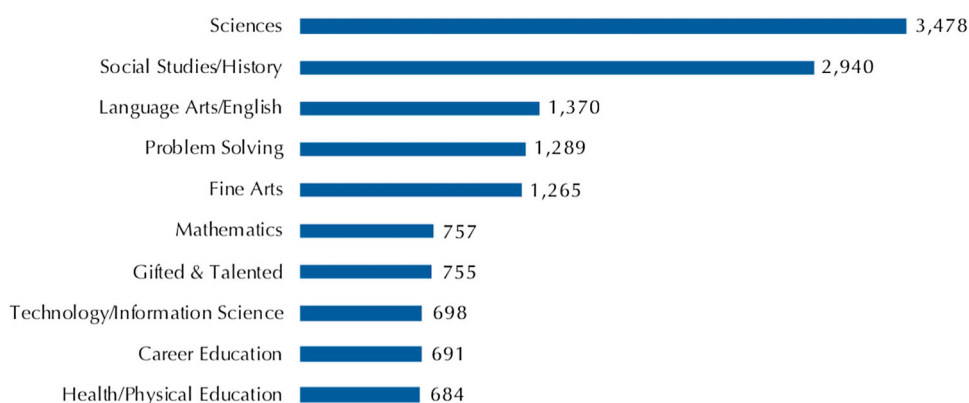
Figure 2. Most popular subject areas for IVL programs booked on CILC between July 1, 2017 – June 30, 2018. Numbers indicate number of programs booked per subject area.

We have summarized the data collected from interviews with virtual educators to produce advice for cultural institutions seeking to integrate IVL experiences into educational department initiatives:[26]

- Repurpose existing content used in on-site educational programs. Chances are if it is already successful in person, it will be successful virtually.
- There is no need to constantly create new programs. Have a core base of good programs, build the clients for these programs, and then reassess and add or eliminate based on the demand from the audience.
- Customer service is essential. Working well with teachers and administrators will keep them coming back and will help you grow your program by word of mouth.
- Be patient with participating schools and be prepared to educate them on what they need to participate. They often do not realize they already have all the technology needed.
- When using technology or developing programs, do not be afraid to try new things. If it does not work, lessons can be learned!

As one member from the IVL pioneer focus group stated, "do not allow the technology to intimidate or frustrate you or your customers. Allow the technology to be the conduit rather than defining the experience."[27]

Many of the focus group members noted a major challenge faced was limits in staffing. A number of those surveyed reported that they were the only one, or at most two, staff educators responsible for developing, scheduling, teaching, and coordinating IVL programs and payments.[28] While it is typical in small institutions for educators to wear many hats, some of the participating virtual museum educators who reported this issue come from large institutions with education departments of over a dozen staff members. Those who expressed frustration felt they simply did not have the capacity to create new content, improve upon current programs, or continue to meet the growing demand of requested IVL programs.[29] Those who participated in focus group interviews expressed a resounding need for museum staff to be cross-trained in IVL programming.[30]

Focus group discussions confirmed that restriction of IVL program staff was not an issue across the board, as several shared their experience working as part of an education team that had a designated role in developing and conducting IVL programs.[31] A few participants in the virtual educator focus groups reported staff members in their department were hired and trained with the expectation that they would be responsible for becoming virtual museum educators for at least some of the year, and only people who were comfortable on camera were hired for positions specifically within the IVL department.[32] Their feedback led to a deeper conversation within the focus group, resulting in participants brainstorming models for effective forms of cross-training staff. One member suggested, cultural organizations strategize peak periods to train staff in IVL. With IVL programming following monthly trends that match the typical school calendars in the US,[33] the virtual educator focus group suggested conducting training during slower periods will allow cultural institutions to meet the increasing demand for virtual visits and in turn increase departmental numbers through IVL programs.[34]

Those surveyed and interviewed realize that not every cultural institution can expand its staff size but believed that all education teams can be trained. They suggest:[35]

- Consider hiring staff members with some theater or public speaking experience. Since they will never be in the same room as their audience, these skills help them become "larger than life" when instructing virtually.
- Make eye contact with camera(s) to engage your audience, it will appear as if you are making eye contact directly with them.
- Do not be afraid to present content through a variety of methods. IVL program delivery should be dynamic.
- Carefully consider who you put in front of the camera. Remember that not everyone is comfortable being on-screen.
- Maximize the skill set of educational staff for a high-quality program. To reduce burnout and fatigue, cross train staff who are comfortable and demonstrate the skills needed for teaching in a virtual setting.
- Record and watch your presentations, then reflect on and improve your practice.

As one participant commented, "think outside the role of the 'traditional educator' as IVL programs do not take place in a traditional education setting."[36] Since the audience is not in the same room as the educator, the IVL experience must be nimble in a way that will translate across a virtual medium.

As shown in Figures 3 and 4, virtual museum educators are currently serving a diverse range of audiences,[37] with K-12 serving as the largest subgroup utilizing IVL programs to date[38] (Figures 3 and 4). As a way to add to the insights collected from both the IVL pioneer and virtual museum educator focus groups, we reviewed CILC data collected from schools across the globe that scheduled IVL programs for their K-12 classrooms.[39] The data suggest that teachers have a high comfort level with the technology set-up necessary to be used in the classroom, debunking the wide misconception that IVL programs still have a complicated technology that is not user-friendly on the school side, and are novel in the field of formal primary and secondary education. K-12 educators reported they primarily use cloud-based software to connect, noting this as the biggest benefit in IVL programming because the technology was familiar, easily accessible, and relatively
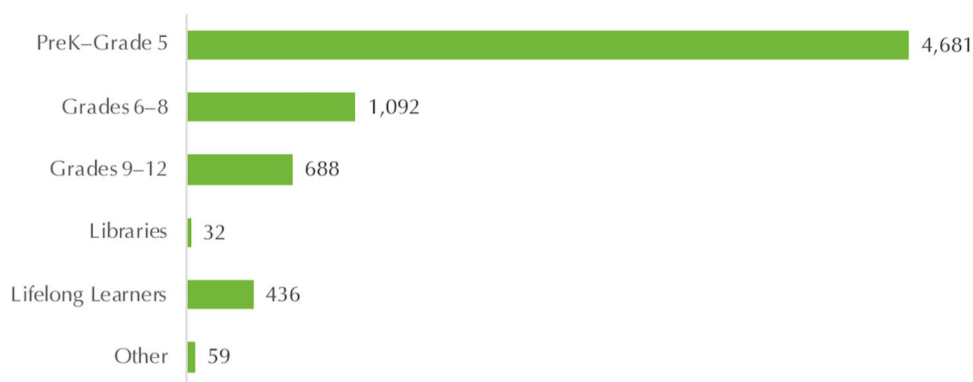
Figure 3. Audience type for IVL programs booked on CILC between July 1, 2017 – June 30, 2018. Numbers indicate number of programs booked per audience.

inexpensive. With the once commonplace fear of technology fading, K-12 educators expressed a desire for more IVL programs to supplement their curricula.[40]

When these findings were discussed with the focus groups, however they pointed out that there are still a fair number of classroom teachers who are new to using technology as an educational tool and require some extra support from the virtual educator to ensure a successful connection and a lasting partnership.[41] The focus groups urged those considering implementing IVL programs to exercise patience when working with groups and to
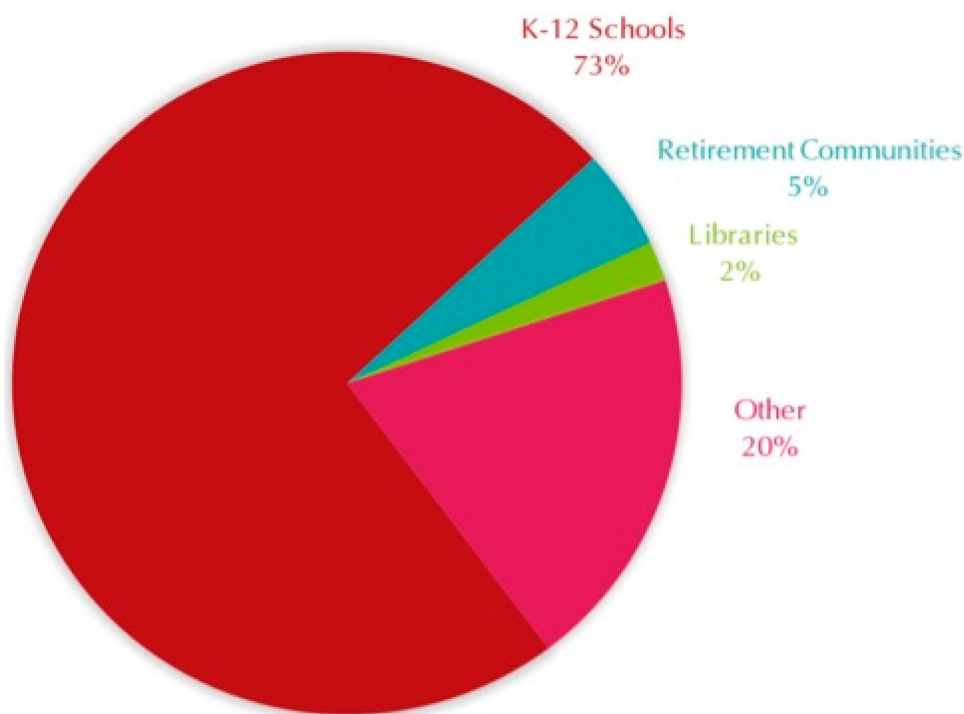

Figure 4. Types of sites that booked IVL programs on CILC between July 1, 2017 – June 30, 2018.

have a staff member with strong digital skills and the ability to work well with myriad personalities to provide dedicated technical support, which is often lacking in K-12 schools.

The focus groups agreed that comfort with technology on both the side of the school and the institution is paramount in increasing interest in IVL programs[42] and offered these final suggestions to those new to the field who hope to build top-notch IVL experiences:[43]

- IVL programs are difficult to sustain on fees alone, as virtual visits often charge a flat rate as opposed to the typical cost per visitor fee employed for on-site programs. If necessary, look for grants to help support IVL program costs and investments.
- Develop the digital skills of education staff to support IVL programs for the institution.
- Not every trend will work for your institution and that is okay. Try something new and if it does not work, that is okay.
- Start simple in terms of technology, embrace what is available and inexpensive. There is no need to spend $50,000 on an IVL studio if your budget is limited.
- Focus on ways to actively engage different audiences in learning. Vary your modes of content delivery: ask questions, do experiments, dress up, or have participants do hands-on activities.
- Be ready to make it work no matter what when working with technology. Conduct technology test calls prior to every new session, and design back-up plans should the technology stumble while live on camera.
- Join a supportive community!

Figure 5. Example of robust IVL studio technology (credit: Mote Marine Laboratory / SEAtrek.TV).

As one focus group member commented,

> experiment and be flexible with the spaces you have available. During peak IVL season, turn a classroom into a studio, then during the summer months, change it back to a classroom for summer camp. If your staff is cross-trained, your spaces are interchangeable, and your content is flexible, you will be set up for success.[44] (Figure 5)

Looking to the future

The field of IVL has changed immensely over the past twenty years and will continue to evolve as the information age progresses. The role technology plays in society will strengthen the comfort levels of future museum visitors and will continue to increase along with the demands for more innovative K-12 programming. What was once an experiment and, then classroom novelty, is now a constant in school communities across the globe. It is now commonplace for scores of cultural organizations to have their IVL programs built into the classroom, school, and district curricula, and depend upon museum-focused IVL programming as a relevant and engaging enhancement to their unit of study. Even though this field is still relatively young, its history is rich with trial and error as well as success stories. As the field of IVL continues to grow, there are a few constants that were reported by all populations, which are the love of this type of teaching and the continual and loyal support of the passionate professional learning community within this unique educational field.[45]

Notes

1. Barnes, et al., *Mapping the Museum Digital Skills Ecosystem*, 1–59.
2. Ibid.
3. Ibid.
4. Cole,et al., *Videoconferencing for K-12 Classrooms*.
5. Ibid.
6. "Interview with Educator Focus Group."
7. H.323 is a recommendation from the ITU Telecommunication Standardization Sector (ITU-T) that defines the protocols to provide audio-visual communication sessions on any packet network. The H.323 standard addresses call signaling and control, multimedia transport and control, and bandwidth control for point-to-point and multi-point conferences."
8. "Interview with IVL Pioneer Focus Group."
9. "Interview with Educator Focus Group."
10. Ibid.
11. Ibid.
12. A nonprofit organization established in 1994, CILC was founded by a major telecom provider with a mission to connect Indiana schools to museums, zoos and other state cultural organizations using videoconferencing. The original website was built to easily identify content for education, manage registration of programs, and to evaluate quality of content. In the early 2000's, CILC expanded its reach to other states outside of Indiana, and then internationally. It has maintained its foothold as the "mothership" for both non-profit virtual educators and K-12 schools looking to book, create, promote, and learn in the field of Interactive Virtual Learning. Since its inception, CILC has provided a valuable resource to K-12 organizations, universities, and senior communities interested in scheduling interactive virtual programs with cultural institutions via CILC's robust online directory.

13. One such community, is the Pinnacle Educator Collaborative (PEC), which is currently comprised of virtual educators that actively teach IVL programs in cultural institutions from across the globe and who use CILC as a portal to market programs. Members of the PEC community meet regularly to exchange best practices, share marketing opportunities, and work together to promote distance learning through PEC Festivals and other means. Currently there are about 80 members of PEC, with 40–50 that are regularly active in PEC meetings and events.
14. "Interview with Educator Focus Group."; "Interview with IVL Pioneer Focus Group."
15. "Interview with Educator Focus Group."
16. "Interview with Educator Focus Group."; "Interview with IVL Pioneer Focus Group."; "Interview with PEC Focus Group."
17. To be interchanged with: virtual field trip, virtual workshop, or virtual visit
18. "Interview with Educator Focus Group."
19. Equipment needed will vary based on institutional needs but generally includes dedicated hardware (iPad, laptop, and/or video conferencing unit), quiet broadcast space equipped with production enhancement tools (such as sound proofing, green screen backdrop to project a digital background picture during programs), audiovisual equipment (such as microphone and additional speakers) as well as personnel or staff time, and funding.
20. Barnes et al., *Mapping the Museum Digital Skills Ecosystem* 1–59.
21. "Interview with Educator Focus Group."
22. Ibdi.
23. "Interview with Educator Focus Group."; "Interview with IVL Pioneer Focus Group."; "Interview with PEC Focus Group."
24. "Interview with Virtual Educator Focus Group."
25. "Interview with Virtual Educator Focus Group."; "Interview with PEC Focus Group."
26. "Interview with Virtual Educator Focus Group."; "Interview with PEC Focus Group."
27. "Interview with IVL Pioneer Focus Group."
28. "Interview with PEC Focus Group."
29. "Interview with IVL Pioneer Focus Group." Online interview by authors. March 7, 2019; "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019; "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019.
30. "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019; "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019.
31. "Interview with PEC Focus Group."
32. "Interview with Virtual Educator Focus Group."
33. Specifically, the highest number of IVL programs are delivered to K-12 students before winter vacations and summer holiday periods as well as after heavy testing dates; "Interview with PEC Focus Group." Online interview by author. February 13, 2019.
34. "Interview with Virtual Educator Focus Group."; "Interview with PEC Focus Group.".
35. "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019; "Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019.
36. "Interview with PEC Focus Group."
37. "Interview with Virtual Educator Focus Group."
38. "Interview with PEC Focus Group."
39. CILC Program Statistics: July 2017 through June 2018. Report. Center for Interactive Learning and Collaboration. 1-18.
40. Gaylord-Opalewski and O'Leary. Surveys from K-12 Classroom Teachers.
41. "Interview with Virtual Educator Focus Group."; "Interview with PEC Focus Group.".
42. "Interview with PEC Focus Group.".
43. "Interview with Virtual Educator Focus Group."; "Interview with PEC Focus Group.".
44. "Interview with PEC Focus Group.".
45. "Interview with Virtual Educator Focus Group."; "Interview with IVL Pioneer Focus Group."; "Interview with PEC Focus Group.".

Acknowledgements

Disclosure statement

About the authors

Kasey Gaylord-Opalewski is the OurEcho Biodiversity Challenge Manager at EarthEcho International. She has extensive experience in designing, developing and coordinating innovative virtual programming for non-profit organizations, and has years of "on-air" experience as a virtual educator, receiving innumerable accolades for her lively and engaging marine science and conservation presentations. Kasey specializes in the interpretation and translation of scientific research concepts and utilizes strategic framing techniques to lead complex conversations, such as those focused on climate change. She has a strong interest in teen programs as well as public programming for adults, such as Science Cafés and professional development for educators and life-long learners. Kasey holds a B.A. in Biology from Minnesota State University – Moorhead (2001), a Graduate Certificate in Coastal Studies (2004) and M.S. in Environmental Education (2006), both from Nova Southeastern University.

Lynda O'Leary is currently a museum educator at the Philadelphia Museum of Art. She has over twenty-three years' experience in museum education, with extensive dedication to virtual programming. She joined the Division of Education at the Philadelphia Museum of Art in 1997, and began her work with its Distance Learning Program in 2001. In her role as Distance Learning Coordinator until 2016, Lynda oversaw all aspects of the program, including development of innovative programming, incorporation of new technologies, and audience growth and retainment. Under her leadership, the program received multiple awards for exceptional content, and was selected by Google as a launch partner for their virtual education initiative. In addition to her part-time work as a school programs educator, Lynda acts as a virtual programming consultant, having worked with numerous cultural institutions across the globe, and is also actively involved in her community through volunteering as the community partnership coordinator at a local public elementary school.

Bibliography

Barnes, S.-A., E. Kispeter, D. R. Eikhof, and R. Parry. *Mapping the Museum Digital Skills Ecosystem: Phase One Report. Report. 'One by One', University of Leicester*. Leicester: University of Leicester, 2018. 1–59.

CILC Program Statistics: July 2017 through June 2018. Report. Center for Interactive Learning and Collaboration. 1–18.

Cole, C., K. Ray, and J. Zanetis. *Videoconferencing for K-12 Classrooms: A Program Development Guide.* 2nd ed. Eugene, OR: International Society for Technology in Education, 2009.

Gaylord-Opalewski, K., and L. O'Leary. *Surveys from K-12 Classroom Teachers*. December 16, 2018. Survey data collected via online form.

"Interview with Virtual Educator Focus Group." Online interview by author. January 29, 2019.

"Interview with IVL Pioneer Focus Group." Online interview by author. March 7, 2019.
"Interview with PEC Focus Group." Online interview by author. February 13, 2019.
"Pinnacle Education Collaborative (PEC)." Center for Interactive Learning - PEC. Accessed February 20, 2019. https://cilc.org/Providers/PEC.aspx.