Roots

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Education and technology: Responding to a global pandemic

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← Prairie Ecology programming at Plains Conservation Center (pre-COVID-19) ©Denver Botanic Gardens/Scott Dressel-Martin

Denver Botanic Gardens has provided online distance-learning programs for schools since 2016. With COVID-19 and changing school models, the demand for these distance learning programs increased significantly, along with unforeseen challenges. Our education and information technology departments forged partnerships to address these challenges, adapting to meet the rapid acceleration of virtual programs in new and creative formats. Denver Botanic Gardens is a multi-site organization, operating school programs out of three locations; our virtual format showcases each unique site while allowing us to serve our local schools and reach new audiences well into the future.

INTERACTIVE DISTANCE LEARNING: ADAPTING SCHOOL PROGRAMS DURING COVID-19

INTRODUCTION

Denver Botanic Gardens typically runs school field trip programs at three different sites in Colorado: at our main horticultural and research location in Denver, at our agricultural, historical and native plant site Chatfield Farms in Littleton, and at Plains Conservation Center in Aurora, a cultural history and prairie conservation partnership site. On-site educational programming highlights the distinctive plants and characteristics of each location. Although Denver Botanic Gardens has offered distance learning since 2016, virtual programs were intended to reach distant audiences rather than replace in-person visits from local schools. When the COVID-19 pandemic hit we were forced to close our sites to field trips, requiring a quick pivot and reallocation of resources and teamwork between the Education and IT departments allowing us to replace cancelled on-site programs with virtual experiences.

↑ A family interacts with a DBG instructor during a live virtual program ©Denver Botanic Gardens/Scott Dressel-Martin

Prior to the pandemic, we offered two virtual school programs: Flower Dissection for primary grades, and Drawing for Scientific Studies for secondary grades. Both were designed for one classroom of students at a time, used Zoom, and required teachers to purchase a grocery store item for use during the live session. Before spring 2020, these virtual programs reached a handful of classrooms each year in several US states and Canada. During spring 2020, we saw a significant increase in local Colorado school participation plus expanded national and global reach with new virtual program participants in Africa, South America, Europe, and Asia. The Gardens currently offers 8 distinct virtual programs in addition to a custom option, with substantial changes to program structure in response to the needs of our audience.

CHALLENGES, SETBACKS AND SOLUTIONS

Once we began replacing cancelled field trips with virtual programs, our first major hurdle was how to set up our instructors to successfully teach programs from home. Supplied by IT, our at-home setup included a laptop with an embedded webcam, ethernet cord, extra monitor and external microphone. This set up ensured that instructors could see, hear, and present to students with a stable internet connection throughout the program. Setting up directly in front of a blank wall or using a portable green screen allowed instructors to utilize virtual backgrounds via Zoom, projecting scenes from our three physical sites behind them. Concurrently, the IT Department began assembling a socially distant virtual program studio on-site for when staff could safely return to the Gardens.

To better serve our teachers, we set up test meetings via Zoom or Google Meet prior to booking their virtual programs so we could prepare for any challenges on their end. With our students and their teachers at home, we could no longer rely on teachers' physical presence with their class to manage behaviour, pass out materials, and assist with facilitating activities. All virtual school programs were re-designed so that the only required materials for students were a writing implement and blank paper. For example, the existing Flower Dissection program depended on teachers passing out a fresh *Alstroemeria* flower to each student; we could not expect all families to make this purchase for their children, so the dissection was replaced with a flower drawing activity. Although interaction with physical materials decreased, we took advantage of the distance-learning format to connect students directly with online resources and citizen science projects such as phenology data collection through Project Budburst, a tool students can use in any season (Henderson *et al*., 2012).

The on-site programs we replaced all involved tangible explorations of gardens, sensory experiences with plants, and hands-on activities such as planting seeds. Our programs prioritize immersion in and access to nature, which have been shown to positively impact health, well-being and academic achievement (American Public Health Association, 2013).

↖ *Virtual program instructor acts out the life of a plant with young program participants ©Denver Botanic Gardens/Scott Dressel-Martin*
↑ *Virtual program studio setup ©Denver Botanic Gardens/Scott Dressel-Martin*

↑ *USB microscope and document cameras allow participants to see plant structures, such as trichomes ©Denver Botanic Gardens/Scott Dressel-Martin*

↑ *Studio setup includes a blue screen for virtual backgrounds, which works well with green items such as plants ©Denver Botanic Gardens/Scott Dressel-Martin*

Replacing in-person experiences with virtual ones can still provide the potential benefits of nature, such as decreased stress (Valtchanov, Barton and Ellard, 2010). Some examples of interactive and nature-based experiences we incorporated into virtual programs include:

- Existing photographs and video content: gardens in bloom, time-lapse of certain plants, unique highlights like controlled burn of grassland area, trap camera footage of wildlife, etc.
- Movement and dramatic play for ages 3-8, such as acting out the life of a plant
- Drawing an ecosystem or food web with Colorado species, via Zoom whiteboard
- Instructor interaction with physical objects such as plants or artefacts, using document camera, webcam, or pre-recorded video

Following pilot programs and initial teacher feedback, we addressed the challenge that not all students had access to internet, an appropriate device, or an environment conducive to virtual learning during live programs. One solution that worked well for multiple schools was to pre-record our programs and provide teachers with a password-protected Vimeo link so their students could separately view the program at a time convenient to them. While less interactive, this format ensured more equitable access to our content. Throughout the development of new distance learning activities, our Bilingual Programs Instructor worked to translate each program for live or pre-recorded instruction in Spanish.

We also provided teachers with follow-up activities for their class, such as a prompt to explore nature using a scavenger hunt or sharing a picture of student drawings via email or social media. We had to balance our desire for getting children out into nature and off their screens with mindfulness around their access to a safe space in the outdoors. Knowing that not every child would have a yard or garden at home, we invited students to connect with botanical materials in nearby parks, or through a window, or even in their own kitchens. In several programs, students are taught about plant parts using edible examples and then learn how to grow a garden from leftover food scraps such as carrot tops, potatoes, and garlic cloves. Content like this often drew the most engagement from parents and caregivers, providing a model for future family-oriented programming.

PRESENT USE AND LOOKING TO THE FUTURE:

With increased demand for distance learning and decreased use of our on-site facilities for in-person classes, it made sense to repurpose a classroom as a more permanent virtual studio. Guided by the feedback from instructors, IT staff created a virtual studio including:

- Computer with 2 additional monitors
- Laptop docking station
- External webcam
- External microphone
- Adjustable front lighting
- Document camera
- USB microscope
- Blue screen for virtual backgrounds
- Desk and chair with adjustable height

While many unknowns still await us, our new breadth of virtual program topics and formats sets us up to better meet the needs of not only our school communities, but also other family, adult, and youth groups. The insight and experience we gained continue to inform our creation of new content as we look to extend program longevity and reach wider audiences well into the future.

↑ Children participating in nature and art programming at Denver Botanic Gardens main location (pre-COVID-19) ©Denver Botanic Gardens/Scott Dressel-Martin

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