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This study describes the transition of a preschool STEM school readiness program from in-person to virtual programming during the early pandemic phase, examines in-person and virtual program data to understand the effectiveness of these two program delivery modes, and presents lessons learned from this abrupt transition. Results suggest that in-person and virtual classes were effective and equivalent on parent ratings and program monitoring variables. Future study will be needed to fully determine the cost-benefit impacts of in-person, virtual, and hybrid program delivery models on STEM school readiness and other family engagement programs.

Keywords: STEM school readiness, parenting education, in-person vs. virtual

Introduction

When the COVID-19 pandemic started in March 2020, many institutions and public spaces had to close. Extension programs across states and regions were forced to rapidly change their existing efforts and program delivery methods to continue responding to community needs (Narine & Meier, 2020). Extension professionals faced challenges such as revising resource allocations and shifts in programmatic focus. Extension programs working with young children and families were particularly challenged because of limited in-person interactions. Transitioning from in-person to virtual programming to meet the health and safety protocols of the pandemic was stressful for professional staff and their clientele. Extension professionals became tasked with the transition to virtual program delivery, trying to be adaptive and innovative, while maintaining effective educational contact with community participants.

This paper describes the transition of a preschool STEM school readiness program from in-person to virtual programming during the early pandemic phase, examines in-person and virtual program data to understand the effectiveness of these two program delivery modes, and presents lessons learned from this abrupt transition.

Let's Discover STEM

Let's Discover STEM is designed for parents of young children to provide enriching foundational Science, Technology, Engineering, and Mathematics (STEM) experiences for their children. STEM in the early years makes a difference in children's lives and previous research suggests that learning rich STEM content during the preschool years is critical to later success in school (Early Childhood STEM Working Group, 2017; McClure et al., 2017). This program was originally funded in 2017 through a 5-year grant from the USDA Children, Youth, and Families At-Risk Sustainable Community Projects. This funding supported development and implementation of the program between 2017 and 2022. When first developed, the program was created using an in-person delivery model.

The program employs family engagement and ecological conceptual frameworks (Bronfenbrenner, 1999; Colombo, 2006; LaRocque et al., 2011) focusing on children, families, schools, and community. The National Association for Family, School, and Community Engagement (2010) defines family engagement as a shared responsibility in which community groups (i.e., schools, community agencies, and organizations) are committed to reaching out to engage families in meaningful ways and in which families are committed to actively support their children's learning and development. High-impact family and community engagement is collaborative, culturally competent, and focused on improving children's learning. Family engagement in a child's education promotes positive academic outcomes for children, such as higher student grades, competence, and achievement test scores (Delgado-Gaitán, 2007; Fan & Chen, 2001; Kim, 2022; McWayne et al., 2004). Families that are more involved with their children's school from kindergarten have children with higher literacy performance in fifth grade, providing evidence of the longitudinal benefits for young children when their parents are involved in schools (Dearing et al., 2006). According to Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner & Morris, 1998), human development is conceptualized to occur when interaction occurs within and among contexts. Many of his early writings recognized the family itself as a more appropriate focus for intervention, rather than the child only (Bronfenbrenner, 1974). Furthermore, positive and supportive interactions between families and community agencies (e.g., schools, community educators) can result in beneficial outcomes for children (Bronfenbrenner, 1974). Accordingly, researchers and educators have documented the value of creating stronger home-school connections for children's educational growth and success (LaRocque et al., 2011). Involving parents encourages them to take an active role in creating a positive and safe environment at home for exploration and discovery, as well as supporting children's learning at school (Dearing & Tang, 2009; Fan & Chen, 2001). According to the STEM Starts Early study (McClure et al., 2017), one-third of parents do not feel confident enough to support their child's STEM learning, because they are not familiar with those subjects.

Therefore, having families be part of their child's early STEM learning will benefit children's entry into and success in school. Despite the clear benefits of parent engagement, many low-income and Latinx parents have yet to become involved in their children's education because of linguistic, cultural, and economic barriers (Baquedano-Lopez et al., 2013; Jeynes, 2017). These parents often lack confidence in their skills to help their children (LaRocque et al., 2011). The Let's Discover STEM curriculum was peer-reviewed and published in 2020 through the author's Extension system (https://extension.unr.edu/parenting/program.aspx?ID=124) and all workshop materials are available in English and Spanish. The curriculum was designed to be used with diverse groups of families, although Latinx families were a particular focus. When the program was in the planning stage, it was designed to focus on Latinx children who were likely not to have early STEM experiences. According to a 2020 Student Research Foundation (SRF) report (2020, https://www.studentresearchfoundation.org/wp-content/uploads/2020/04/Hispanics_STEM_Report_Final-1.pdf), despite having similar STEM interests and aspirations as their non-Hispanic groups, Hispanic high school students were less likely to have internet access and digital preparation. This systemic lack of support led to their enrollment in fewer STEM classes, lower grades, lower confidence levels, and lower attendance at a 4-year college. In 2019, nationally, only 20% of Latinx 4th-graders scored at or above proficiency in science, and only 22% were at or above proficiency in math in 2022 (NAEP, 2019). Many of these Spanish-speaking children enter school already academically behind their English-speaking peers (Hammer et al., 2011). Moreover, according to Pew Research Center (2022), Latinx workers make up 17% of total employment across all occupations, but just 8% of all STEM workers.

When first developed, the program was planned as in-person workshops with a small group of families and required the participation of both parents and children (max 12 families). The program consists of a 7-week series of hands-on, interactive parent-child classes (1 – 1.5 hour per class) in which families with children 3 to 6 years old are exposed to and engage in a variety of fundamental STEM activities every week. The classes focus on beginning science, technology, engineering, and math skills, as well as parents' skills and confidence in boosting children's early STEM learning. Two bilingual (English/Spanish) parenting educators were trained to provide this program series, and our STEM team collaborated with school districts, library districts, and community childcare centers in Nevada's two largest urban counties to deliver the program. Although the program focuses on educating parents on early STEM learning, little lecture was used, and active participation was encouraged and expected from participating parents and children.

Transition to Virtual Programming

The COVID-19 pandemic prompted our Extension STEM team to quickly reorganize Let's Discover STEM for a virtual delivery mode in 2020. The team collaborated with partnering community sites (e.g., local library district, school district, etc.) to plan for virtual classes and select a virtual platform that each partner site preferred (e.g., GoogleMeet, Zoom, etc.). More than half of our community partners recruited families from their own sites, and Extension STEM facilitators also recruited families in the community. When working with community sites during virtual implementation, Extension STEM facilitators often scheduled a delivery of the class materials, including books, (weekly or bi-weekly) to each site, and site staff arranged for on-site pick-up of the class materials with their families. At other times, Extension STEM facilitators delivered all the necessary packets to individual homes.

Before starting virtual programming, a pilot was conducted to explore possible modifications to help us start the virtual program delivery mode (final modifications are listed in Table 1). For virtual programming, class times were shortened to 45 minutes (to avoid online fatigue and distraction), several in-class STEM activities were modified, and the total number of STEM in-class activities were reduced, although take-home books and activities were continued. Overall, STEM staff continued to strive making our classes interactive and engaging through each of the online program session components: mini-lessons, group discussions, book reading, parent-child activities, and take-home activities (focusing on play-based STEM parent-child activities). Staff from some partner sites attended all of our classes together with their families to support our staff and their families. Some sites required our team to use their schools' virtual system, so they stayed during our virtual classes to host virtual meetings, support technical issues, and educate their parents on the virtual learning environment.

For the program evaluation, printed evaluation forms were still used (included in the weekly packet), although an online survey option was available and Extension STEM facilitators answered any evaluation questions during classes. Especially for the first few months of virtual programming, Extension STEM facilitators shared virtual classroom rules with families before the program started.

Table 1. Structural Modification for the Virtual Program Implementation

In-Person	Virtual
• 1- to 1.5-hour classes	• 30- to 45-minute classes
• Printed class handouts and class materials distributed during scheduled class meeting times	• Printed class handouts and class materials delivered to sites a week or two weeks before scheduled class meeting times
• Each session provided 4-5 STEM activities	• Each session provided 2-3 STEM activities
• Printed evaluations collected during scheduled class meeting times	• Printed evaluations delivered to sites and collected later

The purpose of this study was to examine whether different delivery methods of the program (virtual vs. in-person) made any difference in program outcomes. Some previous studies about virtual vs. in-person classes have shown mixed results: one reported face-to-face learning (regardless of COVID-19) was more effective in student learning outcomes, but virtual learning offers flexibility on timing and delivery (Kumari et al., 2021); while another revealed that virtual classes resulted in greater knowledge change compared to in-person classes (Hanifah, et al., 2021). Specifically, we examined five research questions.

RQ1: Do different methods of instruction (virtual, in-person) reach different groups of families?

RQ2: Do different methods of instruction influence the number of sessions attended and the completion of suggested take-home activities among families?

RQ3: How do parent perceptions of program impact vary by method of instruction?

RQ4: Do children's school readiness and parents' confidence and ability to support their child's STEM skills and interests vary by method of instruction?

RQ5: What challenges and opportunities are involved with developing, transitioning, and delivering virtual vs. in-person classes?

Methods

The Let's Discover STEM program was first developed for in-person delivery modes and was delivered in-person between Fall 2017 and Spring 2020. Because of the funding requirement, the program was implemented in disadvantaged communities. During the pandemic, between Fall 2020 and Spring 2022, virtual classes and in-person classes were provided interchangeably. More specifically, only virtual classes were provided during Fall 2020, then some sites started requesting in-person classes starting in 2021. We continued providing virtual options to partner sites in 2022, although more requested in-person workshops. Extension partnered with school districts and libraries to recruit a convenience sample of families using a variety of strategies, including posters, flyers that went home with children, participation in community events and ongoing parent groups, social media and text messaging, and face-to-face at partner sites. An informed consent was shared with participants at the start of the program. Overall, Extension provided 18 virtual classes to 236 families and 72 in-person classes to 779 families during this period. Of the 1,015 program participants, evaluation data was collected from 826 families (81% return rate; see Table 2). The reduced sample size for participants with evaluation data is mostly due to participants' not attending all of the sessions when in-person and to difficulties collecting evaluation forms from families during virtual programming. Sample sizes are smaller for some variables reported because of missing data and attrition of participants during the program. Additionally, some scales (i.e., the STEM School Readiness scale) were not implemented until later in the program life cycle.

Table 2. Number of Participants Who Completed Evaluation Forms by Year (N = 826)

	In-Person (n=642)	Virtual (n=184)	Total Sample
Year			
2017 (Pilot)	70 (100%)	0 (0%)	70
2018	148 (100%)	0 (0%)	148

2019	224 (100%)	0 (0%)	224
2020	71 (51%)	67 (49%)	138
2021	57 (35%)	105 (65%)	162
2022	72 (86%)	12 (14%)	84

Participants

Participants were families from 43 community sites in Clark and Washoe County in Nevada. The study sample reported in this paper consisted of 642 parents/caregivers from in-person classes and 184 parents/caregivers from virtual classes who returned evaluation forms for data collection. Most of the participating parents/caregivers were females, and more of them took the class in Spanish and were Hispanic. More than half of them were stay-at-home parents, and more college-educated parents/caregivers attended virtual classes (See Table 3).

Table 3. Parents/Caregivers Demographics of In-Person and Virtual Class Participants (N = 826)

	In-Person (*n*=642)	Virtual (*n*=184)	Total Sample
Parent Gender			
Male	48 (8%)	13 (12%)	61(9%)
Female	546 (92%)	100 (88%)	646 (91%)
Language			
English	247 (44%)	84 (46%)	331 (44%)
Spanish	319 (56%)	100 (54%)	419 (56%)
Parent Ethnicity			
Hispanic or Latino	444 (76%)	58 (52%)	502 (72%)
Not Hispanic or Latino	143 (24%)	54 (48%)	197 (28%)
Parent Employment			
Employed full-time	104 (18%)	27 (24%)	13 (19%)
Employed part-time	77 (13%)	13 (12%)	90 (13%)
Unemployed	41 (7%)	11 (10%)	52 (8%)
Unemployed, Stay at Home Parent	324 (57%)	58 (52%)	382 (56%)
Unemployed, Student	12 (2%)	2 (2%)	14 (2%)
Retired	14 (2%)	1 (1%)	15 (2%)
Parent Education			
Less than high school	122 (21%)	12 (11%)	134 (20%)
High school	186 (33%)	28 (25%)	214 (31%)
College/Trade	264 (46%)	72 (64%)	336 (49%)

Measures

The following measures were used to collect data from program participants from 2017 through 2022, except for STEM school readiness, which started being collected in 2019. All the measures were developed by the researchers for this project.

Number of Sessions Attended

The number of sessions attended by each parent-child pairing was recorded using an attendance sheet filled out each week by the program instructor and could range from one to seven sessions.

Parent Perceived Impact of Program

The parent perceived impact of the program was the mean of five items collected at the end of the program, each answered on a 5-point Likert-type scale ranging from *very little* to *very much*. Example items include, *how much has the program increased your knowledge about STEM?* and *how much has the program increased your child's interest in doing STEM-related activities?* Cronbach's alpha for the scale was α = 0.88. This measure was developed by the authors.

Parent Efficacy with STEM

The parent efficacy with STEM scale was the mean of four items answered on a 5-point Likert-type scale from *very little* to *very much*. Developed by the authors, this scale was collected at the end of the program as a post-reflective measure, meaning there were four items asking how the parent felt before the program as well as four items asking how the parents felt after completing the program. Example items include, *how confident were you that you could use STEM skills to teach your child?* and *how much did you believe your child could learn from you?* The Cronbach's alpha was α = 0.88 for pre-parent efficacy with STEM and α = 0.88 for post-parent efficacy with STEM.

STEM School Readiness (SRS)

The STEM School Readiness (SRS) scale was the mean of 16 items answered in a 3-point Likert-type scale including *not yet*, *somewhat*, and *yes*. This scale was collected at the end of the program as a post-reflective measure, meaning there were 16 items asking what *my child could do before the program* and 16 items asking what *my child can do after the program*. Example items include, *count 1-20*, *build with blocks*, and *compare objects to determine more or less*. Cronbach's alpha for the pre-STEM school readiness was α = 0.94 and α = 0.90 for post-STEM school readiness, indicating excellent reliability for both scales. This measure also was developed by the authors.

Total Number of Weekly Take-Home Activities Completed

For each weekly take-home activity sheet, parents indicated which of the four activities they completed with their child. This variable is a sum score of the total activities, out of 24, that a parent indicated they completed with their child during the program. This was conceived as a program monitoring component of the evaluation, to assess the differences between in-person vs. virtual parent-child behaviors. It was used as a proxy for the play-based parent-child interaction that is a core component of the in-person program delivery mode and helped assess the experiential focus of the virtual delivery mode.

Parent Demographics

The following demographics were collected from all parents during the program using a common measure from the funding agency. Ethnicity was reported as either *Hispanic or Latino* or *Not Hispanic or Latino*. Gender was reported as either *male* or *female*. Employment status was reported as *employed full-time*; *employed part-time*; *unemployed*; *unemployed, stay at home parent*; *unemployed, student*; or *retired*. Program language was coded based on the language of the survey materials returned and was either English or Spanish. Education level was collected as *less than high school*, *high school diploma/GED*, *post-secondary technical training*, *some college*, *associate's degree*, *bachelor's degree*, or *graduate degree* Due to small sample sizes in many of the groups, education level was recoded into three groups: *less than high school*, *high school*, and *college/trade school*.

Analysis Plan

All analyses were completed using IBM SPSS 28. First, frequencies were calculated for descriptive variables and scales were constructed. Chi-square tests of independence were performed to examine the difference in sample demographics between in-person and virtual settings, including parent ethnicity, gender, employment status, education level, and program language. Then, t-tests were run to examine differences in program outcomes between virtual and in-person sessions including number of sessions attended, perceived impact, and the total amount of time spent on weekly take-home activities. We used Levene's test of homogeneity of variance to determine whether the virtual and in-person parents had equal variance. Finally, repeated measures analysis was performed to determine pre- and post-intervention change in STEM school readiness (SRS) and parent support of STEM for each program delivery mode (virtual or in-person). Missing data resulted because parents chose not to answer some items and because the STEM school readiness and child demographic questions were added at the third year. Pairwise deletion was selected to handle missing data, since this preserved more information than listwise deletion.

Results

Demographic Variables between In-Person and Virtual Participants

Several demographic variables and program outcomes were compared between in-person and virtual class participants (RQ1). Chi-square results indicated there were no significant differences between virtual and in-person groups in terms of gender (χ^2 (1, N = 707) = 1.41, p = 0.24), employment status (χ^2 (5, N = 684) = 4.30, p = 0.51), or language of the session (χ^2 (1, N = 750) = 0.23, p = 0.63). However, there were differences in terms of ethnicity (χ^2 (1, N = 699) =

26.44, $p < 0.001$), and education level (χ^2 (2, N =684) = 13.35, $p < 0.001$), such that in-person participants were more likely to be Hispanic or Latino and have less than a college degree, compared to virtual participants.

Program Outcomes between In-Person and Virtual Participants

Five program outcomes were compared between in-person and virtual class participants: number of sessions attended, total number of take-home activities completed, perceived program impact, parent efficacy with STEM, and STEM school readiness. Among those five outcomes, three consisted of post-reflective data and two consisted of pre- and post-test data. The homogeneity of variance assumption was met for all the variables.

Individual t-test results for three outcome variables indicated that virtual participants attended significantly more sessions (out of seven total sessions) and, although not significant, tended to complete more take-home activities than in-person participants (RQ2). Both groups of parents showed similar perceived program impact scores (RQ3; see Table 4).

Table 4. Independent Samples T-test Results for Virtual vs. In-Person Program Outcomes

	In-Person (N = 642)		Virtual (N = 184)		*t-test*
	M	SD	M	SD	
Number of Sessions Attended	4.48	2.19	6.21	0.94	10.39***
Total Number of Take-Home Activities Completed	19.59	3.13	20.18	3.69	1.19
Perceived Program Impact	4.76	0.45	4.74	0.46	0.54

Note. Number of Sessions and Total Number of Take-Home Activities were based on attendance sheets and take-home activity sheets; Perceived Impact was collected at post-test; Change in Parent Support of STEM and Change in STEM School Readiness represent differences in scores from post-reflective measures of pre-program compared to post-program.

The results of a two-way repeated measures ANOVA revealed that there was a significant main effect of time (pre- vs. post-) on parent efficacy with STEM (F (1, 582) = 937.25, $p < .001$) and STEM school readiness (F (1, 582) = 937.25, $p < .001$) (RQ4). This indicates that parent efficacy with STEM and STEM school readiness skills improved between pre- and post-test. In addition, there was a significant interaction effect of time and virtual vs. in-person participation on parent efficacy with STEM (F (1, 582) = 3.88, $p < .05$) and STEM school readiness (F (1, 365) = 3.55, $p = .06$), such that in-person class participants showed slightly more improvement in parent efficacy with STEM and STEM school readiness between pre- and post-test than did virtual participants (see Table 5 and Figures 1 and 2).

Table 5. Descriptive Statistics of Parent Efficacy with STEM and STEM School Readiness (N = 584)

	Mean	Standard Deviation	*N*
Parent Efficacy with STEM			
In-person pre-test	3.25	1.04	407
In-person post-test	4.72	.48	407
Virtual pre-test	3.41	.99	177
Virtual post-test	4.69	.48	177
STEM School Readiness			
In-person pre-test	2.13	.50	191
In-person post-test	2.66	.34	191
Virtual pre-test	2.26	.51	176
Virtual post-test	2.72	.32	176

Figure 1. Changes in Parent Efficacy with STEM

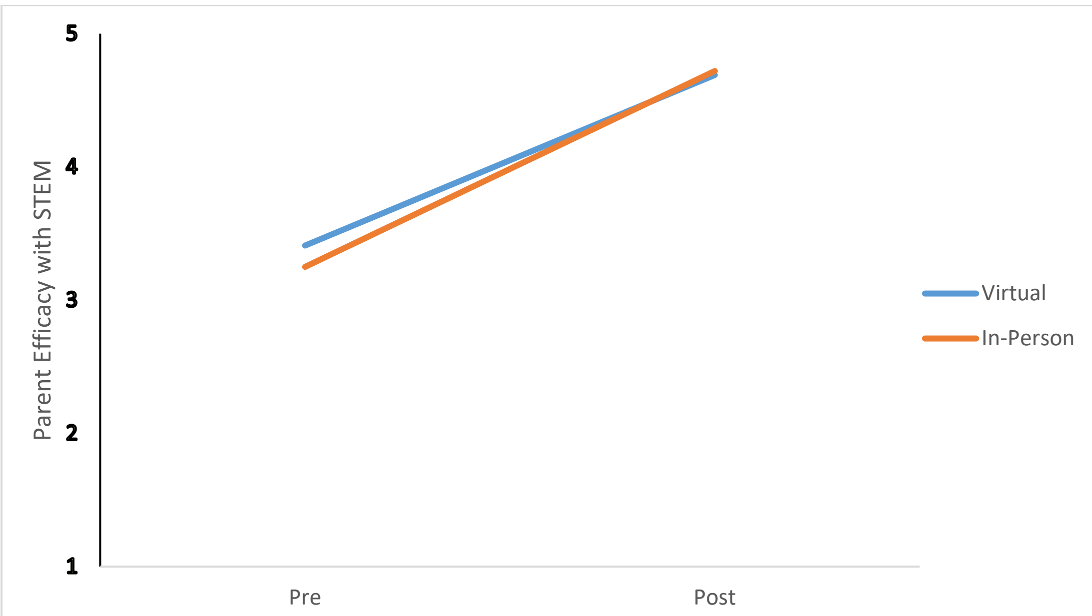
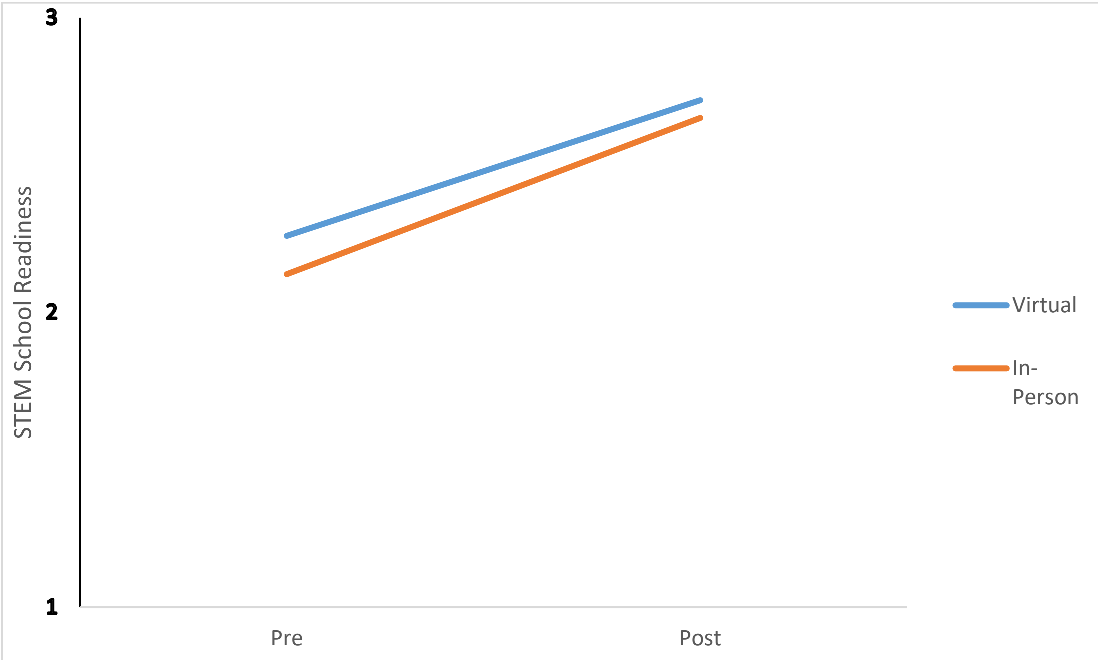


Figure 2. Changes in STEM School Readiness



Finally, in addition to the data collected from families, instructors addressed challenges and opportunities they experienced developing, transitioning, and delivering virtual classes (RQ5; see Table 6). These points may be helpful for Extension professionals when considering program delivery structure and options for early childhood school readiness and educational programs.

Table 6. Challenge and Opportunities of Virtual Classes

Challenges
• It was more difficult to collect data from all participants.
• It was difficult to provide all the planned materials included in the original curriculum.
• Fewer STEM class activities were provided: compared to four or five in-class activities per lesson, our team ended up providing two or three in-class activities per lesson.
• It was difficult for instructors to observe parent-child activities and model parent-child interaction during virtual classes.
• It was time-consuming to prepare for and deliver class packets regularly (usually weekly or bi-weekly).
• For the first 6 months, many families did not have enough digital devices or stable internet connection.
• Social dynamics were lost because parents and children no longer have face-to-face interactions with other parents and children (in-person parenting education often results in more social connections among parents).
• Depending on virtual implementation settings, it can cost more at some sites, especially when Extension STEM facilitators delivered materials to individual houses.
• Because this program targets early childhood learning, virtual program implementation itself can be developmentally inappropriate for some young children.

Opportunities
• Instructors thought that our virtual programming continued to be effective and engaging, and findings also supported their comments. • More-consistent attendance was reported and results also confirmed that families attended more sessions. • Implementing the program was cost-effective (e.g., materials and mileage) when collaborating with community partners. • Family members other than mothers (e.g., fathers and siblings) were able to attend virtual classes. • Program delivery was more convenient, flexible, and time-efficient because of reduced transportation time and cost. • It allowed more flexibility in scheduling classes because it was not necessary to reserve physical spaces. • It was observed that parents took more instructional roles helping children do in-class activities. • It was observed that parents were more actively involved in take-home STEM activities, which results confirmed. • It was reported that there was more communication through texting or the program's official Instagram account between classes. Many parents posted their homework pictures on our SNS, and they texted instructors to share pictures or ask questions.

Discussion and Implications

The current study sought to understand similarities and differences in implementing the Let's Discover STEM program in-person versus virtually and examine possible differences in program outcomes. Results suggest that in-person *and* virtual classes were effective and efficient, although some differences were found: 1) in-person parents were more likely to be Hispanic or Latino and have less than a college degree; 2) virtual parents attended more sessions and completed more take-home activities; and 3) in-person parents reported higher levels of parent efficacy with STEM and reported more improvement in their children's STEM school readiness. Previous studies supported current results that both delivery methods are effective, but in-person classes could show higher improvement. However, virtual classes still have many benefits that include flexibility and program reach (Hanifah, et al., 2021; Kumari et al., 2021; Narine & Meier, 2020).

When STEM facilitators started virtual programming, this was a new, unprecedented service. However, the Let's Discover STEM curriculum was quickly reorganized to continue extending educational reach to families when in-person classes were not an option. Paramount to this program reorganization was our commitment to meet the needs of our community members during this time of crisis. As we begin to learn to live in a post-pandemic yet COVID-19 world, there have been some families and partner sites that continue to want virtual classes because some families still struggle with health-compromised family members, as well as the convenience of virtual educational options.

The transition to virtual program delivery could not have occurred without the hard work of our team and the support of our partners and collaborators. An intentional process was critical for the program transitions described here, first identifying what program elements were possible and practical virtually and then pilot-testing the virtual delivery of Let's Discover STEM. Support and debriefing with frontline staff was needed, because this switch to virtual programming was new. Our team trained frontline staff to deliver virtual classes and spent time problem-solving with staff. Communication with our partners and collaborators to share our plan for the transition to virtual learning also was a critical component of the success of this transition. They supported recruitment and delivery of class materials, and some even provided technology support like Wi-Fi hot spots and tablets.

The virtual implementation of Let's Discover STEM had many unpredictable benefits, including parents' active involvement in take-home activities, more consistent attendance, and increased ratings of flexibility and convenience. Given current results, virtual STEM programming with pre-school children and their families can provide an effective option when distance, societal disruptions, educational resources, or family preferences limit in-person options.

However, we still need to address some barriers with virtual program implementation. Virtual delivery methods are not just options anymore, so it is important that Extension professionals are prepared to reach their clients through more creative ways. The findings of this study of program delivery transition helped to assess how best to support staff teaching efforts and the program components that worked best with participants in each delivery mode. Although most program contents remained same, the results of this study will help us revise our program/curriculum, especially in the section of delivery methods.

Future study will be needed to fully determine the cost-benefit impacts of in-person, virtual, and hybrid program delivery models on STEM school readiness and other family engagement programs. Randomized designs are needed to further assess delivery mode effectiveness among diverse communities and populations. And, just as COVID prompted our dramatic switch to virtual programming, it probably also affected family participation and interest in the program—in negative (some families that may have participated could have been overwhelmed by sick members or job losses) and positive (as noted here in terms of involvement and attendance) ways.

We can never be fully certain that our sample reflects the Latinx families in the U.S. This program implementation was performed only in one state of the western region of U.S., and we targeted disadvantaged communities, so the results of this study may be different in other states and other communities. Previous studies have revealed that native-born Latinx populations differ from foreign-born Latinx populations (Cabrera, Karberg, & Fagan, 2019), and we did not collect such information, which might bias our findings.

Finally, although there are abundant separate literatures on how to design and implement effective virtual and in-person educational programming, scant research has addressed challenges and opportunities related to program delivery transition. We hope the present results help others who undertake transitional program modifications while seeking to maintain program fidelity, interest, and effectiveness.

Conclusion

A hallmark of Extension is the personal connection we develop with families and communities. In-person, face-to-face education has been and will continue to be a central component of our programming. However, for Extension professionals across many communities and programs, a notable benefit of the program implementation described here is that virtual programs can still make significant impacts, can be cost-effective in implementing the program, and may even lead to more consistent attendance. In addition, virtual programming can allow Extension professionals to reach a wider audience and provide more statewide and regional programming for specific populations. If Extension professionals want to develop or transition an existing in-person program to a virtual format, they need to be intentional in their planning, be mindful of the design elements that make for engaging and effective virtual educational experiences, and pilot-test and collect ongoing participant feedback to improve the virtual experience. Finally, in-person vs virtual programming need not be an either-or decision. Extension professionals may find adding virtual components to on-going in-person and face-to-face programming may help extend and expand the in-person learning in new and engaging ways.

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