The Effectiveness of Virtual CASE Institute Professional Development: A Participant Perspective

Abstract

The Curriculum for Agricultural Science Education (CASE) utilized, for the first time, a virtual method of delivery to train and certify teachers across the country in the summer of 2021. This study was created to research the effectiveness of the virtual CASE professional development (PD) sessions, determine the usefulness of the CASE Institute technology and virtual format, and determine the effectiveness of Lead Teacher facilitators on participant learning. Six features of effective professional development were utilized as the framework to guide the study. A descriptive survey was conducted among the participants who were certified in a virtual CASE course in the summer of 2021. From this survey, researchers were able to conclude that the participants found the PD effective because they were confident in the material learned and felt prepared to implement the material into the classroom. The participants highly remarked on the usefulness of the technology and materials and the effectiveness of the Lead Teachers. From the findings of this study, a list of recommendations has been collected for further research and practice in the use of virtual PD for CASE and other education programs. It is recommended for future virtual professional development events for the facilitator to be very intentional about promoting a community of practice among participants and facilitating peer-to-peer interaction.

Keywords: CASE; virtual; professional development

Introduction

The Curriculum for Agricultural Science Education (CASE) originated as an initiative from the National Council for Agricultural Education (NCAE) (CASE, n.d.-c). The NCAE orchestrated this initiative due to a lack of agriculture curriculum and professional development (PD) opportunities within the umbrella of Career and Technical Education. CASE can be described as an organization that provides teachers with access to enriching curriculum materials and transformative professional development in science, technology, engineering, and mathematics (STEM) (CASE, n.d.-a; CASE, n.d.-c). The CASE Model encompasses four components: curriculum, assessment, certification, and professional development (CASE, 2014b via Carraway et al., 2015). The creation of CASE allowed for agriculture teachers to have access to curricula in 11 different agricultural areas including animal systems, plant systems, and natural resources (CASE, n.d.-d). Access to curriculum occurs when teachers become certified by attending one of the CASE Institute PD programs. CASE offers three different PD options: traditional CASE Institute, FastTrack CASE Institute, and BriefCASE. Traditional institutes are 8-day trainings, while a FastTrack training usually lasts five days. A BriefCASE institute is typically a two-day training. Before the COVID-19 pandemic, all three of the PD options met in-person for the specified amount of time. CASE Institutes are unique in that they are peer-taught professional development. *Lead Teachers* are experienced teachers who have previously taught a CASE curriculum and have been trained to teach the CASE Institute PD course. Even with highly qualified lead teachers COVID-19 caused for some adjustments in teaching.

The COVID-19 outbreak created a massive shift throughout the education system, schools across the country switched to online learning and video conferencing to continue their school year (U.S. Depts of Education & Justice, 2021) starting in March of 2020 (Flores & Swennen, 2020). Due to this closure of in-person schools and cancellation of educational programming, professional

development programs had to undergo a shift towards virtual learning – CASE was one of these programs (CASE, n.d.-b). A virtual CASE PD course was completed over a series of days, the length of the training lasted eight to ten days. The virtual training time included both daily synchronous and asynchronous meeting times. Participants were shipped a box of materials that corresponded with the CASE course they were enrolled. These materials were used to complete labs, activities, and other course work associated with the institute. The goal was to maintain hands-on learning while at a distance. A Google Classroom was set up for each PD institute and was used for the synchronous and asynchronous activities, a connection space for the participants, and a place to ask clarifying questions. MyCASE was another platform that participants were able to utilize during the CASE PD sessions. MyCASE is located on the CASE website and contains all the CASE curricular material for each certification area. Traditionally, most of the CASE Institute professional development sessions are structured for 100% in-person learning, this change in delivery provided a challenge for the CASE Lead Teachers and participants alike.

Little research has been completed regarding the effectiveness of CASE Institutes as a professional development source for agricultural educators. The existing research has explored various concerns including: including pre-service teachers' experiences at CASE Institute (Tummons et al., 2020), the influence of CASE on teachers' use of inquiry-based methods (Bird & Rice, 2021), teachers' experiences implementing CASE (Lambert et al., 2014), the potential for interdisciplinary teaching with CASE (Pauley et al., 2019), and preservice teachers' intentions to integrate science in the classroom using CASE curriculum (Carraway et al., 2015). A gap in the literature exists when considering the effectiveness of CASE PD. PD is an important aspect of quality education and helps teachers improve their professional knowledge and classroom practice (Darling-Hammond et al., 2017; Nguyen, 2018). There is limited knowledge surrounding traditional in-person CASE PD. The COVID-19 pandemic required a novel approach to CASE professional development opportunities. Research surrounding virtual CASE experiences does not exist and should be studied.

Literature Review

While virtual learning existed throughout the United States prior to the COVID-19 pandemic, its use exploded during 2020 and 2021 (KU SOE, 2021; Team, 2020). There has been some research into online professional development learning for teachers, but it was primarily conducted prior the COVID-19 pandemic. McConnell et al. (2013) explored online Professional Learning Communities (PLC) for teachers and how the experience differed from traditional PLCs. Most participants appreciated the virtual experience as it was easier to fit in their schedule. The most common concern associated with virtual PLC experience was the lack of bonding and social interaction between participants (McConnell et al., 2013).

Access to high-quality professional development (PD) has been an issue for some teachers due to time, financial, and geographic constraints (Powell & Bodur, 2018). To address these challenges, online teaching professional developments (OTPD) were created (Powell & Bodur, 2018). OTPDs are designed to provide flexible, cost-effective, and wide-scale options for schools wanting high-quality virtual PD (Powell & Bodur, 2018). Quality and effective online PD needs to have the essential features of: the covered material is easily transferable (Parsons et al., 2019; Reeves & Pedulla, 2013 via Powell & Bodur, 2018), the teachers are actively engaged with each other and the material (Parsons et al., 2019; Smith & Sivo, 2012), the learning is sustained over time, and the learning can take place when convenient for the participant (McConnell et al., 2013; Parsons et al., 2019; Powell & Bodur, 2018; Wynants & Dennis, 2018).

Though online PD seems very efficient for teachers across the United States, studies have questioned the quality of experiences and/or outcomes from these experiences (Collins & Liang, 2021; Lay et al., 2020; Powell & Bodur, 2018). Assessing the quality of professional development is important as PD is considered one of the most effective tools for changing teacher practices (Darling-Hammond et al., 2017; Supovitz & Turner, 2000). Effective professional development is commonly defined as, "…structured professional learning that results in changes in teacher practices and improvements in student learning outcomes" (Darling-Hammond et al., 2017). Several studies have investigated, and defined characteristics associated with effective professional development that leads to teacher change (Darling-Hammond et al., 2017; Desimone et al., 2002; Garet et al., 2001). These characteristics are type, duration, collective participation, coherence, content focus, and active learning (Darling-Hammond et al., 2017; Desimone et al., 2002; Garet et al., 2001). Additionally, feedback and reflection, models of effective practice, and coaching and expert support have also been associated with professional development (Bates & Morgan, 2018).

CASE research has often focused on either the curriculum, implementation, or experiences during traditional face-to-face CASE Institute PD (Bird & Rice, 2021; Carraway et al., 2015; Lambert et al., 2014; Pauley et al., 2019; Tummons et al., 2020). Little research has been conducted regarding the professional development effectiveness of CASE Institutes in traditional settings. Due to the abrupt transition to virtual PD institutes, no research exists related to virtual CASE Institutes. This study seeks to explore the effectiveness of the virtual CASE Institute PD courses that took place amidst the COVID-19 pandemic in the summer of 2021. This research will begin to fill the gap in literature regarding the professional development and the experiences surrounding virtual CASE Institutes.

Conceptual Framework

When considering the elements of professional development, it is important to consider the main characteristics of the participants, the facilitator(s), the context, and the program design (Borko, 2004). This study utilized the characteristics identified by Desimone et al. (2002) and Garet et al. (2001) highlighting the features associated with effective professional development that leads to teacher change and increased student achievement (Desimone et al., 2001; Garet et al., 2001). These five features are duration, collective participation, active learning, coherence, and content focus. Duration and collective participation are considered structural features and apply to how the experience is structured. Active learning, coherence, and content focus are core features of the professional development experience itself.

Duration looks at the length of the PD in terms of hours, days, weeks, or months. The longer the participants are exposed to, working with, or implementing a topic, the more comfortable and reflective they become (Greiman, 2010). Collective participation to which teachers from a similar background and setting (for example all the math teachers from a specific school or district) attend the same training. This is done to help foster a community of practice so when teachers are trying to integrate new ideas or topics, they have a local support network to help them in the process. Active learning is the level to which the PD has participants engage with the materials to stimulate learning. Coherence is achieved if the information taught aligns well with local, state, and national guidelines and standards. Content focus is the amount and type of content provided in the PD training sessions.

When considering the CASE Institute virtual courses, this study utilized these features to explore how the virtual CASE PD institutes were effective from a participant perspective. This study addresses the American Association for Agricultural Education's National Research Agenda Research Priority Area Five: Efficient and Effective Agricultural Education Program (Roberts, et al., 2016). By

offering a high-quality professional development it will better prepare teachers to deliver the curriculum within their classrooms.

Purpose and Research Objectives

The purpose of this study was to explore the characteristics of the effective professional development in virtual CASE Institute PD courses that took place amidst the COVID-19 pandemic during the summer of 2021. Effectiveness will be assessed through the participants' perceptions of their experience. This study was guided by the following research objectives:

1. Determine the participants' perceived preparedness to integrate CASE into the secondary classroom after attending the virtual CASE institutes.
2. Determine the usefulness of the CASE Institute technology and virtual PD format.
3. Determine the impact of the Lead Teachers on participants' experiences in the virtual CASE institutes.

Methods

Population

The total population for this exploratory study was as all individuals who participated in at least one 2021 virtual CASE PD institute. A census survey was sent via email to all the participants ($N = 889$). Of those contacted, 798 responded resulting in a response rate of 89.76%. The average participant was female (77.09%), was between the ages of 24-30 (36.05%), had between 2-5 years of teaching experience (25.81%), were primarily licensed in agricultural education (82.21%), and attended the CASE training voluntarily (82.20%). Participants represented 40 states, Honduras, and the United Kingdom. See Table 1 for more demographic information.

Table 1

Selected participant demographic information

Variables	f	%
Selected for CASE		
Volunteered	656	82.20%
Assigned	99	11.51%
Other	43	5.00%
Experience		
0, currently a pre-service teacher	62	7.21%
1 to 2 years	148	17.21%
Table Continued		
2 to 5 years	206	25.81%
6 to 10 years	160	20.05%
11 to 20 years	157	19.67%
More than 20 years	65	7.56%
Primary Teaching License		
Agricultural Science License	656	82.21%
Industrial Arts License	3	0.35%
Other Career and Technical Education License(s)	45	5.23%
Science License	41	4.77%

Other	53	6.16%
Preferred CASE PD Format (*n* = 788)		
Virtual CASE Institute (8-9 days virtual)	271	34.39%
In-person CASE Institute (8-10 days in-person)	445	55.76%
Immersive CASE Institute (12-week session during fall semester)	10	1.27%

Note. (n = 798)

Instrumentation

To investigate the research objectives, a descriptive survey was created using Qualtrics. The instrument contained six sections of questions to evaluate the participants' experience during their CASE Institute PD program and a single page letter to gather informed consent. The sections included: demographic information, teaching background and experience, evaluation of CASE Institute - format and technology utilized, assessment of virtual CASE PD, and evaluation of Lead Teachers. A 5-point Likert-type scale was used with 1 = *Strongly Disagree* and 5 = *Strongly Agree* as the anchors. The instrument was reviewed for face and content validity by a panel of agricultural education experts resulting in minor changes to the instrument. Reliability was controlled by testing the instrument with a sample group of teachers who were not part of the population group. The survey was sent through Qualtrics to all the participants that completed the 2021 virtual CASE Institute PD sessions immediately after completing their institute, between the dates of May 2021 and August 2021.

Data Collection

Researchers utilized a Web-based quantitative survey to collect data from the participants. The survey distribution followed Dillman's Tailored Design Method for Internet Surveys (Dillman et al., 2014). The initial contact for data collection came from the registration information provided through CASE Institute (*N* = 889). All participants of the 2021 virtual CASE Institute PD courses were contacted to participate in this study. Follow-up contacts were sent to non-respondents. To address nonresponse error, early and late responses were compared (Linder, et al., 2001) and no statistically significance differences were found. The total response rate was 89.76% (n = 798).

Data Analysis

The Statistical Package for the Social Sciences software (SPSS) analyzed the collected data. For each of the objectives, frequency counts, means, and standard deviations were calculated. Data was used to determine the percentages of the demographic variables to call attention to the varying population that participated in this study.

Findings

The purpose of this study was to explore the characteristics of the effective professional development in virtual CASE Institute PD courses. Findings from this research cannot be generalized to all virtual professional development programs. CASE Institute professional development planners or other professional development program may wish to utilize the results from this study when planning future virtual professional development courses.

A few limitations of the study should be addressed as there was a mixture of experienced and new CASE participants, the evaluation of preference for all the sample population is unfounded. Another limitation to our study was the short nature of the survey. The researchers purposefully made the survey easy to access and quick to complete so that more participants would be willing to respond. This is viewed as a limitation because a deeper, longer survey could have resulted in more information on varying areas of the study. For example, active learning is an important piece of the effective features of PD, but the survey did not have enough questions to determine if active learning took place. Finally, the study is not generalizable to populations outside the participants of the 2021 virtual CASE institutes.

Objective One

Objective one sought to determine the participants' perceived preparedness to integrate CASE into the classroom after attending the virtual CASE institutes. The participants strongly agreed they understood the CASE model ($M = 4.61$; $SD = 0.63$). Participants also strongly agreed they were prepared to begin implementing CASE in their classrooms ($M = 4.45$; $SD = 0.76$). While their confidence in the implementation of the learned material does not illustrate their learning, the participants strongly agreed that *The lessons and demonstrations facilitated my learning of the course content* ($M = 4.45$; $SD = 0.76$), indicating that the teachers experienced learning of the content during the PD. Additionally, CASE provided conference boxes for each participant that contained equipment and supplies that would aid teachers in their virtual learning process. The participants were satisfied with the delivery of the boxes, the clarity of the supplies needed from their own home, and the ease of identification and organization of the equipment and supplies (Table 2). The supplies were needed to actively participate in the institute.

Table 2

Organization and Execution of CASE Curriculum – Feedback from the format of CASE Institute

Survey Item	f	M	SD
I have a solid understanding of the CASE model.	785	4.61	0.63
The CASE Institute Google Classroom was well organized for digital instruction and learning.	787	4.60	0.69
The CASE courses and CASE Institute are programs that will benefit other teachers in my region and state.	787	4.57	0.70
The expectations of the participants during the CASE Institute were clearly laid out and communicated to me.	785	4.56	0.72
The sequence of the day-to-day schedule was appropriate in order to prepare me to teach this curriculum.	785	4.51	0.71
I am prepared to begin implementing CASE curriculum in my classroom.	784	4.46	0.72
The lessons and demonstrations facilitated my learning of the course content.	787	4.45	0.76
CASE Institute conference boxes arrived on time.	786	4.40	0.95

Table Continued

It was clear which supplies I was supposed to provide myself.	788	4.40	0.82
It was easy to identify and organize CASE Institute equipment and supplies.	787	4.26	0.90
The professional development experience at this CASE Institute exceeded my expectations.	787	4.21	0.94

Note. 1= Strongly Disagree and 5= Strongly Agree. *f* = frequency; *M* = Mean; *SD* = Standard deviation.

Objective Two

  Objective two sought to determine the usefulness of the CASE Institute technology and virtual PD format. The virtual nature of the institutes led to an increased utilization of technology including a course Google Classroom as the learning platform participants were expected to use during synchronous and asynchronous times. The participants strongly agreed (M = 4.60; SD=0.69) their Google Classrooms was organized (Table 2).

  Overall, the participants agreed or strongly agreed with technology utilized in the CASE Institutes was appropriate and they could get their technology questions answered. (Table 3). The participants strongly agreed (M = 4.44; SD=0.72) that access to and utilization of MyCASE was easy to use, and participants strongly agreed the CASE staff and lead teachers could answer technology questions (M = 4.47; SD= 0.73). Despite the different delivery method for CASE Institute PD, the participants found the technology easy to use and helpful when learning material for their PD session. Most participants were satisfied with the virtual CASE Institute format (M = 4.32; SD = 0.76) but were more neutral regarding attending another virtual CASE Institute (M = 3.32; SD = 0.78) (Table 3).

Table 3

CASE Institute technology and format feedback

Survey Item	f	M	SD
Technology Feedback			
CASE staff and/or lead teachers were able to answer my technology questions.	767	4.47	0.73
The curriculum access process was simple.	788	4.46	0.77
Facilitators were able to answer my technology questions.	766	4.45	0.76
MyCASE is a user-friendly platform to access CASE professional development certificates and other CASE resources.	787	4.44	0.72
Format Feedback			
Overall, how satisfied were you with the virtual CASE Institute format?	779	4.32	0.76
Would you attend another virtual CASE Institute?	779	3.32	0.78

Note. 1= Strongly Disagree and 5= Strongly Agree. *f* = frequency; *M* = Mean; *SD* = Standard deviation.

Objective Three

  This objective sought to determine the Lead Teachers' impact on the participants' experience in the virtual CASE institutes. The respondents strongly agreed the lead teachers had expertise in navigating the MyCASE platform (M = 4.66; SD = 0.58) and created an environment where the participants were able to learn and ask questions (M = 4.62) (Table 4). Lead Teachers are an important part of traditional and virtual CASE Institute PD as they are responsible for guiding and teaching participants the CASE curriculum and associated techniques. The participants strongly agreed the Lead

Teachers offered and provided help outside of class time ($M = 4.66$; $SD = 0.60$), created an environment conducive for learning ($M = 4.62$; $SD = 0.64$), had a vast knowledge base for subject content ($M = 4.60$; $SD = 0.65$), provided an explanation for how all aspects of the CASE curriculum fit together ($M = 4.60$; $SD = 0.66$), responded to instructional needs ($M = 4.60$; $SD = 0.67$), and enhanced lessons with support materials ($M = 4.59$; $SD = 0.69$). The participants strongly agreed they would take another course from their instructors ($M = 4.57$; $SD = 0.75$).

Table 4

Lead Teacher Evaluation (n = 788)

Survey Item	M	SD
Followed the scope and sequence (schedule).	4.68	0.56
Demonstrated knowledge and expertise navigating MyCASE.	4.66	0.58
Maintained a professional demeanor in the classroom.	4.66	0.59
Offered and provided help outside of the normal class time, if requested.	4.66	0.60
Created an atmosphere that was conducive to learning (i.e., provided timely breaks, considered learner needs, minimized distractions, etc.)	4.62	0.64
Demonstrated knowledge and expertise in the course content.	4.60	0.65
Demonstrated how individual lessons, activities and projects that are addressed during the CASE professional development programming fit into the broader context of the course curriculum.	4.60	0.66
Understood and responded appropriately to participants' instructional needs.	4.60	0.67
Provided appropriate enhancements with support materials.	4.59	0.69
I would take another course from this instructor.	4.57	0.75
Well organized and prepared for class.	4.54	0.70
Modeled effective presentation skills and content delivery methods.	4.52	0.72

Note. 1= Strongly Disagree and 5= Strongly Agree. M = Mean; SD = Standard deviation.

Conclusions, Implications, and Recommendations

The first objective, *sought to determine the participants' perceived preparedness to integrate CASE into the secondary classroom* after attending the virtual CASE institutes. The participants strongly agreed with they were ready to implement CASE materials in the classroom. As this was a self-perceived survey of their knowledge and abilities, it is difficult to measure the degree to which they learned. However, the participants either agreed or strongly agreed with many statements about their understanding of material and ability to facility CASE curriculum in their classrooms. These statements provide evidence that self-perceived learning took place during their PD sessions. The outcome for effective professional development is a change in a teacher's professional knowledge, attitude, or practice (Darling-Hammond et al., 2017; Nguyen, 2018). It can be argued this experienced prepared them to integrate the curriculum into their classroom.

Content focus and active learning are two of the professional development characteristics that align with the first research objective (Desimone et al., 2002; Garet et al., 2001). To determine the degree to which content was focused during the CASE PD, participants were asked to evaluate the materials and demonstrations utilized during the PD session and how that impacted their learning at the

virtual institute. Most of the participants found the lessons and demonstrations to be helpful in their learning of CASE material. Participants found the schedule and sequence of events as appropriate for their preparation of the curriculum.

For the second objective, *Determine the usefulness of the CASE Institute technology and virtual PD format*, researchers determined that the participants strongly agreed that the technology was useful, easy to use, and helpful for their learning of the virtual CASE PD content. The Google Classroom was well organized, MyCASE was easy to navigate, and there were plenty of support for technological issues. The participants agreed they were satisfied with the virtual nature of the CASE Institute PD setting; however, they only slightly agreed that they would attend another virtual CASE PD. Participants may have only slightly agreed due to the lack of face-to-face interactions or the realization of how they may obtain additional information if the training was held face to face.

When designing virtual professional development in the future, it is important for the technology resources, such as the Google Classroom and MyCASE, to be user friendly and easy to navigate. Facilitators should be trained to help participants navigate each of the virtual resources and help and support participants as needed. Inability to navigate the technology could limit the active participation (Desimone et al., 2002; Garet et al., 2001) which is vital for effective professional development.

The third objective sought to determine the impact of the Lead Teachers on the participants' experiences in the virtual CASE institutes. Borko (2004) state facilitators are a key element for the professional development experience. The participants strongly agreed with all the statements related to the facilitator's effectiveness. In addition to providing technical support, the lead teachers were seen as experts in the course content, implementation of the course content, were able to create an atmosphere conducive to learning while supporting diverse learners, displayed professionalism, and used effective facilitation skills. Demonstrating content knowledge and communication are desirable characteristics in facilitators (Signh et al., 2013).

The lead teachers also helped the CASE institutes provide active learning, coherence, and content focus for the participants (Desimone et al., 2002; Garet et al., 2001). While active learning was not directly apparent, active teaching can be implied based on the content materials utilized. The participants were mailed supplies ahead of time to allow them to complete activities with the facilitator and their peers and strongly agreed the lead teachers offered support outside of class time and found ways to enhance and supplement the materials being discussed. All of this align with the active learning elements of effective professional development (Desimone et al., 2002; Garet et al., 2001). The facilitators are the ones who provide the participants with a variety of opportunities to engage with the content.

The elements of coherence and content focus were demonstrated by the lead teachers. While curriculum is aligned with Next Generation Science Standards, AFNR Common Career and Technical Core Content Standards, Common Core Standards for High School Mathematics, and Common Core Standards for English Language Arts (CASE, n.d.-f) and in the institutes are designed to help teachers learn the technical content and pedagogical strategies need to implement in their classrooms (CASE. n.d.-e), the lead teachers ensured it happened and the participants strongly agreed it did. Following the scope and sequences of the curriculum, demonstrating knowledge in the course content, and helping the participants understand how the individual activities fit into the broader context all align with content focus and coherence (Desimone et al., 2002; Garet et al., 2001).

Collective participation in the traditional sense cannot be explicitly described as it was not researched in this study. Though the study did not specifically look at the collective participation opportunities for the participants, there were several states/regions that had a significant number of participants coming from the same areas. As the CASE Institute PD courses are peer-taught, the participants' interactions with the Lead Teacher have the potential to be classified as collective participation. Future research into the relationship between the participants and Lead Teachers is recommended.

The longer nature of the profession development (eight to 10 days per institute) as opposed to the traditional "one and done" approach to professional development, aligns with the duration characteristic (Desimone et al., 2002; Garet et al., 2001). The traditional day-long workshops may not lead to teacher change due to the brevity and needed longer time to process and interact with the content (Desimone et al., 2002; Garet et al., 2001). Even though new topics were covered each day, it was part of same curriculum and the duration of continuously discussing the content and interacting with it is essential to lead to teacher implementation and change. One recommendation for practice is to plan for extended professional development activities to help participants become familiar with the content. This might include additional follow up virtual meetings throughout the year so participants can ask additional questions of lead teachers or of other participants within the institute.

The virtual CASE PD sessions were researched as the utilization of virtual learning communities and classrooms has increased due to the school closures during the COVID-19 pandemic. School districts and teachers see the value of virtual PD as it provides an opportunity for access to higher quality PD sessions without the burden of financial stress (Powell & Bodur, 2018). Virtual CASE Institute PD is more flexible than the traditional CASE Institute, which requires travel to a location and a two-week stay to complete the institute. Though online PD has the draw of increased flexibility, it is important to note that participants often report their disappointment with the lack of bonding and social interaction between teachers (McConnell et al., 2013). When the participants were asked their opinion on the CASE PD format, many of the participants wanted CASE Institute to return to in-person sessions. When asked about taking another virtual institute, the participants only slightly agreed they would. While this study indicates that virtual CASE Institute PD sessions are effective, most teachers would prefer to have these sessions in-person rather than online.

This study can provide useful information for future virtual CASE institutes and could inform other virtual professional development offerings. As participants were asked to evaluate the format, technology, materials, and delivery of the PD, the program designers have insight into the potential areas that could be changed to improve the virtual PD.

While the virtual setting does offer participants flexibility, they also value the importance of face-to-face instruction and peer-to-peer interactions. One recommendation for future virtual professional development events is facilitators to be very intentional about promoting a community of practice among participants and facilitating peer-to-peer interaction. This might include grouping strategies by lead teachers or by assigning groups to complete labs activities during the work time. This working time could be flexible while allowing teachers another opportunity to interact and/or resource if they had questions.

Future research should explore the success of CASE curriculum implementation of the virtual participants. It would also be beneficial to compare the implementation of CASE material into the classroom based on teachers who received face-to-face instruction and those who received virtual instruction. This research would also bolster virtual CASE Institutes and other virtual professional

development programs by helping identify implementation challenges faced by participants and ways to troubleshoot them. Future research into the participants' virtual experiences with their peers would be beneficial. This study only explored the CASE virtual PD from a participant lens. Future research should also investigate the experiences of CASE Lead Teachers in a virtual PD setting. A virtual PD setting does not always allow for the same type of interactions and activities to occur as in a face-to-face setting.

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