

# School-Based Agricultural Education Teachers Competence of Synchronous Online Instruction Tools During the COVID-19 Pandemic

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## Abstract

*The COVID-19 pandemic forced educators to move course delivery to online learning with little or no advanced training. One of the immediate concerns of the online course delivery was readiness in using the synchronous learning tools available to school districts. Additionally, moving all students to online learning environments presented a challenge for those teachers who knew little about accessibility tools. The purpose of this study was to assess the awareness and self-perceived competence levels of SBAE teachers in South Carolina related to synchronous online instruction and application of accessibility tools during the COVID-19 pandemic. The majority of the teachers indicated they used Google Meet as the institution's synchronous delivery platform. Of those using Google Meet, their ability to use the mobile application to start meetings and use virtual backgrounds was low. The second most used synchronous delivery platform was Zoom. Some of the skill gaps SBAE teachers listed while using Zoom included breakout rooms, the polling feature, and removing unwanted participants. SBAE teachers reported very low competence in using accessibility features provided in Microsoft Word and PowerPoint applications. Recommendations included future in-service training for SBAE teachers in using advanced levels of Zoom, Google Meet, and WebEx features. Also, training for SBAE teachers on the importance of accessibility and the tools provided is warranted. Faculty teaching educational technologies in pre-service programs for SBAE teachers are also encouraged to adapt curricula to support these skills.*

**Keywords:** COVID-19 pandemic; online instruction; school-based agricultural education; virtual platforms

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## Introduction and Review of Literature

In response to the global COVID-19 pandemic, teachers across all grade levels and subject areas were forced to rapidly adapt their classrooms and teaching practices to use virtual platforms (Daniel, 2020). The majority of school districts were unprepared for a large-scale shift in learning in such a short amount of time and could not provide adequate teacher training or support (Daniel, 2020). The response varied across the United States as state educational agencies were faced with guiding K-

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12 schools during the COVID-19 pandemic (Reich et al., 2020). In fact, many districts were forced to adopt new instructional platforms and schedules in a manner of days or weeks that would usually be introduced over months or years (Daniel, 2020). The sudden shift to online-based learning exposed numerous issues with both teacher preparedness and technological capabilities, with one study finding “teachers were devoting what would have been instructional time to tackling technology challenges, whether struggling to get up to speed learning the intricacies of a learning management system or fixing access problems on Zoom calls” (Bushweller, 2020, para. 19). As such, Hodges et al. (2020) coined the term *Emergency Remote Teaching* to differentiate between the current pandemic situation and established online educational programs. While the pandemic response laid bare the problems facing educators utilizing online instructional platforms, even before COVID-19 educators were generally unprepared to engage in online learning and lacked awareness of methods best suited to virtual learning environments (Price, 2018).

With instructional delivery shifting to remote/online learning, it is evident that classroom and homework assignments shall do the same (Bennett et al., 2008). The immediate interruption of School-based Agricultural Education (SBAE) teachers’ day-to-day functions (Linder et al., 2020) caused a shift in creative student engagement and instructional delivery methods (Bozkurt & Sharma, 2020) because SBAE teachers were adapting to the use of various technology solutions (Crawford et al., 2020), including platforms such as Zoom, Microsoft Teams, Google Meet, and Cisco WebEx.

The need for technological awareness and proficiency among educators will not subside following the COVID-19 crisis. Instead, researchers predict a new normal in education that utilizes technology to expand educational opportunities to students (Sintema, 2020) and further emphasizes academic preparedness for response to natural disasters and health emergencies (Cahapay, 2020). These changes in increased technology use also include federal regulations protecting individuals with disabilities through electronic media, which gained greater awareness as courses moved online. The U.S. Access Board (n.d.) states that Section 508 includes documents such as presentations, and the U.S. General Services Administration (2020) highlights the need for accessible Microsoft Word and PowerPoint documents on their Website, titled Create Accessible Digital Products. Given the sudden increased demand for technological proficiency and awareness from SBAE teachers across the country (Linder et al., 2020), we questioned if SBAE teachers in South Carolina were competent and prepared to use online learning platforms to deliver effective instruction when they were quickly called to change their teaching modalities in the fall of 2020.

### Theoretical/Conceptual Framework

Our research of the current competence among SBAE teachers is grounded in human capital theory. Human capital theory holds that as individuals increase their knowledge or skills, their productivity will be equally increased (Goldin, 2016). Therefore, it becomes increasingly important to accurately identify areas of needed human capital development through cost-benefit analysis before investing finite resources (Van Loo & Rocco, 2004). The evaluation of human capital further informs the preparation and professional development of the agricultural education profession. It evaluates the individual stock one takes in their education, skills, experiences, and training related to their chosen career (Becker, 1964; Schultz, 1971; Smith, 2010). Additionally, an increase in SBAE teachers’ specific human capital can ultimately improve ones teaching effectiveness in agricultural education (Eck et al., 2020). Regardless of instructional delivery format, effectiveness can be considered, assuming SBAE teachers continually work to improve their capital through professional development opportunities related to their identified needs (Roberts & Dyer, 2004). Thus, this study aimed to identify the human capital capacity of SBAE teachers in South Carolina related to synchronous online delivery platforms and accessibility features in Microsoft Office and PowerPoint at the beginning of the fall 2020 academic year.

### Purpose of the Study

The purpose of this study was to assess the awareness and self-perceived competence levels of SBAE teachers in South Carolina related to synchronous online instruction and application of accessibility tools during the COVID-19 pandemic. To achieve this purpose, three research objectives guided this study:

1. Identify the most common synchronous learning platform used by SBAE teachers in South Carolina.
2. Determine South Carolina SBAE teachers' awareness and competence of synchronous learning features related to effective instructional practices, and
3. Identify respondent's awareness and competence of accessibility features in Microsoft PowerPoint and Word files.

### Methods and Procedures

SBAE teachers in South Carolina ( $N = 155$ ) were contacted by electronic mail requesting their participation in this researcher-developed survey to evaluate their perceived competence in utilizing common virtual learning platform features and accessibility features included in Microsoft Word and PowerPoint. The survey began by asking respondents to identify which virtual meeting platform they most commonly used between Zoom, Google Meet, Microsoft Teams, and WebEx. Based on their response, they completed specific questions relevant to their experiences with the virtual meeting platform they selected. The platform-specific questions were divided among five categories including, scheduling/meeting tools, meeting/presentation tools, communication tools, security tools, and recording/transcription tools, and participants were asked their awareness of the feature followed by a summated rating scale where one (1) indicated a lack of awareness and four (4) indicated self-perceived competence in utilizing the identified feature. Although categories were used to divide platform-specific questions, individual questions varied based on the platform's common features found on their individual Website. In addition, platform-specific language was utilized in the survey to reduce complexity by providing common terms known to platform users. Pertinent demographics evaluated SBAE teachers age, gender, career tenure, Title I school status, access to internet and technology, and previous exposure to synchronous learning technologies.

The survey was developed following the recommendations of Dillman et al. (2014) and was evaluated for face and content validity by six faculty members and a South Carolina agricultural education director before distribution. A current list of South Carolina SBAE teacher's email addresses ( $N = 155$ ) was provided by the South Carolina Staff for distribution of the survey via Qualtrics, the email contained a weblink along with a QR code for accessibility. Following the recommendations of Dillman et al. (2014), after the initial email was sent to SBAE teachers in South Carolina, a reminder email was sent to those who had not responded five days later, followed by a final notice ten days after the initial contact requesting a response.

Fifty-seven SBAE teachers in South Carolina responded to the survey, resulting in a 36.8% response rate. SBAE teachers responding to the survey ranged from 22 to 63 years of age, with some being in their first-year teaching to others with 36 years of experience. Three (5.3%) respondents were currently working from home, while the remaining 54 SBAE teachers were back on their school campus. Of the 57 respondents, 28% ( $n = 16$ ) currently worked in a Title 1 school. Some respondents ( $n = 11$ ) used synchronous learning technology prior to the pandemic, although the usage was minimal, averaging only 17.5% of the SBAE teacher's time. Additional demographics of South Carolina SBAE teachers are presented in Table 1.

**Table 1**  
*Demographics of SBAE Teachers in South Carolina*

Demographic		<i>n</i>	%
Gender	Male	19	33.3
	Female	29	50.9
	Prefer to not respond	1	1.8
	Did not respond	8	14.0
Age	22 to 29	12	21.1
	30 to 39	14	24.6
	40 to 49	10	17.5
	50 to 59	6	10.5
	60 to 69	6	10.5
	Did not respond	9	15.8
Highest degree earned	Bachelor's	12	21.1
	Some Master's work	6	10.5
	Master's degree	28	49.1
	Master's degree plus	1	1.8
	Doctoral degree	2	3.5
	Did not respond	8	14.0
Number of years teaching SBAE	0 to 5	21	36.8
	6 to 10	11	19.3
	11 to 15	6	10.5
	16 to 20	4	7.0
	21 to 25	1	1.8
	26 to 30	3	5.3
	More than 30	2	3.5
	Did not respond	9	15.8
Access to technology for synchronous learning <sup>a</sup>	Desktop computer	18	31.6
	Laptop computer	45	78.9
	Tablet	15	26.3
	Smartphone	34	59.6
	Wired headphones	9	15.8
	Wireless headphones	10	17.5
	External speakers	14	24.6
	External microphone	3	5.3
	Built-in camera	52	91.2
	External camera	5	8.8
	Cable internet	40	70.1
	Satellite internet	3	5.3
	Dial-up internet	1	1.8
Mobile hotspot	5	8.8	

*Note.* <sup>a</sup>Participants could select multiple options related to their access to technology.

Low response rates can threaten the validity of a research study (Dillman et al., 2014), even more so perhaps in agricultural education research (Roberts et al., 2011). To handle nonresponse bias in this study with 36.8% of SBAE teachers in South Carolina responding, early and late respondents were compared based on demographics (see Table 1) of participants per the recommendations of Linder et al. (2001). The demographics of early ( $n = 29$ ) and late ( $n = 28$ ) respondents were found to be similar based on percentages. Additionally, to help overcome the 36.8% response rate within this study, the demographics were compared to national SBAE teachers' demographics (Eck, 2019) to demonstrate a representative sample of South Carolina SBAE teachers responding (see Table 2).

**Table 2**

*Comparison of Demographics between Respondents ( $n = 57$ ) and National Data ( $n = 2807$ )*

Characteristic	Category	R <sup>a</sup> (%)	NR <sup>b</sup> (%)
Gender	Male	33.3	44.1
	Female	50.9	51.2
	Other	-	0.2
	Prefer not to respond	1.8	0.3
	Did not respond	14.0	4.2
Age	21 to 29	21.1	29.5
	30 to 39	24.6	26.5
	40 to 49	17.5	18.4
	50 to 59	10.5	15.4
	60 to 69	10.5	5.1
	70 +	-	0.1
	Did not respond	15.8	5.0

Note. <sup>a</sup>R= Respondents; <sup>b</sup>NR = Responses from National Data (Eck, 2019)

As demonstrated in Table 2, the SBAE teachers responding to the survey in this study are a representative sample of the target demographic. Therefore, the data collected represented valuable information for consideration at the state, regional, and national level. SPSS version 27 was used to analyze the data received from the surveys.

## Findings

### Research Objective 1: Identify the Most Common Synchronous Learning Platform Used by SBAE Teachers in South Carolina

Of the SBAE teachers in South Carolina who responded, thirty-five (61.4%) used Google Meet as their primary synchronous learning platform, followed by 19.3% ( $n = 11$ ) using Zoom, 14.0% ( $n = 8$ ) used Microsoft Teams, and 5.3% ( $n = 3$ ) implemented Cisco WebEx as their learning platform.

### Research Objective 2: Determine South Carolina SBAE Teachers' Awareness and Competence of Synchronous Learning Features Related to Effective Instructional Practices

Guided by skip logic in the questionnaire, participants answered awareness and competence questions specific to their identified primary synchronous learning platform (i.e., Google Meet, Zoom, Microsoft Teams, or Cisco WebEx). The platform-specific questions were divided into five categories: scheduling/meeting tools, meeting/presentation tools, communication tools, security tools, and recording/transcription tools. The majority of the SBAE teachers who responded (61%) utilized Google

Meet, although their ability to use the mobile application to start meetings and to use virtual backgrounds was reported to be lacking. Table 3 outlines the awareness and competence of the 10 items related to Google Meet features and tools that SBAE teachers in South Carolina rated. The table is organized from highest to lowest mean score.

**Table 3**

*South Carolina SBAE Teachers Awareness and Competence of Google Meet Features/Tools (n = 35)*

Feature/Tool	Percentage Aware	$\mu$	SD
Screen sharing	100.0	3.67	0.49
Mute participants	98.2	3.43	0.85
Manage participants	96.5	3.32	0.89
Record meeting	96.5	3.31	1.08
Share files	96.5	3.14	1.04
Join/start meeting (web browser)	98.2	3.13	0.99
Schedule a meeting in Google Calendar	96.5	3.00	0.92
Remove people	94.7	3.00	1.16
Join/start meeting (mobile app)	96.5	2.71	0.99
Virtual background	91.2	2.58	1.03

*Note.* For mean, 1 = not competent; 2 = somewhat competent; 3 = competent; 4 = highly competent.

The second most common virtual learning platform used by SBAE teachers in South Carolina was Zoom, with 19.3% of respondents primarily using this platform as their synchronous learning tool. SBAE teachers using Zoom lacked the ability to use breakout rooms, implement the polling feature, remove unwanted participants, apply a virtual background, use annotation tools, lock the meeting room to only invited participants, use the virtual whiteboard, transfer files, access recordings and audio transcriptions after the meeting, livestream a session to a desired social media platform, and utilize practice sessions for panelists prior to the actual meeting. Table 4 provides the percentage of participants ( $n = 11$ ) aware of the 22 features and/or tools available, along with the mean and standard deviation for each. The table is organized from highest to lowest mean score.

**Table 4**

*South Carolina SBAE Teachers Awareness and Competence of Zoom Features/Tools (n = 11)*

Feature/Tool	Percentage Aware	$\mu$	SD
Chat	100.0	4.00	0.00
Start a meeting (web browser)	98.2	3.75	0.50
Invite participants to a meeting	98.2	3.60	0.89
Raise hand	100.0	3.50	0.54
Mute participant	96.5	3.50	0.93
Start a meeting (mobile app)	98.2	3.40	0.89
Schedule meetings	98.2	3.25	0.96
Start a meeting (desktop app)	98.2	3.20	1.30
Screen sharing	96.5	3.00	0.89
Record meeting	96.5	3.00	0.89
Breakout rooms	96.5	2.56	1.24
Polling	96.5	2.50	1.18

**Table 4**

*South Carolina SBAE Teachers Awareness and Competence of Zoom Features/Tools (n = 11), Continued...*

Remove participant	96.5	2.50	1.31
Virtual backgrounds	96.5	2.44	1.13
Annotation tools	94.7	2.44	1.24
Lock meeting room	98.2	2.38	0.92
Promote to panelist	94.7	2.25	1.28
Virtual whiteboard	94.7	2.22	1.20
File transfer	94.7	2.20	1.03
Access recording and transcript	96.5	2.14	1.07
Broadcast (Livestream)	93.0	2.10	1.20
Panelist practice sessions	93.0	2.00	1.00

*Note.* For mean, 1 = not competent; 2 = somewhat competent; 3 = competent; 4 = highly competent.

Although the use of Microsoft Teams (14.0%) and Cisco WebEx (5.3%) were less common synchronous platforms used by South Carolina SBAE teachers, similar competence issues existed. Of the 18 tools and features evaluated within Microsoft Teams, SBAE teachers in South Carolina lacked competence in 10 of them (i.e., starting a meeting with the app, sharing a screen, muting participants, using the whiteboard, raising a hand, recording the meeting, locking down the meeting, implementing a poll, assigning presenters, and transcribing audio). For Cisco WebEx, 22 tools and features were identified, of which, SBAE teachers in South Carolina showed low levels of competence in seven of them, including transferring files, live streaming, applying virtual backgrounds, using the whiteboard, annotating, distributing polls, and using breakout rooms.

### **Research Objective 3: Identify Participant's Awareness and Competence of Accessibility Features in Microsoft PowerPoint and Word Files**

Participants indicated low awareness of accessibility features and practices in Microsoft Word and PowerPoint. Rates of awareness ranged from 19.3% (proper use of hyperlinks in Word) to 43.9% (ability to use the accessibility checker in PowerPoint), while on average those who were aware of the features perceived themselves to be somewhat competent (see Table 5). The percentage of participants aware of the eight Microsoft Word and the seven Microsoft PowerPoint accessibility features are shown in Table 5 along with the mean and standard deviation for each.

**Table 5**

*South Carolina SBAE Teachers Awareness and Competence of Accessibility Features in Microsoft PowerPoint and Word (n = 57)*

Microsoft	Feature	Percentage Aware	$\mu$	SD	
Word	Proper use of hyperlinks	80.7	2.63	1.25	
	Proper use of headings	70.2	2.49	1.33	
	Proper use of tables	78.9	2.42	1.20	
	Proper use of lists	71.9	2.42	1.28	
	Exporting to PDF	77.2	2.38	1.21	
	(preserving accessibility)				
	Identify document language	68.4	2.24	1.20	

**Table 5**

*South Carolina SBAE Teachers Awareness and Competence of Accessibility Features in Microsoft PowerPoint and Word (n = 57), Continued...*

		71.9	2.19	1.14
	<b>Adding alternate text for images</b>			
	Using the accessibility checker	63.2	1.93	1.06
PowerPoint	Built in slide templates	71.9	2.16	1.15
	Making hyperlinks and tables accessible	75.4	2.15	1.00
	Export to PDF	75.4	2.12	1.12
	Unique slide titles	73.7	2.11	1.09
	Set reading order of slide contents	66.7	1.98	1.05
	Add alt text to visuals and tables	66.7	1.93	0.99
	Use the accessibility checker	56.1	1.78	1.01

*Note.* For mean, 1 = not competent; 2 = somewhat competent; 3 = competent; 4 = highly competent.

### Conclusions

The majority (61%) of SBAE teachers in South Carolina utilized Google Meet and their self-perceived skills in using features in this platform were high. We conclude this result may be due to the fact that Google Meet has been a learning platform many school districts in South Carolina adopted and utilized prior to the pandemic. Although general competence was found, room for improvement among SBAE teachers in South Carolina still exists in some of the more advanced features (i.e., schedule a meeting in Google Calendar, remove people, join/start a meeting using the mobile app, and implement a virtual background), which could expand learning opportunities. Human capital holds that as an individual increases their knowledge or skills, their productivity will be equally increased (Goldin, 2016). Therefore, furthering South Carolina SBAE teachers human capital related to virtual learning environments, primarily through Google Meet, would not only increase their productivity, but ultimately improve their teaching effectiveness in SBAE (Eck et al., 2020).

Although the majority of SBAE teachers in South Carolina utilized Google Meet, similar concerns were found with the implementation of Zoom (19.3%), Microsoft Teams (14.0%), and Cisco WebEx (5.3%). School districts across the state have invested in these virtual learning platforms, although training specific to effective delivery has been nearly non-existent. Regardless of the virtual learning platform, SBAE teachers in South Carolina were delivering instruction using one of these tools, leaving room for additional development of human capital related to effective delivery and teaching in a distance education system.

Related to accessibility features, SBAE teachers in South Carolina reported very low competence of the features and best practices to make electronic documents accessible to all audiences, regardless of their ability level with using Microsoft Office when developing Microsoft Word documents and PowerPoint presentations. A need exists to assist SBAE teachers in South Carolina with better understanding accessibility guidelines and identifying tools that can help them assure their instructional materials are available to all students enrolled in their courses. Although the accessibility questions in this study focused on Microsoft Office Tools, other platforms, especially Google Suite,

should be considered as a needed area of accessibility development for SBAE teachers across South Carolina as that is the primary platform used.

### **Recommendations**

Considering recommendations for practice, continued professional development is needed for SBAE teachers regarding (1) use of accessibility features and practices and (2) use of synchronous learning platform features beyond basic meeting creation and use. Professional development opportunities should be platform specific to ensure full usage of unique features for student engagement, focused on the goal to ultimately increasing SBAE teacher's human capital. Additionally, SBAE teachers should be made aware of accessibility resources within their school districts and buildings to help them design instructional materials to meet the needs of all learners. SBAE teacher educators should consider the findings of this study as they prepare and evaluate relevant curriculum for SBAE teacher candidates. Perhaps additional training on synchronous online learning platforms is warranted, based on the most common platforms used in a given state.

Teacher education programs for pre-service SBAE teachers should review which courses should address skills needed to use the synchronous platforms and accessibility tools. Perhaps teacher preparation programs should consider specific platform training or certification if one is predominant in the state, in the case of South Carolina, the Google Suite is the primary tool. Therefore, the inclusion of Google Educator certification (Level 1 and 2) could be a consideration to better prepare future SBAE teachers for in-person, online, and hybrid delivery methods. Although specific training would be beneficial based on the current platform being used, this seems to be in constant flux across the nation. Perhaps instruction should focus on the general features that are ubiquitous among all of these tools. Suppose pre-service SBAE teachers are prepared on the concepts more than nuances of specific platforms. In that case, they should be ready to meet their students' needs, considering any future circumstances.

Future research should aim to replicate this study to determine if these areas of competence are South Carolina specific or found throughout the region and/or nation. This would allow for the coordination of regional and national resources to foster the development of skills necessary for SBAE teachers to effectively and efficiently educate students through virtual and hybrid learning environments. Additional research is warranted to investigate the effectiveness of synchronous online delivery of SBAE courses on commonly used platforms (i.e., Google Meet and Zoom). Further evaluation needs to be considered related to accessibility features found in Microsoft Office products, Adobe, and the Google Suite, determining how to best prepare SBAE teachers for effective development and implementation of documents that are accessible to all learners, as the U.S. General Services Administration (2020) highlights the need for accessible Microsoft Word and PowerPoint documents on their Website. Unfortunately, SBAE teachers in South Carolina are not prepared to meet the increased demand for technological proficiency and awareness as identified as a need for SBAE teachers across the country by Linder et al., 2020. Teacher educators at Clemson University should use the findings of this research to evaluate current curricula in the agricultural education teacher preparation program for pre-service teachers and design professional development to address this emergent and urgent need for in-service teachers in South Carolina. Replication of this study is recommended after professional development has been delivered.

### **Discussion**

The face of education and the platforms used in education have quickly changed due to the Pandemic of 2020. SBAE teachers have been forced to adapt hands-on instruction to teach using remote formats where students have fewer opportunities to engage in experiential learning. In the future, the

instructional delivery of courses in SBAE programs may continue to utilize a synchronous virtual platform long after the pandemic is behind us. Given our research findings, in comparison to Bushweller's (2020) findings, it will be essential to provide resources and help to SBAE teachers in South Carolina. Providing assistance may decrease the workload, anxiety, and stress and increase the working human capital for SBAE teachers in South Carolina to teach effectively and gain the competence they need to adapt to new tools and features using existing and new technologies once introduced. Teachers should not be asked to do more without adequate resources and professional development to fulfill their needs.

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