Tapping into Collaboration as an Intervention During Uncertain Times

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Abstract

The pressures created by the Coronavirus-19 pandemic in education and the uncertainty of the evolution of education are central to today’s discussions as the needs of kindergarten through twelfth-grade students are being transformed, and the support offered to educators is being redefined. The increase in disorder and chaos seeks the voice and perspectives of educators. Therefore, this explanatory sequential mixed-methods pilot study investigated the collaborative practices used by middle school science, technology, engineering, and mathematics educators during the onset of the Covid pandemic and explored teachers’ perceptions of collaboration. Survey data from eight teacher participants and interview data from two participants from the same urban school district suggest that all teachers participated in collaboration during the 2020 – 2021 school year. A thematic analysis of the qualitative data suggests that teachers envision collaboration as an opportunity for growth.

Keywords: teacher collaboration, STEM education, early-career teachers, mixed-methods
Early spring 2020 forever changed the educational landscape for our schools, teachers, and students. Coronavirus disease 2019 (COVID-19) forced school closures, leaving millions of students out of balance and caused major disruptions to the typical teaching environment for thousands of educators across the nation (Education Week, 2020). The chaos created by abrupt closures, distant learning, hybrid learning, statewide mask mandates, and quarantined students and teachers has led to educational challenges and technological changes. During uncertain times, teachers must develop resilient mindsets using creative solutions involving their skills and strengths to navigate current and future crises. According to The Association of Teacher Educators (n.d.), impactful teacher educators engage in collaborative opportunities which promote self-learning and offer reciprocal, supportive environments for growth. Therefore, this paper will discuss collaboration as a solution for educators during the current unprecedented educational climate.

**Literature Review**

Difficult circumstances, such as the COVID-19 pandemic, have increased communities' fragility economically, politically, and educationally (Organisation for Economic Co-operation and Development [OECD] Development Co-operation, 2020). Reversing these effects requires educational systems to develop resilient people by investing in human capital (OECD, 2020a). Oxford English Dictionary defines human capital as “a labour force, or the skills it possesses, regarded as a resource or asset” (OED online, 2021). Quality educators (human capital) directly impact students (U.S. Department of Education, n.d.). Hence, educators must be equipped with effective practices and strategies that promote an antifragile mindset. Nassim Taleb (2012) defines antifragile as the opposite of fragile. Teachers with an antifragile mindset can succeed in unknown and uncertain situations and environments. Nevertheless, research suggests that
teachers who teach in isolated, egg-crate environments are more likely to experience teacher burnout and job dissatisfaction (Ostovar-Nameghi & Sheikhahmadi, 2016), further increasing a fragile system.

**Teacher Collaboration for the Antifragile Teacher**

A famous quote states, “two heads are better than one” (British Broadcasting Corporation, 2013). Teachers who participate in meaningful interactions of two (or more) heads instead of in isolation are collaborating. Kelchtermans (2006) defines teacher collaboration as “teachers’ cooperative actions (their actual doing things together) for job-related purposes.” Teacher collaborative strategies cover an extensive continuum which includes informal exchanges of teacher resources, grade level and content-based collaborations, and school and region-specific collaborations (Glazier et al., 2017; Reeves et al., 2017). Literature highlights innovation as one beneficial outcome of collaborating teachers (Vangrieken et al., 2015). Innovation and creativity are birthed from uncertain times (Taleb, 2012). Therefore, as the uncertainty of the COVID-19 pandemic continues, collaborative opportunities for educators may be a solution to encourage antifragility, especially among early-career science, technology, engineering, and mathematics (STEM) teachers.

**Collaborative Opportunities as an Intervention**

Teacher collaboration provides beneficial outcomes for educators. Several studies have shown the intrinsic benefits teachers develop from participation in collaborative activities, such as increased self-esteem and motivation (DuFour et al., 2021; Glazier et al., 2017; Torres, 2019) and higher job satisfaction (Reeves et al., 2017). In addition, educators have benefited from collaboration by increasing their exposure to instructional methods (Tichenor & Tichenor, 2019). Student achievement and leader accountability are additional benefits for educators who
participate in a collaborative environment supported by school-based administrators (Wilson, 2016).

**Tapping into Collaboration during Uncertain Times**

Susan Johnson (2021) conducted interviews with middle school administrators in Massachusetts during the onset of the Covid pandemic. Her work explored how schools with well-established teacher teams adjusted their programs when COVID-19 caused a national shutdown. At Spark Academy, the principal established a collaborative culture that allowed educators to rely on one another to learn how to navigate education during the pandemic. Students and teachers experienced obstacles, such as increased stress and declining attendance; however, the principal modified the structure and time allotted for teacher teams to collaborate (Johnson, 2021). On the contrary, schools that lacked instructional teams were left with little structure and increased confusion. She concludes her study by stating, “effective teams do not emerge or flourish spontaneously” (Johnson, 2021, p. 62). Johnson’s (2021) research shows several benefits that emphasize the teacher’s role as a valuable participant in the collaborative process, even during uncertain times (Carver-Thomas et al., 2021; Johnson, 2021).

**Research Methodology**

This pilot study centers around teacher collaboration, which is operationally defined as “teacher cooperative actions for job-related purpose” (Kelchtermans, 2006, p. 220). Collaboration exists in two main forms: formal and informal practices (Vangrieken et al., 2015). The purpose of this explanatory sequential mixed methods research design was to investigate the collaborative practices used by middle school STEM teachers in Apple Tree school district during chaotic educational times, such as the coronavirus pandemic. In addition, this study explores teachers’ perceptions of collaboration during the 2020 – 2021 school year.
Explanatory Sequential Mixed Methods Design

The pilot study’s research design was framed as an explanatory sequential mixed-methods study. According to Creswell and Creswell (2018) and Schoonenboom and Johnson (2017), mixed-method studies involve integrating quantitative and qualitative data to provide a deeper explanation of the data collected. The explanatory sequential mixed-methods research design allows participants to provide an explanation and voice their views concerning collaboration during Covid and their resiliency.

Research Questions and Research Problem

To investigate which forms of collaboration teachers participated in during the first school year of the Covid pandemic, the following quantitative research question was developed:

What forms of collaboration did teachers participate in during the first school year of the Covid pandemic?

A deeper understanding of the survey results and teacher perceptions were explored using the following qualitative research question:

How do teachers perceive collaboration during the coronavirus pandemic?

As defined by an explanatory sequential mixed-methods research design, the quantitative and qualitative data were integrated (Creswell & Creswell, 2018; Schoonenboom & Johnson, 2017). Therefore, the final research question reflects the integration between the quantitative and qualitative data:

How does a teacher’s perception of collaboration during the Covid pandemic help explain the forms of collaboration in which they participated?
Participants

The participants for Phase I of this explanatory sequential mixed methods design pilot study included eight teachers within the Apple Tree (pseudonym) school district. All teachers were full-time public middle school STEM teachers with two to five years of experience and taught during the 2020 – 2021 school year. The randomly selected schools included an engineering school, a data science school, a traditional school (School C), and an academic magnet school (School H).

Four schools were randomly chosen to participate in the pilot study; however, two schools did not agree to administer the teacher surveys. Math, science, and technology teachers at schools C and H received an email highlighting the participant qualifications and a brief synopsis of the pilot study (see Appendix A).

The two participants for Phase II of this explanatory sequential mixed methods design pilot study volunteered to assist with the qualitative phase of the pilot study during the Fall of 2021.

Survey Design and Data Analysis

During Phase I of the piloted research study, participants completed a survey that included excerpts from the Organisation for Economic Co-operation and Development Teaching and Learning International Survey (TALIS) 2018 (OECD, 2018). The confidential and anonymous survey represented a mixture of topics related to collaboration amongst educators during the onset of Covid-19. The TALIS 2018 survey defines collaboration as exchange and coordination for teaching (informal opportunities) and professional collaboration (formal opportunities) (OECD, 2020b). Questions from the piloted survey included the frequency teachers participated in collaborative tasks and which forms of collaboration they participated in.
Teacher Semi-Structured Interviews and Data Analysis

During the qualitative phase of this study, two teacher participants completed semi-structured interviews via Zoom®. The interview protocol focused on the nature of collaboration so that the educators were able to provide their perceptions of collaboration during the 2020–2021 school year. The audio data was transcribed using Trint® software, and the researcher verified it. The data were manually coded, and themes were developed using descriptions to determine the phenomenon's essence (Saldana, 2015).

Results/Findings

The purpose of this study was to investigate the collaborative practices used by middle school STEM during the onset year of the coronavirus pandemic and explore teachers’ perceptions about collaborating during the 2020–2021 school year. An explanatory sequential mixed-methods design was used. Eight early-career STEM teachers completed the survey, and two interviews were conducted. The following research questions guided this pilot study:

1. What forms of collaboration did teachers participate in during the first school year of the Covid pandemic?
2. How do teachers perceive collaboration during the coronavirus pandemic?
3. How does a teacher’s perception of collaboration during the Covid pandemic help explain the forms of collaboration in which they participated?

This section details each phase of the explanatory sequential mixed-methods design.

Quantitative Phase Study Participants

The participants for this pilot study were early-career STEM teachers in Apple Tree school district. A total of ten surveys were submitted; however, two teachers were ineligible to participate and were directed to the end of the Qualtrics® survey. Four teachers taught at School
H, one listed their school as an anonymous school within the district, one as School C, and two participants did not list their school (Table 1).

**Table 1**

*Participant’s Years of Experience*

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>3 years</td>
<td>4</td>
<td>50.0</td>
</tr>
<tr>
<td>5 years</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Additional teacher demographics showed that 75% of the teachers taught science and/or science with math (Table 2).

**Table 2**

*Subjects Taught by each Participant*

<table>
<thead>
<tr>
<th>Subjects Taught</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Mathematics, Science, and Engineering</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Science</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Technology</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Most participants were between the ages of 25 years old to 29 years old and 46 years old to 49 years old (Table 3). Three participants preferred not to share their ages. Demographics for the race of each participant (Table 4) shows four participants were white (50 %) and four participants were black (50 %). The highest educational degree (Table 5) for each participant is also presented. Most participants in this study earned a professional or master’s level degree.
### Table 3

**Age Range of Participants**

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 – 29 years old</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>46 – 49 years old</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>50 – 54 years old</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>I prefer not to answer</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 4

**Race of the Participants**

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black or African American</td>
<td>4</td>
<td>50.0</td>
</tr>
<tr>
<td>White</td>
<td>4</td>
<td>50.0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 5

**Highest Degrees Earned by Participants**

<table>
<thead>
<tr>
<th>Highest Degree Earned</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s degree</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Master’s degree or professional degree</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Quantitative Phase Data Analysis

Using excerpts from the TALIS 2018 instrument, the participants were asked to identify the frequency in which they participated in eight types of collaboration. The frequencies ranged from once a year or less, 2 – 4 times a year, 5 – 10 times a year, 1 – 3 times a month, or once a week or more.

Collaboration was categorized into two forms: professional collaboration or formal, structured tasks, which provided educators with lower levels of teacher choice (Jones & Dexter, 2014) and exchange and coordination for teaching, which are informal and infrequent teacher interactions with higher levels of teacher autonomy (Avalos-Bevan et al., 2017). The teacher
participants completed the survey by responding to the frequency in which they participated in forms of professional collaboration. Examples of professional collaboration included teaching jointly as a team in the same class (teaching jointly), participating in collaborative professional learning (professional learning), engaging in joint activities across different classes and age groups (joint activities), and observing other teachers’ classes and providing feedback (observe others) (OECD, 2020b).

In addition, the participants responded to how often they participate in collaborative tasks identified as exchange and coordination for teaching. Examples of these collaborative tasks are engaging in discussions about the learning development of specific students (discussions about students), exchanging teaching materials with colleagues (exchange teaching materials), attending team conferences, and working with other teachers in the school to ensure common standards in evaluations for assessing student progress (common standards for assessing student progress) (OECD, 2020b).

Figure 1 results show that all participants engaged in some form of professional collaboration during the onset of Covid. Fifty percent of teachers participated in professional collaboration at least once each month. The results also show that professional learning was the most frequent formal form of professional collaboration.
Figure 1

*Percentage of Teachers Engaging in Forms of Professional Collaborations*

Figure 2 results show that all participants (100%) experienced informal collaboration during the 2020 – 2021 school year. One hundred percent of teachers participated in exchange and coordination activities. Team conferences represent the most frequent form of exchange and coordination activities.
Qualitative Phase Data Analysis

At the end of the survey, participants were given an option to complete an interview. This qualitative section of this explanatory sequential mixed-methods research study was guided by the following research question: How do teachers perceive collaboration during the coronavirus pandemic?

Two participants volunteered to be interviewed during the qualitative data collection process. The data from the interviews were manually transcribed. MAXQDA® 2022 software was used to identify key phrases, eliminate nonessential statements, and develop a coding system using cluster statements. The statements were then synthesized to reveal and understand the true
essence of the phenomenon, teacher collaboration. This process is also known as transcendental phenomenology (Moustakas, 1994). Table 6 shows teacher responses and the themes created about teacher collaboration during the 2020 – 2021 school year: growth opportunity, student-focused, and flexible timing.

Table 6

Qualitative Phase Themes

<table>
<thead>
<tr>
<th>Participant Responses</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Different personalities bring different ideas to the table” (open-minded/perspective)</td>
<td>Teacher collaboration during Covid is a growth opportunity</td>
</tr>
<tr>
<td>“The ability to share and try techniques and running ideas by each other”</td>
<td></td>
</tr>
<tr>
<td>Supportive: “everyone works together,” “the principal supports collaboration,” and “voluntary and intentional.”</td>
<td></td>
</tr>
<tr>
<td>Reflective “we give and receive feedback in a safe space to grow.”</td>
<td></td>
</tr>
<tr>
<td>“[we] are all in the same boat and are attempting to overcome Covid challenges by working together.”</td>
<td></td>
</tr>
<tr>
<td>Conversations are centered around the students (“activities for students” and “techniques to help our students”)</td>
<td>Teacher collaboration during Covid is student-focused</td>
</tr>
<tr>
<td>“The meetings were short, so we talked about the students first.”</td>
<td></td>
</tr>
<tr>
<td>“Arranged after school, during lunch, virtually, and [with friends] on the weekends.”</td>
<td>Teacher collaboration during Covid requires flexible timing</td>
</tr>
<tr>
<td>“Covid distance learning, then hybrid teaching, back to distance learning, and now face to face has been time consuming and unpredictable.”</td>
<td></td>
</tr>
<tr>
<td>“We had less time to get together last school year than in the past.”</td>
<td></td>
</tr>
<tr>
<td>Occurs during team meetings and for planning lessons</td>
<td></td>
</tr>
</tbody>
</table>

Integration: Joint Display

Joint displays are visuals that demonstrate the connectivity of data within a study (Fetters et al., 2013). Table 7 displays the connection between the theme of “student-focused” and quantitative data that shows the discussions about students and attending team conferences that frequently occurred throughout the 2020 – 2021 school year.
Table 7

Research Question 3: Integration of Data using a Joint Display

<table>
<thead>
<tr>
<th>Theme</th>
<th>Quantitative Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher collaboration during Covid is student-focused</td>
<td>Team Conferences and Discussing Students occurred multiple times throughout the year</td>
</tr>
</tbody>
</table>

![Bar chart showing discussions about students and attendance of team conferences](image)

The data from this explanatory sequential mixed-methods pilot study presented the results for eight early-career STEM teachers in Apple Tree school system.

Discussion

The findings from this study provide educational stakeholders with insight into how teachers collaborated during the onset of the Covid-19 pandemic. Qualitative data analysis of the teacher’s perspective on collaboration during the 2020 – 2021 school year revealed three themes: teacher collaboration is considered an opportunity for growth, it is student-focused, and it requires flexible timing.

This study is beneficial because it highlights collaboration as an intervention for growth amongst novice STEM educators during uncertain times. Developing collaboration as a regime within preservice, in-service, and mentoring programs could offer important benefits to educators. The research data led to the following implications:

1. Collaboration exists within a continuum (Vangrieken et al., 2015) in two main forms, informal and formal. Participants in this study participated more frequently in exchange
and coordination opportunities versus formal forms. According to Avalos-Bevan et al. (2017), Chilean teachers were more adept at participating in informal forms of collaboration because the collaborative opportunities required less effort and were less constrained for time and space. Administrators could promote informal collaboration by assigning STEM teachers to classrooms close to one another. This may ultimately provide flexible opportunities to increase their chances of informal collaboration or exchanging and coordinating resources.

2. Participants in this pilot study unveiled that collaboration was a growth and development opportunity despite the educational climate created due to Covid. Tytler et al.’s (2009) research study noted that the lack of exposure to STEM educators or content experts could hinder a teacher’s growth and competency. Therefore, providing space and opportunities for STEM educators to collaborate is necessary. STEM educators should seek both formal and informal opportunities to connect with other STEM educators because it leads to an openness to grow and change or, as Taleb (2012) states, the opportunity to get better [as it relates to antifragility].

Future Research

Future longitudinal data should be collected to develop a deeper understanding of how the frequency of teacher collaboration and the collaborative practices have evolved for the during and beyond the Covid pandemic.

Summary

This paper discussed a pilot study for early-career middle school STEM educators. The literature supports teacher collaboration as an intervention for educators to grow during a time of educational chaos and disorder caused by the COVID-19 pandemic.
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Appendix A

Pilot Email

Greetings,

I am a [REDACTED] and I invite middle school science, technology, engineering, and/or mathematics teachers to participate in a research study.

I am reaching out today because I am piloting my dissertation research survey, which focuses on ways in which STEM teachers collaborate. If you can assist with my 15-minute anonymous electronic survey, please use the link or QR code below. If possible, please complete the survey and offer suggestions/recommendations by Tuesday, July 20, 2021.

You may qualify if

1. You teach science, technology, engineering, and/or math class to students
2. You teach middle school students
3. You have less than six years of teaching experience

I appreciate your time and efforts in supporting my dissertation research.

Survey Link:

Pilot Teacher Collaboration

or QR code:

Thank you,