iejee

International Electronic Journal of Elementary Education
June 2026, Volume 18, Issue 4

A Tale of Two Groups: Elementary Students' Varied Digital Collaborative Writing Processes and Perspectives

Amanda Yoshiko Shimizu[a,*]

Received : 6 March 2026
Revised : 8 May 2026
Accepted : 17 June 2026
DOI : 10.26822/iejee.2026.456

[a,*] **Corresponding Author:** Amanda Yoshiko Shimizu, Eastern Kentucky University, 521 Lancaster Ave, Richmond, KY 40475.
E-mail: amanda.shimizu@eku.edu
ORCID: https://orcid.org/0000-0002-4379-4280

Abstract

As digital technologies become increasingly integrated into modern life, understanding how students participate in digitally mediated writing is critical. This study examined how two groups of elementary students engaged in digitally mediated collaborative writing (CW) in an online classroom. One group used a single scribe, encouraging collective negotiation of a single idea, while the other used multiple scribes to develop ideas in parallel. Across both groups, students relied on offering, elaboration, agreement, and disagreement to move ideas forward. Students valued peers who were helpful, kind, and focused, and who contributed to the shared text. These findings highlight how participation structures influence CW processes and suggest ways digital CW can support flexible participation. Implications for designing inclusive, digitally mediated writing instruction in elementary classrooms are discussed.

Keywords:

Digital literacy, elementary education, multimodal, online learning, collaborative writing

Introduction

Digital technologies are an essential part of modern life and are increasingly integrated into elementary writing instruction, shaping how students collaboratively plan, compose, and share texts (Williams & Beam, 2019). While access to digital technology expanded significantly during the COVID-19 pandemic, with 84% of U.S. district leaders reporting they provided devices for every elementary student by March 2021 (Klein, 2021), questions remain about how students meaningfully engaged with digital tools for collaboration and learning.

Digitally mediated collaborative writing represents an instructional opportunity, supported by both educational standards (Shanahan, 2015) and empirical research. The Common Core State Standards, for instance, emphasize the importance of integrating digital tools into writing instruction from an early age, encouraging students to "explore a variety of digital tools to produce and publish writing, including in collaboration with peers" beginning in Kindergarten (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010, p. 19). Furthermore, a meta- analysis of true and quasi-experiments found that the quality of writing produced by

KURA group
www.iejee.com
ISSN: 1307-9298

2026 Published by KURA Education & Publishing. This is an open access article under the CC BY-NC- ND license. (https://creativecommons.org/licenses/by/4.0/)

young students improved when collaborative writing routines were integrated into instruction (Graham et al., 2015).

Yet research on how young children engage in on-screen and collaborative writing remains limited (Kucirkova et al., 2019; Williams & Beam, 2019), especially in fully online environments. The aim of this study was to examine how elementary students participated in digitally mediated collaborative writing in an online classroom during the pandemic, focusing on how different participation structures and use of digital tools shaped idea development and interaction. By understanding these processes, this study offers insight into how digital writing environments can be designed to support flexible and inclusive participation.

Theoretical Underpinnings

Cognitive theories of writing (Flower & Hayes, 1981), highlight the internal processes that happen in the mind of an author during writing. This theory shows the recursive nature of writing as an author moves through planning, transcribing, and reviewing text while drawing from background knowledge and considering the written text and purpose. While individual writing processes are often internal, CW offers opportunities for the externalization of these processes as writers negotiate meaning with each other (Storch, 2013). In this work, analyzing elementary students' CW processes revealed how they planned, negotiated, revised, and captured ideas on the page.

As CW is inherently social, the study drew from sociocultural theory to understand how learning happens through interaction (Vygotsky & Cole, 1978). This theory positions writing as a dialogic, collaborative endeavor mediated by tools and practices (Prior, 2006). The analysis was informed by sociocultural perspectives, which view writing as a socially mediated process shaped through interaction and the use of tools.

Additionally, the work was grounded in a social semiotics framework, which values communication in diverse forms—text, audio, and visuals—in constructing meaning (Bezemer & Kress, 2015; Kress, 2003). This is especially important when considering how young writers develop ideas and stories using digital tools (Luppicini, 2007). For instance, transmediation, or conveying content between different sign systems (Siegel, 2006), is especially important for understanding how students used multiple modes in the online environment (Burnett, 2015) to transform ideas between oral and written language, and non-linguistic forms like gesturing. While earlier work has emphasized how second-graders transmediated during their individual writing processes (Marich et al., 2021), this study extends that focus by examining how students engaged in transmediation collaboratively, using digital tools to co-construct meaning across multiple authors.

Lastly, this work is informed by a new literacies perspective (Knobel & Lankshear, 2007; Leu et al., 2013). Knobel and Lankshear (2007) distinguish between two key aspects: the tangible "technical stuff," or the tools and platforms used, and the "ethos stuff," which reflects new values and ways of engaging with texts. Unlike traditional literacies that emphasize individual authorship, new literacies prioritize collective participation, collaboration, and openness. This study applied the new literacies perspective to examine how students engaged in digital CW in a fully online classroom. Given this new setting, the analysis explored how they applied foundational writing processes while adapting to new digital tools and context. Together, these theoretical perspectives provided a comprehensive lens for analyzing how elementary students engaged in digital CW, revealing how their interactions, use of tools, and multimodal exchanges shaped idea development, participation, and their perspectives on digitally mediated collaborative writing.

Literature Review

The Benefits of Collaborative and Digital Writing for Elementary Students

Collaborative writing (CW) is defined here as an activity in which participants negotiate meaning while developing a single text from beginning to end (Storch, 2013). These negotiations enable elementary-aged writers to pool their resources and scaffold each other's learning (Daiute, 1986; Daiute & Dalton, 1993; Ferguson-Patrick, 2007; Peterson & Rajendram, 2019; Shimizu & Santos, 2022; Shimizu & Santos, 2025). Research shows positive outcomes when elementary students participate in CW, including improved revision capabilities (Zammuner, 1995), stronger idea development (Boyle & Charles, 2011), clearer organization (Zioga & Bikos, 2020), more linguistically complex sentences (Daiute, 1986), improved sentence writing quality and punctuation (Puranik et al., 2018), and greater writing confidence (De Smedt et al., 2020). For example, observing early elementary students, Chung and Walsh (2006) wrote, "as young children participated in more collaborative endeavors, the less competent children began to carry out more important tasks more often" (p. 402). The authors concluded that working with a peer scaffolded the writing process for students who may have been less confident. From their own perspectives, elementary-aged students, even as young as Kindergarten (Puranik et al., 2018), have expressed enjoyment in working with classmates on writing activities. However, other studies have found no significant effects of CW on writing outcomes for primary students (Hermansson et al., 2019).

As CW increasingly takes place in digital environments and with digital tools, the nature of writing and its associated benefits have expanded. In terms of the nature of writing, digital tools create space for collaborative and multimodal composing (Mills & Exley, 2014; Williams & Beam, 2019; Williams et al., 2025; Yamaç et al., 2020). For example, students in Yamaç et al.'s (2020) study described how technology enriched writing instruction by enabling collaboration and the integration of multimodal forms of composing.

Digitally mediated CW offers several important benefits for elementary students. Doult and Walker (2014) reported that CW with computers offered opportunities for elementary-aged students to develop technological skills. Other studies show that when digital tools are incorporated into CW, students report that collaboration becomes more engaging and effective (Kumpulainen et al., 2014). They appreciated how these tools enabled them to record ideas with greater immediacy and flexibility, communicate with peers, and work on a shared text in real time. As Kumpulainen et al. (2014) observed, such tools provided students with "opportunities to suggest, invent, propose ideas for collective reflection, encouraging them to analyze their writing processes and to explore the past, present, and future of their creative processes" (p. 66).

More recent research continues to highlight the benefits of digitally mediated CW (Seely Flint et al., 2021; Shimizu & Santos, 2022; Shimizu & Santos, 2025; Williams et al., 2025). For example, fourth-grade students in the United States reported that digital tools supported their writing by reducing physical strain and expanding opportunities for idea generation through both internet access and peer collaboration (Williams et al., 2025). Similarly, recent work with third graders found that digitally mediated CW supported elementary students in developing essential literacy and 21st-century skills, such as how to communicate and solve problems (Shimizu & Santos, 2025). These findings align with a recent review of digitally mediated CW, which shows that CW can improve academic skills, deepen understanding through co-construction, increase student participation and motivation, and foster collaborative competencies (Liverano, 2024).

Notably, Liverano's (2024) review of digitally mediated CW during the pandemic (2020–2022) identified only one study in an elementary context. When considered alongside Svenlin and Sørhaug's (2022) review of CW in L1 school contexts, which highlights the limited attention to technology in CW studies, these findings point to an underexplored gap in the literature that this study addresses. Here, this study examines how elementary students participated in digitally mediated CW in a completely online context.

Challenges of Elementary Students' Digital CW Processes

While the prior section underscored what is possible when elementary students engage in CW, it is important to note challenges and limitations. In group work, even with elementary students, social hierarchies (Christianakis, 2010; Lomangino et al., 1999) and gender (Nicholson et al., 1998) can negatively impact the process. In a 5th-grade class, high-status peers were sought for peer editing, while low-status peers and English-language learners were avoided, seen as offering little useful advice (Christianakis, 2010). The teacher's practice of assigning roles, such as expert editor to "more capable" students, reinforced these hierarchical dynamics. In an ethnographic study, Nicholson et al. (1998) found that while female students used inclusive language regardless of partner, male students were less inclusive and especially critical of female peers' ideas. As a result, female writers often either agreed with their male partner's idea or spent time defending their competence and control. This suggests that CW is not inherently equitable and may reproduce existing classroom power structures

In addition to social dynamics, students' prior experiences with school writing can shape how they engage in collaborative work. CW is sometimes perceived by students as conflicting with traditional school literacy practices, which position writing as an individual activity often used for assessment (Grant, 2009). In Doult and Walker's (2014) study with 9-10 year-olds, while they found some joint content development in wikis, more often students composed individually within the shared platform. That is, students approached CW with an independent mindset, prioritizing their own contributions over co-constructing content. In recent work, third-graders also shared that distribution of workload could be uneven if a collaborator lacked the skills or background knowledge to contribute ideas (Shimizu & Santos, 2025). This highlights a mismatch between traditional writing norms and collaborative expectations.

Finally, beyond social dynamics and prior writing experiences, the tools themselves can shape both the CW process and its outcomes. For example, while some elementary students experience digital tools as exciting and generative, others may find the abundance of options overwhelming (Williams et al., 2025). In addition, students' technical skills, or lack thereof, can influence their final products in unintended ways. In Williams et al.'s (2025) study, one student expressed that a visual element was included in their final product because they did not know how to remove it. Other research suggests that shared devices designed for a single user may hinder collaboration (Jocius, 2018; Högström et al., 2024). As Daiute (1986) observed, "the student at the keyboard

often made the final decision" (p. 402). In other words, control over the device can translate into control over the writing. And even when all students do have access to a shared document, technical issues or sharing rights have been shown to impact how elementary students can engage in CW (Shimizu & Santos, 2025). Overall, these challenges highlight that elementary students' CW processes are shaped not only by group interaction, but also by prior writing experiences and the affordances and constraints of digital tools.

The Nature of Elementary Students' Digital CW Processes

While elementary students' CW processes have long been of interest (e.g., Christianakis, 2010; Chung & Walsh, 2006; Doult & Walker, 2014; Jones, 2003; Lomangino et al., 1999; Nicholson et al., 1998; Rojas-Drummond et al., 2008; Shimizu & Santos, 2025), research has largely focused on face-to-face collaboration and drafting processes, with comparatively less attention to digitally mediated CW (Svenlin & Sørhaug, 2022). This represents a critical gap in the research, particularly as digital technologies become increasingly embedded in students' everyday and educational lives.

More than 25 years ago, Sharples (1999) outlined three participation structures of CW: parallel, in which writers compose simultaneously in separate documents that are later combined; sequential, in which a shared text is passed between collaborators who contribute at different stages; and reciprocal, in which writers jointly and synchronously construct and revise a shared text. Among these, reciprocal writing requires the most sustained interaction, as participants continuously respond to and build upon one another's ideas. Digital writing environments may be particularly well suited to supporting this form of collaboration, as shared platforms allow writers to contribute simultaneously, respond to peers in real time, and continuously revise a shared text document, even if they are not in the same physical space.

Studies with elementary students using digital tools for CW highlight how students adapt their CW processes (Chung & Walsh, 2006; Daiute, 1986; Jocius, 2018). Chung and Walsh (2006) observed kindergarten and first-grade dyads writing together on computers and noted that, over time, children increasingly shared the mouse and keyboard, demonstrating greater collaboration. Jocius (2018) found that older elementary students approached two collaborative multimodal composing tasks differently. In one, students divided roles, with one focusing on text content and the other on visual elements, within a shared PowerPoint. In another, each student created individual slides, inclusive of text and images, within a shared PowerPoint. Similarly, Daiute (1986) studied fourth graders writing together on a single computer and observed how they discussed both macro-level elements, such as plot, and micro-level details, like punctuation. While most groups wrote their stories linearly from beginning to end, some discussed and decided on the stories beforehand, while others developed them sentence by sentence. Across these studies, elementary students demonstrated flexibility in how they organized CW, shifting between shared and divided responsibilities depending on the task, tools, and group dynamics.

More recent research in digitally mediated contexts extends these findings. Studies show that when composing in digital environments, students often distribute roles across modes. One student might focus on written text while another develops visual or design elements, while others might collaboratively negotiate ideas within shared spaces (Seely Flint et al., 2021; Shimizu & Santos, 2025; Williams et al., 2025). For example, multiple pairs of fourth graders divided work based on functional roles, with one person being in charge of ideas through dictation and another in charge of translating it to the page through typing (Williams et al., 2025). In a fully online context, elementary students coordinated CW across multiple interactional spaces, such as video conferencing, chat, and shared documents, shaping how ideas were developed and negotiated (Shimizu & Santos, 2025).

In addition to participation structures, others have focused on types of collaboration (Pifarré & Li, 2018) and co-construction processes (Doult & Walker, 2014; Rojas-Drummond et al., 2008). For example, nine- and ten-year-olds in a Spanish primary school were seen proposing ideas, elaborating, summarizing group thinking, and reflecting on their group's progress and products (Pifarré & Li, 2018). Studying fourth graders in Mexico City, Rojas-Drummond et al. (2008) described how students co-constructed texts through their actions and communication, noting how these elementary writers referenced and included ideas from texts and peers in ways that fostered intersubjectivity and created space to transform ideas in sophisticated ways. Together, these findings suggest that digitally mediated environments not only expand what students create, but fundamentally reshape how they participate, coordinate, and negotiate meaning in collaborative writing. Understanding these processes is critical for examining how ideas are developed and transformed in elementary group writing contexts, such as online during a pandemic.

Current Study

The rapid shift to online learning during the pandemic ushered in more one-to-one technology for elementary students in the U.S. and offered space for educators to prioritize human connection over standardized testing (Barnum, 2020). This unprecedented educational context was the backdrop of this study, enabling a

unique exploration of elementary students' digital CW processes and perspectives. Specifically, I asked:

> *(RQ1) How did elementary students develop ideas when engaging in CW of a tall tale narrative?*
>
> *(RQ2) How was idea development shaped by the digital environment and tools?*
>
> *(RQ3) How did students' idea development processes relate to what they valued about their collaborative groups?*

Methodology

Using ethnographic data collection (Heath & Street, 2008) and multimodal interaction analysis methods (Jewitt, 2008; Norris, 2004) this qualitative study developed comparative cases (Stake, 2013) to examine the differences and similarities in the CW processes of two groups of elementary students using one-to-one digital tools in a fully online environment.

Setting and Participants

The study took place at a public charter school in the northeastern United States that engaged in fully online instruction for most of the 2020–2021 school year. Literacy instruction occurred synchronously on Zoom with two literacy teachers: the classroom teacher and myself. Instruction lasted an hour and fifteen minutes daily, with at least half dedicated to a writer's workshop four days per week. Student participants included 50 third-graders evenly divided between two classes. Of these, 65.4% identified as Hispanic, 17.3% as Black, and 15.4% as White; 25% were multilingual, and 69% qualified for free or reduced lunch. The school ensured all students had access to a computer and internet.

Researcher Participation and Positionality

To gather data, I employed participant observation (Spradley, 2016), assuming a co-teaching role in the online writer's workshop. Our aim during the year of online teaching was to forge a community while empowering students to share their stories through digital writing. An impact of teaching in the context of a global pandemic was that systems sometimes cited as constraints on teaching, such as standardized assessments (Levine et al., 2023) were lifted, giving us the ability to try things we may have not tried before, like digital CW.

Notably, as a participant-observer and co-teacher, my presence and instructional decisions likely shaped students' CW processes. For instance, my facilitation during writing conferences, including prompting, questioning, and modeling collaborative and writing behaviors, may have influenced how students negotiated ideas and interacted with one another. Additionally, because video data were only recorded when I was present in breakout rooms, the data may reflect moments of heightened accountability or responsiveness. While this positioning provides rich, in-context insights into students' processes, it also introduces the possibility that observed interactions were partially co-constructed through my involvement.

Writer's Workshop and Focal Unit: Tall Tale CW

Our writer's workshop followed a typical model, beginning each day with a brief mini-lesson. Then, students were released to Zoom breakout rooms to write together and periodically conference with a teacher. Each day concluded with an opportunity for students to share their writing with the class.

The focal unit for this study was a tall tale unit. The academic objective was for students to practice writing in the tall tale genre using exaggerated (1) settings, (2) characters, (3) conflicts, and (4) resolutions that would teach a (5) moral. These five elements were outlined in a simple table graphic organizer pasted at the top of each group's shared Google Doc.

Socially, we designed the unit around CW to give students more time to interact on Zoom, a platform that allows participants to see and hear one another, share screens, and chat. Sixteen groups of 2–4 students were tasked with collaboratively writing one tall tale.

The classroom teacher and I split the groups and conferenced with the same ones throughout the unit. During CW time, we digitally joined our assigned groups' breakout rooms. Since there were more rooms than teachers, student groups did not have constant adult guidance. As such, our mini-lessons incorporated writing skills and genre knowledge, while emphasizing prosocial 21st-century skills like flexibility, communication, and problem solving. To support this, the teachers role-played CW scenarios and showcased exemplar videos of student groups writing together that had been recorded on previous days. The class reflected on the CW skills they noticed and often applied them in their own groups (Shimizu & Santos, 2022).

To foreground kindness and community, students could nominate a peer for a shout out (a compliment) at the end of each day. These were optional, giving students agency over who, when, and why they acknowledged someone's actions. Shout outs were shared the next day at the start of class.

Focal Groups

I worked with seven groups during this unit and selected two focal groups for detailed analysis. While commonalities across the groups will be discussed, preliminary analyses revealed them to be contrast cases (Stake, 2013) based on how they developed

ideas and used digital spaces and tools. The remaining groups showed a variety of interactional patterns combining aspects from each of the contrast cases. The following table provides context about the students in each focal group and their tall tales (all names are pseudonyms).

Table 1
Focal Groups

Group Name	Students	Gender	Ethnicity/ Race (self-reported)	Multilingual Learner
Junk Food Group (JFG)	Tim	Male	Hispanic	No
	Rita	Female	Black	No
	Skye	Male	Other	No
Space Obstacles Group (SOG)	Mark	Male	Hispanic	Yes
	Kendall	Female	Hispanic	Yes
	Scott	Male	White	No

Data Sources

In the larger study, data was collected from the third-grade online writer's workshop for an entire school year. The present study drew from a subset of data from this 17-day tall tale unit. Data sources included video recordings and chats, revision histories, final texts, shout outs, and reflection interviews which are further described in Table 2.

Table 2
Data Sources

Data Source	Description
Video Recordings and Chats	Video data and chat interactions collected during writing conferences in Zoom breakout rooms. (Due to Zoom's functionality, video was only captured when the recording participant, which in this case was the researcher, was present in a breakout room)
Revision History and Final Texts	Archived history and final text in Google Docs
Shout Outs	Voluntary compliments submitted by students for other students via Google Forms
Reflection Interviews	20-30 Zoom interviews with students discussing their online learning experiences and tall tale project reflections

Data Analysis

Different analytic procedures and subsets of the data were used to address each of the research questions. Broadly, the analytic approach was informed by sociocultural perspectives, which view learning and meaning-making as socially mediated processes shaped through interaction and the use of tools (Vygotsky & Cole, 1978). In this study, students' CW processes were examined as co-constructed across participants and mediated through digital tools, including shared documents, chat, and video conferencing. These tools functioned as mediational means, shaping how ideas were introduced, negotiated, and ultimately inscribed into shared texts.

RQ1: How did elementary students develop ideas when engaging in CW of a tall tale? Drawing from social semiotics (Bezemer & Kress, 2015; Kress, 2003), I used the Google Doc histories, video recordings and the text-based chats from the focal groups' writing conferences to create multimodal transcripts (Flewitt et al., 2011) that included the verbal utterances, gestural movements, chat-based statements, virtual pointing (i.e, using the mouse to point, highlighting a portion of text to bring group member's visual attention to a specific point, or scrolling up and reading a certain portion of text), and textual contributions to the tall tale in their shared Google Docs.

Using these multimodal transcripts, I conducted idea tracing (Ehret et al., 2016) to "reveal from whom and how ideas originated, how these ideas were negotiated at different points in the composing process, and how they were manifested in the final product" (Jocius, 2018, p. 17). Discussions that were off-task, such as discussions about a student's elf on the shelf, were not included in the idea tracing analysis.

As ideas were traced across both groups, I used the constant comparative method (Corbin & Strauss, 2015) to conduct an action analysis focused on how participants (i.e., students and teacher) contributed to idea development. The unit of analysis was each turn of talk or action taken by a participant within a single idea tracing sequence. The action codebook was developed iteratively through repeated analysis of the multimodal transcripts. Initial codes were generated inductively by examining how participants introduced, responded to, and extended ideas across interactions. Through ongoing comparison within and across cases, these codes were refined into four categories: offering, elaborating, disagreeing, and agreeing.

Offering was coded when a participant introduced a new idea that did not build directly on a previously established idea. Because this analysis spanned multiple days, many contributions were coded as elaborations, even when they occurred in later

sessions, if they extended prior ideas. For example, if a participant introduced the idea that a character was jealous, and on a subsequent day another participant expanded this idea by specifying what the character was jealous of, this was coded as elaboration rather than a new offering. Elaborating was also used to capture moments in which the teacher prompted further idea development (e.g., asking "What might happen next?"), as these moves functioned to extend or deepen ongoing ideas.

Disagreeing was coded when a participant expressed concern, rejection, or critique of an idea. This could take the form of questioning (e.g., "How would that happen?"), direct negation, or proposing an alternative idea. When a disagreement also included the introduction of a new idea, the action was double-coded as both disagreeing and offering. Agreeing was coded when participants demonstrated support for an idea through verbal affirmation (e.g., "yeah"), nonverbal responses (e.g., nodding, smiling, laughter), or by inscribing the idea into the shared digital text.

Table 3

Action Codebook

Action	Description
Offering	Sharing a completely new idea
Elaborating	Building on a previous idea, even if from an earlier day (e.g., expanding on a character's jealousy mentioned in a prior session)
Disagreeing	Expressing concern or rejection of an idea (e.g., saying "no," asking critical questions, or suggesting a different idea). If a new idea was proposed, it was also double-coded as offering
Agreeing	Showing support for an idea through nodding, laughter, verbal agreement, or typing it into the shared document

RQ2: How is idea development shaped by the digital environment and tools? To address RQ2, I employed a multi-layered analytic approach that combined computational analysis of revision histories with close examination of multimodal interaction. First, I used DocuViz (Wang et al., 2015), a text-mining analysis tool that analyzes Google Doc archived history, to understand students' text construction behaviors. DocuViz provided statistics on the groups' Google Docs for each participant in terms of (1) total contributions, (2) total edits, (3) edits made to their own text, and (4) edits made to the text of others. These metrics were used to calculate each participant's relative contribution to the group text, as well as the proportion of self- versus other-directed revisions, providing a quantitative overview of participation patterns within each group. This analysis provided a comprehensive view of students' writing behaviors across the full composing process, including periods not captured in video recordings, which were limited to moments when I joined breakout rooms.

Building on this overview, I then conducted a qualitative multimodal analysis to examine how ideas were developed and negotiated across digital spaces. To do so, I selected excerpts from the idea tracing analysis that represented ideas that were both collaboratively developed and ultimately incorporated into the shared text. These excerpts were chosen because they captured the relationship between interactional processes and final written outcomes.

Selected excerpts were mapped onto multimodal composing snapshots (Figure 1), which served as an analytic tool for visualizing how interaction unfolded across time, space, and mode. These snapshots represent many variables (Table 4). Time runs linearly and activity is depicted across three interconnected spaces: the Zoom space, the Google Doc space, and a hybrid space created through screen sharing. They also indicate which participants were present in each space, which ideas were being developed, and which participants contributed to those ideas. The snapshots presented in this article were selected excerpts from longer interaction sequences, each representing a single idea tracing sequence in which an idea is introduced, developed, and taken up in the shared text. These excerpts were produced specifically for this study to illustrate key patterns of collaborative idea development and are representative of the distinct interactional patterns observed across the two groups.

Importantly, the snapshots also capture how ideas were developed across multiple semiotic modes of interaction (Bezemer & Kress, 2015; Kress, 2003; Norris, 2004), including verbal talk, gesture, text-based chat, textual revisions, and virtual pointing. Rather than analyzing these modes independently, I examined them relationally to understand how meaning was co-constructed across modes and spaces. For example, a single idea might emerge through transmediation (Siegel, 2006) being developed through verbal discussion, reinforced through gesture, and then be inscribed into the shared document through typing.

This multimodal approach allowed me to trace how ideas moved across interactional spaces, modes and participants, providing insight into how digital tools and environments shape CW processes. By integrating revision history data with multimodal interaction analysis, this method offers a way to examine both the distribution of participation and the processes through which ideas are developed and taken up in digitally mediated CW.

Figure 1

Multimodal Composing Snapshot for Junk Food Group.

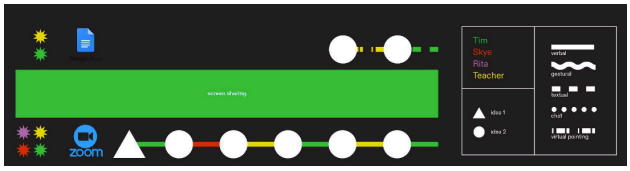


Table 4

Variables Represented in Snapshots

Variable	Description	Representation
Time	Order of actions for idea development	Runs linearly left to right
Digital Spaces	Zoom space where students could talk, chat, and gesture	Bottom portion of snapshot
	Google Doc where the text was written/revised	Top portion of snapshot
	Hybrid Space created when participants shared their screen to display the Google Doc to others	Middle portion of snapshot
Ideas	Idea being developed	Shapes
Participants	Digital spaces participants were present	Colored Stars
	Which participant(s) developed ideas	Color of Lines
Modes of Interaction	Verbal	Solid Line
	Gestural	Wavy Line
	Chat	Dotted Line
	Textual additions/revisions	Dashed Line
	Virtual Pointing	Dotted-Dashed Line

RQ3: How did students' processes relate to what they valued about their collaborative groups? To answer RQ3, students' shout outs and their end of year interviews were triangulated (Shipman, 1981) with the findings from questions one and two to understand what students valued about their digital writing collaborations.

Findings

The comparative case method of analysis (Stake, 2013) examined both similarities and differences in how the groups developed ideas, (RQ1), as well as how the digital environment and tools shaped these processes (RQ2) and impacted students' perspectives on CW (RQ3).

RQ1: How did elementary students develop ideas when engaging in CW of a tall tale?

,

Idea Development Is Bound by Genre and Led Through Elaboration

Results of the idea tracing and action analysis showed both groups most often engaged in elaborative actions (53% and 63%) when collaboratively developing ideas (Table 5). Although the content of the tall tales from each group was different, both groups were constantly meshing ideas together and using one element of the story to elaborate and develop other elements, so ideas were rarely newly offered (7% and 1%).

Table 5

Summary of Actions by Group and Students

Junk Food Group (JFG)					
Action	Tim	Skye	Rita	Teacher	Total
Offering	3	2	1	1	7 (7%)
Disagreeing	6	3	5	5	19 (19%)
Agreeing	7	4	3	6	20 (21%)
Elaborating	18	4	8	22	52 (53%)
Total	34	13	17	34	98
Space Obstacle Group (SOG)					
Action	Scott	Mark	Kendall	Teacher	Total
Offering	2	2	0	0	4 (1%)
Disagreeing	14	3	0	6	23 (10%)
Agreeing	7	15	18	21	61 (26%)
Elaborating	51	30	10	59	150 (63%)
Total	74	50	28	86	238

The tall tale genre bound the groups' idea development. The JFG chose the moral "like food even if it looks bad," while the SOG all agreed their moral should be "do not give up." These morals were the foundation for the subsequent idea development for both groups across the other tall tale elements of setting, character traits, problem, and solution. For instance, the JFG decided that their character, Emma's main trait would be that she was very picky. Building from that idea and their moral of liking food even if it looks bad, they decided her pickiness would lead her to not like any vegetables, so her parents would give her junk food all the time. This in turn, would cause the main conflict that Emma's sister Lisa, whose character trait was jealousy, would be jealous that her sister was able to eat a lot of junk food. Ultimately, the group's resolution had Lisa plead for Emma to try healthy food as a birthday present to her. Emma, being the good sister she was, would then try vegetables and actually enjoy them, teaching their reader the moral to "like food even if it looks bad."

The SOG's main characters were two sibling brothers. The group decided their setting would be space. Building from this, they came to the consensus that their story's main conflict would be that one brother, Sactano, would get kidnapped by space aliens. Then, to resolve this conflict and stay true to their "do not give up" moral, they agreed the other brother Bolbo

needed to be strong in order to persevere through obstacles in space to get his brother back. Both groups were constantly engaging in elaborations of previous ideas that were bound by the groups' co-constructed setting, character traits, conflict, and solutions which all served to teach an underlying moral, a paramount element of any tall tale. Importantly, these elaborative interaction patterns were mediated across Zoom and the shared Google Doc, where students negotiated ideas through talk and gesture while simultaneously inscribing them in text, with participation shaped by who participated or controlled different interactional modes offered by the different digital platforms.

Agreeing and Disagreeing Are Both Essential to Idea Development

The second and third most common actions taken up by these groups were agreement (21% and 26%) and disagreement (20% and 10%). Both actions were essential to groups' successful collaborations. Agreeing moved ideas along to the digital page while disagreeing played an important role in keeping the stories logical and coherent.

Many of the moments of agreement were indicated or followed up by ideas being added to the groups' digital text. For instance, in the JFG Rita elaborated on the idea of jealousy by saying, "She's jealous because Emma always gets Chick-Fil-A every single day even if the drive is like so long." In response, I said, "Lisa thought to herself, 'I can't believe she gets everything she wants even when mom has to drive so far to get Chick-Fil-A'...how many miles, Rita?" To which Rita replied, "20 miles." Tim then showed silent agreement with this idea as he typed I can't believe Mom drove 20 miles to get Emma Chick-Fil-A into the Google Doc.

In the SOG, Scott elaborated about the main conflict, saying that Bolbo may have to sacrifice his ship to save Sactano and escape through a wormhole or a space pod. Kiara responded in agreement, saying "I think it's good." Hearing this agreement, Scott then brought it to the digital page typing he went in his space pod and got his brother before the alien ship got destroyed and they went back to Earth. Both examples highlight how agreeing helped move ideas from verbal discussions off the page to words on the digital page.

Disagreeing helped maintain coherence in both tall tales. In the JFG, Tim offered the idea that the "bully actually took Emma's food and made it into a disgusting food and then Emma Watson didn't be picky no more." To Skye, this idea did not fit into the moral of liking food that looked bad, so he disagreed saying, "I don't know...let's do a different one. What about... her mom like made food that looks disgusting with vegetables...And Emma wants something else." This moment of disagreement kept the conflict true to the moral and was pivotal to the tall tale's development, as many of the subsequent ideas were about Emma not liking vegetables at first, but eventually learning to enjoy them.

In the SOG, it worried Scott that Kendall was writing about the final obstacle of the story, while he was still working on a previous obstacle. He voiced his concern by disagreeing, as he said, "But that's at the end...when they have a lightsaber fight...it's going to be outdated." While this action of disagreement was unwarranted in this case since both ideas could be written in the Google Doc at the same time in the correct order, it is an example of disagreement being used to express concern about events needing to be in the correct sequence to be coherent. Again, these actions of agreeing and disagreeing were mediated across Zoom and the shared Google Doc, with ideas often being negotiated through verbal interaction and often agreed upon through typing onto the digital page.

Female Participants Disagree and Agree to Develop Ideas

While both groups engaged in similar actions overall, the female participants in each of the groups participated differently. Rita in the JFG engaged mostly in elaborations (47%) but her second most frequent action was disagreeing (29%). Such a disagreement came about when discussing the ages of the characters in the story. One member of the group suggested that the main character might be eight years old, to which Rita replied, "I don't like it. Why is Emma eight years old? They're in high school." This disagreement led the group to revise the ages to 11 and 14. Unlike Rita, Kendall in the SOG engaged mostly in acts of agreeing (64%). An example of agreement was when Scott said, "Bob and his army of hamsters started attacking all the... bad guys." In silent agreement Kendall typed hamsters attacked the guards. Often, Kendall's agreement was exhibited by typing the ideas of others in the digital text, whereas Rita engaged in verbal disagreements in response to ideas that were not logical to her. Here, Rita's verbal disagreements, which she shared through the Zoom platform challenged and redirected ideas, while Kendall's agreement through typing moved ideas forward, underscoring how technology supported different modes of participation and CW processes.

RQ1: Summary

Both groups primarily developed ideas through elaboration, building on existing ideas rather than introducing new ones, showing that CW was a cumulative process shaped by prior contributions. The tall tale genre strongly guided idea development, with each group's chosen moral influencing characters, conflicts, and resolutions. Agreement and

disagreement both played essential roles. Agreement helped move ideas into the written text, while disagreement ensured coherence and alignment with the story's logic and moral. Additionally, participation patterns varied, with some students contributing through verbal negotiation and others through typing and affirming ideas. Importantly, these processes were mediated across digital tools and spaces, such as Zoom and the shared document, which shaped how ideas were negotiated, taken up, and ultimately inscribed in the text.

RQ2: How is idea development shaped by the digital environment and tools?

Digital Spaces, Modes of Interaction, and Patterns of Idea Development

Each of the focal groups participated in the digital spaces in different ways. The JFG tended to all be present in the Zoom space, but each day only one student was present in the Google Doc space. This group's reliance on a single student scribe supported a unitary pattern of idea development in which all the participants focused on negotiating a single idea at a time. Whereas, participants of the SOG were all present in both the Zoom and Google Doc spaces each day enabling parallel idea development where more than one idea could be developed synchronously. However, both groups used the screen share feature to provide evidence in moments of disagreement.

Junk Food Group's Unitary Idea Development with a Single Scribe

Being the only student in the Google Doc, Tim generally scribed for the JFG. He ended up making 70% of the total contributions to the text and 66% of the edits in the final text (Table 6). Since all of the other members of this group only were present in the Zoom space, their modes of interaction were usually limited to speaking, gesturing, or using the chat. As such, they developed ideas verbally in the Zoom space, which were translated to the page by a scribe, usually Tim.

While Tim of the JFG was the most dominant participant in terms of textual contributions, all group members actively engaged in the unitary idea development process verbally. An example of this unitary idea development pattern occurred when this group negotiated an idea about the initial setting of the story. Figure 1 illustrates one such excerpt, representing a single idea tracing sequence in which an idea is introduced, developed, and ultimately taken up in the shared text.

In Figure 1, first observe that all the participants are present in the Zoom space as represented by four colorful stars, while only Tim and I are present in the Google Doc space as represented by green and yellow stars. Additionally, Tim is screen sharing the Google Doc so that all participants not in the Google Doc can see the shared text. Most importantly, notice how idea one (triangle) is abandoned, after idea two (circle) was offered by Skye (red). As a result, the group unitarily developed the circle idea through verbal turns in the Zoom space, before making it into the Google Doc space textually by Tim.

In this figure we first see in the Zoom space Tim verbally offered the idea that the first setting in the story should be school (triangle). Then, Skye (red) disagreed and offered a new idea that the characters should be at their house (circle) since the text they had previously written said the characters were waking up. Verbally, Tim (green) and I (yellow) both agreed with Skye's circle idea. Then, in the Zoom space I verbally asked, "How about instead of one day in a school...what if you just deleted this part?" While I was asking this question in Zoom, I virtually pointed in the Google Doc by selecting the text I was recommending be deleted (first circle in Google Doc). All the students in the group could see what text I was suggesting to delete because of Tim's screen sharing. In agreement, Tim revised the Google Doc (second circle in Google Doc) by cutting and pasting the phrase one day in a to a later point in the text while also narrating his actions in the Zoom space (last circle on bottom) saying, "I'll move it here, cause we're gonna need it."

Although Skye was not present in the Google Doc space and only engaged once by verbally disagreeing and offering a new idea, it is his circle idea that is carried forth by Tim and I via verbal turns in Zoom and virtual pointing and textual interactions in the Google Doc. This multimodal composing snapshot helped us see how the Junk Food Group developed ideas in a unitary fashion. First, this group developed ideas through verbal turns in the Zoom space which were then scribed by Tim in the Google Doc space. As shown in Figure 1, idea development is distributed across participants and modes, moving between verbal discussion, gesture, and textual inscription in the shared document.

Space Obstacles Group's Parallel Idea Development with Multiple Scribes

On the first day of this writing unit when I went to conference with the SOG I learned that not everyone had editing rights in the shared Google Doc as Mark announced to me, "I've thought about a moral, it's just that when I want to type I can't." Once this mistake was corrected, all members of this group were active in both the Zoom space and the Google Doc space each day. As seen in Table 7, this group was more equitable than the JFG across writers in both their percentage of total edits and contributions to the digital text.

While this group did more evenly contribute to the process in terms of contributions to the text, they did not always work together synchronously to develop ideas. Instead, since participants in the SOG were present in both the Zoom and Google Doc spaces, ideas could be developed in parallel and could be captured textually by any of the participants. An example of this parallel idea development occurred when this group was developing conflicts for their tall tale story, as represented in Figure 2.

In Figure 2, first observe that all the participants are present in the Zoom and Google Doc spaces as represented by four colorful stars in each space. Additionally, notice how multiple people developed idea one (triangle) through both verbal and gestural turns in the Zoom space and textual additions in the Google Doc space. Most importantly, notice how while Scott (green) and Mark (red) continued to develop the triangle idea verbally in the Zoom space, Kendall (purple) and I (yellow) at the same time silently developed idea two (circle) through Zoom's text-based chat thereby engaging in parallel idea development.

In the excerpt in Figure 2, within the Zoom space, Matt (red) verbally suggested that one of the obstacles should be "asteroids trying to hit the ship" (triangle). After multiple verbal and gestural elaborations in the Zoom space by Mark, Scott, and myself, it was decided that the asteroids would follow the spaceship and explode. I (yellow) began to capture this triangle idea textually in the Google Doc, along with Mark and Kendall (purple), who had been silent in Zoom up to this point but was clearly listening. From there, Mark and Scott (green) continued to capture this idea textually in the Google Doc, while simultaneously narrating their contributions in the Zoom space. For instance, Scott capitalized a name in the Google Doc and verbalized, "It's a name so it's always uppercase" in Zoom.

While Scott and Mark developed the triangle idea together, I (yellow) used Zoom's chat to ask Kendall (purple) what obstacle she wanted to include (circle). Kendall chatted back that she thought the characters should have a sword fight. I chatted back that it was such a cool idea. In the Zoom space, I then verbally announced this idea to the group. Finished with their triangle idea, Mark agreed and Scott

Table 6

Proportion of Edits and Contributions in the Google Doc by Junk Food Group

	Participant	% of Total Contributions	% of Total Edits	% of Self-Edits v. Other-Edits	
Junk Food Group (JFG)	Tim	70%	66%	Self-Edits	82%
				Other-Edits	18%
	Rita	2%	7%	Self-Edits	70%
				Other-Edits	30%
	Skye	18%	14%	Self-Edits	63%
				Other-Edits	37%
	Teacher	10%	13%	Self-Edits	44%
				Other-Edits	56%

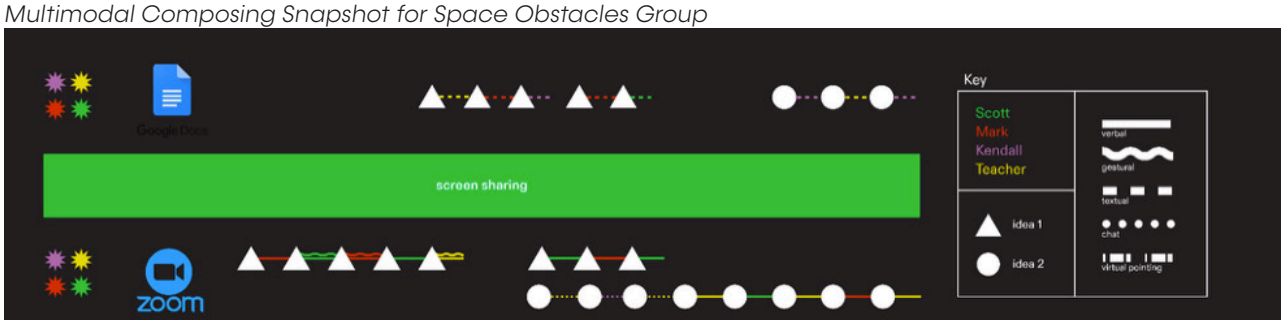
Table 7

Proportion of Edits and Contributions in the Google Doc by Space Obstacles Group Participants

	Participant	% of Total Contribution	% of Total Edits	% of Self-Edits v. Other-Edits	
Space Obstacles Group (SOG)	Scott	38%	30%	Self-Edits	83%
				Other-Edits	17%
	Kendall	21%	30%	Self-Edits	82%
				Other-Edits	18%
	Mark	13%	20%	Self-Edits	79%
				Other-Edits	21%
	Teacher	30%	20%	Self-Edits	91%
				Other-Edits	9%

Figure 2

Multimodal Composing Snapshot for Space Obstacles Group



verbally elaborated that the character might "do the moonwalk dodging all the swords." Once everyone was in agreement, both Kendall and I worked together in the Google Doc space to textually capture this circle idea onto the digital page.

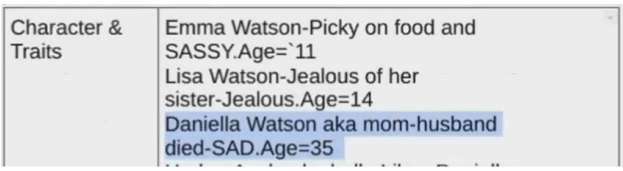
This multimodal composing snapshot showed how every member of this group was present in the Google Doc and used their presence to write in the text. For example, I first observed how idea one (triangle) was scribed at some point by every participant in the Google Doc. In addition, Figure 2 also displayed this group's tendency to engage in parallel idea development; as Scott and Mark continued to develop the triangle idea, Rita and I had a silent conversation using Zoom's text-based chat about idea two (circle), which her presence in the Google Doc enabled her to textually capture herself. In this sequence, the coordination of interaction across digital tools and spaces further shapes how participation unfolds and how ideas are ultimately incorporated into the shared text.

Virtual Pointing Power of The Screen Share

Both groups used Zoom's screen share feature to virtually point or bring the group's attention to a specific or particular place in the text as an additional resource to defend their action of disagreeing. In the JFG, Rita thought Tim had suggested the main character would drive herself to Chick-Fil-A, so she disagreed verbally asking "but how is she gonna drive to Chick-Fil-A if she's not 16?" To emphasize his side of the argument he repeated "The MOM is gonna drive," while simultaneously selecting the mom character's name (Daniella Watson) in the graphic organizer which clearly said she was 35, appropriate driving age (Figure 3).

Figure 3

Virtual Highlighting from Tim to Emphasize His Point of Disagreement.



In the SOG, I once made an incorrect statement about a character's trait. To disagree Scott used a version of virtual pointing enacted by scrolling up to a point in the text and digitally pointing as he read out loud, "It says...Bolbo super smart. Sactano, grateful but forgetful." His screen sharing gave him power to control what I saw on the page. He could use scrolling, physically pointing, and reading aloud to emphasize his disagreement. These moments of virtual pointing, through selecting text or scrolling to a point in the text, occurred when the screen sharer wanted to support their disagreement with text evidence.

RQ2: Summary

The digital environment shaped idea development by structuring how students interacted across spaces and tools. In the JFG, where typically only one student worked in the Google Doc, ideas were developed unitarily through verbal discussion in Zoom and then translated to text by a single scribe. In contrast, the SOG, with all members active in both Zoom and the shared document, engaged in parallel idea development, allowing multiple ideas to be developed and recorded in the Google Doc simultaneously by different participants. The availability of multiple interaction modes (e.g., speech, chat, gestures, and text) enabled students to coordinate ideas in different ways, including silent chat-based conversations that contributed to the final text. Additionally, tools like screen sharing supported virtual pointing, allowing students to use the text itself as evidence during disagreements and shaping how ideas were negotiated and justified.

RQ3: How did students' processes relate to what they valued about their collaborative groups?

Shared Student Perspectives: Helpful, Kind, and On Topic

Analysis of both groups' shout outs showed how all participants appreciated interactions that were helpful, kind, and on topic. In the JFG, Tim shouted out Skye and Rita, "because they help me in our story." Skye shouted out Tim for being "kind and so focused." In the SOG, Mark liked how Scott "was so on topic" and Kendall appreciated when Mark "was helping Scott because Scott can't share screen." However, the groups' varying CW processes and engagement with the digital spaces and tools differentially impacted what they valued about their groups.

Junk Food Group, More Ideas More Challenging

The JFG, who developed ideas in a unitary fashion and had one student scribe in the Google Doc, valued having a space to speak, responsiveness by group members, and coming to a consensus. For instance, Rita wrote a shout out for Tim for "being kind (a bit) in my group and letting everyone have a chance to speak." This group also valued each other's responsiveness to one another's feedback as seen in a shout from Tim to Skye about how he would readily change his idea if the group did not agree or like it. Lastly, they greatly valued how group members were constantly negotiating to reach a consensus as Rita complimented Tim for always asking his group members if they liked the sentence he had scribed for them in the Google Doc.

Tim described the JFG's unitary idea development process saying, "we used our ideas and put a little bit

of each person's idea in one chapter." However, there were challenges. Skye shared, "I liked it, but it was hard cause, like we all wanted to do different stuff. But then, we finally came up for something we all wanted to do." Rita and Tim echoed this sentiment in their interviews. Although this group did an excellent job coming to a consensus, this process was challenging and required effort to get everyone on to the same figurative and literal digital page.

Space Obstacles Group, More Ideas the Better

The SOG valued when collaborators gave direction, were agreeable, and added details to the text. For example, Scott set a vision for the group, which was appreciated by Kendall who wrote Scott "was giving out details and being kind to us and he said you guys can write this and I can write this." For Kendall, Scott's leadership was an asset to their group's CW process. Mark appreciated how Kendall, whose most notable action was agreeing, "always agrees on other people," making their process very efficient. Finally, this group appreciated when multiple members contributed text to their tall tale story. Mark wrote a shout out for Kendall and Scott "because they wrote a lot in writing time."

The SOG also viewed having more ideas from more people as a good thing. During Mark's interview, through his laughter he said the idea for the bad guys' pants to catch on fire was Scott's idea and that it was good to work with people who could give you different ideas. Kendall reiterated this point and alluded to the iterative, messy process of collaborative idea development saying, "When you're in groups, you know what to do because they have ideas and probably they will give you ideas and probably you will think about an idea."

RQ3: Summary

Students in both groups valued collaboration that was helpful, kind, and focused, but their experiences differed based on how they developed ideas. The JFG, which used a unitary process with a single scribe, valued having space to speak, responsiveness, and reaching consensus, though they found this process challenging when ideas conflicted. In contrast, the SOG, which engaged in parallel idea development, valued leadership, agreement, and multiple contributions, viewing a greater number of ideas as beneficial. Overall, students' perceptions of effective collaboration were closely tied to how ideas were coordinated and shared within their digital writing processes.

Discussion and Limitations

This study examined how elementary students participated in digitally mediated collaborative writing, with a particular focus on how participation structures shaped idea development and interaction. By analyzing two elementary groups working within an online classroom context, this study contributes to understanding how CW unfolds across multimodal and digital environments. The findings highlight how participation is not only shaped by interactional patterns, but also by the affordances and constraints of digital tools and spaces. From a sociocultural perspective, these processes can be understood as socially mediated, with students co-constructing meaning through interaction with peers and through the use of digital tools as mediational means (Vygotsky & Cole, 1978).

While both groups worked together to develop macro and micro elements of their stories (Daiute, 1986) mostly through elaboration (Pifarré & Li, 2018), we observed here that it was bound within elements of the tall tale genre. In this study, I identified how agreement worked to move ideas to the page and disagreement was used to preserve narrative coherence. However, both groups adapted their processes differently (Chung & Walsh, 2006; Daiute, 1986; Jocius, 2018; Shimizu & Santos, 2022, 2025) and co-developed roles within their groups. In the JFG, Tim took on the role of scribe, documenting ideas the group reached consensus on. Funneling unitary ideas through one scribe led the group to appreciate responsiveness and a space to speak, while noting it was challenging.

In contrast, the SOG's use of the digital spaces allowed all students to develop and document ideas, provided they fit within the group's story framework, as such the group held a mindset that more ideas were better and not necessarily challenging. These contrast cases (Stake, 2013) underscore how the groups' differing CW practices (Prior, 2006) within the new online landscape (Knobel & Lankshear, 2007; Leu et al., 2013) mediated varied roles and interactions, which shaped what students valued from their fellow collaborating writers. In other words, they were able to develop ideas, distribute cognitive responsibilities, and co-construct knowledge in ways that aligned with their group dynamics and the affordances of the online learning environment.

To examine collaboration, Chung and Walsh (2006) analyzed how students shared the mouse and keyboard. The online environment of this study, enabled all students access to their own mouse and keyboard. As such, instead of considering how students shared the digital tools, this study combined DocuViz (Wang et al., 2015) analysis of archived Google Doc history with recordings of students' interactions (e.g., verbal, gestural, virtual pointing, text-based chats) on Zoom. This approach provided a more comprehensive, social semiotic (Bezemer & Kress, 2015) understanding of elementary students' digital CW processes.

Mapping the processes onto multimodal composing snapshots enabled us to see the power and influence different students had through different modes of interaction. For instance, consider how earlier work found that the power that was held by the controller of the single shared computer (Daiute, 1986; Jocius, 2018; Högström et al., 2024). In this online context, all students had the capability to be in control of the text from their own computer. Therefore, students like Kendall in the SOG, who frequently had connectivity issues that limited her ability to provide verbal input, could and did interact and contribute through the Zoom chat and textual additions or revisions inside the shared text. Perhaps, similar to earlier findings which found young students enjoyed collaboration (Puranik et al., 2018) especially with digital tools (Kumpulainen et al., 2014) this is one reason the SOG valued participation in the Google Doc. While connectivity issues are detrimental to the clarity of verbal modes of interaction, it is less impactful on textual modes of interactions - Zoom's chat or textual additions and revisions. Another possible explanation for Kendall's preference for the textual mode is her background as a multilingual learner. Perhaps the textual mode of interaction gave her more time to process and develop her ideas than the verbal mode which required more immediate responses. This shows the importance of providing multiple modes of participation in digital CW (Burnett, 2015) to ensure all students, including those with connectivity challenges or those who may benefit from more processing time such as multilingual learners, have equitable opportunities to contribute and engage in ways that support their strengths and needs.

While in this case, my understanding of Kendall was that she preferred non-verbal modes of communication, connectivity challenges experienced by her raise important equity concerns. Although the use of Zoom chat allowed Kendall to remain engaged, this adaptation may also reflect a broader risk of marginalizing students with limited or unstable internet access. In such cases, participation may shift to less visible or less influential modes, potentially limiting students' ability to contribute to shared meaning-making. This highlights the importance of considering how digital infrastructure shapes not only access, but also the quality and visibility of participation in collaborative writing.

Building from earlier work which identified young writer's transmediation (i.e., movement between sign systems) during their individual composing processes (Marich et al., 2021), this analysis highlights the role of transmediation in collaborative composing, as they developed and refined ideas. For example, when a student introduced an idea verbally, another might transform it into text, while a third could use digital pointing to support or challenge the idea. Recognizing these modal translations helps us better understand how students externalized their thinking and meaning making with digital tools in the online environment.

This multimodal analysis of group participation also showed that power did not always rest with the person typing in the document. For example, in the JFG, Skye had limited "active" participation, contributing only 18% of the text and 13% of group actions (see Table 6). However, his influence on the group's story was significant. For instance, when he disagreed saying it would make more sense for their character to not try vegetables that looked disgusting, his input shaped all subsequent major ideas in the story. Or in the multimodal composing snapshot (Figure 1), while Tim and I were the most "active" it was Skye's logical idea, that the sisters would wake up at home not at school, that was ultimately carried to the page. Both instances illustrate that although Skye outwardly contributed less often, his persuasive and logical ideas carried power and influence, demonstrating that participation in writing extends beyond direct text production. Specifically, this highlights the importance of educators and researchers valuing diverse contributions, both verbal and written, to support all students to be meaningful contributors to digital CW processes.

While both groups co-developed their own collaborative styles, all students were still reluctant to directly revise their peers' text (Doult & Walker, 2014), with 77% of students' edits directed towards their own contributions. This behavior might stem from the notion that agreed-upon ideas were less in need of revision. Or perhaps typing is still a labor-intensive task for writers of this age so revising the text of others was too cumbersome. Potentially, similar to ideas proposed by Grant (2009), it could reflect a transfer of traditional paper-based practices where classmates' writings are respected and left unaltered, speaking to how traditional literacy practices may transfer to new digital contexts (Knobel & Lankshear, 2007; Leu et al., 2013).

Nicholson et al. (1998) found gender dynamics negatively influenced collaboration for female participants. Rita in the JFG challenged these dynamics by routinely scrutinizing the ideas of her male partners. While the male participants were never observed to criticize Kendall, her most common action was agreeing, which was often enacted by typing what others had said. In fact, her total text contributions were greater than Mark's (21% v. 13%) and she made nearly one-third of the group's total edits. Her propensity to scribe and edit effectively supported the translation of her and her peers' ideas to the digital page. Although these two cases are not generalizable, they provide a glimmer of optimism for the evolving roles female participants can enact in digital CW tasks, whether that be the skeptical critic like Rita or the supportive teammate like Kendall.

While the findings highlight the affordances of digitally mediated collaborative writing, it is important to consider potential limitations and constraints. Digital learning environments introduce challenges such as uneven access to technology, varying levels of digital proficiency, and the potential for distraction or disengagement. The absence of off-task behavior in this study may be influenced by the structured nature of the sessions and the researcher's presence during observed interactions. As such, these findings should be interpreted within the specific context of guided, small-group collaboration, rather than as representative of all digital learning environments.

It is also important to consider how my role as both researcher and teacher may have shaped these findings. My facilitation during writing conferences, including prompting and guiding student interactions, may have influenced how students negotiated ideas and remained engaged in the task. Additionally, because video data collection occurred primarily during these structured interactions, moments of off-task behavior or disengagement may not have been captured. As such, the interactional patterns observed here should be understood as co-constructed within this instructional context.

Taken together, these findings suggest that digitally mediated CW is not simply a transfer of traditional writing practices into online spaces, but rather a reconfiguration of how participation, interaction, and idea development occur. The coordination required across multiple tools and modes introduced both new opportunities and constraints, requiring students to navigate complex interactional environments. Understanding these dynamics is essential for designing CW tasks that are both effective and equitable.

Implications and Future Directions

These case studies offer in-depth insights into elementary students' digital CW processes and perspectives and hold implications for researchers and most importantly, practitioners. Methodologically, this study underscores the importance of analyzing students' multimodal interactions (e.g., verbal, gestural, textual, text-based chat, virtual pointing) within a group. For example, analysis of textual contributions alone might misrepresent the collaborative contributions evident in verbal discussions and vice versa. A limitation of this study is that video data was only recorded when the teacher was present, so future research could build on this study by exploring how elementary students write together in online spaces when a teacher is not present. Ideally, a data collection tool that can record multiple Zoom breakout room interactions simultaneously would benefit future research of CW in online environments.

Pedagogically, elementary teachers should consider incorporating digital CW into their instruction, whether in online or in-person settings, as this study demonstrates how students can externalize and practice writing processes (Flower & Hayes, 1981) while adapting literacy practices to digitally mediated environments (Knobel & Lankshear, 2007; Leu et al., 2013). For instance, both groups encountered moments of disagreement that created opportunities for students to engage in problem solving and monitor their writing for coherence, processes associated with improved writing outcomes for young writers (Graham et al., 2005; Graham et al., 2015).

Importantly, the findings also suggest that how CW is structured matters. Decisions about whether students work with a single scribe or multiple contributors, as well as how access to shared digital tools is managed, can shape how ideas are developed and who participates in the writing process. As such, teachers may need to be intentional in designing collaborative tasks that promote equitable participation and support students in viewing writing as a shared, rather than individual, activity.

In previous studies, teacher's assignment of roles to students perceived to be "more capable" reified existing social hierarchies (Christianakis, 2010). These findings underscore how when prosocial 21st century skills are the foundation of learning, elementary students can co-develop their own roles based on their groups' needs. Such openness allows young students to tailor their engagement, fostering autonomy and empowerment in their learning journey, which potentially can help to begin the dismantling of social hierarchies. However, this does not negate the need for teacher scaffolding. Explicitly teaching CW strategies for addressing social tensions arising from group work can help students navigate such challenges. Here, we modeled compromise and simple conflict resolution strategies like rock, paper, scissors which seemed to be effective. Future research can more explicitly analyze the role of the teacher in facilitating elementary students' digital CW processes.

Moreover, educators should demonstrate diverse modes of digital tool usage, promoting engagement beyond verbal interaction (Burnett, 2015). By modeling and inviting students' contributions in many different modes, teachers can offer a more inclusive learning space for students like Kendall, who may benefit from more think-time or visual processing, or students like Skye who may be less outwardly engaged but are influential through their reasoning and suggestions to the group. This approach accommodates a range of processing speeds and modality preferences, enriching collaborative dynamics and learning opportunities for all learners.

Conclusion

Digital technologies are an integral part of our personal and work lives, so it is important that in schools students have opportunities to engage and learn with digital technology. And while it is important to close the digital divide in terms of access, it is equally crucial that we learn how to leverage technology in our classrooms so all students have meaningful opportunities to be creators. Here, we see how digital collaboration and the use of multiple modes empowered Tim, Rita, Skye, Scott, Mark, and Kendall to grow as writers and collaborators in the completely online world experienced during the pandemic and in many parts of daily life.

AI Disclosure Statement

In the preparation of this paper, no generative AI tools were used.

References

Barnum, M. (2020). *Standardized tests were canceled last school year. Don't count on that happening again, federal official says*. Chalkbeat. https://www. chalkbeat. org/2020/7/24/21337475/us-department ....

Bezemer, J., & Kress, G. (2015). *Multimodality, learning and communication: A social semiotic frame*. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9781315687537/multimodality-learning-communication-jeff-bezemer-gunther-kress

Boyle, B., & Charles, M. (2011). "The three hags and Pocohontas": how collaboration develops Early Years writing skills: Understanding collaborative writing. *Literacy*, *45*(1), 10–18. https://doi.org/10.1111/j.1741-4369.2011.00576.x

Burnett, C. (2015). Being together in classrooms at the interface of the physical and virtual: implications for collaboration in on/off-screen sites. *Learning, Media and Technology*, *41*(4), 566–589. https://doi.org/10.1080/17439884.2015.1050036

Christianakis, M. (2010). "I Don't Need Your Help!" Peer Status, Race, and Gender during Peer Writing Interactions. *Journal of Literacy Research*, *42*(4), 418–458. https://doi.org/10.1080/1086296X.2010.525202

Chung, Y.-H., & Walsh, D. J. (2006). Constructing a joint story-writing space: The dynamics of young children's collaboration at computers. *Early Education and Development*, *17*(3), 373–420. https://doi.org/10.1207/s15566935eed1703_4

Corbin, J., & Strauss, A. (2015). *Strategies for qualitative data analysis*. SAGE Publications.

Daiute, C. (1986). Do 1 and 1 make 2?: Patterns of influence by collaborative authors. *Written Communication*, *3*(3), 382–408. https://doi.org/10.1177/0741088386003003006

Daiute, C., & Dalton, B. (1993). Collaboration between children learning to write: Can novices be masters? *Cognition and Instruction*, *10*(4), 281–333. https://doi.org/10.1207/S1532690XCI1004_1

De Smedt, F., Graham, S., & Van Keer, H. (2020). "It takes two": The added value of structured peer-assisted writing in explicit writing instruction. *Contemporary Educational Psychology*, *60*(101835), 101835. https://doi.org/10.1016/j.cedpsych.2019.101835

Doult, W., & Walker, S. A. (2014). "He"s gone and wrote over it': the use of wikis for collaborative report writing in a primary school classroom. *Education 3-13*, *42*(6), 601–620. https://doi.org/10.1080/03004279.2012.752022

Ehret, C., Hollett, T., Jocius, R., & Wood, S. (2016). Of Shoes, shovels, and a digital book trailer: Feeling, power, and adolescent new media making in school. *Journal of Literacy Research: JLR*.

Ferguson-Patrick, K. (2007). Writers develop skills through collaboration: an action research approach. *Educational Action Research*, *15*(2), 159–180. https://doi.org/10.1080/09650790701314585

Flewitt, R. S., Hampel, R., & Hauck M And Lancaster. (2011). What are multimodal data and transcription? In C. Jewitt (Ed.), *The Routledge handbook of multimodal analysis* (Vol. 339, pp. 40–53). Routledge/Taylor & Francis Group The Routledge handbook of multimodal analysis. https://psycnet.apa.org/fulltext/2011-15493-000.pdf

Flower, L. and Hayes, J.R. (1981) A Cognitive Process Theory of Writing. College Composition and Communication, 32, 365-387. http://dx.doi.org/10.2307/356600

Graham, S., Harris, K. R., & Mason, L. (2005). Improving the writing performance, knowledge, and self-efficacy of struggling young writers: The effects of self-regulated strategy development. *Contemporary Educational Psychology*, *30*(2), 207–241. https://doi.org/10.1016/j.cedpsych.2004.08.001

Graham, S., Harris, K. R., & Santangelo, T. (2015). Research-based writing practices and the common core: Meta-analysis and meta-synthesis. *The Elementary School Journal*, *115*(4), 498–522. https://doi.org/10.1086/681964

Grant, L. (2009). "I DON"T CARE DO UR OWN PAGE!' A case study of using wikis for collaborative work in a UK secondary school. *Learning, Media and Technology*, *34*(2), 105–117. https://doi.org/10.1080/17439880902923564

Heath, S. B., & Street, B. V. (2008). On Ethnography: Approaches to Language and Literacy Research. Language & Literacy (NCRLL). In *Teachers College Press*. Teachers College Press. 1234 Amsterdam Avenue, New York, NY 10027. Tel: 800-575-6566; Fax: 802-864-7626; e-mail: tcp.orders@aidcvt.com; Web site: http://www.tcpress.com. http://store.tcpress.com/0807748668.shtml

Hermansson, C., Jonsson, B., Levlin, M., Lindhé, A., Lundgren, B., & Norlund Shaswar, A. (2019). The (non)effect of Joint Construction in a genre-based approach to teaching writing. *The Journal of Educational Research*, *112*(4), 483–494. https://doi.org/10.1080/00220671.2018.1563038

Högström, J., Paakkari, A., Nilsberth, M., & Slotte, A. (2024). Sticky, slippery, and smooth access – exploring the affective potentials of access to writing technology in lower secondary classrooms. *Learning, Media and Technology*, 1–13. https://doi.org/10.1080/17439884.2024.2436566

Jewitt, C. (2008). Multimodality and Literacy in School Classrooms. *Review of Research in Education*, *32*(1), 241–267. https://doi.org/10.3102/0091732X07310586

Jocius, R. (2018). Becoming Entangled: An Analysis of 5th Grade Students Collaborative Multimodal Composing Practices. *Computers and Composition*, *47*, 14–30. https://doi.org/10.1016/j.compcom.2017.12.008

Jones, I. (2003). Collaborative writing and children's use of literate language: A sequential analysis of social interaction. *Journal of Early Childhood Literacy*, *3*(2), 165–178. https://doi.org/10.1177/14687984030032003

Klein, A. (2021, April 20). During COVID-19, Schools Have Made a Mad Dash to 1-to-1 Computing. What Happens Next? *Education Week*.

Knobel, M., & Lankshear, C. (Eds.). (2007). Sampling the "new" in new literacies. In *A New Literacies Sampler* (pp. 1–24). Peter Lang Publishing. https://play.google.com/store/books/details?id=4Gjs8uT6dxIC

Kress, G. (2003). *Literacy in the new media age*. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9780203299234/literacy-new-media-age-gunther-kress

Kucirkova, N., Wells Rowe, D., Oliver, L., & Piestrzynski, L. E. (2019). Systematic review of young children's writing on screen: what do we know and what do we need to know. *Literacy*, *53*(4), 216–225. https://doi.org/10.1111/lit.12173

Kumpulainen, K., Mikkola, A., & Jaatinen, A. M. (2014). The chronotopes of technology-mediated creative learning practices in an elementary school community. *Learning, Media and Technology*, *39*(1), 53–74, https://doi.org/10.1080/17439884.2012.752383

Leu, D. J., Kinzer, C. K., Corio, J., Castek, J., & Henry, L. A. (2013). New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment. In D. E. Alvermann, N. J. Unrau, & R. B. Ruddell (Eds.), *Theoretical Models and Processes of Reading* (pp. 1150–1181). International Reading Association. https://doi.org/10.4324/9781315110592-19/new-literacies-donald-leu-charles-kinzer-julie-coiro-jill-castek-laurie-henry

Levine, S., Moore, D. P., Bene, E., & Smith, M. W. (2023). What if it were otherwise? Teachers use exams from the past to imagine possible futures in the teaching of literature. *Reading Research Quarterly*, *58*(1), 5–24. https://doi.org/10.1002/rrq.488

Liverano, G. (2024). The educational potential of collaborative writing mediated by digital technology in times of pandemic: a scoping review. *Research on Education and Media, 16*, 64 - 75.

Lomangino, Nicholson, & Sulzby. (1999). The influence of power relations and social goals on children's collaborative interactions while composing on computer. *Early Childhood Research & Practice*, *14*(2), 197–228. https://www.sciencedirect.com/science/article/pii/S0885200699000058?casa_token=THxH46P41zoAAAAA:ZMxcaacPK68q-3z2riH6AEZYnwUVc7HvgaBwADHuGC9LcJpHAySKl3SCTc7OscW6isqBl8RHfg

Luppicini, R. (2007). Review of computer mediated communication research for education. *Instructional Science*, *35*(2), 141–185. https://doi.org/10.1007/s11251-006-9001-6

Marich, H., Brandon, D., Greenhow, C., & Hartman, D. K. (2021). Eight tweeters tweeting: The writing processes of second graders composing with social media. *The Elementary School Journal*, *122*(1), 26–56. https://doi.org/10.1086/715481

Mills, K. A., & Exley, B. (2014). Time, Space, and Text in the Elementary School Digital Writing Classroom. *Written Communication*, *31*(4), 434-469.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *English Language Arts Standards*. Common Core State Standards Initiative. http://www.corestandards.org/

Nicholson, Gelpi, & Sulzby. (1998). Influences of gender and open-ended software on first graders' collaborative composing activities on computers. *Journal of Computing in Civil Engineering*, *9*(1), 3–42. https://www.learntechlib.org/p/86391/

Norris, S. (2004). *Analyzing multimodal interaction: A methodological framework*. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9780203379493/analyzing-multimodal-interaction-sigrid-norris

Peterson, S. S., & Rajendram, S. (2019). Teacher-child and peer talk in collaborative writing and writing-mediated play: Primary classrooms in Northern Canada. *Australian Journal of Language and Literacy*, *42*(1), 28–39. https://doi.org/10.1007/bf03652024

Pifarré, M., & Li, L. (2018). Characterizing and unpacking learning to learn together skills in a wiki project in primary education. *Thinking Skills and Creativity*, *29*, 45–58. https://doi.org/10.1016/j.tsc.2018.06.004

Prior, P. (2006). A sociocultural theory of writing. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of Writing Research* (pp. 54–66). Guilliford Press. https://books.google.com/books?hl=en&lr=&id=VT7YCz2G-iQC&oi=fnd&pg=PA54&dq=A+Sociocultural+Theory+of+Writing&ots=Rb9NPm3Uiv&sig=NQ6GR0sFz4mPKbTiV126TZ1I8ZA

Puranik, C. S., Petscher, Y., Otaiba, S. A., & Lemons, C. J. (2018). Improving kindergarten students' writing outcomes using peer-assisted strategies. *The Elementary School Journal*, *118*(4), 680–710. https://doi.org/10.1086/697432

Rojas-Drummond, S. M., Albarrán, C. D., & Littleton, K. S. (2008). Collaboration, creativity and the co-construction of oral and written texts. *Thinking Skills and Creativity*, *3*(3), 177–191. https://doi.org/10.1016/j.tsc.2008.09.008

Sharples, M. (1999). *How we write: Writing as creative design*. Psychology Press.

Seely Flint A., Rohloff R., & Williams S. (2021), ""I like the first slide. I like how we put it like that [words and pictures on a diagonal]:" composing multimodal texts in a grade four classroom". *English Teaching: Practice & Critique*, Vol. 20 No. 3 pp. 277–297, doi: https://doi.org/10.1108/ETPC-12-2019-0173

Shanahan, T. (2015). Common core state standards: A new role for writing. *The Elementary School Journal*, *115*(4), 464–479. https://doi.org/10.1086/681130

Shimizu, A. Y., & Santos, J. . (2022). Third Graders Collaboratively Writing Online: Interacting in Multiple Modalities across Multiple Spaces to Build a Tale and Community. *Language Arts*, *100*(1), 35–46. https://www.jstor.org/stable/27318287

Shimizu, A.Y., & Santos, J. (2025). Supporting Online Learning for Diverse Elementary Students: A Community of Inquiry Approach to Collaborative Multimodal Composing—Processes, Products, and Perspectives. *Computers & Composition, 78,* 1-20.

Shipman, M. (1981). *The Limitations Of Social Research*. https://philpapers.org/rec/SHITLO-5

Siegel, M. 2006. "Rereading the Signs: Multimodal Transformations in the Field of Literacy Education." *Language Arts, 84* (1): 65–77.

Spradley, J. P. (2016). *Participant Observation*. Waveland Press. https://play.google.com/store/books/details?id=q7DlCwAAQBAJ

Stake, R. E. (2013). *Multiple Case Study Analysis*. Guilford Press. https://play.google.com/store/books/details?id=rQWT5aDHiZYC

Storch, N. (2013). *Collaborative Writing in L2 Classrooms*. Multilingual Matters. https://doi.org/10.21832/9781847699954

Svenlin, M., & Sørhaug, J. O. (2023). Collaborative Writing in L1 School Contexts: A Scoping Review. *Scandinavian Journal of Educational Research*, *67*(6), 980–996. https://doi-org.utk.idm.oclc.org/10.1080/00313831.2022.2115128

Vygotsky, L. S., & Cole, M. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press. https://play.google.com/store/books/details?id=RxjjUefze_oC

Wang, D., Olson, J. S., Zhang, J., Nguyen, T., & Olson, G. M. (2015). DocuViz. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/2702123.2702517

Williams, C., & Beam, S. (2019). Technology and writing: Review of research. *Computers & Education*, *128*, 227–242. https://doi.org/10.1016/j.compedu.2018.09.024

Williams, S., Flint, A. S., & Rohloff, R. (2025). "The Computer Gives Us Lots of Ideas": Exploring Children's Multimodal Writing Process. *Writing and Pedagogy*, *16*(1), 4-20. https://doi.org/10.3138/wap-26257-williams

Yamaç, A., Öztürk, E., & Mutlu, N. (2020). Effect of digital writing instruction with tablets on primary school students' writing performance and writing knowledge. *Computers & Education, 157,* Article 103981. https://doi.org/10.1016/j.compedu.2020.103981

Zammuner, V. L. (1995). Individual and cooperative computer-writing and revising: Who gets the best results? *Learning and Instruction*, *5*(2), 101–124. https://doi.org/10.1016/0959-4752(95)00005-n

Zioga, C., & Bikos, K. (2020). Collaborative Writing Using Google Docs in Primary Education: Development of Argumentative Discourse. *Turkish Online Journal of Distance Education*, *21*(1), 133–142. http://proxy.library.vanderbilt.edu/login?url=https://www.proquest.com/scholarly-journals/collaborative-writing-using-google-docs-primary/docview/2396828909/se-2