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Assessing Online Writing Professional Development with Video-Based Simulations

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Abstract

Persistent disparities in literacy outcomes affect deaf learners, who may experience writing instruction that does not align with their linguistic contexts. This study examined how teachers' instructional reasoning about writing developed during participation in an online Strategic and Interactive Writing Instruction (SIWI) professional development (PD) program. Nineteen teachers of deaf students completed a 30-hour virtual PD that combined asynchronous modules and synchronous collaborative sessions focused on evidence-based writing instruction. Teachers completed video-based situational simulations at three time points across the PD; responses were scored using a 5-point holistic scale to assess growth in pedagogical content knowledge. A post-workshop survey also asked teachers to rate prior use, anticipated implementation, and readiness to implement SIWI-aligned practices on a 3-point scale. Survey results indicated relatively low pre-workshop use of practices and higher anticipated implementation and readiness after PD. Repeated-measures analyses of simulation scores indicated significant improvement over time, reflecting strengthened ability to identify instructional priorities, integrate language and writing instruction, and justify responsive teaching decisions. To illustrate what this growth looked like in practice, the manuscript includes an embedded illustration of one teacher's scenario responses across the three time points, showing a shift from more general/imprecise instructional commentary to more SIWI-aligned, objective-driven reasoning that explicitly links language supports to targeted writing instruction and next instructional steps. These findings suggest that video-based simulations offer a feasible, practice-oriented way to assess teacher learning in online PD, and that programs preparing teachers of deaf writers should pair self-report measures with simulation-based tasks that document how teachers apply pedagogical content knowledge to writing instruction.

Keywords: professional development; teacher professional development; deaf education; writing instruction

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1. Introduction

Professional development (PD) plays an important role in strengthening teachers' content knowledge, instructional practices, and ability to make reflective decisions. As educational research continues to evolve, ongoing PD can give teachers support and guidance in transferring research to practice. Darling-Hammond et al. (2017) conducted a

synthesis of high-quality studies that demonstrated a strong relationship between effective PD, changes in instructional practice, and student learning. The magnitude of this relationship depends in part on the intensity and duration of the PD teachers receive. In a synthesis of experimental and quasi-experimental studies, Yoon et al. (2007) found that PD must reach a minimum threshold of contact hours before it produces measurable effects on student achievement, and that more sustained programs were associated with gains of about 21 percentile points in student outcomes. Kennedy (2016) likewise concluded that the influence of PD on instruction depends less on any single design feature than on whether a program sustains teachers' engagement with content over time. Joyce and Showers (2002) found that durable changes in practice emerge when theory and demonstration are paired with sustained classroom practice and coaching. One of the key characteristics of effective PD emphasized by Darling-Hammond et al. (2017) was supporting teachers in applying new learning to practice through sustained, active, and contextually anchored experiences. Prioritizing application is particularly important for complex instructional practices such as writing instruction, which requires teachers to integrate multiple areas of knowledge and make responsive, in-the-moment instructional decisions.

A substantial body of research has identified what constitutes evidence-based writing instruction across learner populations, including explicit instruction in writing processes (e.g., planning, drafting, revising), genre-based strategies, writing for authentic audiences, and structured feedback (Graham et al., 2012; Graham & Perin, 2007; Strassman & Schirmer, 2012). It is through this work that we understand writing as a complex process that is both cognitive and sociocultural in nature. For deaf learners, the writing experience is further complicated by variability in language access and proficiency, which directly impacts students' encoding process. Due to this heterogeneity, evidence-based writing instruction in deaf education must extend beyond general writing strategies and include intentional, explicit attention to students' language development and meaning-making across languages and modalities.

To address these needs and effectively empower deaf writers in their expressive skill development, educators must develop specialized pedagogical content knowledge for writing instruction with deaf learners. Along with general evidence-based writing practices, teachers also need to know how to meet their deaf students' needs in linguistically responsive ways. For example, effective instruction may involve scaffolding idea generation and text construction through guided, interactive dialogue, explicitly teaching genre features, and supporting students' metalinguistic awareness (Graham & Perin, 2007; Strassman & Schirmer, 2012). Frameworks such as Strategic and Interactive Writing Instruction (SIWI) reflect these principles by incorporating strategy instruction, interactive writing, and language instruction to support writing and language development in deaf learners (Wolbers, 2007). These components draw on independently established lines of research: strategy instruction reflects evidence-based writing practices identified across learner populations (Flower & Hayes, 1981; Graham & Perin, 2007; Strassman & Schirmer, 2012); interactive, collaborative text construction reflects evidence that structured peer interaction and dialogue support writing development (Englert et al., 2006; Yarrow & Topping, 2001); and the focus on metalinguistic knowledge and language draws from research on language learning and translanguaging pedagogy (Andrews & Rusher, 2010; Ellis, 1994; Swanwick, 2017). Multiple research studies have demonstrated that SIWI can lead to improvements in students' writing, language, and fluency outcomes (Dostal et al., 2021; Dostal & Wolbers, 2016; Wolbers et al., 2026); however, teachers implementing SIWI are not working from a scripted program that outlines every next step. This comprehensive instructional framework requires teachers to engage in responsive, dialogic instruction and to make ongoing, student-centered decisions based on their language and writing needs. Developing this

level of instructional expertise requires more than passive exposure to new strategies. It requires opportunities to rehearse, reflect on, and refine practice over time. Because this instruction requires teachers to apply knowledge in dynamic and context-specific ways, it is important to consider how PD can best support their learning and practice, particularly as PD increasingly shifts to online and hybrid spaces (Elliott, 2017). This consideration is especially important in deaf education. Deaf students are a low-incidence population, comprising less than 2% of students served under the Individuals with Disabilities Education Act (National Center for Education Statistics, 2024), and they are dispersed across many schools and districts (Mitchell & Karchmer, 2006). Under these conditions, specialized, content-specific PD can be difficult to access in person, and online delivery makes deaf-focused writing PD feasible for teachers who would otherwise have limited access to it.

Guiding teachers through application and practice is an essential component of online teacher professional development and is often measured by teachers' self-reported use of newly learned approaches in their classrooms (Hertz et al., 2022). However, these data do not reveal how the approach was implemented or whether it was delivered with fidelity. Similarly, the most common forms of assessment for online professional development are surveys and assessment tests, which typically report teacher beliefs, content knowledge, pedagogical content knowledge, or instructional practices (Bragg et al., 2021; Stavermann, 2025). There is evidence that online PD can improve teachers' content knowledge, beliefs, self-efficacy, and instructional practices. A recent synthesis of 115 online PD studies found that the majority of programs produced positive competency gains, though these findings relied predominantly on self-report and survey measures (Stavermann, 2025). However, it remains unclear which design elements most effectively promote transfer of learning to practice, and self-reported gains in knowledge or satisfaction do not necessarily predict constructive changes in professional behavior (Meyer et al., 2023). Few studies examine teacher development beyond survey data or pre–post assessment measures.

These limitations highlight a critical need for approaches that more explicitly investigate how teachers apply pedagogical knowledge in context, particularly within online PD environments. Although online professional development offers increased accessibility and flexibility, evidence suggests that these formats may not fully support the development of all aspects of instructional expertise. For example, research on fully online teacher training found that while teachers demonstrated improvements in knowledge-based components of pedagogical content knowledge (e.g., understanding curriculum and student thinking), less growth was observed in skill-based components, such as instructional strategies and assessment practices (Orleans, 2010; Stavermann, 2025). Research often measures teacher satisfaction with online PD as a primary outcome, but this variable does not reliably predict constructive changes in professional practice. Meyer et al.'s (2023) study points to cognitively activating experiences and opportunities for collaborative engagement as the PD components that bring real pedagogical change. This suggests that developing the complex, practice-based aspects of teaching must extend beyond an educator's initial understanding of specialized content.

Multicomponent online PD models that incorporate evidence-based instructional methods and adult learning principles have demonstrated promise in improving teachers' knowledge and skills within authentic practice contexts (Bragg et al., 2021). For instance, early intervention specialists participating in an online PD program demonstrated gains in identifying learning targets, planning intervention strategies, and applying these practices within real-world settings (Brown & Woods, 2012). Similarly, Linde et al. (2023) found that an online PD course significantly improved both teachers' theoretical understanding and their applied competence in supporting student self-regulated learning. Notably, these

outcomes were supported when instructional designs emphasized active engagement, opportunities to observe and practice skills, and application within authentic contexts (Darling-Hammond et al., 2017).

1.1. Examining Teacher Learning Through Simulation Experiences

Research on simulation-based learning further highlights the importance of structured instructional supports in facilitating applied learning. Simulations provide unique opportunities for learners to engage in decision-making, apply knowledge in complex and dynamic contexts, and reflect on the outcomes of their instructional choices. Many professional fields, including medicine, workforce training, and education, take advantage of simulation-based PD to assess applied knowledge. Simulation experiences can take various forms, such as role-play, interacting with trained actors, and video-based scenarios. In particular, video-based simulations are a valuable tool for assessing teacher learning because they can be used flexibly in both synchronous and asynchronous online settings when direct classroom observation is unavailable. However, the effectiveness of simulations as a learning tool depends on the inclusion of additional supports such as feedback, coaching, reflection, and guided practice (Scholtz & Hughes, 2019). These findings reinforce the importance of designing PD experiences that not only provide realistic scenarios but also actively support learners in interpreting and responding to them.

This body of research suggests that while online PD holds significant potential for improving teacher knowledge, additional attention must be given to how teachers demonstrate their ability to apply that knowledge in practice. Approaches that incorporate authentic, practice-based learning opportunities with opportunities for teacher reflection may provide a more complete understanding of teacher learning in online professional development contexts.

1.2. SIWI Professional Development

Research on Strategic and Interactive Writing Instruction (SIWI), an evidence-based framework for teaching writing to deaf students, provides one of the few examples of PD designed to support this level of instructional complexity (see siwi.utk.edu). SIWI professional development has been implemented through intensive, scaffolded formats, including in-person workshops followed by coaching for classroom-based application. In a multi-year study that included a PD program for teacher participants, teachers attended multi-day in-person summer workshops, followed by classroom implementation and on-site coaching. Outcomes indicated that both teacher knowledge and instructional fidelity increased as participation extended over time (Wolbers et al., 2017). More recently, in a randomized controlled trial, teachers who participated in a year-long SIWI PD program showed significant, large improvements in their knowledge of writing instruction, use of evidence-based practices, and efficacy for teaching writing compared to teacher participants in the control group (Wolbers et al., 2023a). These studies provide compelling evidence that sustained, practice-based professional development can bolster teachers' knowledge, beliefs, and instructional practices. This conclusion is consistent with broader research, outside deaf education, showing that sustained, content-focused PD that incorporates classroom application and coaching produces durable changes in teacher practice (Darling-Hammond et al., 2017). It is further supported by the convergence of SIWI's student-level effects across controlled trials, including a nationwide replication (Wolbers et al., 2026). That said, much of this work relied on self-report, survey, or interview-based measures. While these approaches provide important insights, they may not fully capture the extent to which teacher ratings on surveys align with their abilities to implement the target practices in real time, a limitation that motivates the present study. Additionally, prior

SIWI research has focused on in-person PD models with classroom-based observations, but less is known about how teachers develop and apply their knowledge in online PD environments. Engaging in online PD offers increased flexibility and scalability, but it also presents challenges in supporting and evaluating teachers' application of learning to their practice.

1.3. The Current Study

In response to these challenges, this study looks at how teachers' pedagogical content knowledge for writing instruction develops during participation in online professional development. Despite evidence that PD can improve teachers' knowledge and beliefs, a significant gap remains in adequately supporting and assessing teachers' ability to apply complex, practice-based skills in real instructional situations. This is especially evident in online PD contexts where responsive, in-the-moment instruction is challenging to enact and evaluate. Furthermore, self-report and survey-based measures fall short in capturing these complexities of teacher learning. Moving beyond traditional approaches of assessment, this study incorporates video-based situational simulations to examine how teachers analyze instructional scenarios, construct instructional goals, and provide rationale for their teaching decisions. In this paper, we detail our research methods and present our findings.

2. Methods

This study used a single-group repeated-measures design to examine how teachers' pedagogical content knowledge for SIWI developed over the course of an online SIWI professional development program. This is complemented by a descriptive illustration of one teacher's responses to characterize the nature of that change. We selected this design for two reasons. First, the research question concerned within-teacher growth across the PD. Second, a performance-based measure administered at multiple points allows change in applied instructional reasoning to be observed directly rather than inferred from self-report (Scholtz & Hughes, 2019; Fraidlin et al., 2025). Teachers responded to two video-based situational simulations administered at the beginning, middle, and end of the program. Their narrated responses to each scenario were analyzed across the three time points to document how they described and justified their instructional decisions. Participants were teachers of deaf and hard-of-hearing students, and data were collected across two consecutive academic years of the fully online program.

2.1. Participants

Nineteen teachers (deaf: 10.5%, n = 2; hearing: 89.5%, n = 17) participated in this study as part of the SIWI PD program implemented across two consecutive academic years. All teachers were responsible for providing writing instruction to DHH students and elected to participate in the optional research activities associated with the PD. Participation in this study component was voluntary and independent of teachers' involvement in a larger grant project that involved implementing SIWI in the classroom. Teachers who completed the study requirements received a $25 Amazon gift card for their participation. All procedures were approved by the universities' Institutional Review Boards. Informed consent was obtained prior to the start of the study, and included participants' agreement to the publication of their de-identified responses.

The participating teachers reflected a range of professional roles and taught in programs representing varied communication philosophies. Most were classroom-based teachers (84.2%, n = 16), with three serving in itinerant positions (15.8%). Teachers also worked across multiple grade levels. Approximately one quarter taught exclusively at the

elementary level (26.3%, n = 5), while others were assigned to middle school (21.1%, n = 4) or high school settings (21.1%, n = 4). Five teachers (26.3%) served students across multiple grade levels, and one participant taught graduate students enrolled in a deaf education teacher preparation program.

Teachers also represented the diversity of communication philosophies common in deaf educational settings. Nearly half worked within an ASL–English bilingual framework (47.4%, n = 9), 42.1% (n = 8) reported using a total communication approach with ASL incorporated, and two teachers (10.5%) used simultaneous communication. Comparison of teachers' personal instructional philosophies with those of their schools revealed a high degree of alignment, with 73.7% (n = 14) reporting consistency between their beliefs and their school's philosophy. However, four teachers (21.1%) indicated a mismatch. In every instance of misalignment, teachers personally identified with an ASL–English bilingual philosophy but worked in programs employing a total communication approach with ASL integrated.

Teachers' instructional contexts reflected a broad range of writing development. According to teachers' reports, their classrooms included students working at early-emergent writing levels (K–2; n = 3), transitional levels (K–5; n = 4), and more advanced elementary stages (Grades 3–5; n = 6). Other teachers taught students whose writing spanned wide developmental ranges, including K–8 (n = 1), Grades 6–8 (n = 1), and Grades 9–12 (n = 1), with three teachers not reporting student writing levels. See Table 1.

Table 1. Teacher characteristics (N = 19).

Characteristic	*n*	%
Deaf	2	10.5
Hearing	17	89.5
Role		
Classroom-based teacher	16	84.2
Itinerant teacher	3	15.8
Program Philosophy		
Bilingual (ASL–English)	9	47.4
Total Communication, ASL	8	42.1
SimCom	2	10.5
Grade Levels Taught		
Elementary	5	26.3
Middle School	4	21.1
High School	4	21.1
Multiple Grades	5	26.3
Graduate Students	1	0.05

Note. Percentages may not total 100.0% due to rounding.

Teachers also reported their expressive and receptive ASL proficiency on a scale of 1–5, from high to low proficiency. Expressive ASL fluency (M = 2.74) reflected a wide distribution of skills. Six teachers (31.6%) reported high expressive proficiency (ratings of 1–2), five (26.3%) reported moderate proficiency (rating of 3), two (10.5%) indicated lower proficiency (ratings of 4–5), and three (15.8%) did not report expressive ASL skills. Receptive ASL fluency (M = 2.89) showed a similar pattern, with seven teachers (36.8%) reporting high receptive proficiency (ratings of 1–2), five (26.3%) reporting moderate proficiency (rating of 3), two (10.5%) reporting lower proficiency (ratings of 4–5), and three (15.8%) not reporting receptive ASL skills.

2.2. Procedures

The study procedure spanned a 30 hour online SIWI PD program, video-based situational simulations administered at three time points, and a scoring and analysis approach for evaluating growth, as outlined in Figure 1 and detailed below.

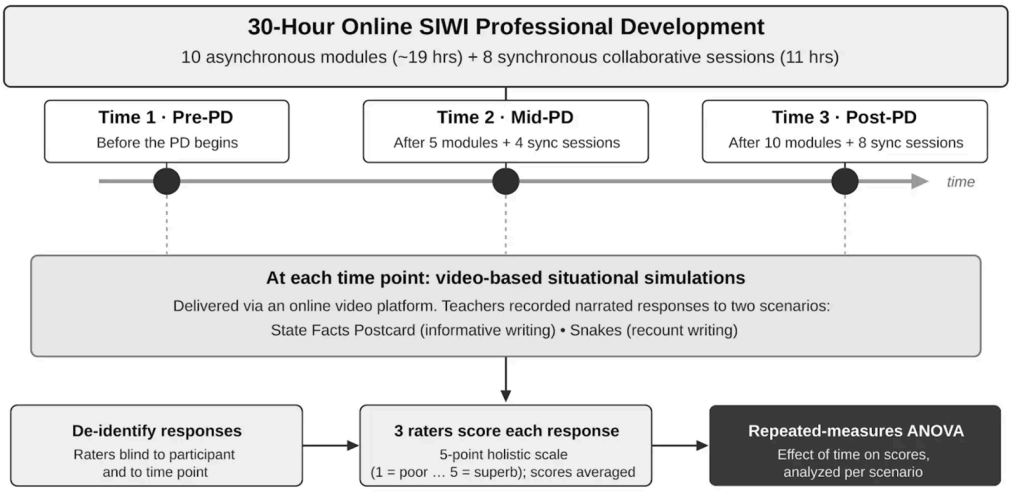


Figure 1. Overview of the study procedure.

2.2.1. Professional Development Program

Teachers participated in the SIWI PD program, an intensive learning experience designed to strengthen teachers' pedagogical and content knowledge through iterative, practice-based learning (Darling-Hammond & Richardson, 2009). The PD supports teachers in internalizing and applying SIWI's core principles, strategic instruction, interactive instruction, and the development of metalinguistic knowledge and linguistic competence, through simulated experiences, authentic task application, and ongoing, context-based feedback.

With the COVID-19 pandemic, the SIWI team began developing a fully online version of the SIWI PD, adapting the in-person workshop so that the online format mirrored its iterative learning approach. The SIWI team redesigned the PD for this new online format, and during the first and second years of implementing it, we (authors) collected the data used in this study to better understand teachers' knowledge and skill development over time in this format. The first full implementation of the online SIWI PD included sixteen PD attendees who elected to participate in the research study, followed by three additional educators who joined both the PD and the study during the second year.

The 30-hour online SIWI PD is designed to be flexibly delivered across a variety of timelines, including a single intensive week, a semester, or a full school year, depending on the needs of participating educators and programs. The PD consists of both synchronous and asynchronous learning components. Participating educators complete ten asynchronous modules that include content presentations, instructional videos, guided demonstrations, model lessons, and downloadable SIWI materials, along with access to classroom footage showing SIWI principles in action. These asynchronous learning modules (approximately 19 hours) are paired with eight synchronous sessions (11 hours total) facilitated by a SIWI team member, during which teachers engage in collaborative application of SIWI principles, guided practice, and discussion of instructional decision-making. This is the PD model that the 19 educators in the present study engaged in during the open summer offerings.

2.2.2. Teachers' Use, Likeliness, and Readiness to Implement SIWI Principles

At the conclusion of the SIWI professional development, all participants completed a brief survey evaluating their prior use of SIWI-aligned instructional principles and their perceptions of implementation feasibility. The survey asked teachers to rate 24 core practices (e.g., strategy instruction for the writing process, use of mentor texts, ASL–English language work, student goal setting) along three dimensions: (a) use of the practice prior to the workshop, (b) likeliness of implementing the practice after the workshop, and (c) readiness to implement the practice after the workshop.

Items were rated on a 3-point scale (1–3), with higher scores indicating more frequent use or greater perceived likelihood or readiness to implement the practice. For *use*, ratings reflected how often the practice was used prior to the workshop (1 = rarely/never, 2 = sometimes, 3 = frequently). For *likeliness*, ratings reflected teachers' anticipated likelihood of implementing the practice after the workshop (1 = not likely, 2 = somewhat likely, 3 = very likely). For *readiness*, ratings reflected teachers' confidence in implementing the practice (1 = not ready, 2 = somewhat ready, 3 = very ready). These descriptive ratings provided a baseline context for interpreting changes in teachers' pedagogical content knowledge across the SIWI PD.

Scores on teachers' use of practices before the workshop were relatively low (M = 1.78, SD = 0.33; range = 1.04–2.46), indicating that, on average, teachers reported using these practices between *rarely* (1) and *sometimes* (2). In contrast, teachers reported high anticipated implementation after the workshop (M = 2.58, SD = 0.31; range = 1.96–3.00) and readiness (M = 2.58, SD = 0.31; range = 1.96–3.00) to use SIWI-aligned practices following the professional development.

We also examined item-level means to identify specific practices that appeared more or less familiar or feasible to teachers. Pre-workshop use of practices ratings were lowest for supporting students with setting personal goals for writing (M = 1.28), strategy instruction for the writing process (M = 1.39), and skill instruction practiced during authentic writing (M = 1.48), suggesting that these practices were less established in teachers' repertoires. Pre-workshop use was highest for communication repair strategies (e.g., drawing, gesture, role play; M = 2.66) and teacher assessment of student writing (M = 2.48). Ratings related to post-workshop feasibility, likeliness, and readiness were lowest for guided translation (*likely*: M = 2.68; *ready*: M = 2.37); however, even these lowest ratings remained relatively high compared to the overall pattern of post-workshop responses. Teachers reported the highest readiness for using visual scaffolds in strategy instruction (ready: M = 2.84) and communication-repair strategies (likely: M = 3.00; ready: M = 2.80).

2.3. Data Collection

We examined teachers' demonstration of SIWI knowledge before, during, and after the SIWI PD. We created two video scenarios that were used across all 3 data collection time points. Each video contained a segment of SIWI implemented in elementary classrooms in ASL; any ASL expressions that were difficult to see on the video were provided as text on-screen. The videos were additionally produced to add an English voiceover and captions. Teachers were sent a link to access FlipGrid, where they viewed the two video scenarios and recorded themselves answering the prompts. The video scenarios contain classroom footage. To protect participant privacy and because consent to publish or distribute this footage was not obtained, the videos cannot be shared in the manuscript or deposited in an open repository.

Teachers were told not to concern themselves with the language being used in the classroom, in case it was different from their own classrooms, and to focus on the instructional moves. Additionally, in their videotaped responses, the participating teachers could

use either sign language or spoken language and were assured that both options were equally acceptable. They were instructed to use the same language consistently across their responses.

2.3.1. Video Scenario #1

The first video, titled State Facts Postcard, was 4 min long. It featured a narrator introducing a classroom video from a combined 3rd and 4th-grade class working on informative writing. The specific task involved writing a postcard about their state to send to another class in a different state. In the video, the narrator explains that the teacher had two clear objectives for the lesson: (1) ensuring students use "a", "an", and "the" correctly in English sentence writing, and (2) incorporating transition words or phrases to connect facts effectively.

Next, the narrator introduces a segment of the classroom video where students were collaboratively brainstorming ideas for their writing. During this activity, the teacher writes the ideas on the board. A brief 10 s clip showed the students actively engaging in brainstorming. Afterward, the narrator describes how students transferred their ideas onto a graphic organizer to prepare for sentence creation. They describe that each student selects one idea and independently crafts a sentence. Once completed, the teacher guides them in organizing their sentences into a cohesive paragraph.

The video then returns to the classroom, showing a student writing her sentence on the whiteboard. The teacher asks the student to sign it, and the student signs the sentence as it was written: "The Liberty bell is old bell that made in 1751." At this point, the video transitions back to the narrator to explain the scenario task to participating teachers and to introduce two reflective questions, which appear as text on-screen: (1) With 15 min remaining, what would you do for the rest of the class? (2) What would you do during tomorrow's 45-min writing time?

The narrator encourages teachers to take two minutes to think about their responses. They encourage teachers to jot down notes or create a list before recording their answers in one video. Text then appears on-screen to reiterate the message–telling participants to "Take 2 min to write notes about the two questions presented" and then "Make one 5-min video sharing your responses for both questions."

2.3.2. Video Scenario #2

The second video was also 4 min in length. The narrator first introduces the scenario, explaining that a 5th-grade classroom had recently gone on a field trip to see and touch snakes. After returning to the classroom, the students and teachers write collaboratively about their experience in a recount essay. The narrator explains that the teacher set two objectives for the students' writing lesson: (1) using past tense verbs in their sentences and (2) writing strong concluding paragraphs. The narrator then explains that students are already familiar with the structure of multi-paragraph writing, including an introduction, body, and concluding paragraph. A 12 s clip of the classroom is shown where the students and teacher are standing near the board discussing their co-constructed text. Afterward, the narrator returns to say that the teacher then separates the students into two groups to work on generating ideas for the concluding paragraph and writing them down. The video transitions back to the classroom for a 17 s clip where the viewer sees one student working with the teacher at the board and the other two students working together on a large portable whiteboard. The video concludes in the same way as video #1, with two questions asking teachers to consider (1) what they would do in the 15 min remaining in class that day, and (2) what they would do during tomorrow's 45-min lesson. Once again, they are

encouraged to think about their responses and take notes before recording both responses in one video, no more than 5 min.

2.3.3. Pilot Testing

Once the scenario videos were developed, we sent them to 10 teachers of deaf students and collected their responses. The teachers were a mix of those having no prior experience with SIWI (n = 2), graduate assistants working on the project who had familiarity with SIWI (n = 3), one teacher who had completed the introductory SIWI professional development (n = 1), and some who had completed the advanced SIWI professional development and had been using SIWI in their classrooms for several years (n = 4). The pilot testing of the video scenarios occurred with an assortment of teachers to collect a range of responses that reflected introductory to advanced understandings of evidence-based writing instruction approaches as applied to authentic classroom experiences.

We additionally wanted a scoring tool that could differentiate various levels of knowledge effectively. The first iteration of the scoring tool had a 3-point scale across three traits; however, we found it did not sufficiently capture the various levels of knowledge of the teachers in the pilot testing sample. After this, we printed approximately 20% of the responses and worked independently to cluster similar types of answers into groups. We discussed the characteristics of the responses represented in our groupings and what traits caused them to hang together. We came to a consensus on five qualitatively different groups that we ordered from low to high knowledge of writing instruction principles. We agreed these groupings effectively differentiated the full range of knowledge represented in the pilot testing data. After applying numerical and category labels to the groups (1 = poor; 2 = fair; 3 = good; 4 = better; 5 = superb), this system became the 5-point holistic scale that we used to score all data.

2.4. Data Scoring and Analysis

The teachers' responses were collected at three time points. The first responses were collected prior to the teachers starting the SIWI professional development. The second set of responses was collected halfway through the professional development after the teachers completed half of the online modules, which provided an overview of the SIWI driving principles. The teachers had also attended four synchronous sessions with the SIWI team to discuss the module content in small groups and apply SIWI in a mock class scenario with support. The final set of responses was collected at the end of the professional development after the teachers received the final online modules containing writing and language assessment and concepts intended to deepen their understanding of the driving principles. During this time, they attended four additional synchronous meetings with the SIWI team to once again discuss concepts in small groups and apply SIWI to an additional mock class scenario with a different genre of writing.

The first, second, and fourth researchers participated in scoring all of the samples using the 5-point holistic scale (1 = poor; 2 = fair; 3 = good; 4 = better; 5 = superb). The samples were first deidentified so that we could not associate the participant or the time point (pre, mid, post) with the response. Nearly all of the responses received scores from the three raters that were within one point (e.g., 2, 1, 2; 3, 3, 4). There were two responses associated with the state facts video that received a wider spread of scores (i.e., 3, 4, 5 and 2, 3, 4). The three scores for each response were averaged, and the average score was entered into the SPSS-31 database for analysis. A repeated-measures ANOVA was conducted to examine the effect of the online SIWI PD experience on participants' knowledge of effective writing practices. Descriptive statistics such as mean and range by time point were also generated.

3. Results

Prior to commencing the SIWI PD, teachers' scores on the "States" video ranged from 1 to 3 points with a mean score of 1.74. These scores were similar to the "Snakes" scenario at the beginning of the year. Scores ranged from 1 to 3.3 with a mean of 1.79. Thus, teachers' starting knowledge of evidence-based writing instruction could be largely characterized as "poor" to "fair". For the "States" video, we observed the mean rose to 2.95 ("good") by the midpoint and to 3.52 ("good" to "better") after the PD. The range of scores by the last time point was 2 to 5 points. For video two, the mean rose to 3.36 at the midpoint (ranging from 2 to 4.7 points) and stayed at a comparable mean of 3.31 by the end of the PD.

A repeated-measures ANOVA was conducted to compare scores for "States" across three time points (pre, mid, post). The ranges, means, and standard deviations are provided in Table 2. Mauchly's test indicated that the assumption of sphericity had been met, X^2 (2) = 3.22, $p = 0.2$. There was a significant effect of time on the dependent variable scores ($F(2, 36) = 27.99$, $p < 0.001$, partial $\eta^2 = 0.61$). Post hoc pairwise comparisons conducted with Fisher's Least Significant Difference (LSD) indicated that there were significant differences between the time points. The mid time point was significantly higher than the pre time point ($p < 0.001$), and the post time point was significantly higher than the mid time point ($p = 0.03$) and the pre time point ($p < 0.001$). This indicates that the participants' writing instruction knowledge improved consistently throughout the PD program, with significant gains apparent at each time point.

Table 2. Descriptive statistics for video one, "States".

Label	N	Min	Max	Mean	SD
Pre	19	1.00	3.00	1.74	0.62
Mid	19	1.30	4.70	2.95	0.94
Post	19	2.00	5.00	3.52	1.01

A repeated-measures ANOVA was also performed to evaluate the effect of time on participants' scores on the "Snakes" video. The ranges, means, and standard deviations may be viewed in Table 3. According to Mauchly's test, the assumption of sphericity was violated, X^2 (2) = 6.26, $p = 0.04$, and therefore degrees of freedom were corrected using Huynh-Feldt estimate of sphericity, $\varepsilon = 0.82$. The effect of time on the "Snakes" video scores was statistically significant ($F(1.64, 29.57) = 43.62$, $p < 0.001$, partial $\eta^2 = 0.71$). LSD Post hoc pairwise comparisons indicated significant differences between pre and mid-timepoints ($p < 0.001$) and between pre- and post-timepoints ($p < 0.001$). Statistically significant differences were not detected between the mid and post timepoints ($p = 0.82$). These results indicate that the largest gains associated with the participants' responses occurred between the beginning and the middle of the PD, comparable to levels achieved by the end time point of the first video scenario. The mean score on "Snakes" was maintained between the mid and end timepoints.

Table 3. Descriptive statistics for video two, "Snakes".

Label	N	Min	Max	Mean	SD
Pre	19	1.00	3.30	1.79	0.78
Mid	19	2.00	4.70	3.36	0.69
Post	19	1.70	4.30	3.31	0.79

Descriptive Illustration of Teacher Growth Across Timepoints

To ground the findings in teacher development, we present a descriptive illustration of one participant's response trajectory across the three data collection points. This example is an illustrative account of the kind of pedagogical content knowledge growth that the scoring scale was designed to capture. Carmela (pseudonym) was selected because her scores were near the group mean and her trajectory tracked the overall pattern of change, so her responses illustrate typical growth. The case is offered as an illustration of the change captured by the scoring scale, and the repeated-measures results reported above carry the inferential weight.

Carmela is a deaf, classroom-based teacher who works at the high school level. Her school adopted a total communication philosophy with ASL available as an option, while Carmela personally identifies with an ASL–English bilingual approach. She completed the full 30-hour online SIWI PD, including the ten asynchronous modules and eight synchronous collaborative sessions. Her scores across both scenarios are presented in Table 4.

Table 4. Carmela's scenario scores by time point.

Scenario	Pre	Mid	Post
State Facts (Informative Writing)	1.3	1.7	4.7
Snakes (Recount Writing)	2.0	4.0	3.7

In the State Facts informative writing scenario, her scores moved from 1.3 at baseline to 1.7 at midpoint and then to 4.7 following the full PD. This is a trajectory that represents movement across nearly the full span of the scale. In the Snakes recount writing scenario, she moved from 2.0 to 4.0 at the midpoint, with a modest decrease to 3.7 at post, though her final score remained substantially above her starting point. Her scores reflect meaningful growth while also capturing the kind of variation that a closer look at individual trajectories can demonstrate.

Pre-PD Responses. At baseline, Carmela's instructional reasoning in both scenarios centered on surface features of student writing, with correction positioned as the primary response to student need. In the State Facts scenario (pre-score = 1.3), her described approach focused on identifying the capitalization error in the student's sentence and reviewing rules for article (a, an, the) use, with explicit reference to anchor charts as the way she would provide this instruction. Her planning for the following day moved to structural conventions of postcard writing (e.g., greetings, closings, format) rather than toward strategic or interactive instructional moves. She noted that students "should already know all of this," orienting the instructional purpose around review rather than development. Although she referenced the importance of purpose and authentic connection, this framing did not extend to the explicit articulation of instructional objectives, strategy instruction, collaborative writing, or coordinated language work.

In the Snakes scenario (pre-score = 2.0), Carmela described modeling a sample conclusion paragraph and providing a grammar-related mini-lesson on verb tense, followed by independent writing and individual conferencing. Her characterization of feedback was corrective in orientation: "Don't forget to change this verb to the past tense. Don't forget punctuation." Writing development and language instruction were treated as largely sequential and separable activities. Interactive co-construction of text, metalinguistic reflection, and explicit strategy instruction were absent from her described approach.

Mid-PD Responses. Mid-point responses were collected after participants had completed half of the asynchronous modules and attended four synchronous sessions focused on application and collaborative discussion of SIWI principles. At this stage, Carmela's

responses began to incorporate elements of the SIWI framework and resources, though integration remained uneven across the scenarios.

In the State Facts scenario (mid score = 1.7), Carmela explicitly referenced several SIWI resources: "I will review the triangle (author, audience, purpose), RIP [a mnemonic genre poster representing Recount, Information Report, and Persuasive writing], and ladders [writing rubrics designed to look like ladders]. . . I'll ask them where we are at in the ladder right now." This represents an emerging process awareness, situating the writing task within a developmental trajectory and thinking about the students as writers. At the same time, much of her described reasoning remained focused on revising errors and reviewing linguistic features, and the integration of language and writing instruction was not yet clearly explained.

The more substantial shift at midpoint appeared in the Snakes scenario (mid score = 4.0), where Carmela's described approach included interactive co-construction in ways that were absent at baseline: "I would put both groups' posters on the smartboard. Then, together we would work on writing sentences. I will be typing and asking students what I should be writing. As they sign, I will write and model what English translation looks like." This response reflects a more coordinated language work embedded in the writing process and explicit attention to grammar and conventions as functional writing decisions. The Language Zone, a space in a classroom where the creation, translation, and revision of ideas is made explicit (see Dostal et al., 2019; Wolbers et al., 2023b for a description), was described as a targeted support integrated into instruction. This midpoint response in the recount scenario demonstrates the kind of interactive instruction and metalinguistic work that characterizes higher scores on the scoring scale.

Post-PD Responses. Post-PD responses were collected after participants had completed all modules, including those focused on writing and language assessment, and had participated in four additional synchronous sessions applying SIWI to a second mock classroom.

Carmela's post-PD response in the State Facts scenario (post score = 4.7) represents the clearest example of integrated pedagogical content knowledge in her trajectory. Rather than beginning with correction, she framed instruction around guided noticing: "I noticed something in your sentence. . . do you notice anything?" This shift, from identifying an error to inviting the student into its recognition, reflects a qualitatively different orientation to the teacher's role in language and writing development. She revisited the writing process and the author-audience-purpose framework to orient students to the writing task. She then explained the communicative function of transitions for readers (e.g., "to guide our readers, it is helpful to put transition words to help them know what will come next. . .") and anticipated entering the Language Zone as a purposeful move. Grammar, in this response, was not treated as an isolated rule review but as language work embedded within a larger instructional purpose. This response reflects explicit noting of objectives, coordinated attention to grammar and writing, metalinguistic framing of language choices, and justified instructional decision-making.

In the Snakes scenario (post score = 3.7), Carmela's response reflected similar growth, though the score was modestly lower than at the midpoint. She reframed her understanding of the instructional approach: "I finally realize now that this is a student-guided writing process." She described strategies and resources to situate the lesson within the writing process, prioritizing co-construction of ideas, and drawing on ideas for explicit, embedded instruction and the Language Zone as tools responsive to student needs. She also noted that linguistic development should be prioritized over simply completing tasks during writing, indicating her growing awareness of the purpose behind writing instruction with deaf students.

Summary. Across both scenarios, Carmela's responses reflected a trajectory from procedural correction toward integrated, strategic instructional reasoning aligned with SIWI's core principles. At baseline, grammar and writing were treated as separable activities, instruction was largely teacher-directed, and described approaches focused on surface features without explicit justification. By post-PD, she addressed objectives, attention to language and writing, metalinguistic work, and interactive co-construction of text. These shifts emerged within a simulated context, suggesting that the PD supported restructuring of instructional reasoning that underlies decision-making during writing instruction.

4. Discussion

Videos have been integrated into teacher training for the purposes of analyzing exemplary performance or one's own video-recorded performance (Fraidlin et al., 2025). This study suggests that classroom video scenarios represent an informative approach for measuring the impacts of online PD on teachers' pedagogical content knowledge and uptake of evidence-based practices for teaching writing to deaf students. Nineteen teachers of deaf students participated in a 30-hour, fully online Strategic and Interactive Writing Instruction (SIWI) PD that combined asynchronous modules with synchronous collaborative sessions. Teachers completed two video-based situational simulations at three time points (pre-, mid-, and post-PD), recording narrated responses that were scored using a 5-point holistic scale to capture growth in instructional reasoning. Across both scenarios, teachers demonstrated measurable gains from the beginning to the end of PD, shifting on average from poor/fair levels of knowledge to good/better levels, indicating that the online SIWI PD was effective in strengthening teachers' knowledge of how and when to implement evidence-based writing instruction practices for deaf students.

The video-based scenario scores appeared to converge with teachers' self-reported practice data. In the literature, teachers' surveys do not always hold predictive validity for their effectiveness in the classroom (Henry et al., 2013). This study demonstrates that the PD influenced teacher knowledge as applied to video scenarios, which aligned with teachers' self-perceptions of the feasibility of implementation. Teachers' pre-workshop ratings suggested relatively limited use of SIWI-aligned practices overall (M = 1.78 on a 3-point scale), indicating that, on average, these practices were used between *rarely* and *sometimes* prior to the PD. Following the workshop, teachers reported a high anticipated likelihood of implementation (M = 2.58) and a high readiness to implement (M = 2.58), reflecting strong perceived feasibility and commitment to enact the principles in their own settings. Taken together, this alignment between scenario-based demonstrations of instructional reasoning and teacher self-ratings suggests that video scenarios capture meaningful shifts in pedagogical content knowledge that may also be present within teachers' reported intentions to apply the practices.

This convergence is methodologically notable because the two measures capture teacher knowledge through different means. Self-report data, while efficient and widely used in PD research, include well-documented limitations, including social desirability bias and the intention-action gap, where teachers may accurately report what they intend to do without that intention translating into observable practice (Bragg et al., 2021; Hertz et al., 2022). Scenario-based responses, by contrast, require teachers to reason through an instructional situation in real time, describing goals, justifying decisions, and applying knowledge under simulated conditions (Scholtz & Hughes, 2019). This positions scenario performance closer to applied knowledge than declarative knowledge, capturing whether teachers are aware of a practice and if they can integrate it in context (Orleans, 2010). That two distinct measures, one performance-based and one perceptual, moved in the same direction strengthens the argument that the PD influenced knowledge in ways that

extended beyond teachers' perceptions of their own practice. When the two measures converge, as they did in this study, that alignment also offers partial evidence that self-report may serve as a practical proxy for applied knowledge in contexts where simulation-based assessment is not feasible. Even so, indicators of practice tend to be more precise when they are classroom-based as compared to teacher-reported survey data, which justifies place observations or classroom simulations of practice when feasible (Mayer, 1999).

4.1. Rating Scale

Unlike the perceptual survey on the feasibility of implementation, the rating scale used to evaluate teachers' responses to the video scenarios captures progress but leaves room for growth. Teachers' end-of-PD scenario scores increased significantly after receiving the PD, while not topping the scale, suggesting the scoring approach could continue to be used as teachers advance in the PD sequence. This emphasis on sensitive, developmentally oriented assessment parallels work on evaluating deaf students' own written language, which similarly finds that conventional measures can miss meaningful growth (Kilpatrick & Wolbers, 2020). Teachers' pattern of development demonstrated in this PD is consistent with prior SIWI PD outcomes, indicating that instructional fidelity is approximately 75% by the end of the first PD experience and during teachers' first year of implementation (Wolbers et al., 2017). With a second year of professional development, including context-based coaching and individualized goal setting, teachers, on average, increase implementation fidelity to 85%. Should the video scenario tool capture second-year increases, it may be a helpful indicator of progress without requiring the same time and resources needed to score a full unit of instruction for fidelity. From a design perspective, these findings highlight the potential value of video-scenario assessments not only as outcome measures but also as tools for PD evaluation across long-term improvement efforts.

The scalability of an online PD model carries particular significance for a low-incidence field like deaf education, where teachers are often geographically dispersed, and professional learning communities are small. In many cases, teachers of deaf students work in itinerant positions or as the sole deaf education specialist in a district, without access to colleagues who share their students' communication needs, instructional frameworks, or linguistic context. For these educators, the barriers to in-person, intensive PD are not incidental but structural. Online PD that combines asynchronous flexibility with synchronous collaborative learning offers a mechanism for reaching teachers for whom traditional PD formats are effectively inaccessible (Elliott, 2017). In this sense, scalability is not only a logistical feature of the SIWI online PD model but an equity consideration. Expanding access to linguistically responsive, evidence-based writing instruction requires reaching the teachers who need it most, including those in rural, low-incidence, or under-resourced settings where on-site coaching and in-person training may not be viable options (Darling-Hammond et al., 2017).

4.2. Scenario Differences

For multicomponent interventions like SIWI, there are many different ways teachers can demonstrate growth. There may be potential for video scenario assessments to identify which SIWI components are being taken up as intended, which require additional modeling or practice opportunities, or which may be inherently more difficult for teachers to translate into action without extended support (Orleans, 2010). In teachers' post-workshop ratings, they indicated the lowest readiness ratings for implementing guided translation (M = 2.37). Deaf students have diverse linguistic repertoires that often span multiple signed and spoken modalities (Lederberg et al., 2013). This can make it challenging for teachers to enact responsive translanguaging pedagogy, for example, raising metalinguistic awareness

of linguistic applications in authentic communication (Holcomb et al., 2023; Swanwick, 2017; Wolbers et al., 2023b), particularly when they may not share the same resources (Knoors, 2016) as their students. Video scenarios of students who are using facial expressions to intensify their signed meanings, for example, require teachers who can identify the richness of their sign language grammar to skillfully guide them in selecting meaningful equivalents in English. Such a scenario would provide a measure of teachers' knowledge and skill related to this, which may or may not correlate with their self-perceptions of readiness. However, if aligned, an increased use of videos of students with diverse linguistic resources could be integrated into the PD for practicing how teachers provide validating and responsive language instruction.

Differences in teachers' growth trajectories across the two scenarios that feature different aspects of writing instruction suggest participants may readily demonstrate specific principles at different points in the PD. In the "Snakes" scenario, participants observed students working in small groups to generate ideas for a shared concluding paragraph, which more directly cued interactive, co-constructed writing moves and may help explain why teachers showed stronger performance earlier in the PD on this task. In contrast, in the "States" scenario, there is an initial collaborative brainstorming component that transitions into independent sentence generation. One student's sentence is placed on the board, requiring teachers to do more inferential cognitive work to redirect instruction back toward interactive writing and coordinated language work.

Future development of scenarios could target the application of specific principles, such as linguistic/metalinguistic work or interactive co-construction of writing. Topic-specific scenarios scheduled to follow PD modules that address when and how the practices are implemented are consistent with design principles for effective simulation-based learning (Scholtz & Hughes, 2019). The periodic scenarios could guide PD facilitators to proceed responsively to the participants' needs, bolstering the application of challenging principles such as interactive writing. This might involve additional practice, for example, in using formative assessment to guide one's decisions for "stepping in" to provide increased support to students and "stepping out" to transfer greater control to them (Englert et al., 2001).

4.3. Limitations

A key limitation of video-based scenarios is that educators are asked to respond to students' writing and language needs without the contextual knowledge that typically drives responsive instruction, such as sustained relationships with students (Li et al., 2022) and familiarity with their strengths, histories, and ongoing goals (Haywood, 2018). Relatedly, because scenarios capture only a slice of instruction, teachers' responses may not fully reflect the complexity and interactional dynamics that shape decision-making in authentic classrooms, thereby impacting ecological validity.

A second limitation concerns the fit across contexts. Because the scenarios were drawn from sign-bilingual elementary classrooms, they may be less relevant for middle and high school teachers and for educators working in settings with differing communication philosophies. This suggests the need for scenario options differentiated by level and instructional approach.

A related limitation concerns the demographic composition of the teacher sample. Two of nineteen participants were deaf, a proportion that reflects a longstanding structural feature of the deaf education teacher population but one that warrants acknowledgment given this study's equity framing. Deaf teachers bring linguistic and cultural knowledge (Hauser et al., 2010) central to the instructional approaches examined here, and a sample with greater deaf teacher representation would strengthen the field's understanding of how this PD model supports the full range of educators serving deaf students.

Finally, carving out time for teacher-focused assessment within a PD program may be difficult; however, scenario responses can be completed asynchronously outside synchronous sessions and embedded as structured checkpoints (e.g., in Canvas modules) to support feasibility.

4.4. Future Directions

In this study, meaningful changes in teachers' instructional decision-making were captured through the use of pre-, mid-, and post-PD video scenarios. As a next step, future research should follow participating teachers into their classrooms to examine the extent to which performance on the video-based scenarios translates into observable instructional practice during authentic writing lessons. Linking scenario scores to classroom-based indicators (e.g., enactment of SIWI principles such as integration of language and writing instruction, and responsiveness to students' needs in the moment) would help determine whether the video-based scenarios and the scoring method function as meaningful predictors of teachers' practice. Establishing these connections would provide evidence of the validity of the video scenarios and scoring approach, and clarify how well this assessment can be used to evaluate PD impact and guide ongoing coaching.

5. Conclusions

This study demonstrates that classroom video–based simulations can serve as a practical, instructionally meaningful way to evaluate teacher learning in fully online writing professional development (PD) for teachers of deaf students. Across a 30-hour virtual SIWI PD model that blended ten asynchronous modules with eight synchronous collaborative sessions, teachers showed measurable growth in pedagogical content knowledge as reflected in their increasingly strategic, objective-driven, and language-integrated instructional reasoning across three time points. Specifically, participants' scenario scores shifted from largely "poor/fair" at pretest to "good/better" by posttest, with repeated-measures analyses indicating significant improvement over time in both scenarios with large effects. Teachers strengthened their ability to interpret students' writing, set instructionally coherent goals, and justify responsive teaching decisions within authentic classroom contexts. Notably, these performance-based gains converged with teachers' self-reported increases in anticipated implementation and readiness to enact SIWI-aligned practices, supporting the claim that the PD influenced both pedagogical knowledge and perceived feasibility. At the same time, variability across scenarios and remaining room for growth by the end of the workshop underscore that developing expertise for linguistically responsive writing instruction likely requires sustained opportunities for coaching and continued practice. These findings also carry a practical implication for current teacher PD programs. Because the video scenarios can be completed asynchronously and scored on a common holistic scale, programs can embed them as formative checkpoints rather than only end-of-program outcome measures. Used this way, the scenarios give PD providers direct feedback on whether teachers are developing applied instructional reasoning, not only satisfaction or self-reported intent. Additionally, they can signal which practices and scenarios warrant additional scaffolding or coaching before teachers move into classroom enactment. Future work that links scenario performance to observed classroom enactment will be essential for establishing the predictive validity of this assessment approach.

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