Enhancing CTE Teaching: The Role of Content-Specific Professional Development

A Review of the Literature

By

Stephanie Scaletta

Lamar University

September 21, 2025

Introduction

Career and Technical Education (CTE) is essential in preparing high school students for both postsecondary education and the workforce by equipping them with practical skills and industry-relevant knowledge. Despite its importance, CTE teachers often face the dual challenge of mastering highly specialized content while keeping pace with rapidly evolving industry standards. My interest in this topic stems from a dedication to supporting CTE teachers in strengthening their instructional practices, as I have observed that effective teaching directly influences student engagement, skill development, and long-term career readiness. In many school contexts, professional development opportunities are frequently generalized, intermittent, or disconnected from the specific content teachers deliver, which limits their relevance and potential impact on classroom instruction. By focusing on ongoing, content-specific professional learning, this study seeks to understand how structured, ongoing, and collaborative professional development can help teachers refine their instructional strategies, address classroom challenges, and foster higher levels of student achievement. Additionally, this research examines the broader implications for school leaders and professional development coordinators in designing professional learning initiatives that are not only practical but also transformative for teaching and learning in CTE programs. With this in mind, the focus of this study is: *How does participation in ongoing, content-specific professional development influence high school CTE teachers' instructional strategies and student learning outcomes?*

Review of the Literature

Definition of Professional Learning

The *Journal of Career and Technical Education* defines professional learning as the full range of both formal and informal learning experiences that teachers engage in throughout their careers, beginning in preservice education and continuing until retirement. Importantly, effective professional learning is described as requiring follow-up, continuity, and depth, rather than being limited to isolated workshops, in order to meaningfully support teacher growth (Ruhland & Bremer, 2002). UNESCO (2012) describes PD as encompassing the full range of activities that build teachers' knowledge and expertise, from workshops and seminars to classroom observations and professional reading. Effective professional learning is further characterized as being sustained, content-specific, and collaborative rather than brief or generic (Darling-Hammond et al., 2017; Learning Forward, 2010). Within Career and Technical Education, professional learning also includes staying current with industry standards and technical skills, making content-specific training especially critical (Ruhland & Bremer, 2002). Scholars also emphasize that sustained professional learning includes recurring opportunities for practice, feedback, and reflection, enabling teachers to internalize new strategies and apply them successfully in their classrooms (Zepeda, 2008; Wigfield et al., 2016). Collectively, these definitions highlight professional learning as an intentional, ongoing process that connects teacher learning directly to classroom practice and student achievement.

Types of Professional Learning

The literature identifies a wide variety of professional development (PD) formats available to teachers, each with varying levels of impact on classroom practice and student learning. Traditional approaches, such as workshops and seminars, remain common, but they are often critiqued for being one-time events that lack depth, follow-up, and contextual relevance (Darling-Hammond, Hyler, & Gardner, 2017). Recent research highlights that professional development is most effective when it is collaborative and sustained over time.

Job-Embedded Professional Development

Job-embedded professional development has emerged as another powerful approach. By situating teacher learning within the daily context of classroom practice, job-embedded PD—including peer observations, lesson study, and action research—encourages teachers to apply new methods immediately, reinforcing transfer from theory to practice (Zepeda, 2008). For Career and Technical Education (CTE) teachers, industry-based PD opportunities, such as externships or internships, are particularly valuable. These experiences allow educators to update technical expertise and align instruction with evolving workforce standards, ensuring relevance for students' career readiness (Ruhland & Bremer, 2002).

Online and Digital PD

Digital and online PD has become increasingly prevalent. Webinars, asynchronous modules, and virtual professional networks offer flexibility and access, though research suggests they are most impactful when interactive, sustained, and tied to classroom practice (Desimone & Garet, 2015).

Professional Learning Communities (PLCs)

Professional Learning Communities (PLCs), for example, bring teachers together on a recurring basis to examine student data, co-design lessons, and reflect on instructional strategies. DuFour (2004) argues that PLCs are most effective when they are focused on content-specific needs and linked to clear learning outcomes. Instructional coaching and mentoring models also provide personalized, ongoing feedback, enabling teachers to practice new strategies in real time and receive tailored support (Desimone & Garet, 2015).

Instructional Coaching / Mentoring

Instructional coaching and mentoring provide one-on-one or small-group support from experienced educators, focusing on modeling, classroom observation, feedback, and guided reflection. This type of professional development is particularly beneficial for novice or transitioning teachers in CTE, as it offers personalized, ongoing support tailored to their instructional needs. Research shows that sustained, job-embedded learning opportunities such as coaching are more effective than one-time workshops, as they promote direct application of strategies in the classroom and allow for continuous refinement (Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009). Furthermore, mentoring relationships contribute to teacher retention, professional growth, and improved student outcomes, especially when paired with structured feedback and opportunities for collaborative reflection (Guskey, 2002; Vangrieken, Meredith, Packer, & Kyndt, 2022).

Advantages of Using Content Specific Professional Learning

The literature consistently highlights that ongoing, content-specific professional development is more effective in improving teacher practice and student learning outcomes than traditional, one-time training models. Darling-Hammond, Hyler, and Gardner (2017) found that PD that is sustained over time and tied directly to teachers' instructional content allows educators to deepen their subject-matter knowledge while learning how to apply new strategies within their unique teaching contexts. This approach not only strengthens teachers' confidence in delivering complex content but also increases the likelihood of long-term instructional change. For CTE teachers, whose work requires both technical expertise and pedagogical skills, content-specific PD ensures alignment between classroom instruction and industry standards, ultimately supporting student readiness for college and career pathways (FutureEd & CALDER, 2023).

Another advantage of ongoing, content-focused PD is its emphasis on collaboration and reflective practice. Teachers who engage in professional learning communities, instructional coaching, or mentoring benefit from shared experiences, peer feedback, and collective problem-solving. These collaborative structures foster professional growth while also helping teachers address classroom challenges in real time. Vangrieken, Meredith, Packer, and Kyndt (2022) emphasize that teacher communities provide a supportive context for professional learning, which can improve instructional practices and enhance student engagement. Furthermore, research suggests that when PD includes opportunities for observation, feedback, and reflection, teachers are more likely to transfer strategies effectively into their classrooms, leading to improved student achievement (Desimone, 2009; Guskey, 2002).

In addition to improving teacher practice, sustained, content-specific PD has been shown to positively impact student learning outcomes. The U.S. Department of Education's Institute of Education Sciences (2014) stresses that effective PD must demonstrate measurable benefits for students, not just teachers. When teachers participate in PD that is aligned with their curriculum and instructional goals, students experience more coherent instruction, stronger engagement, and greater academic progress. In CTE contexts specifically, teacher participation in industry-based PD—such as externships or technical training—ensures that students are exposed to up-to-date workforce skills, thereby increasing their employability and career readiness (Ruhland & Bremer, 2002; FutureEd & CALDER, 2023). Taken together, the literature underscores that ongoing, content-specific professional development not only enhances teachers' instructional capacity but also creates direct benefits for student learning and long-term success.

Barriers to Implementing Content Specific Professional Learning

While the benefits of content-specific professional learning are well documented, the literature also identifies significant barriers to its successful implementation. One of the most common challenges is a lack of time. Teachers often face demanding schedules, making it difficult to balance classroom responsibilities with sustained professional learning. Desimone (2009) highlights that meaningful professional development requires extended and ongoing engagement, yet schools frequently offer professional development in fragmented sessions, such as one-day workshops, that do not allow for depth or sustained application. In CTE programs, time constraints are compounded by the need to stay current with both educational pedagogy and industry standards, leaving teachers with limited opportunities to fully engage in targeted professional learning.

Another barrier relates to funding and resources. High-quality professional development, particularly content-specific opportunities such as externships, coaching, or industry training, often requires significant investment. Schools and districts may struggle to allocate funds for substitutes, travel, instructional coaches, or industry certifications that directly benefit CTE teachers. Guskey (2002) emphasizes that without adequate resources, professional development initiatives often lose continuity and fail to create measurable change. This financial strain can disproportionately affect smaller or rural districts, where access to specialized training opportunities may be limited, further widening the gap between teacher needs and available support (Institute of Education Sciences, 2014).

A third barrier involves the transfer of learning from professional learning into classroom practice. Research shows that teachers often struggle to apply new strategies consistently without ongoing follow-up, modeling, and feedback (Darling-Hammond, Hyler, & Gardner, 2017). In CTE, where instructional practices must integrate both academic and technical skill development, the complexity of teaching may make it difficult for teachers to adapt new approaches without structured support. Vangrieken, Meredith, Packer, and Kyndt (2022) note that collaboration in professional communities can mitigate this issue, but when such communities are absent, teachers may feel isolated and revert to prior practices. This highlights the importance of designing professional learning with built-in mechanisms for accountability, coaching, and reflection.

Research Supporting Ongoing, Content-specific Professional Development Influencing CTE Teachers' Instructional Strategies and Student Learning Outcomes

Although limited research has examined the direct impact of ongoing, content-specific professional development on high school CTE teachers, emerging studies point to important connections between professional development participation, instructional strategies, and student success. Ruhland and Bremer (2002) found that novice CTE teachers report a strong need for sustained professional learning opportunities that focus on both technical content and pedagogy, suggesting that content-specific professional learning plays a critical role in supporting instructional quality during the early years of teaching. Similarly, FutureEd and CALDER (2023) documented that teachers with industry experience often require specialized professional development to effectively translate their technical knowledge into classroom instruction. This highlights the unique importance of targeted, ongoing professional development for CTE educators, who must balance technical expertise with effective teaching strategies.

In terms of student outcomes, research demonstrates that when teachers engage in PD aligned with their instructional content, students experience stronger engagement and achievement. Darling-Hammond, Hyler, and Gardner (2017) stress that professional learning that is sustained, collaborative, and content-focused has the highest impact on student learning. Within CTE, these benefits are particularly significant, as professional development not only enhances academic skills but also ensures alignment with current workforce demands. By participating in content-specific professional learning, CTE teachers can update curricula, adopt innovative instructional practices, and ultimately prepare students more effectively for postsecondary education and careers.

Summary

The literature on professional development highlights both the promise and the challenges of implementing ongoing, content-specific learning for Career and Technical Education teachers. Across multiple studies, scholars agree that professional learning is most effective when it is sustained, collaborative, and directly tied to instructional content, as this approach strengthens teachers' pedagogical practices and enhances student outcomes (Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009). For CTE teachers in particular, content-specific professional development provides unique advantages by helping educators remain aligned with evolving industry standards while also building instructional strategies that prepare students for college and career readiness (Ruhland & Bremer, 2002; FutureEd & CALDER, 2023). At the same time, research underscores persistent barriers, which includes time constraints, limited funding, and difficulties in transferring new strategies into practice which can limit the long-term impact of professional learning initiatives (Guskey, 2002; Vangrieken et al., 2022). Taken together, the literature suggests that while content-specific professional development holds significant potential to transform CTE instruction and student success, its effectiveness depends on intentional design, adequate resources, and ongoing support structures that encourage sustained teacher growth and application.

This Review and the Field of Education

This literature review contributes to the field of education by highlighting the critical role of ongoing, content-specific professional development in strengthening teacher practice and student outcomes, particularly within Career and Technical Education (CTE). While much of the existing scholarship on professional learning focuses on general education, this review

emphasizes the unique needs of CTE teachers, who must continually integrate technical knowledge with effective pedagogy to prepare students for postsecondary and workforce success. By synthesizing research on definitions, types, advantages, barriers, and direct connections to student learning, this review not only validates the importance of sustained, collaborative professional development but also identifies gaps in access, resources, and implementation that continue to limit its effectiveness. In doing so, it contributes to the ongoing conversation on teacher professional development by drawing attention to content-specific strategies that are often overlooked in generic training models. Ultimately, this review underscores the need for education leaders and policymakers to design professional learning initiatives that are both practical and transformative, ensuring that professional learning directly supports teacher growth and student achievement in diverse instructional settings.

Strengths and Weaknesses of this Body of Literature

A key strength of the literature on content-specific professional development is its consistency in identifying the elements that make professional learning effective. Across studies, scholars agree that professional development is most impactful when it is ongoing, collaborative, and directly connected to teachers' instructional content (Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009). This shared emphasis provides a strong theoretical and practical foundation for understanding how learning can influence both teacher practice and student outcomes. Another strength lies in the breadth of approaches covered, from job-embedded learning and professional learning communities to instructional coaching and industry-based experiences, offering a comprehensive picture of the multiple ways professional learning can be designed and implemented. Research also provides strong evidence linking sustained

professional development to improvements in teacher confidence, instructional quality, and student achievement, underscoring the broader value of professional learning within educational systems (FutureEd & CALDER, 2023; Guskey, 2002). Collectively, the literature highlights a clear framework for what works in professional learning, providing guidance for educational administrators and decision-makers seeking to implement effective models.

Despite its strengths, the literature also demonstrates several weaknesses and gaps. Much of the research on professional development focuses on general education settings, leaving Career and Technical Education (CTE) underrepresented in the conversation. While some studies address the unique challenges faced by CTE teachers, such as balancing technical expertise with pedagogy (Ruhland & Bremer, 2002), there remains limited empirical evidence that directly measures the impact of ongoing, content-specific professional development on CTE teachers' instructional strategies and student learning outcomes. Additionally, a lot of studies highlight the potential benefits of professional development for teachers, but there's not much solid, long-term data showing whether it actually improves student performance in measurable ways. Another weakness lies in the limited attention to structural barriers, such as time, funding, and access that often prevent professional learning from being implemented with accuracy. As a result, the field lacks a sufficient understanding of how to overcome these challenges in diverse educational contexts. This absence of CTE-specific, outcome-driven research underscores the need for further investigation to fill the gap and ensure that professional development initiatives are designed to address the specialized needs of CTE educators and their students.

Focus of the Current Study

What I learned from this literature review will guide my action research project on CTE teachers and professional development. The research shows that ongoing, content-specific, and collaborative professional learning tends to have the biggest impact on teaching practices and student outcomes, but it also points out common challenges like limited time, funding, and difficulty putting new strategies into practice (Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009; Guskey, 2002). For my study, I will look at how high school CTE teachers participate in structured, content-focused professional development and how it affects their classroom strategies and student learning. I also want to explore the obstacles teachers face so we can better understand what helps or hinders their growth. The goal is to provide practical ideas for educational administrators and decision-makers on how to create professional learning opportunities that really support teachers and make a difference for students in CTE programs.

References

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. https://doi.org/10.54300/122.311

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Desimone, L. M., & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society & Education, 7*(3), 252–263. https://www.semanticscholar.org/paper/Best-Practices-in-Teachers%E2%80%99-Professional-in-the-Desimone-Garet/31ffd06b4df5bb399f782d3985f17311d2bc44ae

DuFour, R. (2004). What is a professional learning community? *Educational Leadership, 61*(8), 6–11.

FutureEd, & CALDER. (2023). *How do teachers from industry impact student outcomes? Evidence from CTE*. Georgetown University. https://www.future-ed.org

Guskey, T. R. (2002). Does it make a difference? Evaluating professional development. *Educational Leadership, 59*(6), 45–51.

Institute of Education Sciences, Regional Educational Laboratory Program. (2014). *Evaluating professional learning: A tool for schools and districts*. U.S. Department of Education. https://ies.ed.gov

Learning Forward. (2010). *Standards for professional learning*. https://learningforward.org/standards-for-professional-learning/

Ruhland, S. K., & Bremer, C. D. (2002). Professional development needs of novice career and technical education teachers. *Journal of Career and Technical Education, 19*(1), 18–31. https://doi.org/10.21061/jcte.v19i1.656

UNESCO. (2012). *Teacher policy development guide: Policy priorities for quality education*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000210642

Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2022). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education, 113*, 103669. https://doi.org/10.1016/j.tate.2021.103669

Wigfield, A., Guthrie, J. T., Tonks, S., & Perencevich, K. C. (2016). Children's motivation for reading: Domain specificity and instructional influences. *Journal of Educational Psychology, 108*(1), 41–56. https://doi.org/10.1037/edu0000042

Zepeda, S. J. (2008). *Professional development: What works*. Eye on Education.