

Teaching Preparedness and the Professional Development Needs of Novice Career and Technical Education (CTE) Teachers in the United States

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Abstract

This paper proposes a closed loop control technique, for maintaining the high input power factor for non-linear loads. Input current falsification is mainly due to the design of the controller, non-linearity in the multiplier, output voltage feedback path, input voltage sensing, input current sensing, output voltage sensing and poorly designed current controller. These factors hamper effective power factor improvement process. In this work the effective power factor is improved by sensing the input voltage, input current

and output voltage and ignoring other parameters of the circuit. This makes the system less complex and effective PFC is achieved. The system proposed here not only has an improved power factor but also a reliable voltage regulation to the load. It is achieved through a control logic where the duty cycle of the boost converter is varied in such a way that the current will follow the input voltage and thereby enhancing the power factor.

Key Words:Power factor correction (PFC), Boost converter, single stage.

1 INTRODUCTION

Professional development, also known as professional learning in education, can be defined as any in-service training participated by teachers¹. Specifically, professional development is the process to improve teachers instructional skills and increase student learning outcomes². Typically, professional learning occurs via a series of programs designed to improve teachers knowledge, skills, and attitudes in ensuring their effectiveness in meeting student needs³.

Participation in professional learning is well-regarded as an investment for teachers who wish to improve instructional quality and student achievement. It has been shown to have a positive impact on teachers pedagogical skills, teaching practices, and student learning outcomes^{4,5}.

Over the past few years, encouraging teacher participation in professional development has become an important agenda item among researchers, policy makers, and educators community⁶. Participation in professional development is not only important to improve teacher quality and student learning outcomes. One study indicates that professional development benefits novice teachers (less than five years of teaching experience) by helping them persist in their early years of the teaching profession⁷. Novice teachers are targeted for involvement in professional development because this program is one of the best retention approaches and helps them to quickly become effective teachers⁸. Novice teachers that participate in professional development such as induction activities, performance evaluation, and ongoing support have are likelier to remain in the teaching profession, increase their teaching effective-

ness, and develop positive attitudes toward teaching activities^{9,10}.

1.1 PROFESSIONAL DEVELOPMENT AND NOVICE CTE TEACHERS MOST IN NEED

Being a novice in the teaching profession is understood to be a daunting challenge. The term “survival” best describes novice teachers condition because they report feeling anxious, ill-prepared and inadequate to fulfil their teaching responsibilities¹¹. Much of that anxiety stems from developing an appropriate relationship with students, controlling classroom discipline, and having adequate knowledge of instructional strategies with some grounding in theory^{12,13}. For novice CTE teachers, an additional concern is fulfilling 21st-century high-quality CTE teaching demands¹⁴. This includes the expectation of integrating intellectually challenging projects and real-world problems in instructional plans to produce future workers who can learn and adapt to the rapid pace of change in today's globalized economy¹⁴. In addition, a new mission established by CTE leaders addresses the dual, overlapping priorities of students career and college readiness. CTE teachers have been strongly encouraged to implement sophisticated instructional strategies to achieve these goals, such as engaging students in cooperative and project-based learning activities^{4,15}.

The steep learning curve faced by novice CTE teachers highlights the need for professional learning to both inspire them and deepen their expertise. However, some may have critical needs compared to other novice colleagues due to their level of exposure to the academic world prior to entering the teaching profession and their chosen teaching certification pathway. This includes those with less practicum experience¹⁶ and alternative certification¹⁷.

1.2 LESS PRACTICUM EXPERIENCE

Practicums, a supervised student teaching program in the school setting, are important for preservice teachers to equip them with basic experience in the teaching profession¹⁸. Practicum activities provide opportunities for preservice teachers to apply educational theory to practical uses in the real environment¹⁹. Studies found that participation in practicum activities improve teachers pre-

paredness for education profession especially in socialization skills and pedagogical knowledge^{20–24}. In contrast, studies have shown that novice teachers without student teaching experience felt less prepared to teach and were at greater risk for turnover compared to their peers^{16,25}. As an example, in a study on novice teachers in agriculture education (a CTE sub-field) found that those lacking practicum experience felt less confident to teach compared to colleagues with more practicum experience²⁶. The same study also statistically showed that the practicum experience is one of the variables related to novice teachers efficacy in the early teaching profession.

1.3 QUALIFIED THROUGH ALTERNATIVE CERTIFICATION

Alternative certification is one of the main routes toward becoming CTE teachers in the United States. A study of 12,000 CTE teachers from 30 states in the U.S. found that 75% of them were certified to teach from alternative certification programs²⁷. These types of programs provide individuals with the option to become licensed teachers without engaging in traditional four-year educational degree programs^{17,28}. Among eight alternative certification practices available in the U.S., the most popular method to recruit CTE teachers is the non-degree candidate route for associates degree holders or candidates with the equivalent postsecondary CTE certificate and relevant occupational or industrial experience²⁷. Teacher recruitment through the alternative certification route become popular in CTE programs mostly because institutions prefer to hire candidates with skills and industrial experience^{14,29}. Although novice CTE teachers with alternative certification have credit for their skills and industrial experience, studies found that they have to be supported with effective professional development programs^{4,30,29}. The rationale for this level of support can be characterized as unfamiliarity, especially in planning instruction, student assessment, and managing a classroom of diverse students²⁷.

1.4 PURPOSE AND CONCEPTUAL FRAMEWORK

A review of the literature has identified two groups of novice teachers with a critical need for engagement in professional learning programs: novice teachers with alternative certification and those with less practicum experience. In order to show that novice CTE teachers with alternative certification and less practicum experience have critical needs of professional learning, this study was conducted to analyze their preparedness in seven teaching components selected based on Danielson's framework for teaching³¹. In addition, this study identified types of professional learning areas sought by novice CTE teachers, especially those with critical needs. Study findings should provide a better understanding of these groups of novice CTE teachers, and especially their challenges and the supports needed to remedy them. This information hopefully can inspire school districts to develop professional learning plans that support these individuals as they gain experience as teachers.

The broad conceptual basis for this study was Danielson's Framework for Teaching, which includes four domains of teacher responsibilities (see Figure 1). Earlier use of this framework included describing the teaching profession since it aimed to represent what teachers should know and be able to do in their professional practice³¹. It was then applied for broader purposes including teacher preparation programs, teacher evaluation, and professional learning³¹.

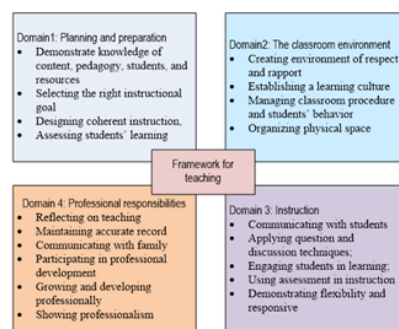


Figure 1. Domains and components of framework for teaching

In this study, seven components from Danielson's Framework of Teaching (Figure 2) were used in determining novice CTE teachers

preparedness in the early stage of their profession. Components of this framework were then utilized to identify professional learning and development needs for novice CTE teachers.

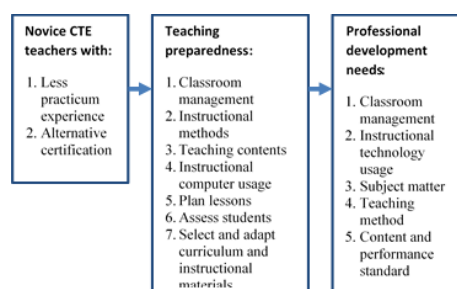


Figure 2. Conceptual Framework of the Study

2 METHODOLOGY

Data for this study were derived from the 1999-2000 National School and Staffing Survey (SASS)³³, a study conducted on the U.S teachers and schools. The SASS used a random sampling approach to select the respondents stratified by school level, public/private sector, and state³⁴. Novice CTE teachers from public schools were selected for analysis. After the filtration process, a total of 510 respondents were qualified to be analyzed as they met the novice CTE teacher criteria, including: (a) having CTE as the teaching subject matter and (b) having less than five years of teaching experience.

2.1 DEPENDENT VARIABLES

From the variety of information available in the 1999-2000 SASS, this study focuses on seven areas of teacher preparedness during their first year in the teaching profession:

- 1 Handle a range of classroom management or discipline situations
- 2 Use a variety of instructional methods
- 3 Teach subject matter
- 4 Use computer in classroom instruction

- 5 Plan lesson effectively
- 6 Assess students
- 7 Select and adapt curriculum and instructional materials.

In the 1999-2000 SASS, teachers were asked to rate their preparedness in seven teaching areas, given four levels of preparedness: 1) not at all prepared, 2) somewhat prepared, 3) well prepared, and 4) very well prepared. For the purpose of this study, those preparedness levels were transformed as dummy variables coded as 0 for the not at all prepared and somewhat prepared rating, while 1 was coded for well prepared and very well prepared. The authors define 0 as less prepared (reference category) and 1 as well prepared.

2.2 INDEPENDENT VARIABLES

Variation in teaching preparedness among novice CTE teachers represented by 1999-2000 SASS respondents are analyzed by their practicum experience and type of teaching certification. The measure of practicum experience was collected from specific questions in the 1999-2000 SASS regarding the duration of teaching practice respondents had. Four rating levels were used: 1) no practice teaching, 2) four weeks or less, 3) five to nine weeks, and 4) 10 weeks or more. The variable coded as dummy was 0 for less than 10 weeks of practicum (reference category) and 1 for 10 weeks or more of practicum experience. The variables accounting for the respondents teacher certification contain 10 categories from questions asking for teaching certificates that respondents have in their teaching assignment field:

- a. Standard certificate/ advanced professional certificate as part of a Bachelors degree program
- b. Standard certificate/ advanced professional certificate as part of a 5th year program
- c. Standard certificate/ advanced professional certificate as part of a Masters degree program
- d. Standard certificate/ advanced professional certificate as part of a Bachelors degree program earned after teaching began as part of an alternative program

- e. Standard certificate/ advanced professional certificate as part of a Bachelors degree program earned before teaching began, as part of an alternative program
- f. Through continuing professional development and learning
- g. Probationary certificate
- h. Provisional or other type given to persons still participating in what the states call an alternative certification program
- i. Temporary certificate (required additional coursework and/or student teaching before regular certificate could be obtained)
- j. Emergency certificate or waiver (complete regular certification program to continue teaching).

A dummy variable was created to account for type of teacher certificate. The variable was coded 1 if the respondent had a standard certificate or advanced professional certificate as a part of a Bachelors degree program, as part of a 5th year program, or as part of a Masters degree program, and 0 otherwise. The authors defined 1 for traditional teacher certification (reference category) and 0 for alternative teacher certification.

2.3 ANALYSIS

Multinomial logistic regression was used to analyze novice CTE teacher preparedness in participants early years in the teaching profession according to practicum experience and teacher certification. From this analysis, point and interval estimates odds ratios reflecting the likelihood of novice CTE teachers preparedness calculated by practicum experience and teaching certificates from logistic regression coefficient will be estimated. This ratio is interpreted as the odds of being less prepared in teaching areas, given a unit change on an independent variable. The descriptive analysis with percentage value was used to identify types of professional learning programs that novice CTE teachers sought. In addition, descriptive analysis illustrates different needs of professional learning among novice CTE teachers with alternative certification and less teaching experience.

3 RESULT AND DISCUSSION

From a total of 510 novice CTE teachers selected for this study, almost half of them (46.7%) had less than 10 weeks of practicum experience while the rest participated in 10 weeks or more of a practicum program. Among those novice CTE teachers, over a third of them (31.8%) entered the teaching profession through alternative certification programs, while the rest represent traditional four-year degrees in teacher training programs.

3.1 TEACHING PREPAREDNESS

Results from the multinomial logistic regression analysis indicate that there are statistically significant differences in teacher preparedness according to their duration of participation in a practicum program. The odds that novice CTE teachers with less than 10 weeks of practicum experience will feel less prepared in teaching are greater than zero in all six teaching areas including: application of instructional method [2.07 (95% CI: 1.35; 3.20)]; lesson planning [2.43 (95% CI: 1.55; 3.81)]; and classroom management [1.73 (95% CI: 1.15; 2.61)] compared to counterparts with 10 weeks or more of practicum experience (see Table 1).

3.2 TYPE OF TEACHER CERTIFICATION

There are statistically significant differences in three of six teachers preparedness according to their routes toward becoming qualified teachers. Table 1 shows that the odds that novice CTE teachers from alternative certification programs will feel less prepared in teaching are greater than zero in: application of instructional methods [1.61 (95% CI: 1.03; 2.50)], subject matter teaching [2.70 (95% CI: 1.34; 5.41)], and lesson planning [2.18 (95% CI: 1.36; 3.48)] compared to those from traditional four-year degrees in teacher training programs.

Table 1 Odds Ratios from Multinomial Logistic Regression Analysis Predicting Novice CTE Teacher Preparedness across Practicum Experience and Type of Certification

Variables	Classroom Management	Pedagogy	Subject Matter Teaching	Instructional Computer Usage	Lesson Planning	Select and Adapt Curriculum
Time spent in practicum (<10 weeks vs > 10 weeks)	1.73*	2.07*	1.19*	1.71*	2.43*	1.54*
Type of teacher certification (alternative certification vs traditionally certified)	ns	1.61*	2.70*	ns	2.18*	ns

Note: Source: Analysis of data elements selected from 1999-2000 School and Staffing Survey (Public School Teachers).
 CTE = Career and Technical Education
 Coefficient reflect the odds of feeling less prepared in teaching elements as compared with more prepared.
 * $p < 0.05$; ns = $p \geq 0.05$

3.3 PROFESSIONAL LEARNING SOUGHT BY NOVICE CTE TEACHERS

As shown by Figure 3, both novice CTE teachers with alternative certification and less practicum experience have the same pattern in type of professional learning needed. Professional learning and development in subject matter teaching was rated as most needed (28.4% of novice CTE teachers with alternative certification and 20.7% of novice CTE teachers with less practicum teaching experience) followed by classroom management and instructional technology usage.

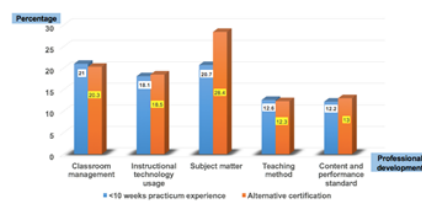


Figure 3. Percentage of Most Needed Professional Development and Learning Rated by Novice CTE Teachers with Less Practicum Experience ($n = 238$) and Alternative Teacher Certification ($n = 162$).

4 DISCUSSION

Novice teachers often encounter feelings of anxiety, insecurity, and instability in their early teaching experience, so additional guidance and support is recommended as they advance in the teaching profession¹⁷. Within this group, some may have especially critical needs because their non-traditional route into the profession offered less exposure to the culture and practice of teaching. As targeted

in this study, the population of concern includes those with: (a) less practicum experience¹⁶, and (b) alternative certification¹⁷.

Based on the results of this study, novice CTE teachers with less than 10 weeks of student teaching experience are likely to feel less prepared in managing classrooms, applying instructional methods, applying instructional computer usage, lesson planning, selecting and adapting curriculum and instructional materials, and teaching their subject matter compared to novice CTE teachers with more than 10 weeks of student teaching experience. Novice CTE teachers with alternative certification are likely to feel less prepared in applying instructional methods, subject matter teaching, and lesson planning compared to novice CTE teachers with traditional certification. Previous studies support these findings. A study found that CTE teachers with less practicum experience are likely to have difficulties developing good rapport with students³⁵. Some were too concerned about gaining respect from students and some were personally affected by students misbehaviour³⁴. They also reported feeling less confident in managing issues related to student discipline³⁵.

The novice teacher issues in fulfilling the first domain of Danielson's teaching framework, which involves planning and preparing lessons, are very common in the education profession¹¹. Novice CTE teachers, especially those immediately out of industry, normally have difficulties in preparing their workshop, materials, and tools for teaching and learning sessions³⁵. They are normally surprised to realize that teaching and learning activities have to be conducted using limited tools, equipment, and facilities. Additionally, some of those supply are out of date compared to the one that they normally use in real-work settings³⁵. Novice CTE teachers are also likely to have additional stress if they are not provided with an adequate induction or orientation program to understand the complexity of the school system, policies, and procedures to manage their classroom³⁵. As an example, they struggle in determining the right procedure in ordering supplies and maintaining a workshops equipment. Challenged to figure out those complicated procedures without adequate support would stall many teachers new to the profession.

For novice CTE teachers with alternative certification, although they have the advantages of content knowledge and industrial expe-

rience, they still require additional support with student discipline and classroom management, instructional deliveries, and teaching strategies³⁰. Studies comparing both alternative and traditionally certified teachers have indicated that those with alternative certification experience more difficulties in the classroom during their early teaching years than their counterparts³⁶. Indeed, they continue to exhibit stress about their teaching environment longer than teachers from traditional training programs³⁷.

IMPLICATIONS FOR PRACTICE AND FINAL THOUGHTS

To address the challenges faced by novice teachers, frequent in-service professional learning programs are needed to improve knowledge and practice, promote professional growth, and enhance student achievement³⁸. Andrews and Quinn⁸ suggest that professional learning is one of the best approaches in helping the novice teacher develop effectiveness. Based on this study's findings, both categories of novice CTE teachers examined would likely agree, each having indicated that the area most needed related to teaching their subject matter. They also ranked classroom management and instructional technology usage highly as needs, areas they were likely less exposed to in prior work experiences. In conclusion, school administrators play an essential leadership role in developing a plan to support novice CTE teachers, making professional learning available and even joining them in participation³⁹. Administrators should identify novice teachers' needs in consultation with them, listening to their individual concerns and issues in regularly held meetings⁴⁰. Teachers are increasingly playing a lead role in their own professional development with the growth of professional development communities⁴¹ and transformative practices of teachers supporting one another⁴². Diligent attention to this issue will assure novice teachers the resources and support necessary to become familiar with new pedagogical responsibilities and environments. Ultimately, providing teachers with essential professional learning and development in a supportive environment benefits student, all of whom deserve the same caliber of experience.

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