A Theoretical Review of the Signaling Role of Certifications in Career and Technical Education

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This paper examines the theoretical and conceptual foundations of the signaling ability of career and technical education (CTE) certifications awarded by industry, trade associations, and other organizations. Additionally, specific attention is directed to the way in which occupational certifications signal expertise and readiness for employment in the context of entry into the labor market. The theoretical frameworks used to explore the impact of education qualifications will be briefly reviewed, starting with human capital theory and moving to the complementary yet, somewhat divergent theories of signaling and screening. The literature applying signaling theory to educational outcomes will be summarized. Finally, a conceptual model of certification and signaling in the service marketing context will be reviewed, and an extension will be proposed that applies the model to certification and signaling in CTE. Conclusions and suggestions for future research are then presented.

Introduction

The appropriate assessment of career and technical education (CTE) has generated widespread discussion in the past several years. The issue is highlighted by an increasing interest in standards-based education, driven by the need for an educated and highly trained workforce able to respond to the increasing pace of change. While there has been continued movement towards improvements in creating dependable measures of student achievement, the assessment of student learning remains “the Achilles’ heel of quality” (Knight, 2002). An associated discussion related to appropriate measures of student achievement has focused on the role of non-traditional educational credentials and certifications. The past decade has seen explosive growth both in the number of certifications awarded and in the number of post-secondary CTE providers offering training and courses leading to certification (Aragon, Woo, & Marvel, 2005; Carter 2005; Van Noy, Jacobs, Korey, Bailey, & Hughes, 2008). In spite of this activity, little is known about the way industry certifications and qualifications in CTE function in terms of their signaling ability in the labor market. This paper seeks to broaden the scope of current knowledge, synthesize existing literature, and propose a model to explain the signaling function of certifications in the CTE context.

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The study of education outcomes increasingly considers the awarding of a credential as a signal or indicator of meeting pre-determined levels of proficiency (Darling-Hammond, 1994; Wang & King, 2009). This paper is primarily focused on an increasingly wide range of credentials known as a certification (alternatively referred to as industry-based certification, occupational certification, and professional certification). A high level of conflict and confusion surrounds the use of terms to describe various educational qualifications, including certification. For the purpose of this paper the following definition of certification is used: certification is a form of credential awarded by an employer, a vendor, an association, or an independent agency (Hale, 2000) that requires “passage of an examination benchmarked to predetermined occupational or professional standards” (Carnevale & Desrochers, 2001, p. 19). Certification may or may not require additional prior education and experience. Hale (2000) described certifications as a form of credential that can be awarded by an employer, a vendor, an association, or an independent agency. Certifications can also be awarded to groups or organizations as well as individuals. For example, the American National Standards Institute (ANSI) and the American Society for Quality Control (ASQC) certify organizations that meet pre-determined process standards. However, the focus of this study is on the certification of individuals by employers, vendors, and professional and trade associations. An important distinction also needs to be made between certification and other types of credentials including degrees, diplomas, licenses, and accreditation, all of which lie outside the bounds of this paper.

Over recent years the increase in prominence, number of programs, and qualifications related to the external certification of workplace skills has become a widely accepted as a key trend in both CTE and education (Acemoglu & Pischke, 1999; Carter, 2005; Castellano, Stone, & Stringfield, 2005; Miller, Kellie, & Acutt, 2001). The unique vocational and occupational focus of CTE has in some ways resulted in the qualification issue being more pronounced than in general academic education. Prior studies in CTE have shown that industry-based certifications do function as signals (Bartlett, 2002; 2004; Bartlett, Horwitz, Ipe, & Liu, 2005; Colardyn, 2009). However, previous research has focused on entry-level certifications with little known on the theoretical mechanisms for how certification operates for workforce entry for occupations typically associated with CTE. This paper seeks to broaden the scope of current knowledge, synthesize existing literature, and propose a model to explain the signaling function of certifications in the CTE context.

**Theoretical Foundations for Assessing CTE Credentials and Certification**

The continued high visibility of occupational certification programs in CTE (Castellano et al., 2005), along with their increasing presence in secondary and postsecondary educational institutions and private sector training providers (Carnevale & Desrochers, 2001; Carter, 2005) raises many questions about the value of these credentials for those seeking entry into the workforce. Of particular interest is the message or signal that an occupational certification sends to employers, as compared to the more traditional qualifications in the same field usually represented by a two-year community/technical college degree or four-year college/university degree. The study of the impact of certification in the CTE context draws on literature, theory, and empirical research from a number of different perspectives in the social sciences. Related disciplines to draw on include education, economics, management, human resource
management, sociology, and industrial organizational psychology. Existing theory provides a strong conceptual framework for examining the role of credentials as an assessment outcome in CTE, especially when focused on the role that qualifications play in explaining how individuals gain entry into the workforce and the variability in their subsequent earnings.

To be valuable a credential should indicate that the holder has acquired the essential knowledge and skills identified by an industry or occupation as critical for success (Tyler, 2003; Walters, 2003). The exact level of knowledge and skill the certificate holder possesses is usually unknown. The certificate, therefore, serves to signal a measure of competence and consequently provides value for both the organization and the certificate holder. A number of theoretical perspectives provide a potential lens through which to understand the impact of educational qualifications on workforce entry, earnings, and advancement. Among the multiple theories researchers have proposed for understanding questions related to certification the most commonly supported include human capital, signaling, control, principal-agent, and cultural capital. Although no single theory is universally applicable or accepted, each has some value in certain labor market settings (Bills, 1992; Levy & Murname, 2001). When limiting the focus of attention to labor market entry (i.e., hiring) and explanations for labor market returns to education (i.e., wages), two broad bodies of theories have emerged as the most robust and commonly applied (Frazis, 2002). Initially focusing on economics and later applied to the economic aspects of education, these two theoretical views are known as human capital theories and signaling theories. Both theories form part of neoclassical economics, described by Kaufman (1985) as the dominate paradigm in labor economics and derived from and extending classical economic theory. The neoclassical approach examines the allocation of scarce resource among alternative ends and accounts for human behavior with the assumptions that individuals exercise rational choice and seek to maximize their well-being. As Kroch and Sjoblom (1994) described, the neoclassical approach is captured in both human capital and signaling theories. Both theories are based on the assumption that individuals acquire education or training up to the point where the marginal benefit (wage earning) just equals the marginal costs of acquiring education. The two theories differ, however, in the reasons that employers pay a premium for education. In the following section each theoretical perspective is briefly reviewed.

**Human Capital Theory**

Over the past fifty years the basic premise of human capital theory has been advanced, applied, and empirically supported in a wide range of education, training, and learning contexts. While this paper will not attempt to provide a thorough review, it is worth briefly summarizing key aspects and seminal studies since human capital has been the dominant theory used in research seeking to understanding the value of education and training. The basic tenet of human capital theory is that expenditures on education and training are investments that produce capital in human beings in terms of knowledge and skills (Benjamin, Gunderson, & Riddell, 1998). As noted by Nerdrum (1999) “generally, human capital accumulation is confined to knowledge reproducing activities” (p. 5), although other investments in human capital have also been considered including migration, health care, and engagement in job search activities (Schultz, 1963; Wang & Holton, 2005). These collective investments are expected to improve individuals’ productivity and, therefore, their earnings. As such, “education augments natural abilities that are subsequently sold in labor markets” (Bedard, 2001, p. 749).
The key feature of human capital theory stresses that education and training should be viewed as an individual investment toward future returns. An individual makes decisions to acquire learning as an investment while delaying current income or benefits in expectation of future increased earning potential (Becker, 1993). Costs associated with education or training include tuition and other fees along with loss of earnings foregone while new knowledge and skills are acquired. A related aspect of this theory is the assumption that because individuals wish to maximize the value of their lifetime earnings, they continue to accumulate education or training (i.e., human capital) up to the point where the marginal benefits – the expected increased income from the investment – equals the marginal cost of acquiring it (Wang & Holton, 2005). Applying this theory to labor market outcomes suggests that any difference in the ability to be hired and the level of subsequent earnings are reflective of the difference in the amount of human capital that an individual possesses.

Because of the unique and diverse setting of CTE learning leading to certification, the benefits to individuals are not easily analyzed with a human capital approach. Further, as described by Livingstone (1997), much human capital is acquired after formal schooling and human capital models in general fail to account for lifelong learning. A second limitation of the human capital theory approach to studying the impact of CTE-related certification in the context of the labor market is associated with employers’ unpredictable attitudes towards these qualifications. This point was stressed in the work of Strober (1990) who noted that “while human capital theory provides some central insights about the supply side of the labor market, the challenges of this theory suggest that the demand side of the market, i.e., the actions of human resource managers, also play a key role in determining earnings and employment” (p. 214). Firms may seek certified employees for a wide variety of reasons, including simplifying recruitment, enhancing marketing, and protecting against legal issues. The specific value that employers assign to certification, in terms of preference for hiring and the resulting wage offered, cannot be fully explained by human capital theories. This non-uniform valuation of certification results from several causes but all limit to some degree the application of human capital to the study of certification in CTE.

**Signaling Theory**

In simplistic descriptive terms, a signal is any observable indicator of something with unobservable quality. However, for the observable indicator to be considered a signal it must meet two criteria: (1) the indicator must be able to be manipulated, at least partly, by an individual, and (2) the marginal cost of difficulty of obtaining the indicator must be inversely correlated with the individual’s ability level (Spence 1973, 1974). A frequently used example of a signal is the college degree, which highlights both the prerequisite criteria. A college degree is a signal of future workplace productivity because acquisition of such a credential is at least partly within an individual’s control and because it is more difficult for those individuals who lack the organizational skills, commitment, motivation, and focus (or other similar such attributes that constitute productivity) to obtain a college degree.
During the recruitment and selection process an organization attempts to identify signals of applicants that are correlated with future performance on the job. As Kaufman (1985) described, the importance of indices and signals for the screening process depends on their usefulness as predictors of each applicant’s actual productivity on the job. The value of a signal is somewhat unique to the criteria of the job and hiring organization, although certain signals, such as education credentials and especially a college degree, often are valued independent of job and organizational context.

The majority of studies applying signaling theory to examine the wage effects of education focus on participation and qualifications earned in secondary schooling or four-year colleges and universities. An important stream in the literature was a series of studies examining the signaling value and returns to education from the sub-baccalaureate labor market. This is usually defined as jobs requiring education beyond high school but less than a four-year degree. A series of studies by Grubb (1992; 1993a; 1993b) examined the employment consequences of enrollment in and acquisition of credentials from two-year community and technical colleges. A study by Kane and Rouse (1995) re-analyzed Grubb’s data and found several errors. Their interpretation and conclusions provided needed focus on the role of qualifications for many entry-level occupations. Grubb (1995) contributed further with a rebuttal with corrected data. When taken with a companion study of Kane and Rouse (1995) these provide an insightful view and application of signaling theory to that segment of the labor market most often associated with CTE occupations.

A newer development in the service marketing literature is studies exploring the role of certification as a signaling device. Certification in the service marketing context often refers to promoting and displaying endorsement of service quality by an independent reputable agency (Corbett, Montes-Sancho, & Kirsch, 2005; Mishra, 2006; Terlaak & King, 2006; Walker & Johnson, 2009). An example would be an automotive service firm displaying signs indicating that its staff is Automotive Service Excellence (ASE) certified. Mishra described how displaying certification in marketing efforts (both advertising as well as prominently displaying ASE seal and actual employee certifications where customers can see) “creates as incentive for firms to deliver of quality promises by using proper techniques to control delivery agents like repair mechanics” (p. 82). A separate but related line of research considers the quality management related certifications offered by the International Standards Organization (Corbett, Montes-Sancho, & Kirsch, 2005; Terlaak & King, 2006). Potentially, the theoretical application of this work to CTE is valuable in furthering the understanding of the role of education qualifications, especially industry-sponsored credentials, as a certification of learning.

The Development of a Conceptual Model of Certification and Signaling in CTE
Mishra (2006) proposed a conceptual model that explains how firms use certification to signal marketing messages to customers. Building on earlier work in service marketing (Zeithaml, Berry, Parasuraman, 1988) Mishra’s model brings together multiple theoretical perspectives related to the role of certification signals in service relationships. Mishra (2006) then tested his model on the role of signaling and screening to overcome information gaps. The
empirical setting for testing was the automotive service industry. The automotive service industry is well suited for exploring the role of certification given that greater information asymmetries and high consumer information search costs are found for products and services with large numbers of choices (Beatty & Smith, 1987). As described by the model, significant information asymmetry exists for customers who are seeking automotive repairs. Customers are often highly uncertain about which of the many available car repair firms is likely to deliver high-quality service. Mishra found considerable empirical support for his model in this setting. In addition, Bartlett (2004) also examined certification in the automotive service industry and found that Automotive Service Excellence (ASE) certification is used as a signal in a variety of ways. “Technicians earning certification are awarded sleeve badges to wear on their work uniforms and certificates that are usually framed and predominantly displayed in public areas of the workplace. In addition, technicians’ employers will often display large blue signs on the business frontage stating that ASE-certified technicians are employed. ASE directs this marketing effort in the hope that customers will seek out firms with ASE-certified technicians when repairs are needed to their vehicles” (p. 10). Although the context of Mishra’s (2006) conceptual model is customer service marketing, potential connections exist to explore the role of educational certification in CTE. This is explored further in the following section.

An Extension of a Conceptual Model of Certification and Signaling in CTE

The model of the role of certification in service marketing developed by Mishra (2006) is potentially useful for considering the impact of education certifications in hiring for CTE occupations. Consequently, an extension of the Mishra model in the CTE context is proposed.

Figure 1 is an extension of the Mishra (2006) model adapted to fit the context of certification in hiring for jobs typically associated with CTE. The rapid expansion of industry certification has not been uniform in all occupations. This model attempts to explain why industry certification is more visible in certain CTE occupations. The model examines the role of certification and screening in bringing about the desired outcome of a successful hire. The model captures both the employer and applicant in examining the signaling role of certification. Certification is a worthwhile investment for an applicant who knows that potential employers will have information asymmetries in relation to their knowledge, skills, and abilities. For employers, certification is a worthwhile screening device to overcome these same information gaps. A successful hire results from both an applicant signaling and organizational screening to identify an applicant’s suitability for the job.

Using this model to explore the signaling role of qualification related to CTE, it becomes apparent that the need for certification would likely be greatest in jobs and occupations with large information asymmetries. Consequently, there is greater need for signaling and screening which can be accomplished with educational credentials. Such information asymmetries are likely to occur when employers do not know the specific knowledge, skills, and abilities for jobs. This situation could be found in CTE related jobs in highly dynamic industries where the requirements for job performance change frequently due to technology, new legal requirements, or other significant factors emanating from the organization’s external environment. The
existing data of occupations and industries with the greatest numbers and expansion of certification programs would lend some support to this conclusion (Adelman, 2000; Carter, 2005).

A range of additional drivers for certification in CTE can be explained by the model and existing literature on signaling theory. The model presented in Figure 1 captures the idea that high information asymmetries lead to the need for relational intelligence generation (Mishra, 2006). This situation is likely to be found in jobs and occupations where customer relationships are important. Many CTE programs focus on occupations with heavy customer service interactions. The model proposed that these occupations are more likely to benefit from the use of certification as a signaling device for entry into the labor market. Examples would include the already discussed automotive service industry along with certain jobs in the health care professions, tourism and hospitality, and IT. Health care is especially noted given the importance of quality customer (patient) interaction which is considered vital for effective and efficient delivery of health care services. Education and training for the highest levels of professionals in

Figure 1. An extension of Mishra (2006): The development of a conceptual model of certification and signaling in CTE.
this field (doctors, nurses, etc) has long been associated with licenses and certification. Yet today certification is increasingly a requirement in many allied health professions (Althauser & Appel, 1996). The IT field also provides an example to test the model in Figure 1. As organizations increasingly rely on information technologies to function, so too do they rely on IT staff able to meet the computer and network needs of all employees in an organization. The complexity of the technology and the rate of change and innovation often create information asymmetries between what employers want in IT employees and their ability to determine if applicants possess the needed skills and knowledge. Consequently, the IT field has emerged as perhaps the leader in certification (Adelman, 2000; Brookshire, 2001; Carter, 2005).

In the Mishra (2006) model, both certification and screening provide a mechanism for an organization to overcome information asymmetries. Applying the adapted model in Figure 1 to educational credentials in CTE the processes of certification and screening can be viewed as steps towards the successful hiring of a new employee with known skills that meet the predetermined needs for a job. A key contribution of the marketing approach embedded in the model of Figure 1 is the focus on relational intelligence generation to meet customer needs. Returning to the context of education certification in CTE, the consumer could firstly be considered to be the employer seeking to purchase labor and skills. A successful hire, therefore, is one in which the new employee is able to meet organizational needs by in turn meeting customer needs. A second tier of consumer could be identified as the customers that the certified employee interacts with on the job.

The Mishra (2006) model, and the extension to CTE presented in Figure 1, includes the costs of certification and screening. If certification costs are high, which would include training, materials, and examination fees, there may be a perception from employers of the greater value of the qualification. Signaling theory supports this proposition, as a signal must meet the requirement of distinguishing between high and low ability individuals. It could be that very expensive certifications are only within the reach of current and future high income earning employees who use the credentials to signal their greater ability. Certainly, there could be evidence for this in the advanced IT certifications currently available today (Hentea & Dhillon, 2006; Nelson & Rice, 2001). Alternatively, in occupations and jobs with high screening costs, certification may also play a more prominent role. The costs to screen employees could include interviews, background checks, and a variety of job related pre-employment assessments (Chapman & Webster, 2003; Huang & Cappelli, 2006). When a firm invests considerable time and expense to screen, there may be a tendency to place greater reliance on certification. Lastly, in certain occupations there are significant costs to a firm for failed hires. In situations where a successful hire is important as a result of high staff turnover, high training costs, high job demand, and limited labor pool, it could expected that certification may play a more prominent role.

One possible critique of the Mishra (2006) model is that the desired outcome of certification and screening are absent, although increased firm profit is perhaps implied. Figure 1 attempts to address this by considering the hiring of an employee with the necessary prior
education and training to perform the job as the outcome of CTE signaling. The feedback loop, absent in the Misha (2006) model although clearly stated in the theoretical literature, is a key aspect of signaling theory. The model of the signaling role of certification in CTE presented in Figure 1 captures the feedback that occurs as employers gradually learn the value of certification with evaluations of subsequent job performance and employees gradually learn the relative value of different education certifications in the screening and hiring process. Eventually, the repeated process of hiring gradually reduces information asymmetries leading to the state of equilibrium. Yet, it must be stressed that the research literature of signaling theory to explain certification in CTE is in its infancy. Much additional research in a variety of occupations and industries is needed.

Conclusions

This paper has examined the theoretical and conceptual foundations of the signaling ability of certifications and credentials to further the understanding of the impact of educational qualifications in CTE. Certification continues to play an expanded role in CTE as a measure of assessment. As students and employers increasingly rely on certification as a signal, a corresponding move to offer education leading to certification has emerged for both secondary and post-secondary CTE providers. This paper explored the theoretical foundation behind the signaling role of CTE certification in the hope that a review of the key elements of the theory can be applied to develop a greater understanding of how certification can and should operate.

While much literature on the role and returns to education is grounded in human capital theory this paper has argued that signaling theory is a more appropriate theoretical framework to examine the certification issue in CTE. The origins of signaling theory as a way to explain how economic markets operate with incomplete information was briefly reviewed, with specific emphasis on the seminal work of Spence and the development of his theory of signaling in the labor market. As explained by signaling theory, there is uncertainty on the part of both employers and job applicants about the best way to identify individuals with the necessary skills and abilities to fill positions. Credentials and certifications play a signaling role by providing potential employees a way to indicate their fit for a vacancy and for employers to quickly identify employees who can perform on the job with minimal additional training.

The empirical research supports the concept that signaling theory can be used to examine the returns to educational credentials from both the employee and employer perspective. Key studies from both perspectives were reviewed. The growing interest in signaling theory in marketing was highlighted for the potential application to CTE certification. More specifically, the role of certification in service marketing was examined with a review and discussion of the model presented by Mishra (2006). An extension of this model was then developed for suggested use to explore issues related to certification in CTE.

The prevalence of industry-sponsored credentials and certification is likely to continue to grow in importance in a variety of occupations, providing additional support for CTE policy
makers, administrators, and instructors to promote the need for lifelong learning within the context of changing career patterns. The model proposed in this paper can provide a framework for determining which industries and occupations are likely to engage in the widespread use of credentials and certifications as signaling devices. Understanding the context in which such signaling is likely to be of benefit to job applicants and potential employers will help CTE professionals react appropriately to this trend.

References


