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The Qualification Process for Career / Technical Education (CTE) Teachers: A New Conceptual Model

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Abstract

Career and Technical Education (CTE) teachers are important contributors to the success of a growing number of students who chose to learn, work, and pursue a career in trade and technical areas. Career and Technical Education, formerly known as "Occupational Education" or "Vocational Education" has become an important factor in the education and training of a large segment of American youth. This article will briefly examine CTE with a focus on teacher preparation and training. A crucial facet of teacher preparation is ensuring that these teachers are qualified. The qualification process for these student teachers will be analyzed in terms of the model of successful qualification process used primarily in the pharmaceutical industry. This new conceptual model facilitates improved program management as well as the dissemination of best practices. Findings and implications will be drawn for future action intended to improve and enhance the critical process of preparing highly qualified and competent CTE teachers.

Keywords: Career and technical education, Installation qualification, New York City College of Technology, Operational qualification, Performance qualification, Qualification process, Success Via Apprenticeship program, Teacher preparation.

1. Overview of Policy Issues of Vocational Technology Teaching

Much has been written about the crisis in American education. There is widespread agreement that education is critically important to the future success of young men and women.

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Every aspect of education, from pre-school to post-graduate, has been examined, resulting in widespread disagreement on how the process should be carried out. This article will focus on a very specific, very tangible portion of the educational puzzle, i.e. career and technical education and the successful preparation of teachers in the field.

Career and Technical Education (CTE) is today a vibrant and important component of the overall educational landscape. Lynch and Ruhland (2007, p. 281) indicate that "Career and technical education cuts a broad swath in the educational landscape in the US. It encompasses a tremendous number of programs and teachers at both secondary and post secondary levels."

Additionally, Jenkins, Zeidenberg, and Kienzl (2009) pointed out that students in educational programs that blend basic skills and occupational training to generate more contextualized learning are far more likely to improve basic skills and earn college-level credits.

CTE, once known as occupational education or vocational education, has been changing with the times to keep pace with the demands imposed by rapidly advancing technological gains seen in every area of daily life. CTE efforts are also aligned with the national emphasis on STEM (Science, Technology, Engineering, Math) initiatives, which are receiving much interest, funding, and applications at state and local levels. Herschbach (2011, p. 97) notes that "interest in STEM instructional models is literally exploding across the educational landscape".

2. Review of Relevant Literature

The system of apprenticeship dates back to the Middle Ages in Europe. Essentially, young people were "apprenticed" to master craftsman who employed them as an inexpensive form of labor in exchange for providing food, lodging, and training in the craft.

In modern times, a variety of definitions can be applied to the notion of apprenticeship.

- Collins, Brown and Newman (1989, p. 453) hold that "apprenticeship is a teaching method utilized by educators to teach students how to solve problems, understand tasks, perform specific tasks, and deal with difficult situations."
- Pratt (2002, p. 9) for instance, has stated that in apprenticeship, "people work on authentic tasks in real settings of application or practice."
- Barab and Hay (2001, p. 72) have indicated that "the notion of cognitive apprenticeship includes: (1) the development of learning contexts that model proficiency, (2) providing coaching and scaffolding as students become immersed in authentic activities, (3) independent practice so that students gain an appreciation of the use of domain-related principles across multiple contexts."

Apprenticeship has developed over time into a comprehensive set of principles and procedures that result in the transfer of knowledge, experience, and competence from a skilled professional to an individual who has chosen to learn the profession.

In the United States, there is an Office of Apprenticeship, located in the U.S. Department of Labor, that oversees programs that offer access to over 1,000 career areas, ranging from seaman and carpenters to chefs and dental assistants.

The basic model employed in apprenticeship programs is, of course, found throughout vocational and industrial training programs of all types. Essentially, conceptual and experiential learning, combined with practical application, accompanied by supervision and constructive feedback, form the core of the approach.

In research on apprenticeship programs, as with any educational program, several dimensions of the program must be specified. (Welty, 1970, pp. 6-8) First of all, there are the inputs to the program. For example, what are the selection criteria for program participants, the aspiring apprentices?

Second, there are process dimensions of the program. What are the activities that the participants engage in while enrolled in the program?

Third, there are the outcomes of the program. For example, what are the proficiencies that the participants will demonstrate upon program completion?

If these dimensions are adequately and consistently specified, an educational program can be more precisely characterized and the possibilities of program management are enhanced. Moreover, the possibilities of identifying and disseminating best practices are also enhanced. Regarding CTE programs throughout the United States, the US Department of Education has observed that Perkins IV funding involves a great deal of "statutory flexibility." (2010, p. 9) The DoE continues that while this "statutory flexibility has enabled states to meet their individual CTE program needs, it has produced dramatic inconsistencies among states in how student populations are defined and has enabled many states to use less valid and reliable measures, particularly for academic attainment and technical skills attainment. As a result, the Department has been unable to make comparisons of student performance across states or track the performance of students over time." (ibid) Thus much of the career and technical education in the United States today has the characteristics of a "black box."

One of the objectives of this article is to present a model of the qualification process that unpacks and illuminates some of the aspects of that process, and clarifies relationships between the qualification process itself and the various assessment processes that are associated with it. This will contribute to not only improved CTE program management, but also to the dissemination of best practices.

Section 3, following, will describe an apprentice-type teacher preparation program that is currently functioning in New York City. Next, in section 4, a model of the qualification process will be detailed, and its relationship to the teacher preparation program will be indicated. In section 5, the assessment of candidates for the teacher preparation program will be discussed in terms of the qualification process. Section 6 will discuss the assessment of the student teachers' performance in the classroom, again in terms of the qualification process. The longer term outcomes of the program, which depend upon the functioning of the graduates of the program and their pedagogical impact on the secondary students in CTE high schools in New York City, will be deferred until a later study.

3. Description of Vocational Technology Program

In order to focus on CTE teacher preparation in a specific manner, a successful program from New York City will be detailed and used in this analysis. The New York City College of Technology, located in Brooklyn, NY, is part of the City University of New York (CUNY). The City University of New York is the nation's leading urban public university serving more than 480,000 students at 23 colleges and institutions in New York City. New York City College of Technology (NYCCT) is a public institution authorized by the New York State Board of Regents to offer 19 baccalaureate degree programs (Bachelor of Technology, Bachelor of Science, Bachelor of Science in Education); 21 associate degrees programs; and 14 certificate programs. NYCCT is accredited by the Middle States Association of Colleges and Secondary Schools. The Career and Technology Teacher Education (CTTE) Department within the New York City College of Technology is accredited by the National Council of Accreditation for Teacher Education (NCATE).

The professional education unit of the NYCCT is the Department of Career and Technology Teacher Education, which is housed in the School of Professional Studies. The CTTE department offers the only two teacher education programs at New York City College of Technology in two separate majors: Career and Technical Teacher Education (CTTE) and Technology Teacher Education (TE). This article will focus on the CTTE program of the department.

The mission of the CTTE program is to prepare reflective and caring technical educators for a world of technology and diversity. The conceptual framework that embodies this mission – the philosophy, purposes, professional commitments, and dispositions of the department – is grounded in the underlying themes of Professionalism, Technology, and Diversity. These three themes are further broken down into seven areas of candidate performance expectations (See Table I).

Table I: Candidate Performance Expectations	
1.	General Knowledge
2.	Professional Competency
3.	Technical Competency
4.	Competency in the Use of Technology
5.	Reflective Practice
6.	Caring Dispositions
7.	Sensitivity to Diversity.

These seven areas of performance expectations are reflected in all aspects of the professional preparation of technical educators – in course syllabi, field placements, and experiences designed to provide teacher candidates to work effectively with secondary students and the larger educational community.

Moreover, the CTTE program and its post-secondary students include the following. The State of New York confers certification in over fifty separate trade areas, including such diverse areas as agricultural, cosmetology, culinary arts, carpentry, electrical, computer repair, graphic arts, and a variety of other vocational areas. Documented, on-the-job experience of four years, plus successful completion of the required number of college level courses, results in the receipt of a NY teaching certificate.

In addition to this, the CTTE Department participates in a unique program to enable talented young students (graduates of any of the 16 CTE high schools in New York City) to gain certification. The program is called Success Via Apprenticeship (SVA). The SVA program is a cooperative effort between the New York City Department of Education, the United Federation of Teachers (UFT), and the City University of New York.

The SVA program has been operating successfully since 1984. The program was designed to prepare highly motivated graduates of the CTE high schools in New York City to become CTE teachers. The program targets candidates from minority populations, including young women, who want to pursue a career in non-traditional trade and industrial occupations such as carpentry, automotive maintenance, HVAC, electrical installation, and others.

The SVA program has three components, consisting of (1) a Teaching Internship, (2) Industrial Work Experience, and (3) Post-Secondary Academic Study.

1. The salaried **teaching internship** includes five months in a CTE high school in New York City during each 12 months of the program (90 % of a first year teacher's salary). In the school, the SVA is assigned to a mentor/teacher from whom the intern learns unit- and lesson planning, lesson presentation, classroom management, and school dynamics. The intern SVA is given many opportunities to plan and present lessons. During the third and fourth year, the intern is required to teach for one full semester.

2. To gain an initial teaching certificate in New York State, a Success Via Apprenticeship student must have a minimum of four years full-time **industrial work experience**. SVA students are placed with employers within the New York City area within their specific trade area. A network of employers in industry, government, and business provide job sites for the students. All participants complete seven months of work experience during each year of the program.

3. In the **post-secondary academic study** portion of the program, students take courses in teacher education in the CTTE Department of the New York City College of Technology. Each student is required to complete 44 credits of coursework during the five and one half years in the program. A total of 62 credits is required for State certification. A number of the SVA students continue on at NYCCT to receive their bachelor's degree (123 credits) after they receive their initial certification and begin teaching. SVAs are committed to teach a minimum of five years in the NY City Public Schools as part of their commitment to the program and in return for the salary received and no cost tuition at New York City College of Technology. The SVA program completion rate has averaged over 90% since the program's inception.

Let us make a few comments on each of these components.

Internship and student teaching are a key component in the Success Via Apprenticeship experience as well as in the experience of other CTE students who are not SVAs. The CTE internship consists of one semester in a CTE High school for a minimum of two days a week, six hours a day. Interns are assigned a mentor at the school who provides direction and assistance. Interns are supervised by a New York City College of Technology faculty member who visits and observes a lesson twice during the semester.

A *mentor or cooperating teacher* is a full time, tenured member of the high school facility who agrees to serve in a "mentoring" capacity to the student teacher. Mentoring includes guiding and supporting the student teacher as he or she plans, presents, and evaluates lessons.

Jackson and Bruegmann (2009, p. 106) have presented evidence that peer influence in pedagogy exists, demonstrating the importance of veteran teachers modeling teaching excellence for novice teachers. They conclude that "novice teachers should be exposed to effective, experienced teachers."

The *college supervisor* is a member of the faculty of the NYCCT whose job includes making three observations of the student teacher during the 15 week semester. The observation is documented using a rubric (see attachment). The observation is immediately followed by a conference with the college supervisor and the points of the observation are reviewed. Student teachers are provided written copies of the evaluation that become part of their official grade in the course.

Now that we have sketched out the CTTE program, let's say a few words about the qualification process.

4. Overview of IQ/OQ/PQ Model

Qualification, in general, means fitness for some purpose, demonstrated by meeting necessary conditions or qualifying criteria. In regulated industry, for instance, "qualification" is used on the one hand in a process sense and, on the other hand, in a status sense. "Qualification" can mean the process of becoming qualified. This is "qualification" as a process, for instance "the qualification of the autoclave in room 213 is complete." Closely associated with that usage is "qualification" as a status, as in "the hiring manager said that the candidate had all the qualifications for the position."

Qualification as process can be applied to anything – equipment, instruments, facilities, and computer systems, for examples. As Ostrove (2008, p. 130) has put it, "equipment, or systems, actually used as part of the production process for the production or manufacturing of a pharmaceutical or medical device product must be qualified prior to its use." It can also be applied to personnel. Ostrove also acknowledges (2008, p. 130) that "the term 'Qualification' appears twice in Title 21 of the CFR: 21 CFR 211.25 –

Personnel qualifications [and] 21 CFR 211.34 – Consultants."

According to the well-accepted approach to equipment qualification, there are three main phases to the qualification process – Installation qualification, Operational qualification, and Performance qualification.

- **Installation qualification (IQ)** is a documented process by which the physical components of a system, which may affect the quality attributes or specifications of processed material, are qualified and verified to have been installed according to design specifications.
- **Operational qualification (OQ)** is conducted to determine if adherence to predetermined operating parameters will assure that a processed product or commodity possesses the required quality attributes and meets specifications.
- **Performance qualification (PQ)** provides objective evidence that the process, under anticipated conditions, consistently produces a product that will meet all predetermined specifications.

These three phases can also usefully be applied to the process of qualification of personnel (Welty, 2010, pp. 84-85). In the case of teacher preparation for CTE, these phases would consist of the following.

- **IQ** means providing objective evidence that ensures that the prospective program participant has the requisite education and background for the relevant tasks. If the teacher preparation program lists several prerequisites, documented evidence must indicate that the prospective student has completed each of these.
- **OQ** means providing objective evidence that the program participant can function in the classroom situation (event) in an appropriate fashion. In a teacher preparation event, for example, this means the performances of the student teacher are within the "control limits" set by the program. In the last analysis, this means that the student teachers can perform the task(s) correctly and independently.
- **PQ** is the monitoring of the newly certified teacher's performance to provide objective evidence that these activities consistently produce outcomes that meet the standards set by the program – that means activities in the classroom or lab subsequent to the teacher preparation process.

Once the process of employee qualification is successfully completed, employees are qualified, and remain so unless and until they become disqualified.

Qualification as status, sometimes called Certification, characteristically applies to persons, i.e. human agents. For instance, an employee is sometimes designated "subject matter expert" (SME) because that employee is the originator of a new procedure. The reasoning for this practice is the following. Only a SME on a given procedure, who is a qualified trainer, can train another employee on that procedure. But who will provide the training to a new procedure? Who is to be the first mover? For a new procedure, there must be at least one SME, or compliant training will never occur. Those SMEs must be designated by management – not because they have been through a qualification process – there isn't any, but because they are the originator of the procedure, which is a status.

5. IQ – Selection Criteria and Process for the CTE Student Teachers

Assessment is, of course, a key component of any teacher preparation effort. Assessment provides objective evidence that the prospective program participant(s) have the requisite education and background for the relevant tasks. Lets briefly summarize the assessment process for CTE students, including Success Via Apprenticeship students, at this point. Further analysis will come as appropriate in the discussion of Operational Qualification and Performance Qualification. As noted earlier, the CTTE Department of the New York City College of Technology offers two bachelor's degrees: Technology Education (TE) and Career and Technical Education (CTE). A number of key assessments are common to both programs (See Table II).

Table II: Assessments of CTE and TE Students
1. Teacher Education Department Admission Essay
2. Pedagogical Core Course Grades
3. NYSTCE Liberal Arts and Science Test (LAST)
4. NYSTCE Secondary Assessment of Teaching Skills Written (ATS-W)
5. Student Teaching Observation Report Form
6. Student Teaching Journal (rubric)
7. Student Teaching Reflective Essay (rubric)
8. College supervisor, cooperating teacher (mentor), and student evaluation of student teaching
9. Professional Portfolio (rubric)

Other common requirements include:

- College transcript
- Transfer GPA (if appropriate)
- Minimum cumulative GPA (2.50)
- Completion of required course with a grade of C or better (B or better in pedagogical core courses).

There are key assessments specific to each program. For the CTE program, the National Occupational Competency Test (NOCTI) is required. For TE program, the NYSTCE Content Specialty Test (CST) is required. One additional requirement for the CTE program is the Work Experience Verification Letter noting specific trade/industrial experience in the working world.

Students apply for student teaching during the semester prior to their expected participation in the student teaching process. Key course and test criteria must be met prior to a student teacher being accepted into student teaching. Essential components that must be met include minimum GPA (2.5) overall and 3.00 in Education Pedagogy courses; the successful passing of certain New York State testing requirements (e.g. the LAST-Liberal Arts and Science Test; the ATS-W-Assessment of Teaching Skills-Written) and the approval of all faculty members in the Student Teacher Approval Meeting.

It is the policy of the New York City Department of Education that all student teachers be finger-printed and cleared by the NYCDOE or an appropriate state agency prior to beginning student teaching. As this is also a New York State Education Department requirement for teacher certification, all student teachers must comply with the finger-printing requirement.

6. OQ - How do Student Teachers Function in the Classroom

Each semester begins with a mandatory student teachers meeting held three weeks prior to the start of the New York City Public School year. At this meeting, all student teachers are provided with a detailed manual containing all the requirements and necessary information for student teaching. The student teachers are addressed by the CTTE Department Chairperson and the Field Experience Coordinator.

All school supervisors (the faculty members assigned to do three observations of the student teacher) are also in attendance.

A major part of this meeting is the individual meetings of the student teachers with their school supervisors to review thoroughly the expectations and ground rules for the three observations. Student teachers are encouraged to contact their assigned school at least two weeks prior to school opening and to visit and meet with the school principal, assistant principal, and their mentor/cooperating teacher (the full time teacher at the school who will mentor the student teacher).

Once the semester begins, the student teacher must provide the CTTE department with his/her individual daily schedule. Student teachers must be at the school for a minimum of 3 days a week, 6 hours a day. It is encouraged that student teachers spend as much time as possible at the school, in excess of the mandated 18 hours a week, to better develop their skills and obtain a fuller appreciation of the teacher's job.

Assessment of student teaching is a key component of the process. As in other instructional assessments, the goal of assessment in student teaching is to improve the student's teacher's classroom practice through self-reflection. The feedback the student teacher receives from both the cooperating/mentoring teacher and the college supervisor during the post-observation conference provides the core of this self-reflection. In addition, the student teacher engages in a self-assessment of his/her own performance.

This is a process of triangulation, where the three roles – CTE faculty member, cooperating teacher, and student teacher – each provide a crucial component of the overall assessment of the student's progress towards certification. (See Figure I)

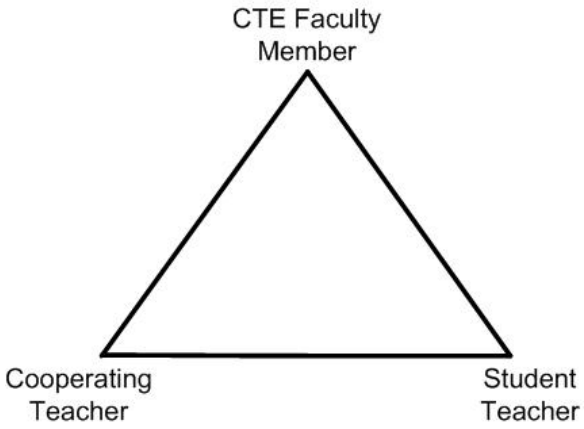

Figure I.

The key documents used in the assessment of student teachers' performance are the CTTE Classroom Observation Lesson Evaluation Form, the College Supervisor Evaluation of Student Teachers, the Mentor/Cooperating Teacher Form, and the Student Teacher Evaluation of Program form. As suggested by the triangulation model, these four forms have a substantial overlap of content (Outcomes), as can be seen in Table III. Thus, all three roles engage in assessing the student teacher's performance along a number of crucial dimensions.

Table III.
Illustrative Evaluation by

Outcomes	CTE Faculty	Coop Teacher	Student Teacher
Motivation for Lesson			
Development of Lesson Plans			
Questioning Techniques			
Classroom Management			
Use of Time			
Proficiency in Subject Matter			

Assessment should be based on clearly defined standards of performance; therefore, even if the overall evaluation is "satisfactory", feedback should include an explanation of the specific student teacher activities or behaviors that are positive as well as those that are negative. Similarly, in an overall unsatisfactory performance, feedback should include an explanation of specific activities or behaviors that are unsatisfactory and need improvement. The assessment should also point out those activities that are positive, even though the overall evaluation is unsatisfactory. (See Welty, 2007; Munyofu and Kohr, 2009)

Feedback must be documented in the observation report and must be regular, specific, and comprehensive. Additional points about the assessment process include:

- Assessment should begin when the student teacher starts teaching and continue throughout the entire lesson period;
- A post-observation conference must be held immediately following an observation by the college supervisor;
- The post observation conference is a process of honest interaction between adults;
- Failure to provide feedback that is specific, clear, and comprehensive could be given a wrong interpretation by the student teacher;
- The post observation report must be typewritten and a copy given to the student and a copy placed on file in the CTTE department; and,
- Assessment should stress growth.

Conclusion

The CTTE students, including the SVA students, have performed at a high rate in the New York State Teacher Certification Exams (NYSTCE). The pass rate of graduating candidates for the past three years has been 100%. There was one occasion, in 2004, when the pass rate was 85%. Following remediation efforts within the program mainly focused on pre-test preparation, the pass rate has consistently been 100%.

The use of the IQ/OQ/PQ model of teacher qualification allows a clarification of a process that had hitherto had the characteristics of a “black box.”

The IQ phase of this model highlights the significance of objective evidence that the prospective program participant has the requisite education and background for the relevant tasks. The OQ phase stresses the importance of objective evidence that the program participant can function in the classroom situation in an appropriate fashion. Finally, the PQ phase emphasizes objective evidence that the newly certified teacher's performance consistently produce outcomes that meet the standards set by the program.

Performance data on graduates who are now teaching in the New York City Public schools have proven difficult to quantify. Anecdotal data is very impressive regarding the number of graduates who are currently teaching; many graduates have become assistant principals, principals, and senior administrators. Efforts are presently being initiated, on the part of the CTTE department and the CUNY Office of Alumni Affairs, to better track and follow graduates. Questions have been developed and will be sent to all alumni of the program in Fall, 2012 to ascertain graduate's satisfaction level with the teaching skills that have been useful on the job. Questions will also seek to ascertain what teaching skills or abilities were not satisfactorily addressed in the program. Recent advances in electronic communication (i.e. e-mail, IM, Facebook, and other social media) will make the task more feasible in the future.

The evaluation of CTE teacher education will continue to be a critical issue in the future preparation of fully qualified and certified educators. The triangulation process, as explained in section six, may soon be enhanced by the increased use of direct video feedback in the student teaching experience. New York State is currently examining the use of direct video feedback, obtained during the classroom portion of student teaching, for use in critiquing, evaluating, and improving teaching techniques. Video feedback has long been used in college classes such as Methods of Teaching in order to provide feedback and awareness to potential student teachers. The use of video feedback in actual classroom settings has not been as widespread for a number of reasons (e.g. logistics, student confidentiality regarding video images, etc.). Should these issues be successfully addressed, as expected, this valuable evaluative/feedback tool will be employed more frequently.

This tool will add another dimension to the IQ/OC/PQ process, which is used successfully in the pharmaceutical industry, and will provide another level of objective data and analysis, which can further strengthen the overall process of preparing and successfully evaluating CTE teachers in the future.

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