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THE NATIONAL BOARD CERTIFICATION PROCESS AS PROFESSIONAL DEVELOPMENT: PERCEPTIONS ABOUT THE IMPACT THAT CHARACTERISTICS OF THE PROCESS HAD ON PROFESSIONAL GROWTH

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THE NATIONAL BOARD CERTIFICATION PROCESS AS PROFESSIONAL DEVELOPMENT: PERCEPTIONS ABOUT THE IMPACT THAT CHARACTERISTICS OF THE PROCESS HAD ON PROFESSIONAL GROWTH

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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Abstract

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Professional development is used by teachers to improve their teaching to enhance student learning, and research indicates that the National Board Certification (NBC) process contains high-quality professional development characteristics. Engagement in the NBC process can lead to professional growth by changing teachers' knowledge, instructional practices, and students' learning. This quantitative study investigated the extent to which characteristics of the NBC process influenced National Board Certified Teachers' (NBCTs) professional growth. Using an online survey, the study collected responses from 119 NBCTs who participated in a specific NBC support program. Key findings included that all 20 high-quality professional development characteristics investigated had a perceived positive influence on professional growth, with some notable differences. The characteristics involving individual analysis of

student work and teaching videos along with reflection were perceived to be most important, while those centering on collaboration with other candidates were perceived as less important. Second, characteristics that had the greatest perceived impact were those that focused on changing pedagogy rather than increasing content knowledge. Furthermore, a significant relationship was found between the perceived importance of duration in the experience and the length of time the candidate was in the process: NBCTs who achieved in one year, as compared to NBCTs who achieved in two or three years, had statistically significant lower ratings on the influence that the duration had on their professional growth. Additionally, those who engaged in the process for financial reasons, as compared to those for professional growth, had a lower rating of perceived importance when all characteristics were combined.

Chapter 1

Introduction

Educational reform became a public policy issue with the 1983 report, *A Nation at Risk* (National Commission on Excellence in Education). The report sounded an alarm on the state of schools and prompted America's politicians to call for raising student achievement. Since teaching quality is the strongest predictor of student achievement, improving teacher effectiveness became a national goal (Carnegie Task Force on Teaching as a Profession, 1986).

While teacher effectiveness can be improved by recruiting more talented people to the profession and by strengthening teacher preparation programs, a third dimension is the continued development of teachers in the field (Darling-Hammond, 2005). Professional development is the avenue by which educators learn and improve their teaching so as to increase student learning (Darling-Hammond & Richardson, 2009; Guskey, 2002; Mizell, 2010; Speck & Knipe, 2005; Zepeda, 2008). For this reason, teacher professional development is an integral part of nearly every educational reform initiative that seeks to improve student learning (Desimone, 2009; Guskey, 2009). One example of professional development that came about due to educational reform is the National Board Certification (NBC) process.

Background for the Study

The NBC process came about as a response to the 1986 Carnegie Task Force on Teaching as a Profession's publication, *A Nation Prepared: Teachers for the 21st Century*. The report, a response to a portion of *A Nation at Risk* (National Commission on Excellence in

Education, 1983), detailed large-scale reforms needed to better America's teaching quality. *A Nation Prepared: Teachers for the 21st Century* (1986) emphasized the critical role teachers play in the education of America's youth and provided suggestions for how to improve teaching. One core recommendation was to establish a national board that would develop standards of teaching excellence and design a voluntary advanced certification system to designate teachers meeting the rigorous national standards of performance. In doing so, the national board would define and recognize accomplished teaching (NBPTS, 2014a).

Hence, in 1987, the National Board for Professional Teaching Standards (NBPTS or National Board) was founded and remains today as a nonprofit, nonpartisan, nongovernmental national organization (NBPTS, 2014a). In 1989, the NBPTS published its Five Core Propositions detailing what teachers of all subjects and grade levels should know and be able to do (NBPTS, n.d.-c). The Five Core Propositions created the foundation for the vision of accomplished teaching and state: (1) Teachers are committed to students and their learning; (2) Teachers know the subjects they teach and how to teach those subjects to students; (3) Teachers are responsible for managing and monitoring student learning; (4) Teachers think systematically about their practice and learn from experience; and (5) Teachers are members of learning communities (NPTS, n.d.-c). At the core of the Five Core Propositions is that the "hallmark of accomplished teaching is student learning" (NBPTS, 2011a, p. 7).

The Five Core Propositions guided and continue to steer the NBPTS as it continuously revises and develops standards of accomplished teaching (NBPTS, 2014c). While the Five Core Propositions apply to all teachers, the Standards state the specific knowledge and skills of accomplished teaching in a particular content area with students of a defined developmental level. For each set of National Board Standards, there is a corresponding NBPTS certification.

Today, the NBPTS offers 25 certificates covering 16 content areas and four student-age groups (Appendix A; NBPTS, n.d.-b).

Using the Five Core Propositions and certificate standards, the NBPTS created an assessment system to certify teachers who exhibit the national standards of accomplished teaching. The certification process, the first of its kind for education, is rigorous, performance-based, peer-reviewed, and uses multiple valid and reliable measures (NBPTS, 2014c). Teachers prior to 2014 could opt to complete all portions of the assessment during the first year attempting achievement or complete the Take One option. In the Take One option, teachers were required to complete at minimum only one specified portfolio entry. All other aspects of the assessment process could be completed later in the three-year timeline.

In regards to the specific assessment components, from its inception in 1994 until 2001, the process included six portfolio entries and four open-ended content questions that were completed at an assessment center, hence called the assessment center exercises. In 2001, the process was altered, and until 2014 included four portfolio entries and six assessment center exercises. To enable more teachers to pursue NBC, the NBPTS revised the certification process for a third time in 2015.

In the revised assessment process, candidates complete three portfolio entries instead of four, and rather than six assessment center exercises, candidates complete three open-ended exercises and a new component of 45 select-response content questions. Additionally, teachers can now choose the order of completing entries and have a longer timeline (five years as opposed to three years) for completing the certification process. This change allows candidates simultaneously to pursue retakes while completing new components. Previously resubmissions were completed only after having submitted all assessment items. The purposes for the changes

were to provide greater access, efficiency, and flexibility for teachers wishing to pursue NBC by reducing the cost, consolidating the process into fewer components, and allowing for choice of when to complete components (NBPTS, 2014e).

While the components have altered throughout the assessment's 20-year history, the overarching intent, rigor and evaluation of the assessment components has not changed (NBPTS, 2014e). The process as a whole has teachers demonstrate their knowledge of content and pedagogy, ability to think critically about their practices, and capacity to reflect and learn from the experience. The evaluation of all components has and continues to be based on the National Board Standards of the candidate's NBC certificate, which correlate to the Five Core Propositions.

Specifically, the portfolio entries have teachers demonstrate their teaching practices and ability to increase student learning. The entries contain student work samples, videotaped lessons, documentation of professional accomplishments, and analytic-reflective writing pieces that provide a rationale for instructional decisions, judgments on effectiveness, and thoughts for the future. Teachers must demonstrate a strong command of content, an ability to design appropriate learning experiences that advance student learning, and a use of assessments to inform instructional decision-making. For the assessment center exercises, NBC candidates must demonstrate content-specific knowledge in a timed computer-based situation (NBPTS, n.d.-a).

Since 1993, when the NBPTS assessment system became operational, 110,447 teachers have achieved NBC (NBPTS, 2014d). The founding mission of the NBPTS was to advance the quality of teaching and learning by developing high standards of accomplished teaching and a process to evaluate teaching against the standards (NBPTS, 2014b). This mission was and

continues to be accomplished today as NBC is often called the "gold standard in teacher certification" (NBPTS, 2014b, para. 1) since it is the "profession's mark of accomplished teaching" (NBPTS, 2014c, para. 1) and the "most respected professional certification available in education" (NBPTS, n.d.-a, para. 2). Certification distinguishes teachers as accomplished because they have "met the highest standards in the profession" (NBPTS, n.d.-f, para. 1).

The NBPTS's Standards are the definition of quality teaching and certification is a way of recognizing accomplished teaching and teachers. Yet, in addition to advancing the teaching profession through the creation of national standards and a process to certify accomplished teaching, the NBPTS also advanced the teaching profession by developing a high-quality professional development experience (Cohen & Rice, 2005). Thus, the creation of the NBPTS provided the field of education with three interlinked components that together advance the teaching profession (Figure 1).

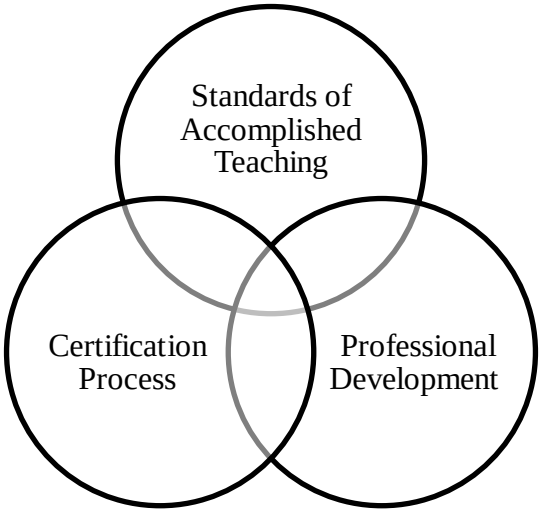

Figure 1. Results from the creation of the NBPTS.

Overview of the Literature

Defining effective professional development. In the field of education, professional development refers to the formal and informal learning opportunities educators engage in to

develop greater knowledge and skills for the purpose of addressing students' needs (Editorial Projects in Education Research Center, 2011). More specifically, Avalos (2011), who examined how 10 years of articles in *Teaching and Teacher Education* defined professional development, concluded that the consensus definition among researchers is "teachers learning…and transforming their knowledge into practice for the benefit of their students' growth" (p. 10). Since the content, design, and results of professional development experiences differ, the term *effective professional development* is used when a professional development experience leads to professional growth by demonstrating all three aspects of the definition: a change in educators' understandings and practices along with an increase in student learning (Archibald, Coggshall, Croft, & Goe, 2011; Desimone, 2009; Guskey, 2003, 2009; Mizell, 2010; Zepeda, 2008).

High-quality professional development characteristics. Research indicates that the ability of a professional development experience to lead to professional growth is linked strongly to the characteristics of the experience (Desimone, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Guskey, 2009). The views of legislation as stated in the No Child Left Behind Act of 2001 (No Child Left Behind [NCLB], 2002), 13 national education organizations (Guskey, 2003), and researchers along with experts on the topic differ about which characteristics are most important in impacting teachers' knowledge, practices, and students' learning. However, when the literature is synthesized, several high-quality professional development characteristics, those which should lead to effective professional development experiences, appear more often and include (a) being intensive, (b) being ongoing and of long duration, (c) being job-embedded, (d) being focused on student learning, (e) addressing current teaching content, (f) aligning with school goals, (g) involving active learning experiences, and (h) being collaborative in nature (Blank, de las Alas, & Smith, 2008; Darling-Hammond, Wei, Andree, Richardson, & Orphanos,

2009; Desimone, 2009; Desimone, Porter, Garet, Yoon, & Birman, 2002; Garet et al., 2001; Guskey, 2003; Ingvarson, Meirers, & Beavis, 2005; NCLB, 2002; Yoon, Duncan, Less, Scarloss, & Shapley, 2007; Zepeda, 2008). Desimone (2009) proposed that the characteristics could be synthesized into five core critical components: (a) Content focus – a focus on the subject matter and how students learn the content; (b) Active learning – the opportunity to engage in learning experiences that may include interactive feedback, discussion on teaching, and reviewing student work; (c) Coherence – a consistency with teachers' beliefs and goals as well as alignment with reforms and policies; (d) Duration – a long span of time and large number of hours spent in the activity; and (e) Collective participation – the participation of teachers from the same school, grade, or department to allow for interaction and discourse.

The NBC process as professional development. Since the purpose of the NBPTS was to define accomplished teaching and develop a method for assessing and recognizing accomplished teaching, most research has aimed to understand the validity of the certification process. Hence, most research has investigated the differences between NBCTs and non-NBCTs' instructional practices and students' achievement (National Research Council [NRC], 2008). The National Research Council (NRC) in 2008 determined that six studies provided valid research to conclude that students of NBCTs have higher student achievement and their teaching practices differ from non-NBCTs.

The question then became whether NBCTs were more effective prior to certification or if it was the process of becoming certified that impacted their knowledge and practices, and students' learning. Based on their research about the high-quality characteristics of the NBC process, Cohen and Rice (2005) suggested the latter: Certification is more than a signal of skilled teaching; NBC indicates that a teacher voluntarily participated in a high-quality professional

development experience. The NRC (2008) investigated how the process impacted teachers and their instructional practices using the limited research available: two studies and four surveys of self-reported data. Both research studies indicated that teachers learned in the process and changed their practices. This supported the survey data that indicated NBCTs felt they were better teachers due to the process. Other research not included in the NRC report (Cohen & Rice, 2005; Place & Coskie, 2006; Tracz, Daughtry, Henderson-Sparks, Newman, & Sienty, 2005) and subsequent research (Coskie & Place, 2008) support these findings. From this small body of literature on the NBC process as professional development, the active learning components of analysis-reflection and use of the Standards, along with the collaboration components of feedback and discussion with other candidates and NBCTs, have been touted as key characteristics of the NBC process for impacting professional growth.

Statement of the Problem

The general professional development literature has similarities in regards to high-quality characteristics that may lead to professional growth. However, there are criticisms of the literature. First, professional development research is conducted on specific professional development experiences that usually do not include teachers of all teaching subjects and student-age groups, and/or the research focuses on understanding a specific professional development experience available only to teachers in a particular setting. Yoon, Duncan, Less, Scarloss, and Shapley (2007) in their review of evidence on how professional development affects student achievement noted that the volume of literature is large, but the literature is limited in scope and subject. For example, in the large Garet, Porter, Desimone, Birman, and Yoon (2001) study, only math and science teachers who participated in an Eisenhower grant program were investigated. Research of this type leads to lack of knowledge about the impact of

characteristics on the professional growth of teachers in various teaching contexts and professional development settings.

Second, professional development studies often use factor analysis to understand the high-quality characteristics, merging similar elements together into a large construct. This leads to general notions about large characteristic constructs, such as active learning and collective participation, rather than a detailed understanding of specific characteristics. Moving forward with research, Guskey (2009) suggested that research would be best that focused on understanding the details of core characteristics, specifically understanding the implications of context.

The field of professional development needs more research to be conducted on the impact of the core high-quality professional development characteristics on teachers' professional growth using professional development experiences that are inclusive of more teaching contexts and settings. Desimone (2009) contends that at minimum the five core features of (a) content, (b) active learning opportunities, (c) coherence, (d) duration, and (e) collective participation should be included in all professional development impact studies because there is enough evidence to conclude these characteristics impact professional growth. By systematically including these characteristics along with other contextual characteristics, researchers will develop a better understanding about the characteristics that impact professional growth in various contexts.

The NBC process includes teachers of all content and student-age groups, and the professional development framework is similar for most participants since all NBC candidates must complete similar tasks (NBCT, n.d.-b). Additionally, the NBC process, especially when completed in a support program, usually contains the core high-quality professional development

characteristics. Thus, the NBC process is a strong choice to use for research in understanding high-quality characteristics that lead to professional growth. Criticisms of the larger research field on the characteristics of professional development are eliminated.

However, most research on the NBC process as professional development has focused on proving it impacts teachers' knowledge and practices, not on understanding what characteristics of the process are meaningful in leading to professional growth. Thus, the understanding about characteristics of the NBC process is limited and comes from research that provides an understanding about the high-quality characteristics of the NBC process as an exploratory or secondary research question. The research also uses small sample sizes, is qualitative, and is specific to a certificate area (Coskie & Place, 2008; Lusick & Sykes, 2006; Park, et al, 2007; Place & Coskie, 2006; Sato et al., 2008; Tracz et al., 2005). Cohen and Rice's (2005) research specifically on the characteristics of the NBC process and their impact on professional growth is the most beneficial. However, it only provides a qualitative overview of characteristics mentioned in small focus groups and interviews. The magnitude of difference in importance of characteristics leading to professional growth was not investigated, nor were large numbers of NBCTs used in the study.

Rationale for the Study

There is a gap in the general professional development research on high-quality characteristics of professional development experiences. Research available does not discuss the relative strength core characteristics have on professional growth, and there is a need to understand the intricacies of the core characteristics at a deeper level. Additionally, most research does not include teachers of diverse content and student-age groups in a variety of settings (Yoon, et al., 2007).

The use of the NBC process as a vehicle for understanding the core high-quality characteristics of professional development resolves criticisms of the current research due to its implementation nationally with teachers of various teaching contexts. Additionally, the small body of research on the NBC process as professional development suggests that active learning components of analysis-reflection and the use of the Standards, along with the collaboration components of feedback and discussion, are influential in leading to professional growth. However, the little research on the NBC process as professional development that alluded to these notions investigated the characteristics as a secondary research question, and due to research methodologies, it is difficult to make generalizations regarding the results.

Research on the NBC process as professional development is needed because it can add to the larger body of literature on high-quality characteristics of professional development. To allow for greater generalizations, the research should (a) be focused on understanding core characteristics at a deeper level along with their relative strength in leading to professional growth, (b) use larger sample sizes, (c) be quantitative, and (d) include all certificate areas..

Significance of the Study

Having a greater understanding about elements of a professional development experience that can lead to professional growth is important for the education community. As school districts develop or revise their professional development frameworks and policies, understanding the relative impact that characteristics have on teachers' professional growth and having a deeper understanding of the core characteristics is valuable, especially when the information is applicable to teachers of various teaching contexts.

Purpose of the Study

This study did not aim to prove the impact of the NBC process on professional growth but rather investigated the characteristics leading to the growth. The purpose of this study was to investigate NBCTs perceptions about the specific characteristics of the NBC process that impacted their professional growth and the characteristics' relative levels of impact. The study aimed to understand perceptions of what and the degree to which, not why, aspects of the NBC process were important in leading to professional growth. Specifically, the study investigated the general professional development literature's core high-quality characteristic constructs and the NBC process as professional development literature's conjectures regarding characteristics within the active learning and collaboration core constructs (Cohen & Rice, 2005; Coskie & Place, 2008; Lusick & Sykes, 2006; NRC, 2008; Park, et al, 2007; Place & Coskie, 2006; Sato et al., 2008; Tracz et al., 2005). The study then further aimed to determine if demographic variables varied with differences. The study differed from previous NBC professional development research as it employed a research design that (a) used a larger sample size, (b) was quantitative, (c) was not specific to a certificate area so as to capture teachers in all contexts, and (d) had a primary focus on understanding the elements of the process that led to professional growth.

Research Questions

The following research questions served as the focal point of this study:

1. What do NBCTs perceive was the extent of impact the characteristics of the certification process had on their professional growth?
2. What are the differences among NBCTs' perceptions of a characteristic's impact on their professional growth?

3. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years in the classroom prior to beginning the certification process?
4. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years pursuing NBC?
5. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the primary motivation for pursuing NBC?

Methodology

This quantitative non-experimental study used an electronic survey developed by the researcher. The survey gathered demographic information about the participants and used a Likert-type scale for participants to rate their perceptions about the extent of impact 20 characteristics of the NBC process had on their professional growth. The 20 characteristics were based on a review of the general professional development literature and specific literature on the NBC process as professional development. Before the survey was used in the study, it was piloted, underwent expert review for content validity, and was field tested for reliability.

A nonprobability purposeful-convenient sampling approach was used to determine participants for this study. All participants were NBCTs who had certified in the past 10 years (2005-2014) and participated in a specific National Board support program. By surveying only the support program participants, there was no considerable difference in the professional development experience, and all participants experienced the collective participation constructions. By eliminating NBCTs who had renewed, the confounding variable of the renewal process was eliminated. Since the date of participation in the NBC process varied among participants, data analysis included ensuring that length of time since certification did not influence ratings.

Findings and Conclusions

Key findings included that all 20 characteristics of the NBC process investigated had a perceived influence on NBCTs professional growth; however, not all characteristics had the same perceived amount of impact. The characteristics were grouped based on non-statistically significant different means; following this, estimated effect sizes between groups were determined. Four tiers of characteristics emerged. Characteristics within each tier had similar perceived influence on professional growth; characteristics in different tiers had different perceived real-world strength in influencing professional growth.

Using the tiers, conclusions were drawn. First, and most notably, individual characteristics were perceived as more powerful than collaborative, and within the collaborative construct, some characteristics had greater importance than others. Those characteristics involving individual analysis of teaching videos and student work along with reflection were perceived to be most important, those involving feedback and sharing of knowledge were second-tier, and those centering on collaborative analysis with other candidates were perceived as third-tier. Second, the NBC component of reflection did not solely have the most perceived influence; other characteristics such as analysis of videos and students' work/data, along with planning lessons and engaging in the portfolio writing process, were perceived as similarly important. Third, the use of the NBPTS' Standards was second tier, but closely intermingled with the importance of reflection. Lastly, characteristics with the greatest perceived impact were those focused on changing pedagogy rather than increasing content knowledge.

Additional data analysis indicated that the number of years in the classroom prior to pursuing NBC did not vary with the perceived impact characteristics had on professional growth. Furthermore, the number of years spent pursing NBC did not vary with the overall rating of

characteristics, but did vary with the perceived impact that duration of the experience had on professional growth. Specifically, NBCTs who achieved in one year, as compared to NBCTs who achieved in two or three years, had statistically significant lower ratings on the influence that the duration had on their professional growth. However, it was unable to be determined if the mediating variable was the Take One process or the resubmission of entries. Lastly, between NBCTs who went into the process for financial gain versus NBCTs who engaged in the process for improving their teaching, there was a statistically significant difference in the perceived impact characteristics had on professional growth. Specifically, the collaborative constructs regarding discussion of the Standards and feedback from NBCTs indicated statistically significant differences.

Chapter 2

Literature Review

This chapter presents a critical review of literature related to professional development characteristics and the National Board Certification process as a form of professional development. First, the literature on professional development, specifically the characteristics of high-quality professional development that should lead to effective professional development, is presented. Secondly, the National Board Certification process is explored, specifically the research on it as a form of professional development.

Method for Literature Review

A systematic review of literature was conducted through various means. Electronic database searches were conducted through EBSCOhost Research Databases (Academic Search Complete, eBook collection, Education Policy Analysis Archives, Education Research Complete, Teacher Reference Center), ProQuest Research Databases (Dissertations and Theses Full Text; ERIC: Educational Resources Information Center), and PsycINFO. The combination of the following specific keywords and phrases was used to find the most relevant sources for this review of literature: National Board Certification (or NBC or NBPTS or National Board for Professional Teaching Standards or National Board) and professional development (or professional learning or staff development or teacher learning). A search of Google Scholar using the same terms was used to widen the types of documents reviewed to include books and other text formats such as policy documents, reports, and research briefs. A review of reference

lists from relevant texts revealed additional readings. Web sites of the educational organizations Learning Forward and the National Board for Professional Teaching Standards were searched, and the researcher consulted with experts in the field throughout the literature review process.

Defining Effective Professional Development

"The most important factor contributing to a student's success in school is the quality of teaching" (Mizell, 2010, p. 1) and professional development is the most effective strategy for ensuring great teaching (Mizell, 2010). Professional development, sometimes called staff development, in-service training, professional learning or continuing education (Bredeson, 2003; Mizell, 2010), broadly refers to formal and informal learning opportunities in which educators engage (Desimone, 2009). Professional development may develop teachers' knowledge and skills; however, it should also directly impact their teaching and students' learning (Mizell, 2010). Avalos's (2011) examination of articles from 2000-2010 in *Teaching and Teacher Education* found that the core understanding of professional development was "teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students' growth" (p.11). The ultimate goal or outcome of professional development experiences should be that student learning increases from an educator's learning. Guskey (2003) stated that improvement in academic as well as affective and behavioral student outcomes, as determined by using various indicators such as assessment results, portfolios, standardized test scores, attendance rates, student attitudes, and participation in school activities, must be the "principal criterion" (p. 750) of professional development effectiveness. Thus the term *effective professional development* includes only those experiences which impact teachers' knowledge, skills, and practices, and demonstrate impact on student learning (Avalos, 2011; Desimone, 2009; Guskey, 2002; Learning Forward, 2011).

When describing the process of how professional development impacts teacher change and student learning, some presume the professional development experience is linear (Figure 2): It first impacts teachers' knowledge and beliefs, next their practices, and lastly student learning (Speck & Knipe, 2005). Yet Guskey (2002), who found that experienced teachers seldom are committed to new teaching practices until they have seen success, developed a model of professional development (Figure 3) that demonstrates first a change occurs in the teacher's practices, and then, because of student success, changes occur in the teacher's knowledge and beliefs. Other models see the relationship as a fluid cycle (Figure 4) with movement going in all directions (Desimone, 2009; Learning Forward, 2011). No matter the framework, both theory of teacher change (professional development impacts teachers' knowledge, beliefs, and skills) and theory of instruction (change in teachers' practices impacts student learning) are considered (Desimone, 2009).

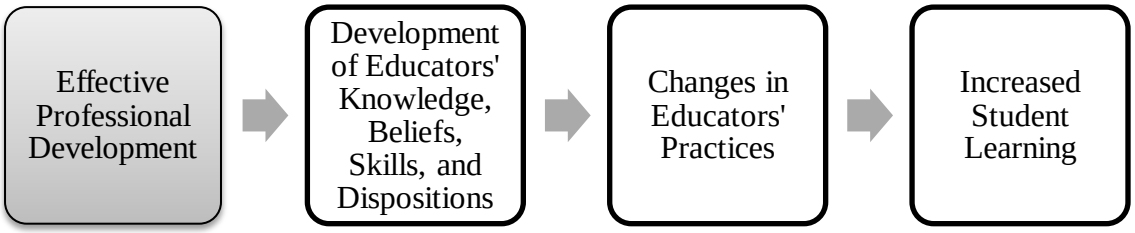

Figure 2. Linear model of the outcomes of effective professional development.

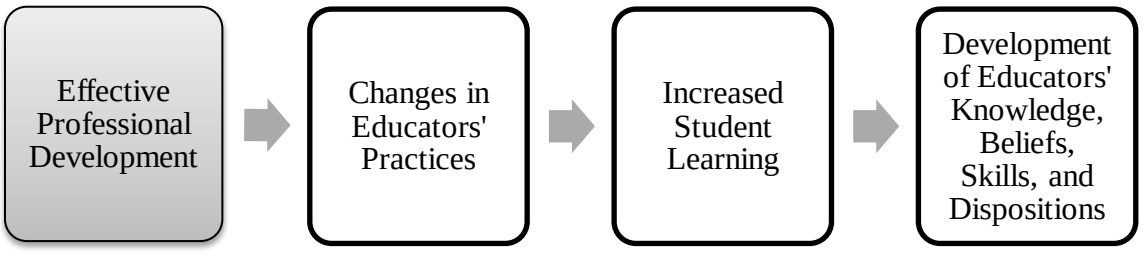

Figure 3. Guskey's model of the outcomes of effective professional development.

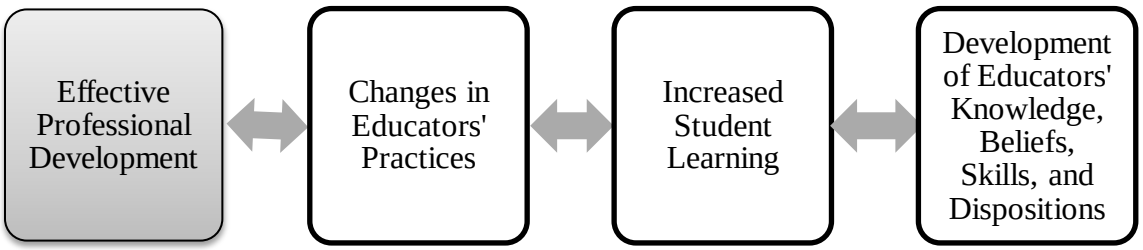

Figure 4. Fluid model of the outcomes of effective professional development.

Characteristics of High-Quality Professional Development

Rather than focus on researching types or formats of learning experiences (e.g., workshop, study group, action research), researchers should study the critical features of professional development experiences (Desimone, 2009; Garet, et al., 2001). This is because the characteristics of an activity are what "make it effective for increasing teacher learning and changing practice, and ultimately for improving student learning" (Desimone, 2009, p.183). Yet, just as there is no agreement on the model for effective professional development, there is no firm agreement among the federal government, education organizations, and scholars on the specific high-quality characteristics that lead to effective professional development outcomes of changing teachers' knowledge, instruction, and students' learning.

A legislative view. In 2001, the federal government provided a legislative definition of the term professional development. The definition, written as part of the No Child Left Behind Act of 2001 (NCLB; NCLB, 2002; Appendix B) was created by Learning Forward and based on the organization's *Seven Standards for Professional Learning* (Learning Forward, 2011; Appendix C). The NCLB statute states the characteristics that should be included in a professional development experience for it to be considered high-quality, with the intent that these elements will lead to effective professional development experiences. The federal definition emphasizes high-quality professional development experiences as experiences that

- are sustained, intensive and classroom-focused;
- are not one-day or short-term workshops or conferences;
- improve and increase teachers' knowledge of the academic subjects the teachers teach; and
- improve teachers' use of data and assessments to inform instruction and classroom practice (NCLB, 2002).

National organizations' views. Professional organizations have created lists of characteristics which specify the elements that should be included in a professional development experience to consider the experience *high-quality*, an experience which should be effective and impact teachers' knowledge, their instructional practices, and students' learning (Guskey, 2003). In 2003, Guskey examined 13 of these lists published by organizations such as the American Federation of Teachers, Association for Supervision and Curriculum Development, Educational Research Service, Eisenhower Professional Development Program, National Governors' Association, National Institute for Science Education, Learning Forward and the U.S. Department of Education. Guskey's goal was to determine the extent to which the lists agreed on high-quality professional development elements and the research on which they were based.

Guskey's (2003) conclusion was that the combined lists included 21 features of high-quality professional development with the most frequently cited characteristic of enhancing teachers' specific content and pedagogical knowledge. The provision of sufficient time and promotion of collegiality along with collaborative exchange were also consistently noted. Most lists stressed using evaluation procedures and that professional development should be school or site-based.

Research-based evidence. While research on professional development began over 30 years ago, it is still in its infancy (Joyce & Calhoun, 2010). This has led to the various notions about what characteristics make an experience high-quality. For decades, research focused on documenting teacher satisfaction or attitude change rather than in understanding the process or results (Desimone, 2009). However in the last decade there has been a call for more empirically valid research studies (Desimone, 2009).

Self-reported surveys. Most data on features come from teachers' self-reported surveys about their learning, changes in practices, and sometimes their beliefs about student outcomes. A large-scale research study on the effects of different characteristics on teachers' learning and teaching practices, but not student learning outcomes, was conducted by Garet et al. (2001). Using a self-reported survey, conducted as part of the national evaluation of the Eisenhower Professional Development Program, from approximately 1,000 math and science teachers who participated in diverse professional development activities, the researchers analyzed six features: reformed or traditional format, duration of activity, collective participation, content focus, active learning, and alignment with teachers' work. Using a regression analysis, the researchers controlled for teacher and school characteristics such as minority enrollment, percent of free and reduced lunch students, gender, grade level, and years teaching to determine the relationship of features on self-reported teacher learning.

The results were that the experience should

- have a focus on content;
- be coherent with teacher work;
- engage collective participation;
- be of longer duration and intensive, as measured by the number of contact hours; and

- have active learning opportunities that are integrated into teachers' daily work.

The researchers found that the format of the professional development experience did not directly affect teacher learning; the effect of format operated indirectly through the experiences' characteristics. Reform formats (professional development that is part of a teacher's daily work; e.g. study groups, mentoring, or coaching) typically impacted teacher learning more than traditional formats (professional development that takes place outside of the teacher's school/classroom, uses an expert, and has participation at scheduled times; e.g. workshops, institutes, courses, conferences) because reform professional development formats tend to be of longer duration. Traditional formats of the same duration as reform formats had the same impact on teacher learning. Thus, the authors concluded that to improve professional development, the focus should not be on the format, but rather on the core features (Garet et al., 2001).

Desimone, Porter, Garet, Yoon, and Birman (2002) conducted a second non-intervention study to build upon their first and aimed to use the same measures with longitudinal data. The researchers used a purposefully selected sample of math and science teachers from three schools (elementary, middle, and high) in 10 districts where the schools and districts had used various formats of professional development. Teachers were surveyed at three points in time to provide data pertaining to three school years (1996-1999), and only data from teachers who completed all three surveys were included in the results. The results replicated the national cross-sectional study demonstrating key features of professional development that were effective in changing teachers: long duration, intensive, collective participation, active learning, and embedded in teachers' work.

A study similar to the first Garet et al. (2001) study was conducted by Ingvarson, Meirs, and Beavis (2005) in Australia. Using a national survey of 3,250 teachers with 10 years or more

of teaching experience who experienced professional development in a variety of content areas, not just math or science, the authors aimed to understand through regression analysis the factors most impacting teacher learning, teacher practice, teacher efficacy, and student outcomes. This study differed from Garet et al.'s (2001) study in that it was larger, more diverse in content areas, used only teachers with significant experience, and attempted to additionally link efficacy and student outcomes. In Ingvarson et al.'s (2005) study, the researchers did not look at the coherence of the professional development activity with a teachers' work, but did include the mediating variable of professional community development.

The findings corresponded with Garet et al. (2001) noting that duration and contact hours were considered by teachers the most influential structural features and the opportunity to learn variables of content focus, active learning, follow-up, collaborative examination of student work, and feedback on practice were the most significant on impacting teacher knowledge. Teacher learning was also enhanced to the extent to which the level of professional community in the experience, a mediating variable, was increased. The strongest influence on teacher efficacy was the extent to which teachers believed the professional development impacted their students' learning outcomes.

Meta-analysis data. Evidence of teacher learning, changes in practices, and increased student learning is difficult, especially linking each to a professional development experience and the characteristics of the experience. Additionally the results "about what happened at one time in a single school or district may be interesting" but they do not justify broader generalizations (Guskey & Yoon, 2009, p. 498). Thus, there is power in meta-analysis because a meta-analysis can demonstrate strong patterns over time and through multiple types of studies (Blank & de las Alas, 2010).

In a 2007 report conducted by scholars from the American Institutes for Research on 1,343 studies that potentially addressed the effect of professional development on student learning, only nine studies provided causal evidence meeting the What Works Clearinghouse standards, standards set by the U.S. Department of Education to provide educators, policymakers, researchers, and the public with scientific evidence about what works in education (Yoon et al., 2007). Of the nine studies, all focused on elementary schools, only five had a randomized control group, and only six were published in peer-reviewed journals. Additionally, the maximum number of teachers involved was 44, students 779.

The authors of this review, supported by the U.S. Department of Education, noted using these few studies, that they were unable to discern a decisive pattern in characteristics of professional development that had a collective causal effect on student achievement (Yoon et al., 2007). However, there were several common elements of which some differed from characteristics frequently noted in other literature. The first was that all studies included workshops or summer institutes that focused on implementation of research-based instructional practices, included active learning experiences for participants, and allowed teachers' to adapt the practices to their unique teaching experiences. Secondly, the professional development programs used outside experts instead of train-the-trainer, peer coaching, or school-based learning experiences models to facilitate the professional learning experience. The authors did note the latter models may be effective, but that the What Works Clearinghouse did not have empirical evidence for it. The analysis confirmed that effective professional development requires considerable time, at minimum 30 contact hours, but cautioned that the time must be purposeful, well-organized, carefully structured, and focused on the specific content area. Structured and sustained follow-up in the form of job-embedded assistance for educators at all

levels demonstrated an increase in student learning. Additionally, student learning increased when the experience focused directly on influencing the teachers' content knowledge and pedagogical skills.

Yoon et al. (2007) stated that a larger number of rigorous causal studies would have helped. This meta-analysis did not indicate that other factors had no effect but instead illustrated that there is no causal scientific evidence determining other factors' impact. To obtain more studies meeting the What Works Clearinghouse standards, the authors suggested that researchers use a quasi-experimental design, provide baseline data for the equivalence of the comparison and treatment groups and look deeper at both the direct effect of the professional development on teachers and the indirect effect on students.

Similar to Yoon et al. (2007) in analysis time period, in 2008 the Council of Chief State School Officers published their review of the evaluation studies conducted on math and science teachers' professional development programs from 2004-2007 (Blank et al., 2008). None of the 25 studies, across 14 states, of which eight had significant, measurable impacts on teacher practices and student outcomes, were included in the Yoon et al. (2007) study because these studies did not meet the What Works Clearinghouse criteria. Blank, de las Alas, and Smith's (2008) examination determined from these studies that effective professional development had the common characteristics of

- a strong focus on content and content-pedagogy;
- active learning methods;
- sufficient duration of time, with an annual duration of more than 100 hours;
- explicit, coherent links to the teachers' work;
- elements of collective participation; and

- school-based format allowing for follow-up and alignment with school curriculum.

Using less stringent criteria than causal relationships like Yoon et al. (2007) and more comprehensive in scope than professional development for only math and science teachers as in Blank et al. (2008), Learning Forward supported another comprehensive study. Conducted by Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009), and reviewed and edited by Yoon, the researchers conducted a three-part multi-year study on professional development at the School Redesign Network at Stanford University. In the first portion, "Professional Learning in the Learning Profession," of the larger three-part study, *The Status of Professional Development in the United States*, their aim was to examine the nature of professional learning opportunities and to use the information about characteristics to provide policymakers, researchers, and school leaders with a research base of understanding about what leads to powerful learning, instructional improvement, and student learning.

Darling-Hammond et al. (2009) concluded from the meta-analysis of both quantitative and qualitative studies that five principles should be considered when developing effective professional development. Professional development should

- be intensive, sustained, in a continuous manner over time, and connected to practice;
- address the teaching of the specific curriculum content;
- align with school improvement goals;
- build strong working relationships with teachers; and
- be designed to engage teachers in active learning which links to analysis of teaching and student learning.

Throughout the report, Darling-Hammond et al. (2009) referred to specific professional development formats that usually implement these five principles: critical friends groups,

professional learning communities, study groups, and the National Board Certification process. In the second report, more research on professional learning communities, peer learning, and literacy coaching were presented to support the same findings. In that second report and the subsequent report, the focus was not on characteristics of professional development that lead to impacting teachers and students' learning, but rather on the differences between states in the professional learning opportunities available and professional development policies (Jaquith, Mindich, Wei, & Darling-Hammond, 2010; Wei, Darling-Hammond, & Adamson, 2010).

Scholars' views. Drawing upon the meta-analysis data and published research, scholars in the field have produced articles, books, and policy pieces to guide educators. Darling-Hammond with McLaughlin (2011) in their policy piece regarding policies that support professional development, state that professional development "involves teachers both as learners and as teachers" (p.82) so it must

- engage teachers in assessment, observation, and reflection tasks;
- be grounded in participant-driven inquiry, reflection, and experimentation;
- be collaborative, involving a sharing of knowledge among educators;
- be derived and connected to teachers' work with their students;
- be intensive, ongoing, sustained, and supported with modeling, coaching, or the collective solving of problems of practice; and
- be connected to school change.

Zepeda's (2008) *Professional Development: What Works*, a research compilation on professional development, states concepts similar to Darling-Hammond and those of Speck and Knipe (2005) in their research compilation, *Why Can't We Get it Right? Designing High-Quality*

Professional Development for Standards-Based Schools. Zepeda stated that high-quality professional development

- is job-embedded and meaningful to teachers' work;
- is focused on student achievement and long-term solutions;
- is collaborative;
- is sustained over a long period;
- is teacher-reflective;
- entails authentic, active learning experiences;
- provides support for teachers;
- is inclusive of subject-matter content; and
- measures the impact on student learning.

Desimone (2009), in her piece to educational researchers on improving the quality of research on teacher learning, noted "determining whether there is an established consensus on the core features of high-quality professional development is not an exact science" (p. 183). This is because distinguishing ideas grounded in conventional wisdom from those based on theory or empirical evidence is difficult. In professional development research, often all three intermingle. However, she continued by stating her belief that there is enough empirical evidence to create a core set of five elements that should be included in studies on professional development effectiveness. The list of five key aspects of effective professional development includes that professional development

- be content focused;
- use active learning;
- be coherent with teachers' work;

- be ongoing; and
- involve collective participation (Desimone, 2009).

Desimone (2009) stated that if these five core features were regularly measured in empirical studies of professional development, the field would move forward in building a consistent knowledge base.

As a response to the differing viewpoints and meta-analyses, the National Comprehensive Center for Teacher Quality in 2011 released a research and policy brief with intent to inform state and district leaders on how to select professional development activities when allocating money (Archibald et al., 2011). Using the research of the self-reported surveys by Garet et al. (2001) and Desimone et al. (2002), along with the meta-analyses of Yoon et al. (2007), Darling-Hammond et al., (2009), and Blank et al.(2008), the brief states that high-quality professional development should have the five characteristics of

- being aligned with school goals, state and district standards and assessments, and other professional learning opportunities including formative teacher evaluation;
- being focused on core content and modeling of specific pedagogical content teaching strategies;
- including opportunities for active learning of new teaching strategies;
- providing opportunities for collaboration among teachers; and
- including embedded follow-up and continuous feedback.

Summary of characteristics of effective professional development. There are similarities in the literature on the characteristics of a professional development experience that influence professional growth. However, the research basis for the conclusions often does not traverse all content and grade levels of teaching. Additionally, studies that focus on

understanding characteristics typically investigate large structural and opportunity to learn concepts, not the small details of the constructs.

National Board Certification as Effective Professional Development

An indicator of accomplished teaching. With its inception in 1987, the purpose of the NBPTS was to define standards of excellence in teaching and to develop a system for certifying teachers who meet the standards. The guiding premise was that student learning would be the "hallmark of accomplished teaching" (NBPTS, 2011a, p. 7) and that National Board Certification would be the national standard of accomplished teaching. The rigorous and peer-reviewed process distinguishes accomplished, effective teachers and demonstrates that a teacher has the "knowledge and skills necessary to advance student learning and achievement" (NBPTS, n.d.-f, para. 2). Thus, during the first decade of existence, research on NBC focused on understanding whether the NBPTS had met its goal. Does the certification process certify accomplished teaching? Using evidence from examining NBCTs' teaching practices and achievement data, the NRC (2008) concluded that the NBC process provides a systematic way of identifying accomplished teachers.

Use of teaching dimensions. In a seminal investigation to provide construct validity evidence, Bond, Smith, Baker and Hattie (2000) sought to evaluate whether NBCTs exhibited a difference in their use of the accomplished teaching standards. The study examined teachers' classroom practices, not achievement scores, and compared the practices of NBCTs to non-NBCTs. Sixty-five teachers (31 NBCTs and 34 non-NBCTs who attempted the middle childhood generalist or early adolescence English language arts certificates) from five states were observed, their students' work reviewed, and their students interviewed and surveyed before being rated on 15 identified dimensions of accomplished teaching. The dimensions

chosen came from a thorough literature review that validated the teaching qualities assessed on the NBC assessments. NBCTs had significant differences in 11 of the 15 dimensions indicating that NBCTs in the study demonstrated more use of the accomplished teaching standards than non-NBCTs.

A similar study by Smith, Gordon, Colby, and Wang (2005) aimed to build on the prior work of Bond et al. (2000). The study used a different sampling technique and compared student work samples and instructional materials of 64 NBCTs and unsuccessful NBCT candidates from a greater number of states, 17. The results concurred with Bond et al. (2000) that NBC does designate accomplished teaching when based on evaluating teaching practices using standards.

Since these construct validations, research on the differences in NBCTs, their teaching, and effectiveness has continued. Specifically, researchers conducted investigations in an attempt to link student achievement data to accomplished teaching. A myriad of results ensued.

Use of student achievement data. In 2006, 12 years after the start of NBC, the United States Congress with the support of the U.S. Department of Education commissioned the NRC to synthesize the research and evaluate the impact of the NBPTS's efforts. The result was the NRC's 2008 report, *Assessing Accomplished Teaching: Advanced-Level Certification*, written by the NRC's Committee on Evaluation of Teacher Certification by the NBPTS. One of the NRC's (2008) research questions investigated the effect of NBCTs on student learning. The investigators stated that the task was "more difficult than we had anticipated because…little valid evidence is available" (p.252) due to researchers' methodological problems. Thus the NRC's (2008) evidence base was "neither broad nor deep" (p. 3) even though research on the effect of NBCTs on student learning had generated the largest numbers of studies within the realm of NBC research. Most research available focused on student achievement, not student

learning, by comparing achievement test scores of students taught by non-NBCTs to those of NBCTs.

Using studies that controlled for school and student variables, the NRC (2008) reviewed 10 studies (Table 1). Of these, three were judged to have sample sizes too small combined with other methodological limitations, and so they were eliminated from the review. The other seven studies used were methodologically sound, but the NRC (2008) cautioned generalizations since the research (a) was only from Florida, North Carolina, and one Los Angeles, CA school district; (b) focused only on reading and math achievement; (c) involved only third to fifth graders; and (d) defined student learning narrowly, using only standardized test scores. Albeit, as a group, the NRC (2008) determined that a relationship, although not strong or consistent across contexts, existed: Students of NBCTs had higher achievement test gains indicating NBCTs are "more effective than other teachers at raising their students' test scores" (p.253).

Table 1

Studies investigated in the NRC (2008) Report on NBPTS

Author and year	Status in NRC (2008) report
Cantrell, Fullerton, Kane, & Staiger, 2007	Used
Cavaluzzo, 2004	Used
Clotfelter, Ladd, & Vigdor, 2006	Used
Clotfelter, Ladd, & Vigdor, 2007	Used
Goldhaber & Anthony, 2007	Used
Harris & Sass, 2006	Used
Sanders, Ashton, & Wright, 2005	Used
McColskey et al., 2005	Not used
Stone, 2002	Not used
Vandervoot, Amrein-Beardsley, & Berliner, 2004	Not used

An effective professional development experience. The NBC process is considered high-quality professional development because it incorporates characteristics from the literature

about high-quality professional development. Cohen and Rice (2005) evaluated the NBC process against six common principles of high-quality professional development:

- vision;
- intensity and duration;
- intersection of content and pedagogy;
- content derived from analysis of disaggregated data;
- job-embedded learning; and
- collegiality and collaboration.

The evaluation determined that the NBC process is a model of professional development as it aligned with these six principles from high-quality professional development literature:

- The process has a vision and system of standards used for measurement;
- The NBC process is long and intense, and depending on the support program, the intensity can be substantial;
- The NBC process requires teachers to focus on content and pedagogy, providing opportunities for teachers to refresh or increase their knowledge and skills;
- The portfolio process requires teachers to reflect on data and explain how it is being used to change instruction and increase student learning;
- The requirements of the process are connected to candidates' classrooms; and
- The portfolio entry on documented accomplishments forces candidates to reflect on how their work with peers and families impacts students. Additionally, candidates in a support program have the addition of working in a collaborative learning environment.

The question remains whether the high-quality professional development characteristics lead to effective professional development, that which changes teachers' knowledge, practices, and students' learning. There are two perspectives on teaching effectiveness and the NBC process. The first is that NBC is a signal of a teacher's preexisting effectiveness. The second is that the NBC process is a form of effective professional development that leads to change in a teachers' knowledge, practices, and students' learning (Goldhaber & Anthony, 2007; NRC, 2008).

The original intent of the NBPTS does not indicate that the creators envisioned teachers' knowledge and practices and student learning to change as a result of the process (NRC, 2008). Yet, research on: (a) motivation for pursuing NBC indicates professional growth is a priority (Belden, 2002; Hildebrandt & Eom, 2011); (b) outcomes of the process indicates that the NBC process is effective professional development because the process changes teachers' knowledge, practices, and student learning; and (c) the design of the process indicates high-quality professional development characteristics inherently lead to professional growth (Cohen & Rice, 2005).

Professional growth as motivation for pursuing NBC. Research to understand teachers' motivations for attempting NBC indicated that teachers pursued NBC because they believed it would be professional development. Belden's (2002) survey, with a response rate of 68 percent (519 NBCTs) and follow-up focus group of California NBCTs who certified in the first six years of certification (those who certified between 1994 and 2000), indicated that 79 percent of the NBCTs attempted certification because they felt it provided an opportunity to strengthen their teaching.

Hildebrandt and Eom's (2011) survey of foreign language NBCTs who certified between 2002 and 2006 (453 respondents; 53 percent response rate) indicated the same. Of five motivational factors (improve teaching; external validation; financial gain; collaborative opportunity; internal validation) for pursuing NBC, the items in the construct of improving teaching had the greatest mean (M = 4.65; SD = .10). The researchers noted the original intent was to separate the motivation factors of professional development and to improve teaching practices; however, their factor analysis indicated the two were components of the same construct: improving teaching. Teachers were motivated to become a better teacher, and this motivation did not vary with age. The items in the construct of financial gain had the second highest mean (M = 4.60; SD = 1.52) and financial motivation did vary with age.

The impact of the NBC process on student learning. When looking at student achievement data, if the NBC process changed teachers, student scores should increase. Using the student achievement data from four studies (Clotfelter, Ladd, & Vigdor, 2006; Clotfelter, Ladd, & Vigdor, 2007; Goldhaber & Anthony, 2007; and Harris & Sass, 2006), the NRC (2008) attempted to answer the question as to whether the process indicates or develops accomplished teaching. The studies' results of student achievement change from prior, during, and after the NBC process indicated some students' scores went up, some went down, and some stayed the same. This indicated that most likely the process does both: it certifies and develops accomplished teaching. Thus, the NRC (2008) stated that researchers may need ways other than using student achievement data to link the NBC process to changing students' learning.

The impact of the NBC process on teachers' knowledge and practices.

Research included in the NRC report. In addition to looking at the change in student learning outcomes due to engagement in the process, the NRC (2008) investigated the extent to which teachers improved their knowledge and practices by virtue of going through the advanced-level certification process. The NRC (2008) found that empirical evidence to answer this question was scant. Only two studies directly investigated teachers' growth in the NBC process, with one using hypothetical situations and the other evaluating actual classroom practices. While the NRC (2008) judged that the two studies suggested teachers change as a result of the NBC process, the NRC indicated that both studies used a small sample and needed replication.

The first study, by Lusick and Sykes (2006) was a longitudinal two-year study of 120 NBC candidates, and it aimed to answer objectively the question of what teachers learn in the NBC process. This was the first step in understanding whether the process changed teachers or whether it was simply an indicator that the teachers were more effective than non-NBCTs prior to the start of the process. Since participants were not randomly assigned to engage in the NBC process, Lustick and Sykes (2006) used a quasi-experimental methodology, with pre and post measures, and the NBC process was the treatment. Three cohorts of teachers, 40 teachers from each year 2001-2002 through 2003-2004, participated to allow for cross-sectional and longitudinal data to be collected.

Teachers were given a sealed packet of artifacts relating to their certification area, adolescent and young adult science (AYA-Science), and then trained interviewers used a structured interview to ask questions that would assess teachers' knowledge of the 13 Standards for the AYA-Science certificate. These interviews were scored using a rubric by two assessors. Using a results analysis flowchart, the researchers determined there was an overall pre-post

significant difference with a moderate-strong effect size of 0.47. Since only half of the teachers certified as NBCTs, analysis indicated that teachers who did not certify also learned something from the NBC process.

The 13 AYA-Science Standards were then grouped into four subsets to determine which subset of standards had significance. Three of the four subsets revealed significant differences between pre-post measures and so the specific standards in these sets were examined more closely to determine specific AYA-Science Standards linked to changes in teachers' learning. The results indicated that the standards of scientific inquiry and assessment were most significant. The standards of goals/conceptual understanding and reflection demonstrated marginal significance. Following the quantitative analysis, the researchers analyzed the qualitative interview question responses. Using a coding scheme based on the language in the 13 Standards, the results supported the quantitative results: AYA-Science NBCTS increased their knowledge in scientific inquiry, assessment, and reflection.

Interestingly, as part of this research, but not published until 2011, Lustick also investigated candidates perceptions of the NBC process as professional development. Using a survey given pre-candidacy and immediately after completing the candidacy process, but before learning the results, candidates were asked to compare the NBC process to 15 other forms of professional development in regards to impacting student learning. The survey asked about both reform and traditional styles of professional development to include experiences of developing science curriculum, reading scientific literature, attending conferences, collaborating with colleagues, mentoring new/student teachers, taking university courses, leading a professional development workshop, sitting on an advisory committee, and participating in professional development activities at the school level. The results indicated that NBC was not perceived as

strong in perceived impact on student learning as two other types of professional development experiences: developing science curriculum and reading scientific literature. The NBC experience was rated similarly to conferences/workshops in impacting student learning, and was rated more important for impacting student learning than the other forms of professional development.

The second study investigated by the NRC (2008) was an unpublished paper. The resulting paper was published later by Sato, Wei, and Darling-Hammond (2008). Their study, unlike Lustick and Sykes's (2006) that intended to demonstrate the NBC process impacted teacher knowledge, aimed to demonstrate the NBC process altered teachers' teaching practices. Thus, Sato et al. (2008) directly measured the changes in teachers' practices, specifically related to assessment, using a comparison group study. The study tracked nine middle and high school math and science National Board candidates' assessment practices over three years (pre-candidacy, during candidacy, and post-candidacy year) and used student work, lesson plans, videotapes, interviews, and observations to compare these teachers' practices to seven similarly experienced teachers who were not National Board candidates. The sample was non-randomized and small, but the results indicated that across all the sources of data there was a substantial increase in the formative assessment practices of the National Board candidates, and the candidates attributed it to the NBC process.

The evidence came from scores in six dimensions of formative assessment on packets of data that were scored by multiple people for reliability. The NBC candidates started with lower means than their comparison teachers, had higher scores during the second year, and continued to gain significantly higher scores in the post-candidacy year. The data indicated that the variety of assessment use and teachers' use of the information from the assessments increased

substantially. While personal situations and access to other professional development activities confounded the data, the trend was consistent indicating that the NBC process had a strong influence on teachers' practices.

Of these 16 teachers, the packets of three non-NBCTs and three NBCTs were analyzed further in a case study to understand the changes. These packets and interviews indicated that the candidates attributed their changes to the Standards that lay out clear goals of practice and provide evidence for what obtaining these goals looks like. The teachers also noted the tasks engaged them in meaningful hands-on experiences and that the collegial interactions were instrumental as they afforded teachers the opportunities for collegial analysis, reflection, critique, sharing, and camaraderie. Sato et al. (2008) concluded from their study that while the NBC process was the professional development activity under study, it indicated the process of examining and reflecting on one's practice and collegial interactions were critical for professional development to change teachers' instructional practices.

Survey data included in the NRC report. Due to limited empirical evidence, the NRC (2008) looked to other sources, including survey data that asked teachers about their experience. While only subjective and self-reported, the survey evidence collected from four surveys (Indiana Professional Standards Board, 2002; NBPTS, 2001a; NBPTS, 2001b; Yankelovich Partners, 2001) indicated that NBCTs found the experience was "a worthwhile professional development activity that improved their teaching practices and stimulated them to become more reflective" (NRC, 2008, p. 192). This conclusion was based on data that indicated that 75% of teachers stated they had incorporated new instructional techniques; 92% claimed the process made them better teachers; and 89% felt equipped to create stronger curriculum and better evaluate student learning. Since the research is older, the NRC (2008) commented that they

would have liked to conduct their own survey that evaluated teachers' perceptions of the process, but had neither the time nor resources.

Research not included in the NRC report. The NRC (2008) investigated only empirical research and used large national surveys to support the research. Other studies, such as Tracz et al.'s 2005 research about teachers' perceptions about how the process impacted their practices, add to the knowledge base in understanding the professional growth of teachers. In the qualitative study of 25 teachers who engaged in the NBC process (22 received NBC certification, 3 did not), teachers were interviewed on the phone about how the process impacted their teaching. The teachers in this study were primarily from California and Ohio and participated in a support program. The study included teachers who varied in NB certificate area, and the average was 18 years of teaching experience. The results from the semi-structured and open-ended questions revealed that teachers believed their assessment practices and reflection practices had changed. Further, teachers commented on positive changes in (a) their planning, (b) use of the Standards in their teaching, (c) their accommodation of students due to an increased awareness of student needs, and (d) the amount and quality of their assessment practices.

Research since the NRC report. Since the NRC (2008) study, Coskie and Place (2008) published the results of a multi-year qualitative case study that demonstrated the same results and conclusions about the NBC process as Sato et al. (2008): The process changed teachers' thinking about assessment along with their assessment practices and this was due to the Standards and collegial nature of the activity. The primary differences in the studies were the sample groups (one was elementary literacy, the other middle/high science and math) and the type of study. Sato et al. (2008) used a quantitative approach supplemented by case studies and compared

NBCTs to non-NBCTs, contrasting the Coskie and Place (2008) study that was qualitative and looked at differences between NBCT candidates.

In Coskie and Place's (2008) study, eight elementary literacy teachers who received scholarships to participate in the NBC process with candidacy support groups were followed during their candidacy year; five remained in the study for the following year. Of the five, three certified in the first year, one in the second, and one did not certify. The focus of the study was on Portfolio Entry One, an assessment of student work. The study used interviews, artifacts, simulations, taped think-alouds and a classroom observation. The data from year two was focused on collecting information in regards to whether teachers' practices they claimed to have learned from the NBC process were manifested in their work. The researchers aimed to understand what the teachers learned about literacy through the NBC process as well as whether it was integrated into their practice post-candidacy. The data were coded based on themes relating to (a) the National Board's standard of Knowledge of Students, (b) the instruction-assessment cycle of feedback, and (c) assessment.

The results indicated that teachers learned about literacy instruction while in the first year of the NBC process and that some of the key ideas were retained a year later. Teachers were more aware of the Knowledge of Students standard that included differentiation and motivation and the tool of the instruction-assessment cycle. The researchers noted the positive influence of the candidacy support groups and that personal and external constraints on teachers' practices (such as curriculum mandates) limited the teachers' ability to integrate what they learned.

Other small research indicates that teachers' knowledge and practices change because of the NBC process. In Hunzicker's (2010) ethnographic study of teacher learning through the NBC process, three teachers pursuing the middle childhood generalist certificate from one

suburban school district were investigated. Seven interviews and four classroom observations over 12 months indicated that teachers modified their teaching to be more aligned with the Standards. Additionally, it was noted that the teachers' capacity for "intentional teaching" (Hunzicker, 2010, p. 7), both recognizing and adjusting for student individuality, changed. The major reasons for these changes were the required reflection on their teaching practices and the professional reading/preparation for the assessment center exercises.

This corresponded to Unrath's (2007) investigation of art teachers. The purpose of the investigation was to learn about art NBCTs' perceptions of how the portfolio creation of the NBC process impacted their practices. Using a survey given to NBCT art teachers before and after engaging in the NBC process, the study found that 77% of the candidates claimed to reflect formally or informally before engaging in the NBC process; but that after the process, 87% reported that they reflected more often, and 94% of the respondents considered themselves more reflective practitioners because of the portfolio creation.

Brantlinger, Sherin, and Linsenmeir's (2011) research was unique in that it specifically investigated the impact of video clubs on math teachers in the NBC process. The purpose of the research was to understand the development of a professional community, not the NBC process, using a situated learning theory construct and the conversations of five teachers from one school. Their conclusion was that collectively vetting video tapes of instruction helped the teachers grow professionally. It was not the act of watching the video that led to growth, but rather it was the discourse and vulnerability to constructive criticism. The teachers believed that they learned about instructional styles through the process because they moved from teaching in isolation to collaboration.

Similar to Brantlinger et al. (2011), Park, Oliver, Johnson, Graham, and Oppong (2007) were investigating how collegial interactions and reflection were factors in the professional growth of teachers; yet differing from Brantlinger et al. (2011), Park et al. (2007) used social constructivism as their theoretical background. The researchers used the NBC process as a vehicle for understanding the role colleagues play in professional growth. The researchers conducted qualitative research using interviews with 14 teachers, all teaching at the same high school, but in different content areas. Their conclusion was that the rigor of the NBC process facilitated teachers' collaboration with each other and enhanced their knowledge specifically about the benefits of reflection.

Rhodes and Woods (2013) proposed in their research on physical education NBCTs that the role colleagues play in professional growth through the NBC process is due to the process establishing a *community of practice*. Using the Community of Practice Theory and Complexity Theory, the researchers investigated the "nature of the mechanism" (p. 45) through which the NBC process impacts teachers' instructional practices. The authors propose that the process has environmental conditions that, "much like the hive of insects" (p. 51), the candidates follow rules that force them to adapt to the environment of the NBPTS's Five Core Propositions. In doing so, reflection and collaboration are mandatory. Then as candidates are required to think about their practices systematically, a shared repertoire of knowledge is established through the community of practice.

Place and Coskie (2006) also investigated the community of practice framework through a qualitative study of eight literacy NBCTs. The purpose of the study was to learn whether NBC candidates changed their literacy practices due to the NBC process. The study focused on candidates before, during, and immediately following the end of the candidacy year. All eight

teachers were elementary generalist NBC candidates from Washington State and attended a NBC support group; however, only three achieved NBC during the first year. All of the candidates saw the process as an opportunity to learn, and it was their primary motivation for engaging in the process. Using artifacts from the process and interviews, the researchers determined that teachers grew and that Wenger's three aspects of communities in practice (joint enterprise, shared repertoire, and mutual engagement; as cited in Place & Coskie, 2006) were observed and led to the teachers' growth. Through detailing the experiences of two candidates, the researchers suggest that the actual writing of the portfolio entries was a learning process, helping candidates to understand the Standards in relation to their practice. Another characteristic of the process that was important for facilitating growth was the portfolio directions because it provided a framework for thinking and reflecting. Lastly, the feedback from both peers and NBCTs assisted the candidates in understanding the Standards.

Dissertation research. Other small-scale dissertation research supports the notions of published articles on how the NBC as professional development changes teachers' knowledge and instruction. Standerfer's 2007 case study of three music NBCTs indicated that participants in the NBC process changed their planning and delivery of instruction and assessment processes due to their engagement in the portfolio process. Tingle's (2014) dissertation used an online survey of 125 NBCTs, who achieved in 2012 in Maryland, to compare NBC to other forms of professional development. The results of the survey indicated that 66% of the NBCTS considered the process their most valuable professional development because they regarded the process as improving their instruction and thus impacting student learning because of the reflective and analytic processes. Cast's (2014) dissertation that included 1,179 Arkansas NBCTs used an electronic survey of 20 Likert-type statements to determine that NBCTs

perceived their professional practices, students' achievement, and professional leadership were impacted by the NBC process. In particular, self-reflection and critical analysis of NBCTs' own teaching were the instructional practices believed to be most affected by the NBC process.

Sullivan's 2010 interviews of 10 NBCTs in Illinois were designed to elicit responses to allow for a better understanding of how the NBC process impacted their professional practices. Becoming a reflective practitioner was the number one theme. Buchanan's (2014) mixed-method research on 116 special education NBCTs used a constructivist framework to understand that reflection was the critical characteristic impacting professional growth. Coble's (2005) naturalistic study of seven NBCTs concluded that the NBC process of examining classroom practices was a catalyst for increased reflection and a perceived increase of focus on student learning.

The impact of high-quality professional development characteristics of the NBC on professional growth. From research specifically on what knowledge and instructional practices change, patterns emerge for what aspects of the process candidates and NBCTs perceive were important in leading to the professional growth. Two research studies specifically investigated what aspects of the process influenced professional growth.

When Cohen and Rice (2005) qualitatively investigated the NBC process as a form of professional development, interviewing candidates in focus groups (5-10 individuals from five or fewer sites – the research did not indicate a specific sample size) from eight support programs around the country, they found the following elements of high-quality professional development were consistently noted by candidates as being perceived as important for professional growth:

- Analyzing teaching practices against high-quality teaching standards;
- Preparing the portfolio entries in the current teaching context; and

- Preparing for the assessment center by refreshing and enhancing content knowledge.

The qualitative research indicated that teachers perceived they had the opportunity to grow professionally through the use of the Standards, the portfolio preparation process, and preparation for answering the open-ended questions at the assessment center. Specifically, teachers learned from examining, reflecting, and writing about their students' work because the NBC process provided the opportunity to reflect on their teaching by looking at their assignments, assessments, and student progress. NBC candidates also noted that by reviewing and writing about their videotaped lessons, they reflected on their planning and interactions in the classroom. Third, candidates perceived that the process of preparing lessons to meet the portfolio requirements encouraged them to try new lessons or techniques. For the documented accomplishments entry, candidates perceived it allowed teachers to undertake new activities that contributed to their knowledge, skills, and practices. In regards to preparing for the assessment center exercises, teachers had the potential to refresh or enhance their content knowledge due to studying by reading either new or previously studied content materials.

Thus, Cohen and Rice (2005) concluded the NBC has embedded features of high-quality professional development and teachers perceive the process allows for learning opportunities leading to professional growth. Some candidates may not see the process as professional development, but rather as a way of demonstrating their capacities. Other candidates may not take advantage of the opportunities to grow because they don't feel they need to grow. However, the opportunity to change one's knowledge, instructional practices, and students' learning is available.

In addition to investigating the aspects of the NBC process that all candidates engage in, Cohen and Rice (2005) specifically looked at additional high-quality professional development

characteristics that support programs provided. The most cited feature leading to professional growth from the support programs was interaction with others throughout the NBC process. This included interactions with mentors, other candidates, and support program staff specifically about (a) developing the portfolio entries; (b) discussing the Standards; (c) preparing for the assessment center; (d) reviewing teaching practices against the Standards; (e) conversing about requirements of the process; (f) understanding how to write descriptively, analytically, and reflectively; and (g) sharing of knowledge, materials, and resources.

Cohen and Rice (2005) noted that mentor interactions were especially important. Working individually with candidates to review and provide feedback on the portfolio requirements helped candidates make good choices about evidence to demonstrate their teaching and helped candidates clearly articulate the rationale behind their decisions. This process provided the opportunity for candidates to grow professionally because of (a) the discussion about the Standards, (b) the modeling of analysis against the Standards, (c) sharing of resources, and (d) offering of assistance with skills such as writing.

In regards to candidate-to-candidate interactions, Cohen and Rice (2005) determined that small groups were important for professional growth so that candidates could (a) discuss, review, and study the Standards; (b) share knowledge, experiences, and practices; and (c) give and receive feedback on their portfolio entries. Their research noted that the small-group interaction was important both inside and outside of formal support group meetings.

Cohen and Rice's (2005) *National Board Certification as Professional Development: Design and Cost* research had limitations. In the first qualitative portion of the study, large numbers of candidates were not involved, and the candidates chosen for the focus groups were hand-picked by the support program coordinators. The researchers looked for characteristics of

the process that candidates perceived impacted their professional growth but did not attempt to determine a ranking order for which characteristics candidates perceived were more or less important than others.

In the second phase of the study, the quantitative phase, Cohen and Rice (2005) determined using NBC assessment scores of candidates whose participation in a support program could be associated with a candidate's assessment score. Investigating the differences between support programs, those programs that had (a) a high intensity of group sessions (seven or more) had a correlation of .81 with the average assessment score of candidates; (b) formal peer-interaction situations correlated at .81 with average assessment score of candidates; and (c) mentor-candidate matching by certificate area had a correlation of .73 with assessment score. This indicated that these characteristics most likely facilitated professional growth.

It should also be noted that Cohen and Rice (2005) did not attempt to determine the effectiveness of the NBC process as professional development (i.e., whether teachers' knowledge, instruction, and students' learning changed). The researchers were charged with only determining (a) whether the process incorporated aspects of high-quality professional development, (b) what features of the NBC process and support programs were considered by candidates to be important learning opportunities, (c) who bears the costs of the NBC process as professional development, and (d) how the costs of the NBC process as professional development compare to other common professional development opportunities.

A dissertation by Alvarado (2004) also specifically investigated candidates' perspectives on the NBC process as high-quality professional development. The study did not aim to determine if the NBC process was effective by investigating whether teachers changed their knowledge, practices, and students' learning, but rather assumed professional growth and

explored what aspects of the process candidates perceived were important for their professional growth.

Through interviews and a review of the 12 early-childhood generalist candidates' portfolios, Alvarado (2004) had candidates compare their NBC experience to other professional development activities in order to gain insight into what aspects of the process made it more or less powerful than other forms of professional development. From the data, Alvarado developed the following six assertions:

- The Standards provide a common language and framework to use for analyzing aspects of one's teaching that have become intuitive, and thus, the Standards allow for deeper reflection on practice.
- The NBC process helps teachers refocus on developing specific aspects of high-quality instructional practices. This includes focusing on students as individual learners and on examining the value of specific instructional practices.
- The NBC process helps develop confidence in teachers.
- Emotional and technical support from peers and mentors is invaluable throughout the NBC process.
- The NBC process helps teachers focus on their students in the context of their current teaching situation allowing candidates to focus internally on their teaching and decisions.
- The NBC process, through its reflective components, helps candidates develop a new awareness of how their teaching impacts students' learning.

Summary on National Board Certification. The majority of research on the NBC process has attempted to demonstrate the validity of the assessment process in identifying

accomplished teachers. The research, using both the assessment of differences in various teaching dimensions and achievement data, reveal that NBC indicates accomplished teaching. NBCTs teach differently and have greater student learning results than non-NBCTs. Additionally, collectively the limited research on the NBC process as professional development indicates that the process affords teachers the opportunity to grow professionally and that teachers do change their knowledge and instructional practices. When reviewing the research on NBC as professional development, secondary conclusions from the qualitative research provide some, albeit limited, insight into what characteristics specific small groups of teachers perceived as having an impact on their professional growth. There is a void in the quantifiable measurement of larger more diverse NBCTs' viewpoints.

Summary of Literature Review

The literature defines effective professional development as experiences that change teachers' knowledge, skills, or beliefs; their instructional practices; and their students' learning. The order in which these changes occur is still debated. Research demonstrates the changes occur due to the experience's characteristics rather than the format or type of experience. Scholars, national organizations, and legislation differ on the high-quality professional development characteristics that most significantly impact teachers' professional growth. Thus, the lists compiled for states and school districts to use in policy making often limit the suggested characteristics to broad categories and eliminate the specifics.

The NBPTS was created for the purpose of developing standards of accomplished teaching and for creating an assessment process to evaluate teachers against the standards. Yet research demonstrates that a secondary result of the NBPTS's work was that the assessment process was professional development. The process contains high-quality professional

development characteristics, and engaging in the process can change teachers' knowledge, their instructional practices, and their students' learning. This study does not dispute the validation of this fact. Instead, this study investigates the extent to which characteristics lead to professional growth and whether demographics influence the extent of impact.

The research on understanding what characteristics of the process changed teachers is limited, usually small, qualitative, certificate specific, and a secondary research question. It is only from this small literature base that educators can gain a vague idea of what characteristics might be the catalyst for impacting the professional growth of teachers. Thus, this study aims to build on the literature by (a) employing a larger and more diverse sample size and (b) using quantitative methods to delve into the hypothesized characteristics that impact teachers' professional growth.

Definition of Terms

Accomplished teachers. Teachers who have achieved National Board Certification which demonstrates their teaching has met the National Board for Professional Teaching Standards' rigorous standards of accomplished teaching.

Characteristics of professional development. The structural and learning components that comprise a professional development experience (Desimone, 2009; Wayne, Yoon, Zhu, Cronen, & Garet, 2008). The term characteristics may be used interchangeably with the terms of aspects, components, conditions, elements, features, qualities, or variables.

Effective professional development. An experience that impacts educators' knowledge, beliefs, attitudes, or skills, changes their practices, and increases student learning (Avalos, 2011).

High-quality characteristics. Characteristics of professional development considered critical in changing teachers' knowledge, beliefs, attitudes, or skills, their practices, and students'

learning. Their incorporation into professional development should lead to an effective professional development experience.

High-quality professional development. An experience that incorporates high-quality characteristics and should lead to an effective professional development experience.

Learning Forward. The largest and only non-profit international association and advocacy organization focused on ensuring success for all students by advancing educator effectiveness through standards-based high-quality professional learning. Prior to 2010, Learning Forward was known as the National Staff Development Council (Learning Forward, 2014).

National Board Certification (NBC) or Board Certification. An advanced teaching credential that certifies accomplished teaching as defined by the National Board for Professional Teaching Standards (NBPTS, n.d.-c).

National Board Certified Teacher (NBCT). A teacher who holds a National Board certificate.

National Board for Professional Teaching Standards (NBPTS) or National Board. The independent, nonprofit organization formed in 1987 whose purpose is to advance the quality of teaching and learning by developing professional standards for accomplished teaching, creating a voluntary system to certify teachers who meet those standards, and integrating Board-certified teachers into educational reform efforts (NBPTS, 2014b).

National Staff Development Council. See Learning Forward.

Professional development. An experience that affords professional growth. The experience may or may not impact educators' knowledge, attitudes, beliefs, or skills, change their instructional practices, and increase student learning (Desimone, 2009). The term

professional development may be used interchangeably with the terms of professional learning, continued education, staff development, teacher learning, and teacher development.

Professional growth. A change in an educator's beliefs, attitudes, knowledge, or skills, instructional practices, and students' abilities.

Standards. Developed primarily by teachers, the National Board Standards identify the specific knowledge, skills, and attitudes of accomplished teaching (NBPTS, n.d.-a). Each of the 25 National Board Certification certificates are based on the National Board for Professional Teaching Standards' Five Core Propositions and have specific standards based on the teaching subject and student developmental level (NBPTS, n.d.-c).

Student achievement. The status of a student's knowledge, understandings, and skills at one point in time and can be used to identify gaps in what a student knows and should know (NBPTS, 2011b). The term is used interchangeably with the terms of student performance and student outcomes.

Student learning. The growth of a student's knowledge, understandings, or skills over time that is measured by comparing a student's abilities at successive points in time (NBPTS, 2011b). The term is used interchangeably with the term of student growth.

Chapter Three

Methodology

This study examined NBCTs' perceptions about the extent to which characteristics of the certification process impacted their professional growth. It also explored whether a relationship existed between demographics (independent variables) and the perceived influence of characteristics (dependent variables) on professional growth. The study utilized the following questions:

1. What do NBCTs perceive was the extent of impact the characteristics of the certification process had on their professional growth?
2. What are the differences among NBCTs' perceptions of a characteristic's impact on their professional growth?
3. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years in the classroom prior to beginning the certification process?
4. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years pursuing NBC?
5. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the primary motivation for pursuing NBC?

Research Design

This study used a non-experimental quantitative research design with an electronic survey to gather self-reported data. This was the most appropriate approach since the

phenomena could be studied objectively and the research questions were best answered using data collected and analyzed numerically. Since this research aimed to understand the perceptions of many NBCTs, the self-administered electronic survey had the advantage of easy distribution to a large number of people. Additionally, the self-report survey provided a research environment that allowed participants to provide more honest answers so as to lessen social desirability and demand characteristic bias. While the survey did not ask for identifying data such as participant name, nor did the survey track who in the survey population participated in the study, the survey did collect demographic information that could allow for identification of some participants. Hence, the survey collection was not considered anonymous for all participants but was confidential because the survey data were disaggregated for analysis.

Population and Sampling

Population. In December 2014, nationally there were 110,447 teachers who had achieved NBC, and from the state researched in this study, 3,091 NBCTs (NBPTS, n.d.-e). The target population included NBCTs from four districts within the state which, based on self-reports by NBCTs to the NBPTS, included 445 NBCTs (NBPTS, 2014d). The four school districts' NBCTs comprised 14.4% of the state's NBCTs, and one of the four districts was in the top five school districts statewide for total number of certified teachers (NBPTS, n.d.-e).

The target population for this study included only NBCTs from the four school districts but also had a second parameter of including only NBCTs who participated in the regional NBC support program. Thus, the target population was smaller than 445, but the exact number could not be determined since the number of NBCTs who participated in the NBC support program was unknown.

The National Board Certification support program. The target population for this study included only NBCTs who had participated in a specific NBC support program, a collaborative effort of the four school districts and a university. Since 2001, the four school districts and university have had an alliance working together to coordinate the NBC support program, as well as other teacher leadership and professional development opportunities.

Most teachers in the four districts pursue NBC via participation in the support program as typically participation is a requirement if the school district financially supports the candidate with a portion of the NBPTS fees. There is no cost to the candidate to participate in the support program as the support program is fully funded by the school districts and university. While the teachers self-select to participate in the NBC process, due to the school districts' financial and human resource commitment, each school district uses a prescreening process to limit the numbers and/or quality of teachers it supports in the certification process.

One requirement of the support program is that candidates must actively participate in a structured series of workshops. The year-long series of workshops (a) provide candidates with a cohort of peers; (b) disseminate critical information about the certification components; (c) include activities meant to assist the candidate in completing the portfolio requirements and preparing for the assessment center; (d) set timelines for completing the process; (e) provide a support system of NBCTs to assist candidates; and (f) require individual and collaborative reflection on candidates' teaching and writing, and their students' work.

Researcher disclosure. For full disclosure, it should be noted that the researcher of this study was involved with the NBC support program prior to conducting the investigation. The researcher achieved NBC status as a participant in the support program, and the researcher's school district, with whom the researcher was and is still currently employed, fully-funded the

researcher's NBC experience. Additionally, the researcher was a facilitator for the support program for three school years (2009-2012) but removed herself from this role two years prior to beginning this study. From this involvement, some participants in the study knew the researcher.

Survey population. The survey population consisted of 283 NBCTs who were derived from the estimated target population of 445 NBCTs. Nonprobability purposeful-convenient sampling methods were used to determine the survey population.

The survey population was purposeful as it only included NBCTs who (a) most likely participated in the support program due to affiliation with one of the four school districts and (b) had achieved since 2005 indicating their NBC had not expired or been renewed. By including only NBCTs of the four school districts, it was assumed that most of the survey population participated in the NBC support program and were knowledgeable about the study's investigated constructs. By removing from the survey population NBCTs who had renewed, the confounding factor of participation in the NBC renewal process, which focuses on professional development, was eliminated (NBPTS, n.d.-d). Similarly, by removing NBCTs whose certificate had expired, the confounding variable explaining why the NBCT opted to not renew their certificate was eliminated.

The survey population was also convenient due to the difficulty of obtaining access to NBCTs. The NBPTS provides an open-access web database of NBCTs that is searchable for NBCTs based on name, state, school district, certification area, and date of certification. The NBPTS database does not provide contact information. Thus, this specific NBC support program consisting of NBCTs from the four school districts was used because all four school districts' websites provide a searchable, open-access database of email addresses.

To determine the survey population of 283 NBCTs, the NBPTS database was used to acquire the names of the 445 teachers who had achieved NBC and self-affiliated with one of the four school districts (NBPTS, 2014d). The 445 NBCTs names were then sorted based on the date of achievement and the date of certificate expiration. Seventy-seven NBCTs had dates of achievement prior to 2005. These NBCTs, the NBCTs who had renewed (46) or let their certificate expire (31), were eliminated from the survey population due to confounding variables (NBPTS, 2014d). This process reduced the number of NBCTs for the survey population from 445 to 368.

The searchable open-access email databases available on the four districts' websites were then used to search for the email addresses of the 368 NBCTs. Eighty-five NBCTs were eliminated from the survey population because there was no link between the name in the NBPTS database and the school district email database. This disconnect could be due to a name change or the NBCT leaving the school district. Hence, this process reduced the number of NBCTs for the survey population from 368 to 283.

Delimitations. There were critical choices made regarding the boundaries of the study's survey population and sample for this study. The first is that the study only investigated the perceptions of NBCTs or accomplished teachers. It did not investigate those teachers who underwent the process but did not achieve NBC, as access to the names of these teachers was unattainable. Thus, the study's results must be delimited to explaining only the perceptions of NBC candidates who achieved certification.

Secondly, the study only investigated the perceptions of the NBCTs in a specific support program to ensure participants had knowledge of the survey's constructs. Thus, the study's

results could be due to the context of the specific support program and must not be generalized to all support programs or to NBCTs who achieved without a support program.

Additionally, the study only included NBCTs who had achieved since 2005 as these NBCTs would have a current non-renewed or expired certificate since certificates are valid for 10 years. Additionally, at the beginning of the survey, respondents were asked if they had started the renewal process. If respondents self-selected yes, they were exited and did not fully complete the survey. These decisions were made due to the confounding factors of the renewal process and reasons for not renewing. Hence, the results of this study must be delimitated to NBCTs who meet these requirements.

The combination of these research design decisions makes it challenging to generalize the results beyond these delimitations. It is unknown whether similar results would occur when including in the survey population (a) teachers who did not achieve certification, (b) teachers who did not participate in a support group, (c) NBCTs who participated in a different support group, and/or (d) NBCTs who have renewed or allowed their NBC to expire.

Therefore, although it is hoped that this research will result in data of importance to the NBPTS, NBC support groups, researchers and scholars in the field of professional development, and school districts, it is critical to delimit the results (Figure 5).

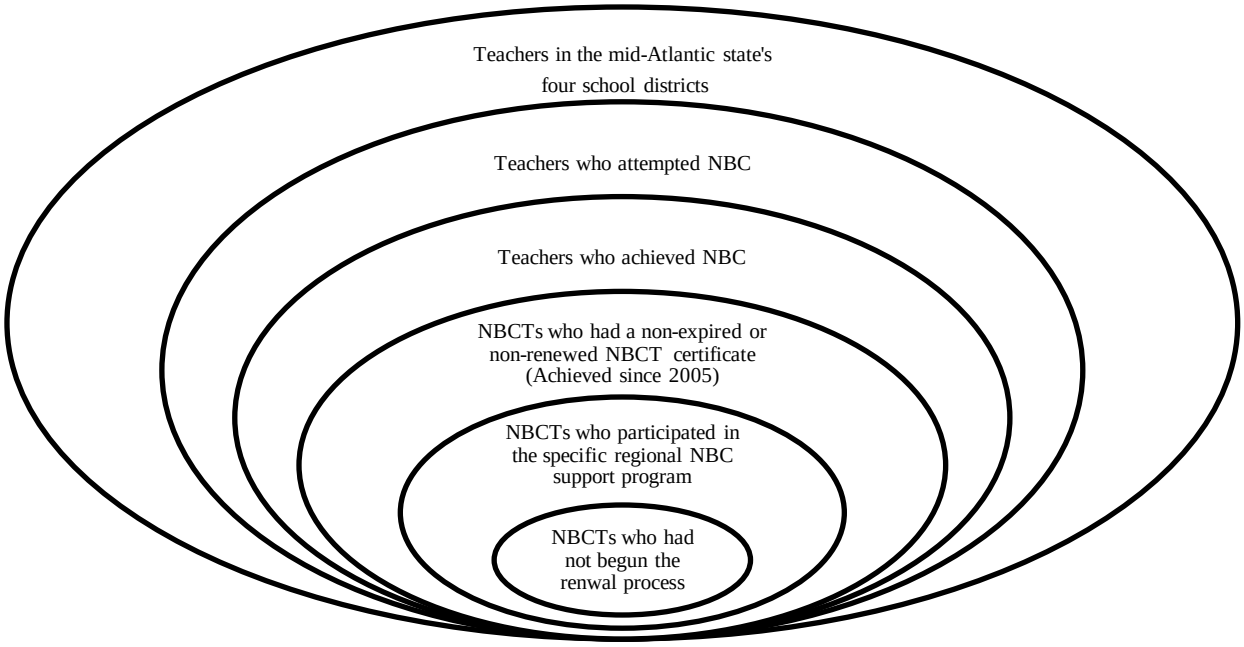

Figure 5. Delimitations.

Sample. For this investigation, the sample of 119 participants was derived from the survey population of 283 NBCTs and 131 survey respondents. The qualifying questions at the beginning of the survey exited 12 survey respondents who did not meet the study's parameters. Thus, the sample of 119 participants included only NBCTs who (a) held a non-expired and non-renewed certificate, (b) had an active email address with one of the four school districts, (c) indicated participation in the support program, and (d) indicated not having begun the renewal process.

Instrumentation

After reviewing the literature on effective professional development characteristics and the NBC process as professional development, the study's survey was developed (Appendix D). The survey objectively measured NBCTs' perceptions of the extent to which characteristics of the NBC process impacted their professional growth, and it gathered demographic information. The survey was developed to fulfill two purposes: (a) To determine the perceived degree of

influence 20 characteristics of the NBC experience had on the professional growth of NBCTs; and (b) To explore relationships between demographic variables and the perceived extent of the characteristics' influence.

Survey design. The survey consisted of three sections and was expected to take less than 10 minutes for participants to complete.

The first section had two questions that determined whether participants would continue with the survey or be exited prior to completing the survey. These two questions asked whether the NBCT had begun the NBC renewal process and whether the NBCT participated in the NBC support program. A filter was added to the survey to exit NBCTs who answered yes to the renewal question or answered no to the support program question.

Asking whether the NBCT participated in the support program was a critical question because some teachers may have elected to pursue certification individually without receiving school district support. Additionally, the NBPTS's database of NBCTs in a school district is based on self-reports. This allows NBCTs to change their school district affiliation based on current employment, not the district of achievement. Hence, some teachers may have transferred to the school district and changed their NBPTS affiliation post-certification. Second, while the survey population excluded those NBCTs who had recertified based on certification date, some NBCTs might have started the process but not completed it. Thus, it was critical to ask if an NBCT had begun the renewal process to exit these NBCTs.

The second section of the survey was comprised of 20 Likert-type items which used a scale of one to seven (1 = *not of importance* and 7 = *extremely important*) to indicate the level of perceived importance each characteristic had in impacting the NBCT's professional growth. The term importance was used to operationalize the concept of impact. The term professional growth

was clearly defined at the top of the survey so that each statement did not need to include the definition. The seven-point positively weighted scale (3 = *neutral*) ensured an appropriate range of response variability.

The third section of the survey included a ten-item set of demographic questions about the participants. Six questions acquired general demographic information and four questions asked for NBC demographic information.

Dependent variables and validity. The selection of characteristics (dependent variables) was based on (a) the existing professional development literature, and (b) the NBC process as professional development literature. To increase the survey's content validity, three experts on the NBC process as professional development, and specifically on the investigated support program, reviewed the survey's content. The experts included

- the NBC Support Program Director,
- one of the two current NBC Support Program Facilitators, and
- one of the NBC Coordinators for a school district in the support program.

After reviewing the drafted survey, no characteristics were eliminated, but the wording of six statements was adjusted and four characteristics were added so that characteristics had a paired-match of an individual and collaborative statement. This process ensured a complete construct with no extraneous or overlapping variables.

Independent variables. In addition to characteristic data, the survey collected demographic data to ensure variability in participants and for investigating the study's exploratory independent variables (Table 2). The number of years teaching prior to beginning the NBC process was a continuous variable that began with the attribute of three since the NBPTS requires teachers to teach a minimum of three years prior to beginning the NBC process.

The number of years spent engaging in the NBC process included four discrete categories since the process could take candidates one, two, or three years to achieve. The option of four or more years was included for those candidates who might not certify in three years and restart the process. The determination of discrete categories for the primary motivation for engaging in the NBC process was based on Hildebrant and Eom's (2011) research on motivational factors for pursuing NBC.

Table 2

Exploratory Independent Variables

Research question	Correlating variable	Variable type	Variable attributes
Three	Years teaching prior to engaging in the NBC process	Continuous	Three to fifty
Four	Years spent engaging in the NBC process	Discrete	One, two, three, four or more
Five	Primary reason for engaging in the NBC process	Discrete	Financial gain Improvement of teaching/professional development Potential for advancement/leadership Prestige/recognition Self-validation None of the above

Pilot test. A small scale trial was conducted in which five NBCTs not in the survey population completed the survey and commented on the mechanics of it. These five NBCTS were current non-renewed NBCTs who had participated in the support program, but their NBPTS name did not match with an email address in their affiliated school district's database. The researcher had other access to their unpublished email address.

The purpose of the pilot test was to ensure low participant confusion so as to decrease measurement error. The NBCTs were asked for feedback regarding the clarity of the directions,

statements/questions, and computer format/interface. The pilot participants were also asked if any additional characteristics of the NBC experience should be included. Adjustments to wording were made based on the pilot, but no additional characteristics were added.

Field test to determine reliability. A survey's reliability is dependent on the ability of the survey to be consistent in what it measures. Therefore, after the pilot test, the survey was field tested using a test-retest structure to determine reliability. The survey was sent to 45 NBCTs in a school district in the same state as the study's target population. This district provides a similar, but not the same, support program to the study's target population. The field test participants were found using the same procedures as the sample: Use of the NBPTS database and school district searchable open-access web database of email addresses.

The field test survey was adjusted from the actual survey so that the first question asked the participants for an email address as a unique identifier code. This allowed for correlating the data using a test-retest structure. Participants were asked to take the survey between Monday and Wednesday and then to retake the survey between the following Monday and Wednesday. An incentive of an electronic Starbucks gift card was provided to the NBCTs who took the survey twice; hence, the email address as an identifier code was appropriate.

The initial field test response rate was 16 participants (36%); the retest response rate was 13 participants (29%). Only these 13 participants' data were included to determine reliability. To determine the reliability, the degree to which the scores were consistent and not due to random error, the number/percentage of exact matches, adjacent matches, and non-adjacent matches for each of the 20 professional development characteristic survey items was examined.

Results for the characteristics demonstrated that 57% (n = 149) of the test-retest responses were an exact match, 36% (n = 93) of the responses were an adjacent match, and 7%

(n = 18) of the responses were non-adjacent responses. The 18 non-adjacent responses were spread over 10 of the 20 characteristics, and only two characteristics had more than two participants provide non-adjacent scores. These characteristics included "collaborative discussion about the portfolio directions" with three non-adjacent matches and "length of time (number of years) you spent attempting to certify" had four non-adjacent matches.

Table 3 indicates the test-retest reliability coefficients for each characteristic. Thirteen characteristics indicated a strong (.7 or higher) correlation between tests. Four characteristics indicated a moderate (.5 to .69) positive correlation between tests. Two characteristics indicated a weak (.3 to .49) correlation between tests, but the correlation coefficient was not statistically significant at the $p \leq .05$ level. One characteristic, "Number of hours you spent in the process," indicated no relationship between tests [$r(13) = .05$, $p = .87$], but did not have a level of significance $\leq .05$.

Table 3

Survey Reliability

Characteristic	*r*
Collaborative discussion about the portfolio directions	.91**
Giving and receiving feedback with other candidates on the writing of portfolio entries	.87 **
Feedback from NBCTs	.69**
Your engagement in reflective thinking	.76**
Your engagement in the portfolio writing process	.70**
Your planning of lessons to meet the portfolio requirements	.49
Your preparation for the assessment center exercises	.90**
Your use of the Standards documents	.89**
Your use of the portfolio's directions	.95**
Your analysis of your teaching videos	.89**
Length of time (number of years) you spent attempting to certify	.62*
Number of hours you spent in the process	.05
Direct link of the process to your specific teaching position	.66*
Connection of the process to your work with your students	.54
Your individual analysis of your students' work/data	.39
Focus on demonstrating student learning	.82**
Collaborative sharing of knowledge with others in the process	.94**
Collaborative examination of student work/data	.83**
Collaborative analysis of videos	.91**
Collaborative discussion about the Standards	.99**

* $p \leq 0.05$; ** $p \leq 0.01$

Institutional Review Board

Before data collection began, the research study (HM20004146) was approved as exempt by the Virginia Commonwealth University Institutional Review Board (IRB). This indicated the study was consistent with the rules and regulations of the institution and ensured the research met the ethical guidelines of not impinging on the rights or harming participants.

Data Collection

After the survey population was secured, an email (Appendix E) with attachment (Appendix F) indicating the purpose of the study, assurance of confidentiality, amount of time anticipated for survey completion, date by which the survey should be completed, generic link to the survey, and importance of voluntary participation was sent to the survey population. Participants were not offered an incentive for participation in the survey.

When participants clicked on the link in the email, they were directly and anonymously taken directly to the survey hosted by Toluna's QuickSurveys.com. Toluna QuickSurveys was chosen for data collection since it (a) provided a secure web application for building and managing online surveys, (b) was easy to use for both researcher and participant, (c) had the ability to share the survey link through the researcher's email account, (d) had a mobile platform for participants, and (e) directly exported data into Excel and SPSS.

In part one of the survey, participants responded to the qualifying questions regarding participation in the support program and status in the renewal process. Participants who qualified were directed to the second portion of the survey. If either condition was not met, the participant was exited and provided a screen explaining that they did not meet the study's criteria. After the participant completed the second (characteristics) and third (demographics) portions of the survey, Toluna's QuickSurveys.com provided a screen stating that their responses were recorded and thanked the NBCT for their participation. Due to the short length of the survey, participants did not create a user name/code in order to begin and later return to their answers.

Two weeks after the initial mailing, each person in the survey population was sent an electronic reminder containing the same information as the original email. All people in the

survey population received the email since identifiers were not kept to know who had taken the survey. After four weeks, it was determined that a large enough sample size was acquired, and the online survey was closed.

Data Analysis

SPSS version 22 was utilized for analyzing the data, and significance for this study was established at the $p \leq 0.05$ level. Prior to conducting analyses, descriptive statistics on the sample were analyzed to ensure variability and each participant's overall mean score (all 20 characteristics combined) was determined. Additionally, the grand mean score and standard deviation for all of the characteristic data combined (all participants' scores on all 20 characteristics) was determined. Using the grand mean and individual overall mean scores, the researcher determined and eliminated participants with an overall mean outlier score, examined individual characteristic data for outlier data points, and then evaluated the data to determine if retrospection was an issue.

To address research question one, descriptive statistics on each of the 20 characteristics were calculated in order to summarize the sample's perceptions of the importance each characteristic had on influencing the NBCTs' professional growth. Kurtosis and skewness were investigated to determine the normalcy of each characteristic's distribution to ensure parametric data.

To address research question two, the characteristic data were rank ordered based on mean scores. Then by systematically conducting specific paired *t*-tests, the characteristics that had non-significantly different means were determined. This information was then used to group characteristics with similar means. Each group's characteristics' mean was then calculated and estimated effect sizes between groups were determined.

To address research question three, a Pearson's product-moment correlation was used, as the independent and dependent variables were both continuous. The correlations were used to indicate if years of experience related to rating of characteristic importance. The NBCTs were then placed into one of five groups based on similar years of teaching experience. Using the categorical groups as variables, an ANOVA was conducted to determine if the mean of any characteristic differed based on years of experience.

For research questions four and five, ANOVAs with necessary post hoc tests were used as the independent variables were categorical. This allowed for determining if the impact of a characteristic on professional growth was influenced by the number of years in the certification process or motivation for engaging in the NBC process.

Table 4

Data Analyses

Research question	Statistic	Data analysis
One	Descriptive	Means, standard deviations, skewness, kurtosis
Two	Inferential	Paired t-tests
Three	Inferential	Bivariate correlation, ANOVA with necessary post hoc tests
Four	Inferential	ANOVA with necessary post hoc tests
Five	Inferential	ANOVA with necessary post hoc tests

Chapter Four

Findings

The purpose of this study was to determine the perceived impact that characteristics of the NBC process had on NBCTs' professional growth when professional growth was defined as a change in a teacher's knowledge, practices, and students' learning. A quantitative survey with a positively-weighted Likert-type scale of 1 to 7 (1 = *not of importance*, 2 = *of little importance,* 3 = *neutral*, 4 = *slightly important*, 5 = *moderately important,* 6 = *very important*, 7 = *extremely important*) was used to investigate the perceived level of importance that 20 characteristics of the NBC process had on the NBCTs' professional growth. The survey also collected demographic information about the participants and their NBC experience.

The survey responses were used to answer the following research questions:

1. What do NBCTs perceive was the extent of impact the characteristics of the certification process had on their professional growth?
2. What are the differences among NBCTs' perceptions of a characteristic's impact on their professional growth?
3. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years in the classroom prior to beginning the certification process?
4. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years pursuing NBC?

5. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the primary motivation for pursuing NBC?

Rate of Return and Missing Data

Rate of return. The survey population of 283 NBCTs was derived by using a combination of the NBPTS database and school district email databases. The 283 NBCTs (a) indicated affiliation with a school district that participated in the NBC support program, (b) had achieved NBC in 2005 or later indicating that they had not renewed, and (c) had a current email address with the affiliated school district in the NBPTS database. Of the 283 NBCTs, 131 responded (46% response rate) to the survey.

Using filters, the survey exited respondents at the beginning of the survey who did not meet the study's parameters of (a) participating in the specific NBC support program, and (b) having not started the NBC renewal process. The study exited five NBCTs (4%) who indicated they had not participated in the support program, and of the remaining 126 respondents, the study exited another seven NBCTs (5% of the original 131 respondents) who indicated they had started the renewal process. Thus, the resulting sample included 119 participants, 91% of those who responded to the survey request.

Missing data. The survey was designed to allow participants the option of not responding to questions. For the 10 demographic questions, some participants opted to not respond to all questions. Contrastingly, all participants responded to each of the survey's 20 questions regarding the importance of characteristics on their professional growth.

Participants

The descriptive data revealed participant variability for research on education pertaining to teachers from the state studied. Table 5 describes the descriptive data for the self-reported

non-NBC demographics, and as indicated in Table 6, the participants' affiliations with the school districts were similar to that of the survey population.

Table 5

Participant Demographics

Demographic	*n*	%
Gender		
Female	101	86
Male	16	14
Age		
25-29 years old	3	2
30-39 years old	45	38
40-49 years old	32	27
50-59 years old	27	38
Over 60 years old	11	10
Years teaching prior to certification		
3-5 years	17	12
6-10 years	38	33
11-15 years	30	26
16-20 years	13	11
Over 20 years	16	14
Education level		
Bachelor's	21	19
Master's	71	65
Post-Master's or doctorate	18	16
Current educational position		
Teacher	81	68
Teacher with administrator duties	6	5
Building level administrator	2	2
District level administrator	5	4
Other	25	21

Note. For current educational position, the data were self-reported and participants who selected "other" were asked to write in their position. While some of the positions may be considered a "teacher" position in one district, they may not be in another. No self-reporting data for educational position was changed.

Table 6

Frequency and Percentage of School District Affiliation of Survey Population and Participants

	Survey population		Participants	
District	*N*	%	*n*	%
District A	82	29	37	31
District B	61	22	22	19
District C	107	38	50	42
District D	33	12	8	7

Participants were also asked to provide additional demographic information specific to their NBC experience. Table 7 indicates the responses regarding primary reason for engaging in the process. The most prevalent reason was for professional development; prestige or recognition as an NBCT was not a main factor. Appendix G provides the participants' specific self-reported certificates while Table 8 indicates the overall variety of content and student-age groups taught. All content areas except for physical education/health were represented in the sample, and teachers of all student-age groups were represented.

Table 7

Frequency and Percentage of Primary Reason for Engaging in the NBC Process

Primary reason	*N*	%
Financial gain	30	25
Improvement of teaching/professional development	49	42
Potential for advancement/leadership	11	9
Prestige/recognition	4	3
Self-validation	20	17
None of the above	4	3

Table 8

Frequency and Percentage of NBC Content Areas and Student-Age Groups Taught by Survey Population and Participants

	Survey population		Participants	
Demographic	*N*	%	*N*	%
Content area				
Art	6	2	3	3
Career and Technical Education	16	6	7	6
English as a New Language	1	< 1	1	1
English/Language Arts	37	13	15	13
Exceptional Needs	24	8	10	9
Generalist	57	20	27	24
Library Media	15	5	6	5
Literacy	28	10	13	11
Math	26	9	9	7
Music	6	2	3	3
Physical Education and Health	3	1	0	0
School Counseling	16	6	4	3
Science	22	8	9	8
Social Studies – History	17	6	6	5
World Languages	9	3	3	3
Student-age groups				
Early Childhood through Young Adulthood (Ages 3-18+)	55	19	19	16
Early and Middle Childhood (Ages 3-12)	96	34	46	39
Early Adolescence (Ages 11-15)	41	14	12	10
Early Adolescence through Young Adulthood (Ages 11-18+)	30	11	11	9
Adolescence and Young Adulthood (Ages 14-18+)	61	22	31	26

The majority of participants were successful at achieving NBC in one year (n = 85, 71%), and none took more than three years to achieve (Table 9). There was a large disparity in the number of participants who achieved in one, two, or three years, and this had to be accounted for during data analysis. However, the sample did have variability in the year of achievement as approximately 10 percent of the sample came from each certification year from 2005-2015. The

participants were grouped based on achievement year to allow for large enough participant numbers when conducting data analysis (Table 9).

Table 9

Frequency and Percentage of Length of NBC Experience and Certification Year of Survey of Survey Population and Participants

	Survey population		Participants	
Demographic	*n*	%	*n*	%
Year of NBC achievement				
2005, 2006, 2007	84	30	45	39
2008, 2009, 2010	80	28	32	28
2011, 2012, 2013	89	31	27	23
2014	30	11	11	10
Length of NBC process				
One year	-	-	85	71
Two years	-	-	27	23
Three years	-	-	7	6
Four or more years	-	-	0	0

Outlier Data

Before analysis of the data, each participant's overall mean (i.e., their mean score for all 20 characteristics combined) was calculated. Then the data's grand mean (M = 5.67, SD = .89) was determined. This included using all 119 participants' scores on each of the 20 characteristics.

Data outliers were then assessed using a histogram (Figure 6) and z-scores for each participant's overall mean rating of the combined 20 characteristics. One participant's overall mean z-score was four standard deviations away from the data set's grand mean (z = -4.04), and two participants' overall mean z-scores were three standard deviations away from the data set's grand mean (z = -3.28; z = -3.01). These participants' data were eliminated from data analysis because their overall mean total did not fall within the range of 99.7% of other data. Since these

participants' data were an abnormal distance from the other values in the sample, the exclusion of it allowed for less skewed data analysis.

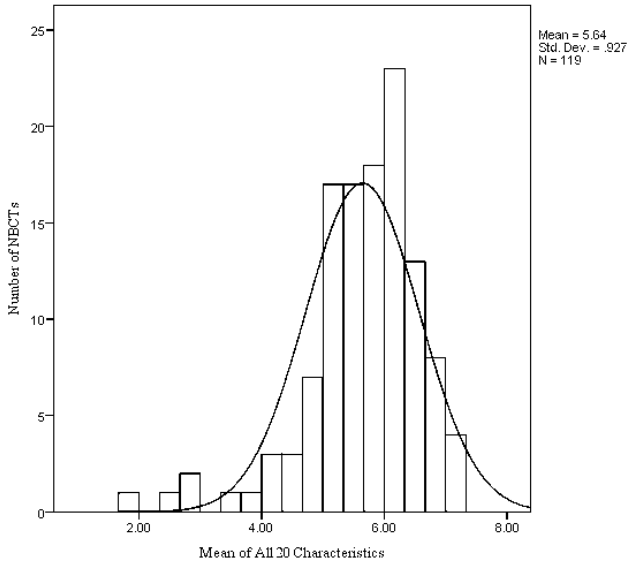

Figure 6. Histogram of each participant's grand mean for all characteristics.

Prior to deleting the three participants due to their outlying overall mean score, each of the 20 characteristics was individually examined for outlier data. Using *z*-scores, 24 (.01%) data among 12 characteristics were more than three standard deviations away from the characteristic's mean.

Once the three outlier participants were eliminated, the data on each characteristic were reexamined. The number of characteristics with outlier data were reduced to seven, and the number of outlier data points was reduced to eight. The means and standard deviations of the seven characteristics with outlier data were investigated through *z*-scores and determined to not be affected by the outlier data. Thus, the eight outlier data points were not eliminated.

After outlier analysis and deletions of the three participants, the data used for analysis included 116 participants who had responses for all 20 characteristics. The grand mean without outliers was 5.72 (*SD* = .78).

Retrospection

Since the research design used retrospective reports, the data were analyzed to determine if retrospection was an issue. Five participants did not provide a certification year; therefore, they were not included in the retrospection analysis. For retrospection analysis, an ANOVA was used for comparing the participants' overall mean rating to groups of self-reported certification years. The results indicated that based on certification year there was no difference in the participants' overall mean scores rating at the $p \leq .05$ level [$F(3,107) = .33$, $p = .8$; see Appendix H for descriptives]. A second analysis of each participant's overall mean score was run using a Pearson bivariate correlation. This allowed for determining if there was a correlation between overall mean score and individual years of certification. The analysis showed a small correlation that was not statistically significant [$r(111) = -.15$, $p = .13$].

To ensure there was no particular characteristic for which retrospection was an issue, an ANOVA for each characteristic was run comparing the means of each certification year group. The ANOVA results in Table 11 (see Appendix H for descriptives) indicated there was a difference in groups at the $p \leq .05$ level for the characteristic of "connection of the process to the work of your students" [$F(3, 107) = 2.66$, $p = .05$]. Since Levene's test for homogeneity of variances indicated no difference at the .05 alpha level between the certification year blocks [$F(3, 107) = .38$, $p = .77$], post hoc tests were run to determine which groups' means differed. A Tukey post hoc analysis indicated the difference was between the groups of 2005-2007 and 2014, the oldest and newest blocks, with a mean difference of .67 between the two groups. However, when looking at the homogeneous subsets, there was no difference in the means among the 2005-2007, 2008-2010, and 2011-2013 groups ($p = .97$). The Tukey post hoc test used a harmonic mean sample size of 25.77 since the number of participants in each group

differed. Thus, a Games-Howell post hoc analysis (Table 10) was also conducted since it could account for the unequal numbers among the groups. It revealed no difference among the groups of certification years at the $p \leq .05$ level.

Table 10

Games-Howell Post Hoc of "Connection of the Process to Your Work with Your Students" by Year of Achievement Group

Group for year of achievement	Group for year of achievement	Mean difference	*SE*	*p*
2014	2005-2007	-.67	.28	.10
	2008-2010	-.57	.26	.15
	2011-2013	-.62	.27	.11

A Pearson correlation for individual characteristics and specific certification year was also conducted to investigate retrospection by characteristic. The bivariate correlation of each participant's rating for each characteristic based on specific year indicated two relationships at the $p \leq .05$ level (Table 11). The correlations were between year of achievement and the characteristics of "connection of the process to the work of your students" [$r(111) = -.22$, $p = .02$] and "length of time attempting to certify" [$r(111) = -.19$, $p = .04$]; however, both associations were weak.

Using these analyses, it was determined that retrospection did not influence the overall data set.

Table 11

ANOVA and Pearson's r *for Retrospection Analysis of Characteristics*

	ANOVA by Group Year of Achievement		Pearson's *r* by Year of Achievement	
Characteristic	*F*(3, 107)	*P*	*r*	*p*
Your engagement in reflective thinking	.26	.85	-.11	.25
Your engagement in the portfolio writing process	.61	.62	.23	.81
Your planning of lessons to meet the portfolio requirements	.30	.83	-.13	.19
Your preparation for the assessment center exercises	.09	.97	-.06	.54
Your use of the Standards documents	.43	.74	.02	.85
Your use of the portfolio's directions	.57	.64	-.12	.22
Your analysis of your teaching videos	.71	.55	-.16	.09
Your individual analysis of your students' work/data	.20	.90	-.61	.52
Direct link of the process to your specific teaching position	1.28	.28	-.05	.58
Connection of the process to your work with students	2.66	.05*	-.22	.02*
Focus on demonstrating student learning	1.04	.38	-.05	.62
Length of time (number of years) you spent attempting to certify	.91	.44	-.19	.04*
Number of hours you spent in the process	.10	.96	-.01	.94
Collaborative sharing of knowledge with others in the process	.99	.40	-.17	.07
Collaborative examination of student work/data	1.19	.32	-.13	.18
Collaborative analysis of videos	1.45	.22	-.14	.15
Collaborative discussion about the Standards	.58	.63	-.15	.12
Collaborative discussion about the portfolio directions	.42	.74	-.07	.49
Giving and receiving feedback with other candidates on the writing of portfolio entries	.32	.81	-.10	.29
Feedback from NBCTs	.27	.84	.01	.90
Overall	.33	.80	-.15	.13

* $p \leq .05$

Note: Overall corresponds to the mean score on all 20 characteristics.

Research Question One

To answer the research question "What do NBCTs perceive was the extent of impact the characteristics of the certification process had on their professional growth," descriptive statistics were used to determine the mean, standard deviation, skewness, and kurtosis for each of the 20 characteristics. Characteristics were not merged into larger characteristics constructs so as to see the intricacies of larger constructs.

The results reported in Table 12 reveal the descriptive statistics (n =116) for each of the NBC process characteristics rank ordered by the mean score of importance for impacting professional growth (greatest to least). The scale to measure level of importance used the following ratings: 1 = *not of importance,* 2 = *of little importance,* 3 = *neutral,* 4 = *slightly important,* 5 = *moderately important,* 6 = *very important,* 7 = *extremely important*. The mean scores ranged from 3.92 to 6.52 which indicated that NBCTs perceived 19 characteristics were important, and one characteristic was neither important nor unimportant in impacting their professional growth.

Very important characteristics. The NBC process characteristic of "your engagement in reflective thinking" had the highest mean (M = 6.52, SD = .85). This indicated the characteristic was *very important* in impacting professional growth, and if the mean score were rounded, the characteristic would be considered *extremely important*. The mean scores for characteristics two through seven were between 6.14 and 6.42. These characteristics were also perceived to be *very important* in impacting professional growth.

Moderately important characteristics. Characteristics eight through 12 had mean scores between 5.70 and 5.98, falling in the level of *moderately important,* but could be rounded

up and considered *very important*. Characteristics 13-19 had mean scores between 5.17 and 5.45 and were considered *moderately important*.

Slightly important and neutral characteristics. No characteristic had a mean score of 4, *slightly important*. However, the characteristic of "length of time (number of years) you spent attempting to certify" had the lowest mean (M = 3.92, SD = 1.83) and was close to a rating of four, *slightly important*.

A mean of 3.92 indicated that NBCTs were neutral about whether the length of time in the process impacted their professional growth. However, this particular characteristic in the test-retest field test for reliability had four participants (n =13) provide non-adjacent matches, and the correlation coefficient (r = .62, p = .02) indicated only a moderate relationship. This could indicate confusion of the question. Additionally, this characteristic had the largest standard deviation (1.83) indicating that the range of responses included some participants who felt more strongly of its importance and some believed it was not important to professional growth. A histogram of the frequency distribution (Figure 7) demonstrated the lack of consensus on the characteristic's importance. While the mode was a rating of 3 (*neutral*) with 27 participants, the range, or the greatest difference in number of participants between any two rating categories, was only 16 participants. Twenty-two percent of the participants rated the characteristic as *not important* (score of 1 or 2); 23% of the participants provided a *neutral* rating, and 55% provided a positive rating (scores of 4-7). There were no extreme ratings that skewed the mean.

Lastly, the results of this characteristic were investigated as part of research question four and indicated a difference between groups based on number of years it took an NBC to achieve [$F(2,113) = 6.79$, p = .00; see Appendix L for descriptives]. Specifically, NBCTs who took two

or three years to achieve rated this characteristic statistically significantly different than those NBCTs who achieved in one year (Table 16). While there was still a considerable spread in the responses based on the number of years in the process, as the number of years spent pursuing NBC increased, the mean importance score increased. Those who achieved in one year (n = 83) had a *neutral* rating (M = 3.55, SD = 1.80); those who achieved in two years (n = 26) had a *slightly important* rating (M = 4.73, SD = 1.64); those who achieved in three years (n = 7) had a *moderately important* rating (M = 5.29, SD = 1.38). Since 72% of the sample achieved in one year and only 28% took two or three years, the characteristic's mean (3.92) was skewed toward neutral due to larger numbers who achieved in one year.

Using all this information, it was justified to round the mean score (3.92) to a rating of 4, *slightly important*, which would indicate that the characteristic had importance; however, the level of importance varied based on amount of time in the process.

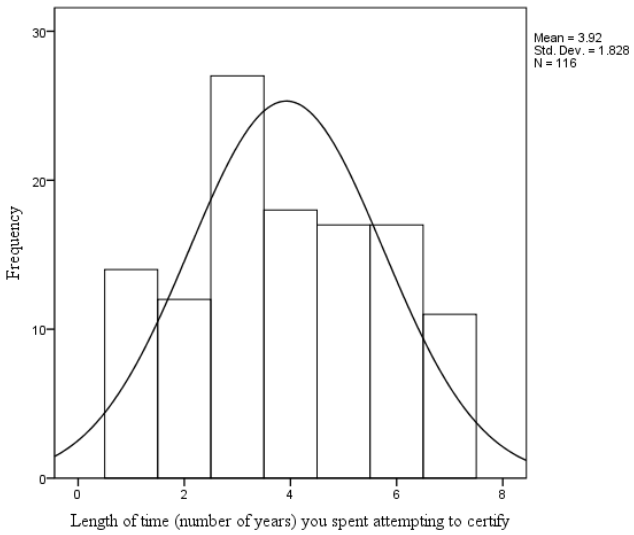

Figure 7. Histogram of participants' ratings for "length of time (number of years) you spent attempting to certify."

Table 12

Descriptive Statistics of Characteristics

Characteristic	Rank	*M*	*SD*	Skewness	Kurtosis
Your engagement in reflective thinking	1	6.52	.85	-3.04*	14.89**
Focus on demonstrating student learning	2	6.42	.76	-1.49*	3.01**
Your analysis of your teaching videos	3	6.32	.83	-1.12*	.67
Your individual analysis of your students' work/data	4	6.27	.81	-.93	.33
Connection of the process to your work with students	5	6.16	.88	-.79	-.22
Your planning of lessons to meet the portfolio requirements	6	6.15	1.03	-1.31*	1.77
Your engagement in the portfolio writing process	7	6.14	1.09	-1.89*	5.11**
Your use of the Standards documents	8	5.98	1.20	-1.53	3.00
Collaborative sharing of knowledge with others in the process	9	5.90	1.14	-.96	.71
Direct link of the process to your specific teaching position	10	5.82	1.18	-1.01*	.81
Feedback from NBCTs	11	5.78	1.24	-.94	.40
Giving and receiving feedback with other candidates on the writing of portfolio entries	12	5.70	1.36	-1.23*	1.32
Collaborative examination of student work/data	13	5.45	1.39	-1.05*	.83
Collaborative discussion about the Standards	14	5.41	1.33	-.99	.76
Collaborative discussion about the portfolio directions	15	5.40	1.62	-.95	.15
Your use of the portfolio's directions	16	5.36	1.76	-.82	-.33
Number of hours you spent in the process	17	5.35	1.51	-1.04*	.66
Collaborative analysis of videos	18	5.34	1.36	-1.04*	.82
Your preparation for the assessment center exercises	19	5.17	1.59	-.99	.50
Length of time (number of years) you spent attempting to certify	20	3.92	1.83	.06	-1.00
Overall	-	5.73	.78	-.78	1.10

* Skewness exceeds -1. ** Kurtois exceeds 3.

Notes: Overall corresponds to the mean score on all 20 characteristics. $n = 112$. Lines indicate where data were subdivided based on .5 of a score for discussion regarding rating scale level of importance.

Spread of data. A trend of the standard deviations indicated an inverse relationship with the mean: As the mean scores decreased, typically the variances increased. This indicated that there was less spread of the data for characteristics ranked higher in importance. NBCTs were less diverse in their ratings for characteristics they believed were most important.

Due to this trend and to determine normalcy of the data, skewness and kurtosis were examined. Skewness of the data indicated that for all of the 20 characteristics, the data were skewed left, or negatively skewed, indicating a positive association with professional growth. Kurtosis of the data indicated that three characteristics (characteristics ranked one, two, and seven), had notable peaks. Using histograms of these three characteristics, it was established that a normal curve for the data still existed. This indicated normalcy needed for statistical analysis.

Additionally, histograms and frequency counts were examined. The only characteristic with an unusual histogram (Figure 8) was the characteristic of "your use of the portfolio's directions." It had a notable peak outside of the normalcy curve. Descriptives indicated that 41% (n = 47) of the participants rated the characteristic as extremely important in impacting professional growth.

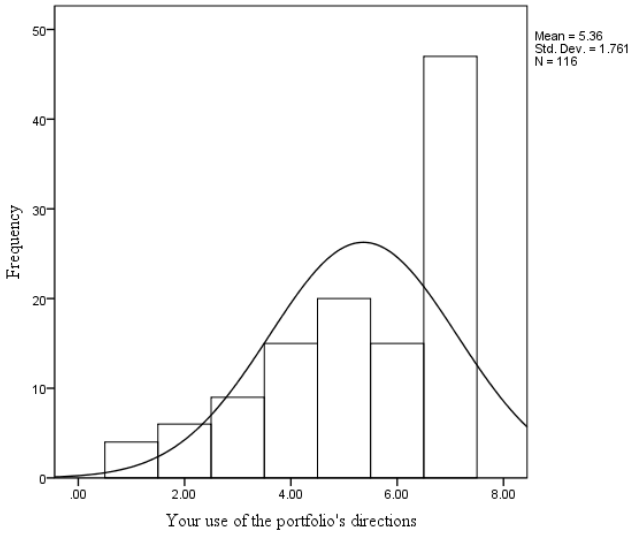

Figure 8. Histogram of participants' ratings for "your use of the portfolio's directions."

Research Question Two

For research question two, "What are the differences among NBCTs' perceptions of a characteristic's impact on their professional growth," descriptive data from research question one were used to rank order the characteristics in order of perceived importance in professional growth (1 = most important; 20 = least important; see Table 12).

Statistically significant differences between individual characteristic means. To determine whether there were statistically significant differences between characteristic means (n = 116), paired t-tests were systematically run. Figure 9 demonstrates the probability that two characteristics' means differed. Once a probability of two means differed at the $p \leq .00$ level, conducting paired t-tests for that characteristic stopped. Appendix H provides the specific information (t-statistic, standard deviation, exact p-value, and mean difference) regarding the first located difference between characteristic means at approximately the $p \leq .05$ level.

Characteristic Ranking	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-																			
2		-																		
3	.02	.15	-																	
4	.01	.04		-																
5	*	*	.09		-															
6	*	.01	.08			-														
7	*	.01	.10				-													
8	*	*	*	.01	.12	.10	.13	-												
9	*	*	*	*	.01	.06	.07		-											
10	*	*	*	*	*	*	.01			-										
11	*	*	*	*	*	.01	.01	.14			-									
12	*	*	*	*	*	*	*	.06	.09			-								
13	*	*	*	*	*	*	*	*	*	.01	.02	.03	-							
14	*	*	*	*	*	*	*	*	*	*	*	.03		-						
15	*	*	*	*	*	*	*	*	*	*	.01	.02			-					
16	*	*	*	*	*	*	*	*	*	*	.01	.06				-				
17	*	*	*	*	*	*	*	*	*	*	.01	.05					-			
18	*	*	*	*	*	*	*	*	*	*	*	*						-		
19	*	*	*	*	*	*	*	*	*	*	*	*	.09	.12	.14				-	
20	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-

Notes. Differences are noted with a *p*-value for $.01 \leq p \leq .15$. The * indicates a difference in the paired *t*-test at $p \leq .00$. Shaded regions indicate no statistically significant differences in means between characteristics.

Figure 9. The probability of differences between means of characteristics using paired *t*-tests.

Statistically significant differences between groups of characteristics. Using this information, groups of characteristics that had statistically significant similar means were created. The means of each characteristic within a group had no statistical difference at the 95% confidence level. Table 13 indicates the seven groupings of characteristics, in order from greatest to least of perceived importance in impacting professional growth. The group mean indicates the mean score of all characteristics within the group.

Using this information, statistically, the mean scores of "your engagement in reflective thinking" and "focus on demonstrating student learning" did not differ. These two characteristics had statistically equal perceived levels of impact on professional growth. The same was true for characteristics three and four (group two characteristics of "your analysis of

your teaching videos" and "your individual analysis of your students' work/data") and characteristics five, six, and seven (group three characteristics of "connection of the process to your work with students," "your planning of lessons to meet the portfolio requirements," and "your engagement in the portfolio writing process"). The mean scores for groups one through three were each greater than 6 indicating that the characteristics in these groups were perceived to be *very important* (6 = *very important*) in impacting NBCTs professional growth.

Characteristic eight, "your use of the Standards documents" (group four) did not have a statistically similar mean with any other characteristic. It was the median group of the seven groups with a *moderate* perceived impact on professional growth.

The next two groups' (five and six) means (M = 5.8 and M = 5.35) indicated *moderate importance* in influencing professional growth. Due to the larger variation in participant responses, these two groups had more characteristics with similar means (four characteristics in group five; seven characteristics in group six).

The characteristic, "length of time (number of years) you spent attempting to certify," had a mean score of 3.92, *neutral* in importance on impacting professional growth. However, as explained in the results for research question one, *slight importance* would be a more accurate term describing the perceived impact on professional growth. This characteristic's mean was also considerably less than the other 19 characteristics and had no constructs with statistically significant similar means.

Table 13

Characteristics Grouped Based on Non-Statistically Significant Different Means

Characteristic	Rank	Group rank	Group mean
Your engagement in reflective thinking	1	1	6.47
Focus on demonstrating student learning	2		
Your analysis of your teaching videos	3	2	6.30
Your individual analysis of your students' work/data	4		
Connection of the process to your work with students	5	3	6.15
Your planning of lessons to meet the portfolio requirements	6		
Your engagement in the portfolio writing process	7		
Your use of the Standards documents	8	4	5.98
Collaborative sharing of knowledge with others in the process	9	5	5.80
Direct link of the process to your specific teaching position	10		
Feedback from NBCTs	11		
Giving and receiving feedback with other candidates on the writing of portfolio entries	12		
Collaborative examination of student work/data	13	6	5.35
Collaborative discussion about the Standards	14		
Collaborative discussion about the portfolio directions	15		
Your use of the portfolio's directions	16		
Number of hours you spent in the process	17		
Collaborative analysis of videos	18		
Your preparation for the assessment center exercises	19		
Length of time (number of years) you spent attempting to certify	20	7	3.92

Practical significance of differences between groups of characteristics. By grouping characteristics with statistically non-different means together, a more accurate ranking of perceived importance in impacting professional growth can be seen (Table 13). However, the results in Table 13 only indicate the statistical differences between characteristics, not practical differences. To determine practical differences, an estimated effect size was calculated.

Effect size for experimental studies. For experimental studies, effect size measures, such as a Cohen's *d* statistic, can be used to estimate the size of a difference between two interventions on independent groups. The standardized statistic takes the difference of the two means and divides it by the average of their standard deviations (Lakens, 2013). In doing so, the statistic indicates the percentage of non-overlap between the two means' distributions. A zero represents that the mean distributions of the two groups overlap completely. A .5 represents that the two groups' means differ by half a standard deviation and with 33 % of non-overlap. A one represents that the two groups' means differ by one standard deviation, and the non-overlap is 55.4 % (Becker, n.d.).

By using a standardized effect size, the magnitude of the results can be understood regardless of the scale for measuring the dependent, or intervention, variable. The standardized effect size helps put the findings of research into context, indicating the usefulness of the results. As a measure of strength, effect size communicates the practical significance of the results and allows for examining effects across studies. When using Cohen's *d* as a standardized effect size, a .2 indicates a small, but meaningful, difference. A .5 effect size indicates a medium effect and .8 a large effect. Even if statistically significant, an effect size less than .2 would mean the difference between the means was minor, often irrelevant (Lakens, 2013). While the Cohen's *d* statistic is standardized, the words attached to the statistic's magnitude (small, medium, large)

are arbitrary. In particular fields of study, a .1 effect could have a large impact. Thus, use of the literature in the field of study is important for understanding the practical significance of a Cohen's *d* , eta squared, correlation/regression coefficient or other effect size measures (Lakens, 2013).

In the field of education, few studies address the effect of professional development on professional growth as a combination of changes in teachers' knowledge, instructional practices, and students' learning. Most research investigates the effects of professional development experiences on teachers' learning or teaching practices; very few studies link professional development to student achievement since designing causal studies between professional development and student achievement is difficult (Yoon et al., 2007). Yet, two meta-analyses provide guidance on the average effect size of professional development on student achievement. These meta-analyses assumed that the professional development experience was effective in that it impacted teachers' knowledge, practices, and students' learning, although, only student achievement was evaluated.

John Hattie's meta-analysis work on understanding the average effect sizes of 138 influences, including teachers' professional development, on student achievement, found the average effect size of an influence on student achievement was .4 (Hattie, 2009). The range of the influences' effect sizes was -.34 to 1.44. Specifically, the impact of professional development on student achievement indicated that professional development had an average effect size of .62. This is approximately .2 standard deviations greater than the average effect of all influences on student achievement and indicated that teacher professional development can have a strong effect on student achievement.

In *Reviewing the Evidence on How Teacher Professional Development Affects Student Achievement* (Yoon et al., 2007), the authors reviewed 1,300 studies addressing the impact of teacher professional development on student achievement, but only nine met the What Works Clearinghouse Standards evidence standards. Hence, only these nine studies were included in the meta-analysis for determining the average effect size of professional development on student achievement. Using these nine studies, Yoon et al. (2009) determined the average effect size of professional development on student achievement across the nine studies was .54 (range of -.53 to 2.39). Half a standard deviation indicated a moderate effect on student achievement, and a moderate effect was defined as the average student's achievement would increase by 21 percentile points if their teacher participated in the professional development. The researchers did note that the studies reviewed only focused on the elementary level and were underpowered, only reporting overall effects instead of subgroups, so an adjusted moderate effect size might be .25.

Estimated effect size for current study. Since this study was nonexperimental, using Cohen's *d* to determine an effect size was not appropriate. However, the Cohen *d*'s statistic provided an understanding for how to best use the nonexperimental data to provide an estimated magnitude of difference, or practical difference, between the statistically different group characteristic means. This information helped interpret what groups of characteristics NBCTs perceived were in reality more or less important in impacting professional growth.

To estimate the effect size of each group of characteristics, the differences between the characteristic groups means were determined (Table 14). Using the mean differences, a moderate effect size was estimated as those groups of characteristics that had a difference of approximately half of the grand mean's standard deviation (M = 5.72, SD =.78), approximately

.39. Thus, the grand mean was used as a standardized reference point. Half a standard deviation change was considered a moderate effect based on the professional development literature for effect sizes of professional development on student achievement [.62 (Hattie, 2009); 0.54 or 0.25 (Yoon et al., 2009)], when it was assumed that teachers' knowledge and instructional practices also changed. An approximate .5 standard deviation difference (.39 difference in means) indicated that the two groups of characteristics' means' distributions had some, but not full overlap, and indicated a sizable or moderate difference in perceived impact on NBCTs' professional growth.

Table 14

Differences Between Characteristic Groups' Means

Characteristic group	1	2	3	4	5	6	7
1	-						
2	.17	-					
3	.32	.15	-				
4	.52*	.32	.17	-			
5	.67*	.50*	.35	.18	-		
6	1.12*	.95*	.80*	.63*	.45*	-	
7	2.55*	2.38*	2.23*	2.06*	1.88*	1.43*	-

* Indicates an estimated moderate effect size when defined as the difference between characteristics' group means being approximately more than half a standard deviation (.39) of the grand mean's standard deviation (.78).

Characteristic group mean differences used for estimated effect size. Characteristic groups one, two, and three had statistically significant different means, but the group means did not differ by more than half a standard deviation (.39) of the grand mean. Thus, it was estimated that for practical significance, the characteristics in these three groups (characteristics one through seven) had little difference in perceived strength of impact on professional growth. This implied that while the characteristics of "engagement in reflective thinking" and "focus on demonstrating student learning" were statistically significant and grouped as most important,

their practical perceived strength in influencing professional growth was no greater than the perceived impact of the characteristics of

- "your analysis of teaching videos;"
- "your individual analysis of your students' work/data;"
- "connection of the process to your work with students;"
- "your planning of lessons to meet the portfolio requirements;" and
- "your engagement in the portfolio writing process."

This estimated effect size similarity corresponded with the survey scale: All eight characteristics had individual means greater than 6 (*very important*) as well as group means greater than 6.

The results shown in Table 14 indicated that the first practical difference in strength occurred between the characteristics in group one and group four. Based on the estimated effect size, the characteristics of "your engagement in reflective thinking" and "focus on demonstrating student learning" had greater strength in their perceived impact on professional growth than characteristics ranked eight to twenty which were in groups four to seven.

The characteristics in group two, "your analysis of your teaching videos" and "your individual analysis of your students' work/data," statistically had greater importance on professional growth than those in groups three and four, but not an estimated real-world difference. The characteristics in group two did have an estimated moderately larger perceived strength at impacting professional growth than the 12 characteristics in groups four through seven.

The three characteristics in group three ("connection of the process to your work with students," "your planning of lessons to meet the portfolio requirements," and "your engagement in the portfolio writing process") had only a greater practical estimated impact on professional

growth than those characteristics in groups six and seven. There was only a small difference in real-world strength in impacting professional growth between group three characteristics and those in groups four and five.

While the characteristic in group four, "your use of the Standards documents," had no estimated weaker strength than characteristics in groups two or three, it also had no estimated greater strength in impacting professional growth than those characteristics in group five. The characteristic of "your use of the Standards documents" only had less strength at impacting professional growth than "your engagement in reflective thinking" and "focus on demonstrating student learning" and only more of a perceived greater estimated effect on professional growth than the characteristics in groups six and seven.

Group five, with characteristics ranked nine to twelve, differed practically by having less strength than those in group one ("your engagement in reflective thinking" and "focus on demonstrating student learning") and group two ("your analysis of your teaching videos" and "your individual analysis of your students' work/data"). The estimated effect size indicated that the characteristics in group five had little practical strength difference than those in group three or four, but indicated the characteristics in group five had greater strength in impacting professional growth than those characteristics in groups six and seven.

The characteristic group mean for group six (seven characteristics; $M = 5.35$) had a moderate or larger estimated effect size difference from all other groups. This indicated that the characteristics in this group have statistically similar means (no difference between characteristics in the group), and there was a statistical and practical strength difference with all other characteristics.

Group seven, with only the characteristic ranked 20, "length of time (number of years) you spent attempting to certify," was similar to group six in that the characteristic also statistically and practically differed from all characteristics.

To summarize the estimated effect sizes of each group:

- The characteristics of "your engagement in reflective thinking" and "focus on demonstrating student learning" in group one had greater perceived strength in impacting professional growth than the 13 characteristics in groups four through seven.
- The characteristics of "your analysis of your teaching videos" and "your individual analysis of student work" in group two had greater perceived strength in impacting professional growth than the 12 characteristics in groups five through seven.
- The characteristics of
    - "connection of the process to your work with students,"
    - "your planning of lessons to meet the portfolio requirements,"
    - "your engagement in the portfolio writing process,"
    - "your use of the Standards documents,"
    - "collaborative sharing of knowledge with others in the process,"
    - "direct link of the process to your specific teaching position,"
    - "feedback from NBCTs," and
    - "giving and receiving feedback with other candidates on the writing of portfolio entries"

  in groups three, four, and five had greater perceived strength in impacting professional growth than the eight characteristics in groups six and seven.

- The characteristics of
    - "collaborative examination of student work/data,"
    - "collaborative discussion about the Standards,"
    - "collaborative discussion about the portfolio directions,"
    - "your use of the portfolio's directions,"
    - "number of hours you spent in the process,"
    - "collaborative analysis of videos," and
    - "your preparation for the assessment center exercises"

  in group six had more perceived strength in impacting professional growth than the one characteristic in group seven.
- The characteristic in group seven, "length of time (number of years) you spent attempting to certify," had no greater perceived strength in impacting professional growth than any characteristic.

Characteristic tier mean differences used for estimated effect size. Using the estimated effect size information, it was plausible to condense the seven groups of statistically different characteristics into four tiers. The tiers were created based on a practical or real-world moderate strength difference (half or greater than half of the grand means' standard deviation of .78) in the perceived importance the characteristics had on impacting professional growth. Table 15 indicates each tier's mean score. The difference between tier means which determined a moderate estimated effect size difference between tiers was as follows:

- Tier one and two had a difference of .42.
- Tier two and three had a difference of .54.
- Tier three and four had a difference of 1.43.

Using these mean differences, the difference between each tier of characteristics was greater than .39, half a standard deviation of the grand mean's standard deviation. Thus, each tier's characteristics had a moderate difference of impact on professional development than characteristics in adjacent tiers.

Table 15

Characteristics Tiered Based on Estimated Effect Sizes

Characteristic	Rank	Group rank	Tier	Tier mean
Your engagement in reflective thinking	1	1	1	6.31
Focus on demonstrating student learning	2			
Your analysis of your teaching videos	3	2		
Your individual analysis of your students' work/data	4			
Connection of the process to your work with students	5	3		
Your planning of lessons to meet the portfolio requirements	6			
Your engagement in the portfolio writing process	7			
Your use of the Standards documents	8	4	2	5.89
Collaborative sharing of knowledge with others in the process	9	5		
Direct link of the process to your specific teaching position	10			
Feedback from NBCTs	11			
Giving and receiving feedback with other candidates on the writing of portfolio entries	12			
Collaborative examination of student work/data	13	6	3	5.35
Collaborative discussion about the Standards	14			
Collaborative discussion about the portfolio directions	15			
Your use of the portfolio's directions	16			
Number of hours you spent in the process	17			
Collaborative analysis of videos	18			
Your preparation for the assessment center exercises	19			
Length of time (number of years) you spent attempting to certify	20	7	4	3.92

Research Question Three

To address research question three, "Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years in the classroom prior to beginning the certification process," a Pearson correlation (Appendix J) and an ANOVA (Appendix K) were used for data analysis. Four participants did not respond to the demographic question regarding the number of years in the classroom; thus, their data were not included for analysis.

The Pearson correlation demonstrated there was no significant correlation between the number of years teaching and participants' overall mean score on all 20 characteristics [$r(112) = -.12$, $p = .22$]. However, the bivariate correlation indicated that the characteristic, "your individual analysis of your students' work/data," had a significant correlation with number of years teaching at the $p \leq .05$ level, yet that the correlation was weak [$r(112) = -.23$].

For the ANOVA, participants were put into groups based on the number of years teaching (3-5 years, 6-10 years, 11-15 years, 16-20 years, 20+ years) to allow for large enough numbers in analysis. The ANOVA indicated that no groups of years teaching in the classroom prior to the beginning of the certification process had significant differences on the overall mean score [$F(4,107) = .61$, $p = .65$] or on specific characteristics' scores.

Research Question Four

To address research question four, "Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years pursuing NBC," an ANOVA was conducted. The ANOVA (Appendix L) indicated there was no significant difference between participants' overall mean score and the number of years to achieve [$F(2,113) = .3$, $p = .74$]. However, there was one significant difference at the $p \leq .05$ level between the characteristic of "length of time

(number of years) you spent attempting to certify" and the number of years pursuing NBC [$F(2,113) = 6.79$, $p = .00$].

The Games-Howell post hoc was used for determining the differences rather than the Tukey post hoc due to the unequal number of teachers in each group. Table 16 demonstrates that there was a significant difference between NBCTs who took one year to achieve and those NBCTs who took either two or three years to achieve. There was no significant difference in the means between teachers who took two and three years to achieve NBC.

Table 16

Games-Howell Post Hoc of "Length of Time (Number of Years) You Spent Attempting to Certify" by Year of Achievement Group

Group for year of achievement	Group for year of achievement	Mean difference	*SE*	*P*
One	Two	-1.18	.39	.01*
	Three	-1.73	.69	.03*
Two	Three	-.55	.74	.74

* $p \leq .05$

Research Question Five

To address research question five, "Is there a relationship between NBCTs' perceptions of a characteristic's impact and the primary motivation for pursuing NBC," an ANOVA was conducted. Due to the small number of responses for the primary reason of prestige/recognition ($n = 4$) and none of the above ($n = 4$), these categories were eliminated from the analysis. Additionally, one participant did not indicate a primary reason. Therefore, the n was 107.

Before analyzing each characteristic individually, the overall mean score of each participant's rating on all 20 characteristics and their reason for pursuing NBC was investigated. The ANOVA indicated there was a significant relationship between overall mean score and reason for pursuing NBC at the $p \leq .05$ level [$F(3, 103) = 4.04$, $p = .01$; see Appendix M for

descriptives]. A Games-Howell post hoc (Table 17) indicated that the difference was between the groups of those who indicated a primary reason of engaging in the NBC process for financial gain and those who indicated for improvement of teaching.

Table 17

Games-Howell Post Hoc of the Mean Score of all Characteristics by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*P*
Financial gain	Self-validation	-.09	.27	.98
	Improvement of teaching	-.57	.08	.02*
	Potential for advancement	-.18	.36	.96
Self-validation	Improvement of teaching	-.48	.2	.1
	Potential for advancement	-.08	.37	1
Improvement of teaching	Potential for advancement	.39	.33	.65

* $p \leq .05$

At the $p \leq .05$ level, the results (Table 18) indicated that the analysis of specific characteristics demonstrated five characteristics for which there was a statistically significant difference between group means. The characteristics were

- "your planning of lessons to meet the portfolio requirements,"
- "your use of the Standards documents,"
- "feedback from NBCTs,"
- "collaborative discussion about the Standards," and
- "number of hours you spent in the process."

Descriptives for the ANOVA can be found in Appendix M.

Table 18

ANOVA of Characteristics by Primary Reason for Pursuing NBC

Characteristic	*F* (3, 103)	*P*
Your engagement in reflective thinking	1.53	.21
Focus on demonstrating student learning	1.46	.23
Your analysis of your teaching videos	1.21	.31
Your individual analysis of your students' work/data	2.04	.11
Connection of the process to your work with students	2.18	.10
Your planning of lessons to meet the portfolio requirements	3.82	.01*
Your engagement in the portfolio writing process	.29	.83
Your use of the Standards documents	2.82	.04*
Collaborative sharing of knowledge with others in the process	2.03	.12
Direct link of the process to your specific teaching position	1.20	.32
Feedback from NBCTs	2.72	.05*
Giving and receiving feedback with other candidates on the writing of portfolio entries	.98	.41
Collaborative examination of student work/data	1.24	.30
Collaborative discussion about the Standards	4.06	.01*
Collaborative discussion about the portfolio directions	2.09	.11
Your use of the portfolio's directions	1.22	.31
Number of hours you spent in the process	3.89	.01*
Collaborative analysis of videos	.95	.42
Your preparation for the assessment center exercises	1.99	.12
Length of time (number of years) you spent attempting to certify	1.16	.33
Overall	4.04	.01*

* $p \leq .05$

Note: Overall corresponds to the mean score on all 20 characteristics.

Post hoc analysis using a Games-Howell test (Table 19) revealed no difference between groups for "your planning of lessons to meet the portfolio requirements" although the groups with the primary reasons of "self-validation" and "improvement of teaching" had a significant mean difference at the $p \leq .10$ level.

Table 19

Games-Howell Post Hoc of "Your Planning of Lessons to Meet the Portfolio Requirements" by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*P*
Financial gain	Self-validation	.44	.31	.49
	Improvement of teaching	-.29	.20	.47
	Potential for advancement	.51	.48	.73
Self-validation	Improvement of teaching	-.74	.29	.07
	Potential for advancement	.06	.52	1.00
Improvement of teaching	Potential for advancement	.80	.47	.36

For the characteristic of "your use of the Standards documents," the post hoc (Table 20) revealed no difference between groups; however, "self-validation" and "improvement of teaching" had a significant mean difference at the $p \leq .10$ level.

Table 20

Games-Howell Post Hoc of "Your Use of the Standards Documents" by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*P*
Financial gain	Self-validation	.31	.40	.87
	Improvement of teaching	-.50	.28	.30
	Potential for advancement	.13	.55	1.00
Self-validation	Improvement of teaching	-.80	.33	.10
	Potential for advancement	-.18	.58	.99
Improvement of teaching	Potential for advancement	.63	.50	.61

For the characteristic of "feedback from NBCTs," the post hoc test (Table 21) indicated a mean difference of -.78 (*SE* = .20) between the groups of "financial gain" and "improvement of teaching" at the $p \leq .05$ signficance level. This indicated that statistically NBCTs who went into the process for financial gain perceived that feedback from NBCTs had less importance on their professional growth than those who went into the NBC process for the purpose of improving their teaching.

Table 21

Games-Howell Post Hoc of "Feedback from NBCTs" by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*P*
Financial gain	Self-validation	-.18	.40	.97
	Improvement of teaching	-.78	.29	.04*
	Potential for advancement	-.31	.51	.93
Self-validation	Improvement of teaching	-.60	.35	.34
	Potential for advancement	-.14	.55	1.00
Improvement of teaching	Potential for advancement	.47	.48	.76

* $p \leq .05$

The characteristic of "collaborative discussion about the Standards" (Table 22) indicated similar results as that of "feedback from NBCTs." The post hoc test revealed the statistically significant difference was between groups of teachers who stated their primary reason for pursuing NBC was "financial gain" and those who selected "improvement of teaching." The mean difference of -1.04 (*SE* = .33) between these two groups suggested that those who engaged in the NBC process for financial reasons perceived the Standards when used collaboratively had less impact on their professional growth than NBCTs whose primary reason for pursuing NBC was for professional development.

Table 22

Games-Howell Post Hoc of "Collaborative Discussion about the Standards" by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*p*
Financial gain	Self-validation	-.50	.42	.64
	Improvement of teaching	-1.04	.33	.01*
	Potential for advancement	-.89	.42	.17
Self-validation	Improvement of teaching	-.54	.36	.44
	Potential for advancement	-.39	.44	.82
Improvement of teaching	Potential for advancement	.16	.35	.97

* $p \leq .05$

For the characteristic of "number of hours you spent in the process," the Games-Howell post hoc (Table 23) indicated the statically significant difference between groups occurred between "financial gain" and "improvement of teaching" with a mean difference of -1.1 (*SE* = .39). Those participants who engaged in the NBC process for the primary purpose of improving their teaching had a statistically higher perception of the importance the number of hours had on their professional growth.

Table 23

Games-Howell Post Hoc of "Number of Hours you Spent in the Process" by Primary Reason for Pursuing NBC

Primary reason for engaging in the NBC process	Primary reason for engaging in the NBC process	Mean difference	*SE*	*p*
Financial gain	Self-validation	-.33	.48	.90
	Improvement of teaching	-1.10	.39	.04*
	Potential for advancement	-.18	.60	.99
Self-validation	Improvement of teaching	-.77	.37	.19
	Potential for advancement	.15	.59	.99
Improvement of teaching	Potential for advancement	.92	.51	.33

* $p \leq .05$

Chapter Five

Discussion and Conclusions

"American teachers say that much of the professional development available to them is not useful" (Darling-Hammond et al., 2009, p. 5). It is critical then for educators to understand the characteristics that lead to effective professional development experiences. The literature on characteristics of high-quality professional development presents various lists of characteristics that should lead to effective professional development experiences, those that change teachers' knowledge, instructional practices, and students' learning. Yet, while these lists have similar elements, the lists do not describe the relative level of importance that the characteristics have in impacting professional growth, and similar, yet different, characteristics are often clumped together into general constructs. Additionally, the research on characteristics of high-quality professional development is often specific to a particular teaching setting and is unable to be generalized to all teaching contexts.

The NBC process can be a strong choice of vehicle for gaining an understanding of high-quality characteristics since the NBC process is similar for most teaching contexts regardless of location, content, and student-age group (NBPTS, n.d.-b). However, most research on NBC as professional development has investigated the changes to teachers' knowledge and instructional practices; a secondary or exploratory research question investigated the characteristics leading to the changes. Additionally, typically, the investigations were small, qualitative, and certificate specific (Coskie & Place, 2008; Hunzicker, 2010; Lusick & Sykes, 2006; Place & Coskie, 2006;

Sato et al., 2008; Tracz et al., 2005). There is even less research specifically on understanding the aspects of the NBC process that may lead to professional growth (Alvarado, 2004; Cohen & Rice, 2005; Park et al., 2007; Rhodes & Woods, 2013).

The purpose of this quantitative non-experimental study was to investigate the extent to which the characteristics of the NBC process were perceived by NBCTs as important in impacting their professional growth. In addition, the investigation explored whether specific demographics varied with characteristics' perceived level of impact on professional growth.

This study used a survey population of NBCTs who had achieved since 2005 (non-renewed and non-expired NBCTs) and who had participated in a specific NBC process support program to expand on Cohen and Rice's (2005) study about the NBC process as professional development. The literature on high-quality professional development and the NBC process as professional development were also used as the basis for developing the survey to answer the research questions. The following questions framed this study:

1. What do NBCTs perceive was the extent of impact the characteristics of the certification process had on their professional growth?
2. What are the differences among NBCTs' perceptions of a characteristic's impact on their professional growth?
3. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years in the classroom prior to beginning the certification process?
4. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the number of years pursuing NBC?
5. Is there a relationship between NBCTs' perceptions of a characteristic's impact and the primary motivation for pursuing NBC?

Discussion

The results of this study indicated that NBCTs perceived all 20 investigated characteristics of the NBC process to be important in impacting professional growth. However, not all characteristics had the same extent of perceived impact on professional growth. Additionally, the demographic variable of length of time in the process varied with the perceived strength that the duration of the experience had on impacting professional growth, and the demographic variable of motivation for engaging in the NBC process was linked to statistically significant differences in the overall mean score regarding the 20 characteristics' perceived impact.

Perceived extent of impact that characteristics had on professional growth. Using prior research, this study presupposed the NBC process was effective professional development and instead aimed to understand what aspects made the experience influential. The results indicated that all characteristics were important for impacting professional growth; however, the extent of impact differed among characteristics.

It is not surprising that all 20 characteristics were rated as important for impacting professional growth since this study investigated characteristics noted by researchers, experts, and policymakers as elements of high-quality professional development that should lead to effective professional development. The characteristics mentioned extensively on lists and supported by this research as leading to professional growth included (a) being intensive in number of hours, (b) being ongoing and of long duration, (c) being job-embedded, (d) being focused on student learning, (e) addressing current teaching content and content-pedagogy, (f) involving active learning experiences, and (g) being collaborative in nature (Blank et al., 2008;

Desimone, 2009; Desimone, et al., 2002; Garet et al., 2001; Ingvarson, et al., 2005; NCLB, 2002; Wei et al., 2009; Yoon, et al., 2007; Zepeda, 2008).

The latter two characteristics, active learning and collaboration, were investigated in-depth as specifically, this study incorporated characteristics of the active learning and collaboration constructs of the NBC process that were noted in the NBC process as professional development literature as impacting professional growth. The active learning characteristics included (a) reflection, (b) using the Standards, (c) analyzing teaching videos and students' work/data, (d) preparing for the assessment center exercises, (e) engaging with the directions, (f) planning of lessons to meet the requirements, and (g) writing the portfolio entries. The collaborative characteristics included (a) giving and receiving feedback on writing by colleagues, (b) feedback from NBCTs, (c) collaborative sharing of knowledge, (d) collaborative analysis of videos, (e) collaborative examination of student work/data, (f) discussion about the Standards, and (g) discussion about the portfolio directions (Alvarado, 2004; Brantlinger et al., 2011; Cohen & Rice, 2005; Coskie & Place, 2008; Hunzinger, 2010; Lustick, 2006; Park et al., 2007; Place & Coskie, 2006; Rhodes & Woods, 2013; Sato et al., 2008; Tracz, 2005). Thus, this study supported previous small qualitative NBC research by indicating through analysis of larger numbers of NBCTs in more numerous certificates that these active learning and collaboration characteristics were perceived to lead to professional growth.

To determine the relative impact of characteristics on professional growth, characteristics were rank-ordered based on mean score. After finding the non-statistical differences between characteristic means, groups of characteristics with similar perceived impact were created. Estimated effect sizes between groups were calculated and used to create tiers of characteristics (Figure 10). The characteristics in each tier are similar; they had a statistical and

practical difference in perceived strength on professional growth than other tiers. Each tier was estimated to have a moderately stronger real-world influence on professional growth than the tier below it. Characteristics in the first tier had the greatest perceived strength while the characteristic in tier four had the least perceived influence.

When looking at the characteristics within each tier, common themes emerged (Figure 10). The themes in tier one included (a) individual analysis-reflection, (b) changes to instructional or pedagogical practices, and (c) link to purpose of increasing student learning. Most notably, all of the constructs in the top tier were individualistic as compared to collaborative concepts, dealt with increasing instructional or pedagogical practices rather than content knowledge, and revolved around analysis and reflection for the purpose of increasing current students' learning.

Tier two themes included (a) feedback from others, (b) Standards, which correspond to teaching position, and (c) collaborative sharing of knowledge. The third tier included the themes of (a) collaborative analysis, (b) increasing content knowledge, and (c) directions. The fourth tier included the characteristic regarding duration of time; however, due to methodology issues, caution was used in making conclusions about duration's relative importance to other characteristics.

Using the themes, it can be deduced that not all general professional development high-quality characteristics had the same amount of perceived impact on professional growth. The same is true for the NBC characteristics within the active learning and collaboration constructs.

	Tier One	Tier Two	Tier Three	Tier Four
Themes	Individual analysis-reflection Changes to instructional or pedagogical practices Link to purpose of increasing current students' learning	Feedback from others Standards, which correspond to teaching position Collaborative sharing of knowledge	Collaborative analysis Increasing content knowledge Directions	
Specific Characteristics	• Engagement in reflective thinking • Focus on demonstrating student learning • Analysis of your teaching videos • Analysis of your students' work/data • Connection of process to your work with students • Planning of lessons to meet portfolio requirements • Engagement in portfolio writing process	• Use of the Standards documents • Collaborative sharing of knowledge with others in the process • Direct link of the process to specific teaching position • Feedback from NBCTs • Giving and received feedback with other candidates on the writing of portfolio entries	• Collaborative examination of student work/data • Collaborative analysis of videos • Collaborative discussion about the Standards • Collaborative discussion about the portfolio directions • Your use of the portfolio's directions • Number of hours you spent in the process • Your preparation for the assessment center exercises	• Length of time (number of years) you spent attempting to certify

Figure 10. Tiers of characteristics based on estimated effect size.

Analysis-reflection. The perceived impact that analyzing and reflecting on one's instruction through the use of teaching videos and students' work/data has to be investigated as two constructs: The analysis-reflection that occurred individually and that which occurred collaboratively.

Individual analysis-reflection. The literature on NBC as professional development is replete with notions about the significance of the reflection component on professional growth (Cohen & Rice, 2005; Hunzicker, 2010; Park, et al., 2011; Sato, et al., 2008; Tracz et al., 2005). This study's results align with this literature: The reflective component of the NBC process was perceived as critical at impacting professional growth. It ranked first with the highest mean (M = 6.52, SD = .85) and had the smallest spread of scores. Based on NBC literature and this result, it appears as though reflection should be a core characteristic, one separated from the construct of active learning experiences, due to its strength.

Yet, the results of this study indicate that perhaps reflection does not act independently when impacting professional growth. Other characteristics in this study had similar statistical and practical perceived strength at impacting professional growth; specifically, the characteristics of individual analysis of one's own teaching and analysis of students' work/data. Cohen and Rice's (2005) qualitative investigation found that teachers learned from examining, reflecting, and writing about their students' work, and that teachers learned from the process of reviewing and writing about their teaching videos. Thus, this study's results support Cohen and Rice's (2005) notions that the active learning characteristics of analysis and reflection are almost inseparable. Additionally, it makes sense that the general professional development high-quality characteristics of connection of the process to your work with students and demonstrating

student learning would be interwoven with analysis and reflection. These characteristics set the context and purpose for the analysis and reflection.

Two other active learning characteristics, planning of lessons and engagement in the portfolio writing process, clustered in tier one based on perceived strength at impacting professional growth. Cohen and Rice's (2005) research also provides insight as to why engagement in the portfolio writing process clustered with analysis and reflection: The portfolio writing process provided the opportunity to reflect on one's planning of lessons and interactions with students.

Thus, when the characteristics in tier one are combined and seen as a whole, a core active -learning construct forms: individual analysis-reflection. It is the individual's analysis and reflection on their own work at increasing their students' learning that had the most perceived strength at impacting professional growth. The characteristics in tier one centered around learning about one's own teaching. Most interestingly, none of the characteristics in the construct involved collaboration with others.

Collaborative analysis-reflection. Contrasting the individual analysis-reflection construct, the collaborative analysis-reflection aspects were in the third tier of characteristics perceived to impact professional growth. The lower results do not imply that the collaborative analysis-reflection aspects were not important; the combined mean of the two constructs ("collaborative analysis of videos" and "collaborative analysis of students' work/data") was 5.45 indicating a perceived low but still *moderate* strength rating for impacting professional growth. The results instead indicate that collaborative analysis-reflection had less perceived importance than individual analysis-reflection. The mean of the combined collaborative analysis-reflection components (M = 5.45) was significantly lower than that of the individual analysis-reflection

constructs (*M*= 6.38), and the difference between the two means (.93) was greater than one standard deviation of the data's grand mean (*M* = 5.72, *SD* = .78). This demonstrates a considerably large estimated effect size difference and indicates that individual analysis-reflection on one's own teaching was perceived as more important than collaborative analysis.

The notion that individual analysis-reflection has greater perceived strength on professional growth suggests that theories of social learning, as used by Park et al. (2007), Rhodes and Woods (2013), and Place and Coskie (2006), to explain professional growth in the NBC process, are not the main learning epistemologies present in the NBC process, even when candidates participate in a support program. The idea that an individualist constructivism theory has more strength as an epistemology is surprising: Both the general professional development literature (Blank et al., 2008; Desimone, et al., 2002; Garet et al., 2001; Ingvarson et al., 2005; Wei et al., 2009) and the NBC literature tout the strength of collaborative learning in the process, especially that from support groups (Brantlinger, et al., 2011; Cohen & Rice, 2005; Coskie & Place, 2008; Park et al., 2007; Place & Coskie, 2006; Sato et al., 2008). Yet, while a social learning theory may not be the primary theoretical framework for understanding professional growth in the NBC process, social learning theories, which contend that learners create knowledge as a result of social interaction, clearly still play a role (Prichard & Wollard, 2010).

Collaboration. As indicated by its placement in tier three, the collaborative analysis-reflection construct was perceived to have a lower amount of impact on professional growth than most other characteristics. However, other collaborative characteristics, specifically those surrounding feedback and collaborative sharing of knowledge, fell in the middle of the perceptions of characteristics impacting professional growth. NBCTs perceived that these tier

two collaborative characteristics had less impact than the individual analysis-reflection construct, but more than the collaborative analysis-reflection construct.

Using the results from this study and the literature (Cohen & Rice, 2005; Park et al., 2007; Place & Coskie, 2006; Rhodes & Woods, 2013), it can be surmised that different forms of collaboration influence professional growth at different strengths. To combine all types of collaboration into one core construct may misconstrue the strength of the individual collaborative characteristics.

Cohen and Rice's (2005) study specifically correlated NBCTs' assessment scores to features of support group programs: Programs with higher candidate interaction had higher candidates' assessment scores (.81 correlation; no *p*-value or specific type of bivariate correlation was noted); programs with mentorship by NBCTs in same certificates had higher candidate assessment scores (.73). This study's results are consistent with Cohen and Rice's findings: Collaborative characteristics, both those involving NBCTs and other candidates, had positive ratings with similar perceived impact on professional growth.

However, it is unclear if this study's results, which indicated that the collaborative constructs involving feedback and sharing of knowledge had greater strength than those involving analysis-reflection, are aligned with Cohen and Rice's (2005) conclusions. In their commentary on candidate interactions in support groups, the aspects discussed by candidates were described as "jointly reviewing, studying, and discussing the standards and other resources; sharing knowledge, experience, and practice; and providing and receiving feedback on portfolio entries as they are being prepared" (Cohen & Rice, 2005, p. 38). Since the aspect of sharing practice was not detailed, it is unknown whether this included sharing ideas about practice or sharing actual practices through the video/student work collected for the portfolio assessment.

However, it is clear that NBCTs stated they valued the collaborating with others during the process for discourse and the sharing of ideas.

Park et al.'s (2007) longitudinal qualitative investigation of colleagues' roles (five NBCTs; five candidates) in one high school made a strong argument for supporting social learning in the NBC process. The results of this study support Park et al.'s (2007) findings that colleagues' roles, both candidates and NBCTs, were critical both for sharing of ideas and facilitating reflection. For this reason, Park stated that a "collaborative community of teaching practice was nurtured" (Park et al., 2007, p. 374). However, this study's results challenge Park et al.'s conclusion that social constructivism is the critical learning theory for professional growth in the process.

Standards. The use of teaching standards is not mentioned in the general professional development literature as a core component, rather it is a component of the active learning construct. Yet, the NBC process is built around the concept of the Five Core Propositions and certificate Standards (NBPTS, n.d.-c), and the Standards are mentioned in the NBC literature as impacting teachers' professional growth (Cohen & Rice, 2005; Coskie &Place, 2008). Thus, it was assumed that the use of the Standards would have a significant role in professional growth. The results of this study indicated that statistically and practically, NBCTs perceived the use of the Standards as secondary to the individual analysis-reflective characteristics impacting their professional growth. However, the estimated perceived difference was slight.

While "your use of the Standards documents" fell into tier two, because the mean (M = 5.98, SD = 1.20) was statistically different from other characteristics, its mean can be independently compared to the tier one (individual analysis-reflection construct) mean of 6.31. The difference in means of only .29 is less than half (.39) a standard deviation of the grand mean

(.78). This indicates that while there is a practical difference between the two constructs, the difference is marginal, less than a moderate effect size. As suggested by Place and Coskie (2006), this could be due to the requirement of using the Standards as the basis for engagement with the analysis-reflection construct for writing the portfolio entries. The Standards provide a reference point for what is expected; thus, the Standards may have defined the goal and provided a measuring tool that NBCTs use when individually analyzing and reflecting on one's own teaching.

It is interesting that NBCTs perceived individual use of the Standards (M = 5.98, SD, 1.20) to be more powerful than collaborative use of the Standards (M = 5.41, SD = 1.33). The difference in the individual-collaborative usage means (.57) indicated a substantial effect size difference. This notion that individual use of the Standards was perceived as more powerful at impacting professional growth than collaborative usage of the Standards aligns with this study's results regarding the analysis-reflection construct: Independent engagement has more influence than collaborative engagement.

Content. In the general professional development literature, a focus on content and content-pedagogy is noted as a key characteristic impacting professional growth (Blank, et al., 2008; Garet et al., 2001; Ingvarson et al., 2005; Wei et al.; Yoon et al., 2007). In this study, the concept of gaining content knowledge was operationalized by the characteristic of "your preparation for the assessment center exercises." This operationalization was done because the assessment center exercises focus on assessing content knowledge (NBPTS, n.d.-a).

While acquiring content knowledge was rated as *moderately* important (M = 5.17, SD = 1.59), the characteristic "your preparation for the assessment center exercises" was rated in the third tier in estimated magnitude of impact on professional growth. The characteristics' practical

significance for impacting professional growth was similar to the collaborative analysis-reflection characteristics and use of the directions. The low ranking as compared to characteristics in tiers one and two revolving around changes to content-pedagogy or instructional practices is notable.

While this study is unable to explain why the characteristic of preparing for the assessment center rated in a lower tier than those surrounding instructional practices, there are two plausible explanations. The first explanation could be that because the NBCTs in this study were prescreened by their school districts prior to beginning the NBC process, these NBCTs started the process with considerable content knowledge; little content had to be learned. In this case, the amount of prior content knowledge was the moderating variable. Secondly, NBCTs ratings could have been moderated by the variable of amount of time spent preparing for the assessment center exercises. The NBCTs may have perceived less impact on professional growth because they spent less time engaging in this aspect of the process. The amount of time preparing, whether mediated by prior content knowledge level or other factors, could have impacted perceptions about the characteristic's influence on professional growth.

Directions. Both the individual and collaborative characteristics surrounding the impact of the NBPTS's directions for certification were ranked low and had similar means. This is the only individual-collaborative matched-pair construct that had both characteristics rated similarly. Place and Coskie (2006) suggested that the directions provide a framework for thinking and reflecting. Thus, this study's results could indicate that understanding the directions individually or collaboratively had no impact directly on professional growth; the impact was indirect through analysis-reflection components.

Duration. Duration is a key feature listed on high-quality professional development characteristic lists (Desimone, 2009; Guskey, 2003; Zepeda, 2008), including that of legislation (NCLB, 2002), due to research proving its effectiveness (Blank et al., 2008; Darling-Hamond et al., 2009; Desimone et al., 2002; Garet et al., 2002; Igvarson, et al., 2005; Yoon et al., 2007). Yet Archibald et al. (2011) in the research and policy brief for the National Comprehensive Center for Teacher Quality on high-quality professional development did not include duration as a factor. This study's results support Archibald's decision to not include duration as an important factor.

While duration appeared to have neutral or limited perception of impact on professional growth, conclusions from this study regarding its relative strength are cautioned. This study did not have similar numbers of NBCTs in the demographic regarding number of years it took achieve NBC (achievement in one, two, or three years); thus, the mean score was weighted heavily by the 72% of responses coming from NBCTs who achieved in one year. The unequal numbers of participants skewed the results because number of years in the process significantly correlated to perceptions about duration of the experience.

When data were analyzed by how long teachers were in the NBC process, those who achieved in one year had a statistically different mean (M = 3.55, SD = 1.80) than those took two (M = 4.73, SD = 1.64) or three years (M = 5.29, SD = 1.38) to achieve: The mean difference between one and two years was -1.18 (SE = .39, p = .01) and between one and three years was -.73 (SE = .69, p = .03). These results indicated that duration was an important factor for professional growth, just only for those who were in the process for longer than one year.

These results may be due to simply having more time in the process, although the characteristic in regards to intensity, or number of hours in the process, did not vary based on

number of years in the process. A more plausible explanation is that a mediating variable explained the variation in responses, not the number of years. The mediating variable could be the NBPTS's Take One process. If so, then duration would be important for professional growth because those NBCTs who did the Take One option did not complete the entire process at one time. However, another mediating variable could be the re-doing of entries that did not meet the Standards of accomplished teaching on the first submission. In this case, candidates evaluated the reasons for why an entry did not meet the Standards and completed the entry a second time. Factors involved with resubmitting an entry would mediate and explain why length of time was important.

Correlation of characteristics' importance with demographics. This research investigated three exploratory variables to determine if characteristics' ratings depended on demographic variables. The results indicated that the number of years teaching prior to the experience did not influence NBCTs' perceptions about characteristics. This is surprising as Torff and Sessions (2008), in their study investigating factors associated with professional development among 214 teachers in New York, determined that teachers with two to nine years of experience have a decrease in amenability to professional development and that amenability to professional development then plateaued from 10 years of experience onward. Perhaps the reason the current study did not find differences in perceived impact of characteristics based on years of teaching experience is that all teachers opted to engage in the NBC process. Thus, whether the reason was for financial gain, professional development, prestige, or opportunities for advancement, teachers still had a positive attitude surrounding the professional development experience.

Secondly, the amount of time in the process (one, two, or three years) did not vary with NBCTs perceptions about characteristics of the experience, except for duration as previously explained.

The third demographic variable, the reason for engagement in the process, did vary with demographics. Participants' overall mean score on all 20 characteristics significantly differed based on reason for engagement in the NBC process. Hildebrandt and Eom (2011) discovered through factor analysis that NBCTs engage in the process for five reasons. Using those categories for this study, those who reported engaging in the process for financial gain (25% of the sample) had a statistically significant lower overall mean (M = 5.45, SD = .84) than those participants who reported engaging in the process to improve their teaching (42% of the sample; M = 6.02, SD = .61). Additionally, these two groups of NBCTs differed significantly on their perception of feedback from NBCTs, collaborative discussion about the Standards, and the number of hours in the process.

One reason that may explain this difference is that those who were motivated by money grew less professionally. The NRC (2008) posed the question about whether NBCTs were accomplished prior to engaging in the process or whether NBCTs became accomplished because of the process and stated that most likely both occur. Perhaps those who engaged in the process for financial reasons grew less; therefore their perception of characteristics' impact would be less as well. Without asking the participants to rate their level of perceived professional growth, this assumption can be predicted, but not made conclusively.

However, another reason could be that the motivation for engaging in the NBC process moderates another variable. Hidebrandt and Eom (2011) found financial motivation for engaging in the NBC process could be explained by candidates' age. NBCTs in their 30s were

more motivated to engage in the NBC for financial reasons than those in their 20s or older than 40. So while in this study financial motivation correlated with NBCTs' perception of characteristics' impact on professional growth, age could be the explanatory variable and financial reasons for engaging the moderating factor. In this scenario, age would impact the reason a teacher engages in the NBC process (teachers in their 30s are more financially motivated), and so it is age that actually impacts the characteristics' perceived impact. Without further analysis, both quantitative and qualitative, this study is unable to determine whether age or financial motivation was the critical variable

Conclusions

The results of this study indicated that characteristics included in professional development's general literature on high-quality characteristics as well as those active learning and collaboration characteristics specific to the NBC process were perceived to have impacted professional growth. All characteristics investigated had a positive influence on professional growth; some had more perceived influence than others.

- Reflection did not act independently of other active learning characteristics; rather it was inseparable from the characteristics of analyzing and writing about one's instruction focused on increasing student learning. This construct of individual analysis-reflection on one's instruction had the strongest perceived influence on the impact on professional growth and differed in perceived impact from the construct of collaborative analysis-reflection.
- The individual use of the Standards for improving instruction was important and intertwined, although to a lesser degree, with the construct of individual analysis-reflection. The collaborative use of the Standards was perceived as less important and

follows with the other conclusions regarding the difference in individual versus collaborative characteristics.

- Characteristics of the collaboration construct were not all perceived to have equal strength at impacting professional growth: Those involving (a) sharing of knowledge and (b) giving/receiving feedback on analysis-reflection were perceived to have greater strength relative to those involving collaborative analysis of teaching. Even in a support program, NBCTs perceived characteristics surrounding their individual construction of learning had more perceived importance on their learning than collaborative characteristics. This suggests that a social learning theory was not the predominant epistemology.
- Characteristics surrounding the development of pedagogical or instructional practices had more perceived value than those of increasing content knowledge. This may be due to previous amount of known content knowledge or a moderating factor of amount of time spent engaging in this aspect of the process.
- While perceptions about the importance that length of time in the process varied, the variance may be explained by a mediating factor of repeating a portion of the NBC process for resubmission.
- The motivational factors for engaging in the process may influence or be a mediating factor for characteristics' importance.

Implications for Practice

Governor James Hunt, Jr. in his forward as part of *Professional Learning in the Learning Profession: A Status Report on Teacher Development in the United States and Abroad* (Darling-Hammond et al., 2009) stated, "We need to place a greater priority on strengthening the capacity

of educators" (p. 2). It is hoped that this research will further the field in understanding (a) high-quality professional development characteristics that should lead to effective professional development experiences, those that change teachers' knowledge and instructional practices, and students' learning, and (b) characteristics of the NBC process when engaged in the NBC process as part of a support program.

Research has demonstrated that the characteristics, not format, of the process are critical for effectiveness (Desimone, 2009). Thus, it is important to understand the characteristics in order for school districts to create and adapt their policies on professional development. By using the NBC process as a vehicle to understand high-quality characteristics, implications for practice emerged. These included:

- The high-quality characteristics of (a) having a focus on student learning, (b) being job-embedded, (c) using standards of accomplished teaching, (d) requiring analysis and reflection on teaching practices, (e) collaborating, and (f) having a focus on both improving instructional practices and content knowledge should be included in professional development experiences.
- Individual analysis-reflection on one's own teaching towards impacting student learning should be the central focus of the professional development experience. Teaching standards should be the foundation for analysis-reflection.
- The focus of collaborative time in a professional development experience should be on sharing knowledge and providing feedback.
- While professional development should include a focus on changing teachers' instructional practices and content knowledge, an emphasis should be on instructional practices.

Limitations

There were several limitations to this study surrounding the survey design and participants.

Survey design. The first set of limitations involves the survey design. The survey investigated only 20 characteristics while there may be more aspects of the NBC process that lead to professional growth that were not identified through the expert review. For instance, Desimone (2009) suggested investigating the characteristic of professional development facilitator that this survey did not investigate. Additionally, more aspects regarding the role of NBCTs beyond that of providing feedback would have been beneficial in deconstructing the difference between the perceived impact of NBCTs and those of other candidates.

Secondly, the survey's reliability indicated that the statement of "number of hours you spent in the process," or intensity of the process, might have measurement error as indicated by the no relationship correlation coefficient (r = .05) between the test-retest scores during the field test. To complement the analysis of this characteristic, a demographic question asking NBCTs to estimate the number of hours spent in the process would have been beneficial. While it was assumed that the NBCTs spent substantial time, each candidate's hours in the process could vary with their rating on this characteristic. The number of hours could be a moderating variable. Additionally, the statement, "length of time (number of years) you spent attempting to certify," or duration of the process, could also have measurement error due to the four out of 13 non-adjacent matches. Since both of these constructs involve time, it could be that the concepts were worded in a confusing manner.

A third limitation of the study due to the survey design was that the survey asked the number of years the participant took to achieve NBC, but the survey did not ask participants

whether they (a) submitted all four entries and completed the assessment center exercises the first year or (b) engaged in the Take One process. Teachers who engaged in the process for two years purposefully (by choosing the Take One option) versus those who engaged for two or three years due to resubmitting could have different perceptions. Thus, the reason for why an NBCT took two or three years to achieve could also have been a moderating variable.

Fourth, the survey provided a "none of the above" category for "primary reason for engaging in the NBC process;" however, a stronger category would have been "other" with participants being asked to write in their reason. Having the write-in response, as was done with the question regarding current educational position, would have helped understand further motivations for pursuing NBC.

Lastly, this study used NBC literature to presuppose the process impacted teachers' professional growth, and the study did not attempt to validate this fact. However, the survey could have asked teachers to rate on a scale of 1-10 (low to high) their perceived amount of (a) overall professional growth, (b) change in knowledge and beliefs, (c) change in instructional practices, and (d) change in students' learning. These scores could have provided more information when interpreting the analysis of a characteristic's perceived impact as the amount of perceived growth overall or in one category could be a moderating or mediating variable.

Participants. The second area of limitations revolves around the survey response and participants. Since the self-reporting survey required NBCTs to be motivated to respond, there was the potential for bias due to survey non-responses. It is permissible to believe that the outlier participants' data might be similar to those NBCTs who did not respond. Other self-reporting issues could have included that demand bias for social desirability and response-set

bias since the survey did not vary the statement wording into both positive and negative statements.

As for the 119 participants, there was variability in their demographics except in category regarding the length of time to achieve NBC. Seventy-one percent of the participants achieved in one year while only six percent took three years to achieve. This limitation means that the results are more generalizable to those who achieve in a shorter amount of time than over multiple years.

Implications for Further Study

Most importantly, this study aimed only to determine if there were differences in the perceived impact of different characteristics on NBCTs professional growth and between what characteristics there was a perceived difference. Just as this research built on Cohen and Rice's (2005) study indicating that characteristics of the process impacted NBCTs professional growth, future studies should build on this study to understand why particular characteristics have more perceived influence than others. This research only found the differences; future studies should aim to understand the reasons for the differences.

Secondly, the current research study only looked at NBCTs perceptions after achievement. With the revised NBC process, candidates have more flexibility in the order of submitting entries and length of time to finalize the process. Thus, the use of this survey along with follow-up interviews during a candidate's multiple-year engagement in the process could provide even greater insight into the NBC process as effective professional development. The research could help understand whether a characteristic's impact changes over time and when characteristics have their greatest impact. The research could also help understand the concept of duration's mediating variables. The multi-year research could investigate whether the

perceived strength of characteristics impacting professional growth changes based on whether candidates must resubmit an entry. Longitudinal data from the same participants versus cross-study data would provide greater understanding about mediating variables.

Lastly, further research might also expand upon this survey to investigate correlations of NBCTs' ratings of characteristics of the process and specific impact on their professional growth: knowledge, instruction, and students' learning. The research could attempt to evaluate whether the perceived impact of specific characteristics correlates with specific areas of change.

Concluding Thoughts

Professional development is the avenue by which teachers grow in order to increase student learning (Darling-Hammond, 2005; Guskey, 2002; Mizell, 2010; Speck & Knipe, 2005; Zepeda, 2008). Hence, the importance of understanding the characteristics of professional development that may lead to changes in teachers' knowledge, instructional practices, and students' learning, is imperative.

Guskey (2009) suggested that researchers stop creating lists of high-quality professional development characteristics and instead aim to understand the characteristics and their impact on professional growth. The NBC process can be used as a vehicle for understanding the characteristics due to its national implementation for teachers of all subjects and student-age groups.

This quantitative research provided an understanding of NBCTs' perceptions about the extent to which characteristics of the NBC process impacted their professional growth. Analysis of the characteristics indicated that all investigated characteristics were important. The specific characteristics surrounding engagement in individual analytic-reflective thinking about one's own teaching when using standards as a reference and for the purpose of demonstrating student

learning, had the greatest perceived impact on NBCTs' professional growth. Contrastingly, collaborative constructs had less perceived importance on professional growth indicating that individual construction of knowledge may be more powerful than social construction.

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Appendix A

NBPTS Certificates

Table 24

NBPTS Certificates

Content	Student developmental level
Art	Early and Middle Childhood (Ages 3-12)
Art	Early Adolescence through Young Adulthood (Ages 11-18+)
Career and Technical Education	Early Adolescence through Young Adulthood (Ages 11-18+)
English as a New Language	Early and Middle Childhood (Ages 3-12)
English as a New Language	Early Adolescence through Young Adulthood (Ages 11-18+)
English Language Arts	Early Adolescence (Ages 11-15)
English Language Arts	Adolescence and Young Adulthood (Ages 14-18+)
Exceptional Needs Specialist	Early Childhood through Young Adulthood (Ages 3-18+)
Generalist	Early Childhood (Ages 3-8)
Generalist	Middle Childhood (Ages 7-12)
Health	Early Adolescence through Young Adulthood (Ages 11-18+)
Library Media	Early Childhood through Young Adulthood (Ages 3-18+)
Literacy	Early and Middle Childhood (Ages 3-12)
Mathematics	Early Adolescence (Ages 11-15)
Mathematics	Adolescence and Young Adulthood (Ages 14-18+)
Music	Early and Middle Childhood (Ages 3-12)
Music	Early Adolescence through Young Adulthood (Ages 11-18+)
Physical Education	Early and Middle Childhood (Ages 3-12)
Physical Education	Early Adolescence through Young Adulthood (Ages 11-18+)
School Counseling	Early Childhood through Young Adulthood (Ages 3-18+)
Science	Early Adolescence (Ages 11-15)
Science	Adolescence and Young Adulthood (Ages 14-18+)
Social Studies – History	Early Adolescence (Ages 11-15)
Social Studies - History	Adolescence and Young Adulthood (Ages 14-18+)
World Languages	Early Adolescence through Young Adulthood (Ages 11-18+)

Appendix B

Professional Development as Defined by the *No Child Left Behind Act of 2001*

(34) PROFFESIONAL DEVELOPMENT – The term professional development -

(A) Includes activities that -

(i) improve and increase teachers' knowledge of the academic subjects the teachers teach, and enable teachers to become highly qualified;

(ii) are an integral part of broad schoolwide and districtwide educational improvement plans;

(iii) give teachers, principals, and administrators the knowledge and skills to provide students with the opportunity to meet challenging state academic content standards and student academic achievement standards;

(iv) improve classroom management skills;

(v) (I) are high quality, sustained, intensive and classroom-focused in order to have a positive and lasting impact on classroom instruction and the teacher's performance in the classroom; and

(II) are not one-day or short-term workshops or conferences;

(vi) support the recruiting, hiring, and training of highly qualified teachers, including teachers who became highly qualified through state and local alternative routes to certification;

(vii) advance teacher understanding of effective instructional strategies that are -

(I) based on scientifically based research (except that this subclause shall not apply to activities carried out under part D of title II); and

(II) strategies for improving student academic achievement or substantially increasing the knowledge and teaching skills of teachers; and

(viii) are aligned with and directly related to -

(I) State academic content standards, student achievement standards, and assessments; and

(II) the curricula and programs tied to the standards described in subclause (I) except that this subclause shall not apply to activities described in clauses (ii) and (iii) of section 2123(3)(B);

(ix) are developed with extensive participation of teachers, principals, parents, and administrators of schools to be served under this Act;

(x) are designed to give teachers of limited English proficient children, and other teachers and instructional staff, the knowledge and skills to provide instruction and appropriate language and academic support services to those children, including the appropriate use of curricula and assessments;

(xi) to the extent appropriate, provide training for teachers and principals in the use of technology so that technology and technology applications are effectively used in the classroom to improve teaching and learning in the curricula and core academic subjects in which the teachers teach;

(xii) as a whole, are regularly evaluated for their impact on increased teacher effectiveness and improved student academic achievement, with the findings of the evaluations used to improve the quality of professional development;

(xiii) provide instruction in methods of teaching children with special needs;

(xiv) include instruction in the use of data and assessments to inform and instruct classroom practice; and

(xv) include instruction in ways that teachers, principals, pupil services personnel, and school administrators may work more effectively with parents; and

(B) may include activities that -

(i) involve the forming of partnerships with institutions of higher education to establish school-based teacher training programs that provide prospective teachers and beginning teachers with an opportunity to work under the guidance of experienced teachers and college faculty;

(ii) create programs to enable paraprofessionals (assisting teachers employed by a local educational agency receiving assistance under part A of title I) to obtain the education necessary for those paraprofessionals to become certified and licensed teachers; and

(iii) provide follow-up training to teachers who have participated in activities described in subparagraph (A) or another clause of this subparagraph that are designed to ensure that the knowledge and skills learned by the teachers are implemented in the classroom.

Appendix C

Learning Forward's Seven Standards for Professional Learning

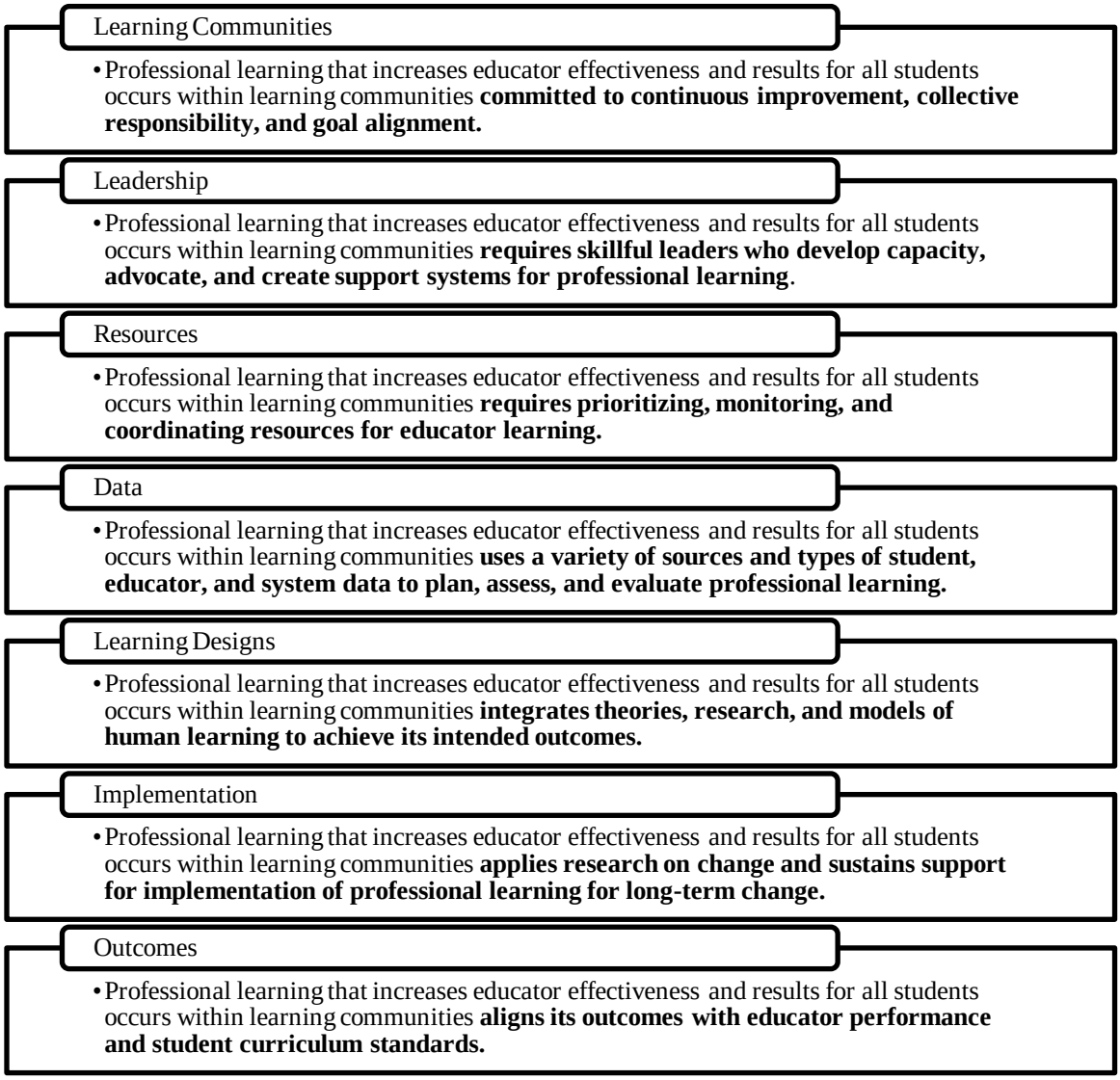

Figure 11. Learning Forward's seven standards for professional learning. Adapted from *Standards for professional learning: Quick reference guide* (p. 2), by Learning Forward, 2011.

Appendix D

Survey

1. Did you participate in the National Board Certification Support Program sponsored by your school district through XXX and XXX?

   Yes
   No

2. Are you currently in the process of renewing your National Board certification? This would include registering or starting to complete submission materials.

   Yes
   No

3. Professional growth is defined as a change in your knowledge and practices which impact student learning. How important was each of the following aspects of your NBC experience in impacting your professional growth?

	Not of importance	of little importance	neutral	slightly important	moderately important	very important	extremely important
1. collaborative discussion about the portfolio directions							
2. giving and receiving feedback with other candidates on the writing of portfolio entries							
3. feedback from NBCTs							
4. your engagement in reflective thinking							
5. your engagement in the portfolio writing process							
6. your planning of lessons to meet the portfolio requirements							

7. your preparation for the assessment center exercises							
8. your use of the Standards documents							
9. your use of the portfolio's directions							
10. length of time (number of years) you spent attempting to certify							
11. number of hours you spent in the process							
12. direct link of the process to your specific teaching position							
13. connection of the process to your work with students							
14. your individual analysis of your students' work/data							
15. focus on demonstrating student learning							
16. collaborative sharing of knowledge with others in the process							
17. collaborative examination of student work/data							
18. collaborative analysis of videos							
19. collaborative discussion about the Standards							
20. your analysis of your teaching videos							

4. How many years of teaching experience did you have PRIOR to beginning the NBC process?

5. What was your primary reason for engaging in the NBC process?

   financial gain
   improvement of teaching/professional development
   potential for advancement/leadership
   prestige/recognition
   self-validation
   none of the above

6. How many years did it take for you to certify?

   one
   two
   three
   four or more

7. What school district were you employed by during the NBC process? – The four school districts were listed in alphabetical order for participants to choose.

8. What is your certificate area?

   Art - Early and Middle Childhood (Ages 3-12)
   Art - Early Adolescence through Young Adulthood (Ages 11-18+)
   Career and Technical Education - Early Adolescence through Young Adulthood (Ages 11-18+)
   English as a New Language - Early and Middle Childhood (Ages 3-12)
   English as a New Language - Early Adolescence through Young Adulthood (Ages 11-18+)
   English Language Arts - Early Adolescence (Ages 11-15)
   English Language Arts - Adolescence and Young Adulthood (Ages 14-18+)
   Exceptional Needs Specialist - Early Childhood through Young Adulthood (Ages 3-18+)
   Generalist - Early Childhood (ages 3-8)
   Generalist - Middle Childhood (Ages 7-12)
   Health - Early Adolescence through Young Adulthood (Ages 11-18+)
   Library Media - Early Childhood through Young Adulthood (Ages 3-18+)
   Literacy - Early and Middle Childhood (Ages 3-12)
   Mathematics - Early Adolescence (Ages 11-15)
   Mathematics - Adolescence and Young Adulthood (Ages 14-18+)
   Music - Early and Middle Childhood (Ages 3-12)
   Music - Early Adolescence through Young Adulthood (Ages 11-18)
   Physical Education - Early and Middle Childhood (Ages 3-12)
   Physical Education - Early Adolescence through Young Adulthood (Ages 11-18+)
   School Counseling - Early Childhood through Young Adulthood (Ages 3-18+)
   Science - Early Adolescence (Ages 11-15)
   Science - Adolescence and Young Adulthood (Ages 14-18+)
   Social Studies: History - Early Adolescence (Ages 11-15)
   Social Studies: History - Adolescence and Young Adulthood (Ages 14-18+)
   World Languages - Early Adolescence through Young Adulthood (Ages 11-18+)

9. What year did you achieve certification?

2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

10. What is your gender?

female
male

11. What is your age?

12. What is your highest level of education?

bachelor's degree
master's degree
post-master's degree
doctoral degree

13. What is your current professional position?

teacher
teacher with administrator duties
building level administrator
division wide administrator
other, please specify:

Appendix E

Email to Participants

Dear National Board Certified Teacher,

I am a doctoral student at Virginia Commonwealth University (VCU) and, like you, a National Board Certified Teacher (NBCT). As part of my dissertation research, I am conducting a survey of NBCTs in order to study your perceptions about how aspects of the process impacted your professional growth.

I found your name in the NBCT directory, and I am contacting you in hope that you will complete a short online survey. Completing this survey is voluntary, will take approximately 10 minutes, and identifying information will be kept confidential. The link to the survey is generic and not linked to your email address.

As a teacher, I know you have many demands on your time. If you are able to participate, I would greatly appreciate your completion of the survey within the next week. The above hyperlinks and this link will take you to the survey. If you would like to read additional information about the survey, I have attached information to this email.

Your perspectives about your National Board Certification experience are not only valuable to me, but also to the larger academic community focused on improving teacher quality. Although a great deal of research has explored the effectiveness of NBCTs, far less research has examined the NBC experience. This survey and my research study are intended to provide valuable information about your perceptions of the experience.

I greatly appreciate your honest responses and willingness to participate. Please feel free to contact me via email (XXX@vcu.edu) with any questions.

Sincerely,

Heather Bumgarner
NBCT, MC-GEN 2009
Doctoral Candidate at Virginia Commonwealth University in Richmond, Virginia

Appendix F

Attachment to Email to Participants with Information about Survey

The Professional Development Components of the National Board Certification Process

Thank you for your willingness to complete this survey.

The National Board Certification (NBC) process is a unique experience. The purpose of NBC is to certify those teachers who meet the rigorous National Board for Professional Teaching Standards. A byproduct of the process is that teachers grow professionally. The purpose of this survey is to understand National Board Certified Teachers' perceptions about how the experience impacted their professional growth. Data gathered through the survey will contribute to research on effective professional development.

This survey should take approximately 10 minutes to complete.

You will be asked to complete 3 components. For the first component, you will be asked two questions to determine eligibility for this research study. If qualified, in the second component, you will be asked to respond to items by rating the extent to which a statement describes your perception of the impact each aspect of the National Board Certification process had on your professional growth. In the third component, you will be asked demographic questions.

Completing this survey is voluntary.

Survey responses are confidential.

You may skip items or exit the survey at any time. After you exit the survey, you will not be able to return to your answers.

Your time and candid responses are greatly appreciated.

If you would like to print a copy of this information for your records, please print this page.

If you have questions or concerns about the survey, please feel free to contact Heather Bumgarner at XXX@vcu.edu.

Appendix G

Self-reported NBPTS Certificates of Sample

Table 25

Self-reported NBPTS Certificates of Sample

Content	Student developmental level	n	%
Art	Early and Middle Childhood (Ages 3-12)	2	2
Art	Early Adolescence through Young Adulthood (Ages 11-18+)	1	1
Career and Technical Education	Early Adolescence through Young Adulthood (Ages 11-18+)	7	6
English as a New Language	Early and Middle Childhood (Ages 3-12)	1	1
English as a New Language	Early Adolescence through Young Adulthood (Ages 11-18+)	0	0
English Language Arts	Early Adolescence (Ages 11-15)	3	3
English Language Arts	Adolescence and Young Adulthood (Ages 14-18+)	12	10
Exceptional Needs Specialist	Early Childhood through Young Adulthood (Ages 3-18+)	10	9
Generalist	Early Childhood (Ages 3-8)	17	15
Generalist	Middle Childhood (Ages 7-12)	10	9
Health	Early Adolescence through Young Adulthood (Ages 11-18+)	0	0
Library Media	Early Childhood through Young Adulthood (Ages 3-18+)	6	5
Literacy	Early and Middle Childhood (Ages 3-12)	13	11
Mathematics	Early Adolescence (Ages 11-15)	5	4
Mathematics	Adolescence and Young Adulthood (Ages 14-18+)	4	3
Music	Early and Middle Childhood (Ages 3-12)	3	3
Music	Early Adolescence through Young Adulthood (Ages 11-18+)	0	0
Physical Education	Early and Middle Childhood (Ages 3-12)	0	0
Physical Education	Early Adolescence through Young Adulthood (Ages 11-18+)	0	0
School Counseling	Early Childhood through Young Adulthood (Ages 3-18+)	4	3
Science	Early Adolescence (Ages 11-15)	3	3
Science	Adolescence and Young Adulthood (Ages 14-18+)	6	5
Social Studies – History	Early Adolescence (Ages 11-15)	1	1
Social Studies - History	Adolescence and Young Adulthood (Ages 14-18+)	5	4
World Languages	Early Adolescence through Young Adulthood (Ages 11-18+)	3	3

Appendix H

Descriptives for Retrospection

Table 26

Descriptives for Retrospection

Variable	2005-2007		2008-2010		2011-2013		2014		Total	
	n = 28		*n* = 32		*n* = 34		*n* = 17		*n* = 111	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1	6.64	.62	6.47	.80	6.47	1.13	6.53	.72	6.52	.86
2	6.36	.91	6.47	.72	6.56	.75	6.18	.64	6.42	.77
3	6.43	.69	6.38	.79	6.21	.98	6.12	.86	6.30	.84
4	6.36	.78	6.25	.88	6.29	.76	6.18	.81	6.27	.80
5	6.32	.90	6.22	.75	6.26	.83	5.65	.93	6.17	.86
6	6.29	.94	6.09	1.17	6.06	1.04	6.06	.97	6.13	1.04
7	6.14	1.08	5.97	1.33	6.09	1.03	6.41	.80	6.12	1.10
8	5.93	1.15	5.84	1.49	5.88	1.12	6.24	.90	5.94	1.21
9	6.11	.99	6.00	1.05	5.73	1.11	5.65	1.27	5.89	1.09
10	5.96	1.07	5.47	1.61	5.97	.87	5.71	.92	5.78	1.19
11	5.82	1.25	5.78	1.21	5.76	1.18	6.06	.83	5.83	1.51
12	5.82	1.42	5.85	1.19	5.62	1.37	5.53	1.46	5.72	1.34
13	5.43	1.48	5.81	1.09	5.32	1.51	5.12	1.32	5.46	1.37
14	5.57	1.20	5.47	1.24	5.38	1.39	5.06	1.39	5.41	1.30
15	5.61	1.52	5.25	1.88	5.21	1.65	5.52	1.33	5.37	1.63
16	5.68	1.56	5.16	1.97	5.15	1.74	5.29	1.86	5.31	1.78
17	5.32	1.68	5.19	1.57	5.38	1.30	5.35	1.69	5.31	1.52
18	5.36	1.52	5.66	1.10	5.26	1.46	4.82	1.07	5.33	1.38
19	5.11	1.59	5.19	1.75	5.00	1.67	5.18	1.24	5.11	1.60
20	4.14	1.72	4.06	1.91	3.71	1.71	3.35	1.80	3.86	1.79
Overall	5.81	.80	5.72	.92	5.67	.69	5.60	.65	5.71	.78

Note: Vertical variable numbers correspond to characteristic ranking; Overall corresponds to the mean score on all 20 characteristics.

Appendix I

Selective Paired *t*-test Results for Research Question Two

Table 27

Selective Paired t*-test Results of Characteristics Indicating the Point at Which the* p*-value First Differed at Approximately ≤ .05*

Characteristic	Ranks	*M* difference	*SD*	*t* (116)	*p*
Your engagement in reflective thinking and your analysis of your teaching videos	1 and 3	.20	.90	2.38	.02
Focus on demonstrating student learning and your individual analysis of your students' work/data	2 and 4	.16	.81	2.07	.04
Your analysis of your teaching videos and your use of the Standards documents	3 and 8	.34	1.21	3.00	.00
Your individual analysis of your students' work/data and your use of the Standards documents	4 and 8	.28	1.16	2.63	.01
Connection of the process to your work with students and collaborative sharing of knowledge with others in the process	5 and 9	.27	1.07	2.68	.01
Your planning of lessons to meet the portfolio requirements and direct link of the process to your specific teaching position	6 and 10	.33	1.19	2.98	.00
Your engagement in the portfolio writing process and direct link of the process to your specific teaching position	7 and 10	.32	1.22	2.82	.01
Your use of the Standards documents and giving and receiving feedback with other candidates on the writing of portfolio entries	8 and 12	.28	1.58	1.94	.06
Collaborative sharing of knowledge with others in the process and collaborative examination of student work/data	9 and 13	.45	1.05	4.6	.00
Direct link of the process to your specific teaching position and collaborative examination of student work/data	10 and 13	.37	1.51	2.64	.01

Feedback from NBCTs and collaborative examination of student work/data	11 and 13	.34	1.49	2.43	.02
Giving and receiving feedback with other candidates on the writing of portfolio entries and collaborative examination of student work/data	12 and 13	.25	1.2	2.24	.03
Collaborative examination of student work/data and length of time (number of years) you spent attempting to certify	13 and 20	1.53	2.00	8.23	.00
Collaborative discussion about the Standards and length of time (number of years) you spent attempting to certify	14 and 20	1.48	2.09	7.65	.00
Collaborative discussion about the portfolio directions and length of time (number of years) you spent attempting to certify	15 and 20	1.47	2.24	7.08	.00
Your use of the portfolio's directions and length of time (number of years) you spent attempting to certify	16 and 20	1.43	2.06	7.52	.00
Number of hours you spent in the process and length of time (number of years) you spent attempting to certify	17 and 20	1.43	1.77	8.73	.00
Collaborative analysis of videos and length of time (number of years) you spent attempting to certify	18 and 20	1.41	1.92	7.91	.00
Your preparation for the assessment center exercises and length of time (number of years) you spent attempting to certify	19 and 20	1.25	1.86	7.26	.00

Appendix J

Bivaiarte Correlations for Research Question Three

Table 28

Bivariate Correlations of Characteristics by Number of Years Teaching Experience Prior to Beginning the NBC Process

Characteristic	*r*	*p*
Your engagement in reflective thinking	-.09	.34
Focus on demonstrating student learning	-.08	.43
Your analysis of your teaching videos	-.13	.18
Your individual analysis of your students' work/data	-.23	.02*
Connection of the process to your work with students	-.13	.19
Your planning of lessons to meet the portfolio requirements	-.05	.63
Your engagement in the portfolio writing process	-.08	.40
Your use of the Standards documents	.02	.84
Collaborative sharing of knowledge with others in the process	-.08	.43
Direct link of the process to your specific teaching position	-.13	.19
Feedback from NBCTs	-.02	.80
Giving and receiving feedback with other candidates on the writing of portfolio entries	-.12	.20
Collaborative examination of student work/data	-.11	.25
Collaborative discussion about the Standards	-.16	.09
Collaborative discussion about the portfolio directions	-.11	.27
Your use of the portfolio's directions	-.07	.49
Number of hours you spent in the process	-.11	.23
Collaborative analysis of videos	-.06	.56
Your preparation for the assessment center exercises	-.05	.63
Length of time (number of years) you spent attempting to certify	-.07	.45
Overall	-.12	.22

* $p \leq .05$

Notes: Overall corresponds to the mean score on all 20 characteristics. $n = 112$.

Appendix K

ANOVA for Research Question Three

Table 29

Descriptives of Characteristics by Number of Years Teaching Experience Prior to Beginning the NBC Process

Variable	3-5 Years		6-10 Years		11-15 Years		16-20 Years		21+ Years		Total	
	n = 16		*n* = 37		*n* = 30		*n* = 13		*n* = 16		*n* = 112	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1	6.69	.48	6.49	1.14	6.60	.72	6.38	.77	6.31	.70	6.51	.86
2	6.63	.50	6.32	.88	6.50	.68	6.46	.88	6.25	.77	6.42	.77
3	6.44	.63	6.38	.79	6.40	.77	6.31	.95	5.94	.93	6.32	.81
4	6.44	.73	6.41	.76	6.30	.75	6.15	.80	5.81	.83	6.27	.78
5	6.25	1.06	6.24	.80	6.13	.90	6.23	.73	5.94	1.06	6.17	.89
6	6.06	1.12	6.24	.95	6.27	1.17	6.08	.86	6.00	.97	6.17	1.02
7	6.13	1.02	6.27	.96	6.10	1.30	6.38	.65	5.75	1.29	6.14	1.09
8	6.06	.77	6.08	1.34	5.93	1.34	6.08	.95	6.00	.82	6.03	1.15
9	6.13	1.02	5.97	1.14	5.63	1.30	6.00	1.08	5.81	1.17	5.89	1.16
10	6.06	1.00	5.89	1.20	5.87	1.17	5.61	1.39	5.50	1.32	5.82	1.19
11	5.88	1.40	5.91	1.04	5.53	1.50	5.77	1.10	5.81	1.17	5.80	1.25
12	5.88	1.02	6.03	.99	5.33	1.77	5.69	1.49	5.50	1.41	5.71	1.37
13	5.57	1.59	5.73	1.26	5.00	1.55	5.92	.86	5.07	1.39	5.44	1.40
14	5.94	1.06	5.57	1.30	5.133	1.46	5.00	1.41	5.31	1.30	5.40	1.34
15	5.69	1.35	5.73	1.63	5.03	1.65	5.38	1.71	5.19	1.83	5.42	1.64
16	5.25	1.73	5.57	1.76	5.63	1.63	5.23	1.88	5.00	2.03	5.42	1.76
17	5.69	1.01	5.38	1.72	5.60	1.33	5.00	1.41	5.13	1.71	5.40	1.49
18	5.44	1.55	5.46	1.43	5.07	1.44	5.69	1.03	5.06	1.24	5.32	1.38
19	5.13	1.75	5.43	1.61	4.83	1.64	5.38	1.39	5.25	1.44	5.20	1.59
20	4.19	1.80	3.59	2.02	4.07	1.91	4.00	1.58	4.13	1.59	3.93	1.84
Overall	5.88	.64	5.83	.77	5.65	.78	5.74	.72	5.54	1.00	5.74	.78

Notes: Vertical variable numbers correspond to characteristic ranking; Overall corresponds to the mean score on all 20 characteristics.

Table 30

ANOVA of Characteristics by Number of Years Teaching Experience Prior to Beginning the NBC Process

Characteristic	*F* (4, 107)	*p*
Your engagement in reflective thinking	.53	.71
Focus on demonstrating student learning	.71	.59
Your analysis of your teaching videos	1.11	.36
Your individual analysis of your students' work/data	1.98	.10
Connection of the process to your work with students	.39	.82
Your planning of lessons to meet the portfolio requirements	.29	.88
Your engagement in the portfolio writing process	.81	.52
Your use of the Standards documents	.08	.99
Collaborative sharing of knowledge with others in the process	.62	.65
Direct link of the process to your specific teaching position	.58	.68
Feedback from NBCTs	.53	.72
Giving and receiving feedback with other candidates on the writing of portfolio entries	1.23	.30
Collaborative examination of student work/data	1.91	.12
Collaborative discussion about the Standards	1.42	.23
Collaborative discussion about the portfolio directions	.94	.45
Your use of the portfolio's directions	.47	.76
Number of hours you spent in the process	.65	.63
Collaborative analysis of videos	.75	.57
Your preparation for the assessment center exercises	.65	.63
Length of time (number of years) you spent attempting to certify	.47	.76
Overall	.61	.65

Notes. The groups were 3-5 years, 6-10 years, 11-15 years, 16-20 years, and 20+ years. Overall corresponds to the mean score on all 20 characteristics.

Appendix L

ANOVA for Research Question Four

Table 31

Descriptives of Characteristics by Amount of Time to Achieve NBC

Variable	One year $n = 83$		Two years $n = 26$		Three years $n = 7$		Total $n = 116$	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1	6.52	.89	6.50	.81	6.57	.53	6.52	.85
2	6.45	.67	6.31	1.05	6.57	.53	6.42	.76
3	6.34	.80	6.35	.85	6.00	1.15	6.32	.83
4	6.35	.72	6.08	.93	6.00	1.15	6.27	.81
5	6.17	.87	6.19	1.02	6.00	.58	6.16	.88
6	6.19	.92	5.97	1.34	6.29	1.11	6.15	1.03
7	6.11	1.17	6.35	.80	5.71	.95	6.14	1.09
8	6.07	1.09	5.85	1.38	5.43	1.72	5.98	1.20
9	6.01	1.06	5.61	1.33	5.58	1.27	5.90	1.14
10	5.84	1.17	5.77	1.27	5.71	.95	5.82	1.18
11	5.75	1.31	6.00	1.06	5.43	1.13	5.78	1.24
12	5.76	1.39	5.69	1.32	5.00	1.00	5.70	1.36
13	5.48	1.40	5.42	1.30	5.14	1.68	5.45	1.39
14	5.46	1.28	5.42	1.27	4.71	1.98	5.41	1.33
15	5.46	1.71	5.46	1.36	4.43	1.27	5.40	1.62
16	5.30	1.77	5.73	1.78	4.71	1.50	5.36	1.76
17	5.31	1.51	5.54	1.56	5.14	1.46	5.35	1.51
18	5.19	1.49	5.69	.88	5.71	.76	5.34	1.36
19	5.08	1.59	5.35	1.65	5.57	1.62	5.17	1.59
20	3.55	1.80	4.73	1.64	5.29	1.38	3.92	1.83
Overall	5.71	.78	5.80	.85	5.55	.54	5.73	.78

Note: Vertical variable numbers correspond to characteristic ranking; Overall corresponds to the mean score on all 20 characteristics.

Table 32

ANOVA of Characteristics by Amount of Time to Achieve NBC

Characteristic	*F* (2, 113)	*p*
Your engagement in reflective thinking	.02	.98
Focus on demonstrating student learning	.47	.63
Your analysis of your teaching videos	.55	.58
Your individual analysis of your students' work/data	1.56	.22
Connection of the process to your work with students	.13	.88
Your planning of lessons to meet the portfolio requirements	.56	.57
Your engagement in the portfolio writing process	1.04	.36
Your use of the Standards documents	1.15	.32
Collaborative sharing of knowledge with others in the process	1.50	.23
Direct link of the process to your specific teaching position	.07	.94
Feedback from NBCTs	.71	.49
Giving and receiving feedback with other candidates on the writing of portfolio entries	1.01	.37
Collaborative examination of student work/data	.20	.82
Collaborative discussion about the Standards	1.02	.36
Collaborative discussion about the portfolio directions	1.34	.27
Your use of the portfolio's directions	1.09	.34
Number of hours you spent in the process	.29	.75
Collaborative analysis of videos	1.65	.20
Your preparation for the assessment center exercises	.50	.61
Length of time (number of years) you spent attempting to certify	6.79	.00*
Overall	.30	.74

* $p \leq .05$

Notes. The groups were one year; two years; and three years. Overall corresponds to the mean score on all 20 characteristics.

Appendix M

Descriptives for Research Question Five

Table 33

Descriptives of Characteristics by Primary Reason for Pursuing NBC

Variable	Financial gain		Self-validation		Improvement of teaching		Potential for advancement		Total	
	n = 28		*n* = 20		*n* = 48		*n* = 11		*n* = 107	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1	6.29	1.30	6.55	.69	6.65	.53	6.18	.98	6.49	.87
2	6.25	.84	6.30	.98	6.58	.58	6.27	.90	6.41	.78
3	6.11	.92	6.20	1.01	6.46	.71	6.18	.87	6.29	.85
4	6.18	.90	5.95	.94	6.46	.62	6.27	1.01	6.27	.82
5	5.89	1.03	6.10	.85	6.40	.68	6.09	1.04	6.18	.87
6	6.14	.89	5.70	1.17	6.44	.77	5.64	1.50	6.14	1.01
7	6.07	1.15	6.05	1.05	6.25	1.12	6.00	1.18	6.14	1.11
8	5.86	1.35	5.55	1.39	6.35	.76	5.73	1.62	6.00	1.19
9	5.50	1.43	5.80	1.01	6.15	.95	6.00	1.18	5.90	1.14
10	5.54	1.26	5.80	1.32	6.02	1.02	5.55	1.37	5.80	1.19
11	5.32	1.28	5.50	1.43	6.10	1.06	5.64	1.50	5.74	1.27
12	5.46	1.45	5.55	1.36	5.98	1.38	5.64	1.36	5.73	1.39
13	5.07	1.46	5.55	1.15	5.67	1.36	5.55	1.04	5.48	1.33
14	4.75	1.48	5.25	1.41	5.79	1.17	5.64	1.03	5.40	1.34
15	4.96	1.86	5.10	1.89	5.83	1.31	5.45	1.51	5.43	1.63
16	5.25	2.05	4.90	2.00	5.73	1.43	5.18	1.89	5.39	1.77
17	4.82	1.85	5.15	1.50	5.92	1.15	5.00	1.61	5.39	1.53
18	5.07	1.30	5.30	1.30	5.59	1.30	5.36	1.21	5.38	1.29
19	4.89	1.47	4.85	2.11	5.65	1.33	5.18	1.47	5.25	1.57
20	3.61	1.94	3.65	1.95	4.31	1.70	3.91	1.70	3.96	1.81
Overall	5.45	.84	5.54	.80	6.02	.61	5.62	1.06	5.73	.79

Note: Vertical variable numbers correspond to characteristic ranking; Overall corresponds to the mean score on all 20 characteristics.

Vita

Heather J. Bumgarner is a Virginia native who completed her Bachelor of Arts and Master of Teaching degrees at the University of Virginia in 2001. With teaching certifications in pre-K through eighth grade and gifted education, Mrs. Bumgarner taught in Hanover, Virginia from 2001-2010, first as an elementary gifted resource specialist and then as a fifth-grade teacher. While teaching, Mrs. Bumgarner achieved National Board Certification in 2008 and then was a facilitator for the National Board Certification support program through the Metropolitan Educational Training Alliance (META). In 2010, Mrs. Bumgarner took a two-year leave of absence from Hanover Public Schools to be a fellow at Virginia Commonwealth University concurrently pursuing her Post-Master's Certificate in Educational Leadership and her Doctorate in Instructional Leadership. During her fellowship, Mrs. Bumgarner continued as a facilitator for META's National Board Certification support program, coordinated META's Clinical Faculty program, and was an adjunct professor for an introductory teacher education course. In 2012, Mrs. Bumgarner returned to the classroom, and while teaching, completed her post-master's in December 2013 and her doctorate in August 2015.