

# Promoting Teacher Effectiveness in North Carolina

Report Prepared for the North Carolina Department of Public Instruction

Daniel Behrend  
Magdalena Fernandez  
Allison Horowitz  
Di Luong

Terry Sanford Institute of Public Policy  
Duke University

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Daniel Behrend, Magdalena Fernandez, Allison Horowitz, and Di Luong  
Terry Sanford Institute of Public Policy  
Duke University  
Box 90584  
Durham, NC 27708

Philip Price  
Chief Financial Officer and Associate State Superintendent  
Office of Financial and Business Services  
North Carolina Department of Public Instruction  
301 North Wilmington Street  
Raleigh, NC 27601

May 1, 2009

Dear Mr. Price,

Enclosed is our final report for the *Promoting Teacher Effectiveness in North Carolina* spring consulting project. We would like to thank Dr. Bill Sanders, Dr. June Rivers, and their colleagues at SAS for taking time to share their expertise, for providing many helpful suggestions that helped us focus our project, and for allowing us to use their EVAAS data in our analysis. We would like to thank the teachers and principals across the state who allowed us to conduct classroom observations and took the time to share their thoughts on teacher effectiveness with us. We would also like to recognize the assistance of Drs. Charles Clotfelter, Thomas Ahn, and Anna Gassman-Pines for their guidance on our research. Lastly, we would like to thank you and Ms. Allison Anderson for your accessibility and for your quick responses to all of our questions. Thank you for providing us with the opportunity to work with the Office of Financial and Business Services of the North Carolina Department of Public Instruction.

Sincerely,

Daniel Behrend, Magdalena Fernandez, Allison Horowitz, and Di Luong

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Daniel Behrend  
Magdalena Fernandez  
Allison Horowitz  
Di Luong

Terry Sanford Institute of Public Policy  
Duke University  
Box 90239  
Durham, NC 27708-0239

919-613-7401

May 1, 2009

# EXECUTIVE SUMMARY<sup>1</sup>

## POLICY QUESTION (page 1)

What are the characteristics of effective middle school math teachers, and how can the North Carolina Department of Public Instruction (DPI) and the State Board of Education (SBE) promote those characteristics among its active teaching force?

## RECOMMENDATIONS (page 12)

In order to promote effective teaching we recommend that DPI implement the following alternatives:

*Alternative 1: Provide teachers and administrators with classroom goal summaries for end-of-grade exams.*

*Alternative 2: Provide professional development through a video sharing website.*

*Alternative 3: Provide teachers with a professional networking website.*

## PROBLEM (page 1)

Teacher quality is the most influential school-related factor in determining student achievement and growth. Despite having developed statistical models to identify effective and ineffective teachers based on student growth comparisons, researchers have been unable to establish a pattern of common background characteristics among effective teachers.

In addition to identifying effective teachers, it is also important to understand what methods can be used to enhance the performance of teachers in the classroom. Providing instruction that is targeted to individual students' needs, promoting mentoring between experienced and novice teachers, and sharing best practices among teachers have been identified as factors that can increase teacher effectiveness. Further, peer observations allow teachers to share best practices and identify ways by which teachers can improve their methods. Currently, teachers are often unable to avail themselves of

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<sup>1</sup> This student paper was prepared in 2009 in partial completion of the requirements for PPS 304, a course in the Masters of Public Policy Program at the Terry Sanford Institute of Public Policy at Duke University. The research, analysis, and policy alternatives and recommendations contained in this paper are the work of the student team who authored the document, and do not represent the official or unofficial views of the Terry Sanford Institute of Public Policy or of Duke University. Without the specific permission of its authors, this paper may not be used or cited for any purpose other than to inform the client organization about the subject matter. The authors relied in many instances on data provided to them by the client and related organizations and make no independent representations as to the accuracy of the data.

such opportunities. Teachers of the same courses or grades usually teach simultaneously, making it nearly impossible for them to observe one another.

## CRITERIA FOR EVALUATING ALTERNATIVES (page 4)

We used the following five criteria to evaluate the policy alternatives.

- Maximize stakeholder buy-in. Stakeholders include the State Board of Education (SBE), North Carolina Department of Public Instruction (DPI), the North Carolina Association of Educators (NCAE), teachers, principals, parents, and students.
- Minimize cost to the SBE.
- Maximize feasibility of implementation.
- Maximize replicability of the alternative in school districts across the state.
- Increase student achievement as assessed by end-of-grade test results.

## ALTERNATIVES (page 5)

We evaluated 4 alternatives to address problems surrounding the promotion of effective teaching.

*Alternative 1: Provide teachers and administrators with classroom goal summaries for end-of-grade exams.*

*Alternative 2: Provide professional development through a video sharing website.*

*Alternative 3: Provide teachers with a professional networking website.*

*Alternative 4: Provide teachers with a definition of teacher quality based on student performance.*

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## POLICY QUESTION

What are the characteristics of effective middle school math teachers, and how can the North Carolina Department of Public Instruction (DPI) and the State Board of Education (SBE) promote those characteristics among its active teaching force?

## PROBLEM

Teacher quality is the most influential school-related factor in determining student achievement and growth.<sup>2</sup> The quality of teachers varies widely across the teaching force, even for teachers within the same school.<sup>3</sup> Despite having developed statistical models intended to identify effective and ineffective teachers based on student growth comparisons, researchers have been unable to establish a pattern of common background characteristics among effective teachers. Therefore, the evidence collected from these models provides little insight into how to adjust hiring practices to favor effective teachers.

Many principals have said that the most important characteristics they look for in hiring teachers include a passion for teaching and good interpersonal skills. Research supports using these characteristics, suggesting that highly effective teachers have a passion for teaching.<sup>4</sup> These characteristics are not easily identified through tests or résumés, and principals must often rely heavily on recommendations from former employers in making their hiring decisions.

In addition to identifying effective teachers, it is also important to understand what methods can be used to enhance the performance of teachers in the classroom. Providing instruction that is targeted to individual students' needs, promoting mentoring between experienced and novice teachers, and sharing best practices among teachers have been identified as factors that can increase teacher effectiveness.<sup>5</sup> Further, peer observations allow teachers to share best practices and identify ways by which teachers can improve their methods. Currently, teachers are often unable to avail themselves of such opportunities. Teachers of the same courses or grades usually teach simultaneously, making it nearly impossible for them to observe one another.

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<sup>2</sup> Sanders, W. L., & Horn, S.P. (1998). Research findings from the Tennessee Value-Added Assessment System (TVAAS) database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education*, 12(3), 247-256.

<sup>3</sup> Clotfelter, C.T., Ladd, H.F., & Vigdor, J. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects." *Economics of Education Review*, 673-682.

<sup>4</sup> Barber, M., & Mourshed, M. (2007). How the world's best-performing school systems come out on top. McKinsey & Company.

<sup>5</sup> Garet, M.S., Porter, A.C., Desimone, L., Birman, B.F., & Yoon, K.S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38(4), 915-945.

The initial policy question was developed to identify common background characteristics of effective teachers. Background research as well as our own analyses show that even those characteristics that are identified as impacting student achievement account for only a small portion of the variation in teacher quality and explain little of the association between teacher quality and student achievement. As we began to collect more qualitative data from principals and teachers, the focus of our investigation and the alternatives we developed shifted to ways of promoting effective teaching within North Carolina's current teacher work force.

## BACKGROUND<sup>6</sup>

Although teaching quality matters for all grades and content areas, we focused on middle school because this grade range represents a critical point in a child's educational career and one at which academic motivation decreases significantly.<sup>7</sup> Further, middle school course enrollment may affect students' course selection later in middle school, throughout high school, and into post-secondary education.<sup>8</sup> Students who take challenging mathematics courses in middle school exert more academic effort and acquire more desirable academic habits, which in turn lead to higher achievement and enrollment in more challenging mathematics courses.<sup>9</sup> We focused on mathematics because, more than literacy skills, the acquisition of mathematics knowledge occurs through formal school instruction.<sup>10</sup>

Despite evidence suggesting that teacher quality affects student achievement, few readily measurable teacher characteristics consistently account for differences in student performance.<sup>11</sup> The characteristics that do matter explain only a small portion of the association between teacher quality and student achievement.<sup>12</sup>

## METHODOLOGY & RESULTS<sup>13</sup>

Working with the developers of the Education Value-Added Assessment System (EVAAS), we identified teachers characterized as "effective" or "ineffective" based on

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<sup>6</sup> Please see Appendix 1 (page 16) for a more detailed discussion of the importance of middle school mathematics and of teacher characteristics associated with student performance.

<sup>7</sup> Anderman, E.M., & Maehr, M.L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research*, 64(2), 287-309.

<sup>8</sup> Hoffer, T.B. (1992). Middle school ability grouping and student achievement in science and mathematics. *Educational Evaluation and Policy Analysis*, 14(3), 205-227.

<sup>9</sup> Lleras, C. (2008). Race, racial concentration, and the dynamics of educational inequality across urban and suburban schools. *American Educational Research Journal*, 45(4), 886-912.

<sup>10</sup> Nye, B., Konstantopoulos, S., & Hedges, L.V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis*, 26(3), 237-257.

<sup>11</sup> Goldhaber, D. (2008).

<sup>12</sup> Ibid.

<sup>13</sup> Appendix 2 (page 21) contains a more detailed discussion of our methodology.

student performance data.<sup>14</sup> The selected sample of 52 teachers represents a small, non-random subset of teachers in North Carolina. All research was conducted using a double-blind design to ensure that the observers did not know whether teachers being observed had been identified as highly effective.

After identifying the sample of teachers for inclusion, we pursued a multifaceted research strategy: 1) analysis of background characteristics, 2) an electronic survey of teacher experiences, 3) observations of classrooms, and 4) interviews with principals.

### *Quantitative Data Analysis*<sup>15</sup>

We received a range of teacher background characteristics for our sample from DPI's teacher licensure file. We then conducted a series of statistical tests to determine whether effective and ineffective teachers systematically varied in terms of their background characteristics and whether any specific characteristics influence a teacher's effectiveness with his or her students. Analysis of our sample of teachers confirms prior research that has found few background differences between teachers of high and low effectiveness. Based on the recommendations of researchers in the field and in response to this lack of differences in background characteristics, our team chose to collect additional qualitative data on professional development.

### *Electronic Survey*<sup>16</sup>

The research team developed a short survey to collect information on professional development opportunities and teaching philosophies. Over half of respondents listed co-workers as one of the most important factors influencing their decision to teach at their school. Several respondents also noted other working conditions, such as a school's proximity to home, the environment of the school, and the characteristics of students.

The majority of respondents reported participating in district-based, school-based, and optional professional development workshops in the last 12 months. The vast majority of respondents had also served on a school committee or served in extracurricular activities in the last year. Over half of respondents had taken a college course and participated in a professional conference within the past three years.

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<sup>14</sup> The identification of teachers for our sample is not meant as an endorsement of a particular method of measuring effectiveness. Other factors in addition to or instead of test scores may be an important rubric by which to measure teacher effectiveness.

<sup>15</sup> Appendix 3 (page 25) contains a summary of the analysis of these background characteristics.

<sup>16</sup> A copy of the survey tool is available in Appendix 4 (page 28), and a summary of the survey results is available in Appendix 5 (page 33).

### *Classroom Observations*<sup>17</sup>

The research team conducted classroom observations of a non-random subsample of the 52 teachers in our sample. We developed a standard checklist with which we recorded the presence of specific behaviors during teacher observations.

Effective teachers utilized several classroom management strategies, such as establishing set routines that help students know their roles and responsibilities throughout the class period. Effective teachers also tailored activities to fit the needs of students and utilized teacher-developed worksheets and outside resources instead of relying solely on the textbook.

### *Principal Interviews*<sup>18</sup>

In-person or telephone interviews with the principals of the schools at which we observed teachers were designed to elicit principals' thoughts on characteristics of effective teachers, the characteristics they look for in prospective teachers, and professional development needs.

Principals reported looking first and foremost for passionate teachers. Principals also highlighted teachers who understand students' ability levels and tailor lessons accordingly. Principals discussed the need for professional development trainings that address individual teachers' needs and help teachers formulate goals for their students at the beginning of the year.

Principals highlighted teachers as professional development resources for other teachers within the school and the state. Professional and personal relationships between teachers can help those teachers who are struggling to capitalize on the lessons that other teachers have learned. Principals also expressed a desire for more data that focus not only on overall student achievement, but also on the subject areas and benchmarks with which students struggle the most.

## CRITERIA

- Maximize stakeholder buy-in. Stakeholders include the SBE, DPI, the North Carolina Association of Educators (NCAE), teachers, principals, parents, and students.
- Minimize cost to the SBE.
- Maximize feasibility of implementation.

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<sup>17</sup> A copy of the observational tool is attached in Appendix 6 (page 39), and a summary of results from classroom observations can be found in Appendix 7 (page 44).

<sup>18</sup> The interview protocol is attached (Appendix 8, page 46). A summary of themes that emerged in the principal interviews is also attached (Appendix 9, page 48).

- Maximize replicability of alternative in school districts across the state.
- Increase student achievement as assessed by end-of-grade test results.

## ALTERNATIVES

*Alternative 1: Provide teachers and administrators with classroom goal summaries for end-of-grade exams.*

Teachers currently receive end-of-grade (EOG) scores on their students. DPI could make more data available to teachers and principals across the state by also providing information on an overall class's performance on each of the competency goals assessed in the EOG exam. This alternative would not involve providing information on individual students' performance on specific goals or objectives.

*Alternative 2: Provide professional development through a video sharing website.*

This alternative would provide teachers with a means to share videos of effective lessons and an avenue for observing effective teachers teaching the same material. As noted by several principals during our interviews, teachers' opportunity to observe peers represents an important but underutilized resource for professional development. A video sharing website would overcome any logistical limitations that prevent peer observations by allowing teachers to observe one another at their convenience.

While video sharing websites such as YouTube.com have become commonplace, they have been generally underutilized as a means of providing readily accessible professional development to teachers. TeacherTube.com,<sup>19</sup> a video sharing website devoted to sharing instructional videos, represents one example of using the medium to provide teachers with an online community for sharing and evaluating lessons. A program in North Carolina could expand on this framework to provide targeted professional development opportunities. Programs such as Learn NC<sup>20</sup> already use the Internet to provide North Carolina educators with access to resources and professional development opportunities, and these programs could be potentially expanded to include video sharing.

The SBE could implement this alternative at a number of different levels. Provision of video-sharing technology at the school level could enable teachers to share content for peer feedback. School administrators could use this tool to provide teachers with personalized and targeted feedback in areas where they show a need for improvement. Additionally, video sharing allows school administrators to highlight highly

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<sup>19</sup> TeacherTube, LLC. [TeacherTube.com](http://teachertube.com/). 4 April 2009. 4 April 2009 <<http://teachertube.com/>>.

<sup>20</sup> University of North Carolina at Chapel Hill School of Education, LEARN NC. [About LEARN NC](http://www.learnnc.org/lp/pages/2766). 4 April 2009 <<http://www.learnnc.org/lp/pages/2766>>.

effective teachers within their school and share examples of their practices with other teachers. Interestingly, when asked to name the most effective math teachers within their school, every principal listed the effective teachers included in the sample provided by the developers of EVAAS. This suggests that principals may be in a good position to select which teachers to highlight at the school level using video sharing.

At the district level, video sharing provides districts with an avenue to provide professional development to all of the teachers within the district. Districts can use video sharing to efficiently disseminate professional development to the entire district and save the recordings for future use. By creating a centralized repository of district-level professional development programs and recorded best practices, video sharing could provide teachers with access to review these resources whenever they need. Additionally, curriculum specialists at the district level can use video sharing as a means of providing differentiated professional development to address the specific needs of individual teachers. By posting videos of highly effective teachers, video sharing also provides districts with an effective way of providing recognition for their most effective teachers and for promoting high quality teaching throughout the district.

Video sharing also allows the SBE and DPI to provide professional development to all of the teachers, administrators, and staff within the state. For example, video sharing could serve as an important component of the SBE's and DPI's rollout of the new teacher evaluation instrument and process, especially since the framework focuses on preparing students to compete in the 21<sup>st</sup> century. The SBE could also use video sharing as a means of showcasing highly effective teachers and providing teachers from across the state with access to video content from these highly effective educators. The SBE could incentivize teachers to post and review videos through recognition, prestige, licensure renewal credits, or financial incentives. Potentially, the program would be partnered with teacher preparatory colleges and educational researchers to analyze the videos of effective teachers collected through the program. Analysis of these videos would hopefully result in the identification of additional effective teaching practices and the characteristics of effective teachers. In turn, these methods could be used to create professional development opportunities and training for current and future teachers.

*Alternative 3: Provide teachers with a professional networking website.*

In recent years, internal professional networking sites have become more prevalent in numerous industries (see for example, Nissan,<sup>21</sup> IBM,<sup>22</sup> and Lockheed Martin<sup>23</sup>). Such programs provide colleagues with a means of communicating and

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<sup>21</sup> Hall, Kenji. "Why Is Nissan Mimicking MySpace?" BusinessWeek 30 October 2007: [http://www.businessweek.com/globalbiz/content/oct2007/gb20071030\\_537362.htm](http://www.businessweek.com/globalbiz/content/oct2007/gb20071030_537362.htm) (accessed April 4, 2009).

<sup>22</sup> IBM. Beehive: Allowing IBM employees to create social and personal connections. 4 April 2009 <[http://www-01.ibm.com/software/ucd/gallery/beehive\\_research.html](http://www-01.ibm.com/software/ucd/gallery/beehive_research.html)>.

<sup>23</sup> Messmer, Ellen. "Lockheed Martin gives homegrown social-networking platform a spin." Network World 11 March 2009: <http://www.networkworld.com/news/2009/031109-infosec-lockheed-martin-social-networking.html> (accessed April 4, 2009).

collaborating. The design of such sites varies, but many include the features of social networking sites such as facebook.com or professional networking sites such as LinkedIn.com.

Several principals noted during interviews that peer interaction and collaboration play an important role in promoting teacher effectiveness. At least one principal stated that there needed to be more opportunities for teachers to collaborate and network professionally with teachers across the state beyond state conferences, which only a limited number of educators attend each year. A professional networking site would allow for teachers to easily connect, network, share resources, and collaborate with other teachers across North Carolina. It would also allow veteran teachers to mentor less experienced colleagues. Depending on the goals of the SBE and budgetary constraints, the networking website could be developed in conjunction with the video sharing website suggested in Alternative 2.

*Alternative 4: Provide teachers with a definition of teacher quality based on student performance.*

Currently, the SBE's evaluation of teacher quality focuses entirely on classroom observations conducted by school administrators.<sup>24</sup> Value-added measures of teacher contributions to student achievement on standardized tests are not an explicitly defined measure of teacher quality. However, incentives based on standardized test results, such as No Child Left Behind's Adequate Yearly Progress (AYP) requirements and North Carolina's ABCs of Public Education accountability standards, currently target school-level measures of student performance. Despite this school-level analysis, there has been a move towards assessing individual teacher effectiveness based on a teacher's ability to promote growth in student achievement. We do not advocate a particular measure of teacher quality based on student performance. However, if such measures continue to be used to identify effective teachers in North Carolina, even indirectly, then the SBE could provide educators with a definition that explains how these measures are calculated.

## ANALYSIS

### *Overview of Analysis*

The following matrix evaluates the policy alternatives against each of the criteria presented earlier. Alternatives are ranked on a scale ranging from 1 to 5, where 1 indicates that the alternative does not meet the criterion at all and 5 indicates that the alternative fully meets the criterion. The total score represents the strength of each alternative in addressing the problem.

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<sup>24</sup> North Carolina Professional Teaching Standards Commission. North Carolina Teaching Standards. Raleigh, NC: The North Carolina State Board of Education, 2006-2007.

**Table 1. Outcomes Matrix**

Alternative	Criterion					Total
	Maximize Stakeholder Buy-in	Minimize Cost	Maximize Feasibility	Maximize Replicability	Promote Student Achievement	
1) Provide Classroom EOG Scores	3	4	4	5	4	20
2) Video Sharing	5	3	4	5	3	20
3) Social Networking	5	3	4	5	3	20
4) Define teacher quality	1	5	3	4	3	16

*Alternative 1: Provide teachers and administrators with classroom goal summaries for end-of-grade exams.*

This alternative requires buy-in not only from the SBE and DPI but also from principals and teachers. Principals and teachers will likely consent to this alternative because it places no additional burden on them but provides them with additional requested information. However, buy-in from DPI and the SBE may be limited. As evidenced by DPI's response to questions posed at the 2008 North Carolina High School Network Conference, DPI indicated that it does not believe individual student goal summary reports for end-of-course (EOC) tests are useful for diagnostic or remediation purposes.<sup>25</sup> If this view holds for EOG tests and classroom goal summaries as well, DPI and the SBE may oppose an alternative advocating such reporting. DPI, however, acknowledges that it is looking into ways of providing additional information at the student level,<sup>26</sup> which may indicate an openness to classroom level reporting. Stakeholders may also oppose this alternative on the grounds that the information provided by classroom goal summaries may be misused by educators when modifying their instruction and that such reporting may be incorrectly used as a substitute for diagnostics and assessments that should be used instead. This alternative would be strengthened if implemented in conjunction with programs that provide teachers and administrators with the appropriate training to interpret and better utilize more detailed reporting of EOG examinations.

<sup>25</sup> North Carolina Department of Public Instruction. Frequently Asked Questions from the 2008 North Carolina High School Network Conference. Raleigh, NC: North Carolina Department of Public Instruction, 2008.

<sup>26</sup> North Carolina Department of Public Instruction. Frequently Asked Questions from the 2008 North Carolina High School Network Conference. Raleigh, NC: North Carolina Department of Public Instruction, 2008; . North Carolina Department of Public Instruction. North Carolina End-of-Grade Science Assessments Grades 5 and 8, Frequently Asked Questions. Raleigh, NC: North Carolina Department of Public Instruction, 2009.

The technology to gather and disseminate this information already exists. DPI currently provides information on individual students' overall scores, and DPI could convert this system to also capture specific classroom goal scores. This alternative would rely heavily on an existing technological framework to provide goal-level information. Therefore, this alternative would be at most a minor financial burden for DPI to implement.

This alternative is highly feasible because many schools currently analyze classroom needs by using benchmark data. Therefore, schools could easily have all their teachers utilize a similar system. This alternative also maximizes replicability because modification of statewide data reporting on the classroom level would be consistent across the state. A statewide system would allow every teacher and administrator to access information on the specific needs of the classroom more readily.

This alternative does not guarantee improved student performance but may affect how teachers improve their lesson plans on particular topics. Reporting of aggregate classroom performance on specific goals could help teachers tailor their curriculum to meet their students' needs by encouraging teachers to target weaknesses in delivery of content and improve their instruction. Because of the intermediate steps between providing data and improving test scores, the alternative's ability to improve student performance is unclear.

*Alternative 2: Provide professional development through a video sharing website.*

Providing professional development through a video sharing website meets most criteria. As a tool for providing teachers with professional development opportunities, the alternative will likely encounter little opposition from stakeholders, and will therefore maximize acceptance by stakeholders. Teachers using video sharing report "valu[ing]" the opportunity to observe other teachers.<sup>27</sup> Many of the criticisms directed at video sharing in the educational setting stem from concerns regarding inappropriate or ineffective use of video content during instruction.<sup>28</sup> While use of video sharing for professional development may raise some concerns depending on the way the program is implemented, these concerns may be addressed by creating the program with stakeholder input. When this idea was presented to teachers and principals during the course of our research, those questioned seemed very receptive and even excited about the prospect of using this new technology.

The customizability of providing a video sharing website also minimizes the cost of this alternative. The scope of the program can be adjusted based on the SBE's budgetary constraints. Further, partnerships with service providers and organizations interested in education reform may reduce the costs of the program. For example, the

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<sup>27</sup> De Avila, Joseph. "Teachers Tap Video-Sharing in the Classroom." The Wall Street Journal. 26 March 2008: D1.

<sup>28</sup> Ibid.

video sharing program aligns closely with the missions and expertise of LEARN NC<sup>29</sup> and the Friday Institute for Educational Innovation,<sup>30</sup> and partnering with these organizations may reduce the SBE's expenses.

A video sharing website maximizes feasibility by utilizing existing technology and frameworks. While the videotaping of lessons may have legal implications, especially when conducted with students present, these issues may be resolved either through obtaining parental permission or by restricting access to state personnel and approved entities. The designers of the program must also be aware of the need to make users cognizant of copyright issues. By using a medium that can effectively reach every teacher in North Carolina, this alternative also maximizes replicability.

Finally, little evidence exists which assesses the relationship between providing teachers professional development opportunities through video sharing and promoting student achievement. Partnering with organizations with expertise in evaluation of educational technology would give the SBE the opportunity to better understand the impact of providing professional development through video sharing on student achievement.<sup>31</sup> For example, NC State University College of Education's William & Ida Friday Institute for Educational Innovation, which researches, creates, and evaluates educational resources, programs and innovations could potentially serve as a collaborator in the evaluation of this initiative.<sup>32</sup> While not directly connected to student achievement measured by test scores, this alternative may facilitate teachers' ability to meet SBE's teaching standard of "integrat[ing] and utiliz[ing] technology in their instruction,"<sup>33</sup> by familiarizing teachers with the technology. Through facilitating increased knowledge of video-sharing technology among the teaching workforce, this alternative could also contribute toward reaching the SBE's goal that students complete school prepared for the 21<sup>st</sup> Century.<sup>34</sup>

*Alternative 3: Provide teachers with a professional networking website.*

Providing educators with professional networking opportunities will likely encounter little opposition from stakeholders. A professional networking website would provide more opportunities for teachers to share information across the state to improve their own teaching methods but imposes few obligations on them. Therefore, this alternative will maximize stakeholder buy-in.

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<sup>29</sup> University of North Carolina at Chapel Hill School of Education, LEARN NC. About LEARN NC. 4 April 2009 <<http://www.learnnc.org/lp/pages/2766>>.

<sup>30</sup> NC State University College of Education, The William & Ida Friday Institute for Educational Innovation. What We Do. 4 April 2009 <<http://www.fi.ncsu.edu/what-we-do/>>.

<sup>31</sup> NC State University College of Education, The William & Ida Friday Institute for Educational Innovation. Evaluation of Educational Innovation. 4 April 2009 <<http://www.fi.ncsu.edu/what-we-do/evaluation/>>.

<sup>32</sup> NC State University College of Education, The William & Ida Friday Institute for Educational Innovation. What We Do. 4 April 2009 <<http://www.fi.ncsu.edu/what-we-do/>>.

<sup>33</sup> North Carolina Professional Teaching Standards Commission. North Carolina Professional Teaching Standards. Raleigh, NC: North Carolina Professional Teaching Standards Commission, 2007.

<sup>34</sup> Ibid.

As with Alternative 2, due to the nature of the technology involved and its ability to be implemented as a pilot project, the scope of the project can be shaped to fit the budgetary constraints of the SBE. As in Alternative 2, the SBE could partner with existing service providers to develop a cost-effective program. For example, the SBE could create a site through a company such as [www.ning.com](http://www.ning.com),<sup>35</sup> which provides a platform for creating social networks. Alternatively, the SBE could work with an existing free social network for educators, such as [www.techade.com](http://www.techade.com)<sup>36</sup>. A professional networking website also maximizes feasibility by utilizing existing technology and frameworks. Again, because the Internet can effectively reach every teacher in North Carolina, this alternative maximizes replicability.

Finally, research suggests that, “strong professional development communities are important contributors to instructional improvement and school reform.”<sup>37</sup> Although little evidence exists which assesses the relationship between providing teachers with Internet-based professional networking opportunities and promoting student achievement, partnering with organizations with expertise in evaluation of educational technology, such as the Friday Institute, would help evaluate the efficacy of such programs.<sup>38</sup> By providing access and familiarizing teachers with professional networking tools, this alternative may also promote the integration of this technology in instruction and help promote the SBE’s goal of preparing students for life in the 21<sup>st</sup> Century.<sup>39</sup>

*Alternative 4: Provide teachers with a definition of teacher quality based on student performance.*

Because many stakeholders have different views on the correct definition of teacher quality, developing a definition of teacher quality based on student performance is likely too politically contentious to be feasible. Since defining individual teacher quality in terms of student performance is a politically charged issue, this alternative will not attract buy-in from stakeholders.

Excluding the transaction costs involved in procuring stakeholder buy-in, developing a definition of teacher quality based on student performance is low-cost and fiscally possible. Political opposition will likely make implementation problematic. This alternative therefore fails to maximize feasibility of implementation. Since a definition of teacher quality applies to every teacher within the state, however, this alternative would maximize replicability.

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<sup>35</sup> Ning.com. [Ning: About](http://about.ning.com/). 4 April 2009 <<http://about.ning.com/>>.

<sup>36</sup> TeachAde. [Frequently asked questions](http://www.teachade.com/faqs.do). 4 April 2009 <<http://www.teachade.com/faqs.do>>.

<sup>37</sup> Little, J.W. Locating learning in teachers’ communities of practice: Opening up problems of analysis in records of everyday practice. *Teaching and Teacher Education*. 18: 917-946, 937.

<sup>38</sup> NC State University College of Education, The William & Ida Friday Institute for Educational Innovation. [Evaluation of Educational Innovation](http://www.fi.ncsu.edu/what-we-do/evaluation/). 4 April 2009 <<http://www.fi.ncsu.edu/what-we-do/evaluation/>>.

<sup>39</sup> North Carolina Professional Teaching Standards Commission. [North Carolina Professional Teaching Standards](#). Raleigh, NC: North Carolina Professional Teaching Standards Commission, 2007.

Finally, the effect of instituting a definition of teacher quality based on student performance remains unclear.

## RECOMMENDATIONS

We recommend implementing Alternatives 1, 2, and 3 because they each fulfill the criteria. Furthermore, these alternatives could work interactively to enhance the effectiveness over and above the separate benefits of each individual alternative.

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APPENDIX 1: LITERATURE REVIEW AND BACKGROUND  
INFORMATION

## *The Importance of Middle School*

We focus on middle school math teachers for several reasons. First, middle school represents a critical transition point in a child's educational career. Entering middle school generally involves not only a change in schools but also a change in scheduling, organizational structure, and academic expectations.<sup>40</sup> Researchers have demonstrated that overall academic motivation decreases significantly in the middle grades.<sup>41</sup> This decreased motivation may have lasting consequences because middle school achievement may determine later educational and career trajectories.<sup>42</sup> Motivation in specific subject topics, including mathematics, generally drops between the sixth and seventh grades.<sup>43</sup>

Further, the knowledge introduced in middle school forms the building blocks of more complex material necessary for success in high school and after graduation. Prior research suggests that more than half of students who will eventually drop out of high school can be identified by the end of their sixth grade year. Ability grouping that differentiates curricula across students begins in middle school and intensifies in high school.<sup>44</sup> These ability groupings remain stable as a student moves from one grade to another.<sup>45</sup> Assignment to a lower ability group in middle school restricts students' ability to take high-level mathematics courses, such as calculus, in high school.<sup>46</sup> Because the mathematics courses taken in high school affect students' SAT scores, odds of acceptance into a competitive four-year college, and performance in college-level mathematics,<sup>47</sup> a student's middle school course enrollment may have lasting consequences. Middle school course enrollment also matters for academic habits and skills in general. Students who take challenging mathematics courses in middle school exert more academic effort and acquire more desirable academic habits, which in turn lead to higher achievement and enrollment in more challenging mathematics courses.<sup>48</sup>

## *The Importance of Mathematics*

On the advice of our partners at SAS, we focused specifically on mathematics because, more than literacy skills, the acquisition of mathematics knowledge occurs

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<sup>40</sup> Dauber, S.L., Alexander, K.L., & Entwisle, D.R. (1996). Tracking and transitions through the middle grades: Channeling educational trajectories. *Sociology of Education*, 69(4), 290-307.

<sup>41</sup> Anderman, E.M., & Maehr, M.L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research*, 64(2), 287-309.

<sup>42</sup> *Ibid.*

<sup>43</sup> Haladyna, T., & Thomas, G. (1979). The attitudes of elementary school children toward school and subject matters. *Journal of Experimental Education*, 48, 18-23.

<sup>44</sup> Useem, E.L. (1992). Middle schools and math groups: Parents' involvement in children's placement. *Sociology of Education*, 65(4), 263-279.

<sup>45</sup> Dauber, S.L., Alexander, K.L., & Entwisle, D.R. (1996). Tracking and transitions through the middle grades: Channeling educational trajectories. *Sociology of Education*, 69(4), 290-307.

<sup>46</sup> Hoffer, T.B. (1992). Middle school ability grouping and student achievement in science and mathematics. *Educational Evaluation and Policy Analysis*, 14(3), 205-227.

<sup>47</sup> Useem, E.L. (1992).

<sup>48</sup> Lleras, C. (2008). Race, racial concentration, and the dynamics of educational inequality across urban and suburban schools. *American Educational Research Journal*, 45(4), 886-912.

through formal school instruction.<sup>49</sup> By contrast, out-of-school activities and behaviors significantly affect the development of literacy skills. Lee and Croninger find that the amount of reading material in the home, family discussions about school, parents' educational expectations, minority status, language spoken at home, academic background, and parental education level explain over 40 percent of the variation in reading achievement between middle-school-aged poor and non-poor students. School characteristics such as within-class grouping, percentage of minority enrollment, teacher absenteeism, student absenteeism, and teacher-student relationships explain only an additional 13 percent of variation.<sup>50</sup>

### *Characteristics Associated with Teacher Quality and Effectiveness*

Teacher quality can be measured in terms of teacher credentials or teacher practices. However, a large body of research using econometric and statistical analysis measures teacher quality in terms of a teacher's impact on student performance on standardized exams.<sup>51</sup> Researchers generally agree that teacher quality is the most influential schooling factor on student achievement.<sup>52</sup> Teacher effects on student achievement are also additive and cumulative.<sup>53</sup> Students with a series of high quality teachers have drastically different outcomes than students with a series of low quality teachers.<sup>54</sup> For example, by analyzing the impact of teacher effectiveness on students' math achievement for two cohorts over three years, Sanders and Rivers found that the difference between having a series of highly effective teachers and a series of low quality teachers resulted in a difference in mean student performance of 52 to 54 percentile points.<sup>55</sup>

Although teacher quality profoundly impacts student achievement, few easily measurable teacher characteristics account for differences in student gains.<sup>56</sup> Goldhaber, in addition to providing a good overview of teacher quality research, captures the current dilemma in his aptly titled chapter, "Teachers Matter, But Effective Teacher Quality Policies Are Elusive."<sup>57</sup> Researchers generally agree that the teacher

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<sup>49</sup> Nye, B., et al. (2004).

<sup>50</sup> Lee, V.E., & Croninger, R.G. (1994). The relative importance of home and school in the development of literacy skills for middle-grade students. *American Journal of Education*, 102(3), 286-329.

<sup>51</sup> Goldhaber, D. (2008).

<sup>52</sup> Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, 673-682; Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2006). Teacher-student matching and the assessment of teacher effectiveness. *Journal of Human Resources*, 41(4), 778-820; Sanders, W.L., & Horn, S.P. (1998). Research findings from the Tennessee Value-Added Assessment System (TVAAS) database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education*, 12(3), 247-256.

<sup>53</sup> Sanders, W.L., & Rivers, J.C. (1996). Cumulative and residual effects of teachers on future student academic achievement. Research Progress Report, Knoxville: University of Tennessee Value-Added Research and Assessment Center, 1996, p.3, 6.

<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

<sup>56</sup> Goldhaber, D. (2008).

<sup>57</sup> Ibid.

characteristics discussed below impact student performance. Nevertheless, these sorts of easily observable teacher characteristics do not explain most of the association between teacher quality and student achievement.<sup>58</sup>

### *Experience*

Most researchers agree that experience matters: experienced teachers increase student achievement more than less experienced teachers.<sup>59</sup> The association between teacher experience and increased student achievement is especially strong during the beginning of teachers' careers. Most of the gains in student achievement related to teacher experience occur in the first four years of teaching.<sup>60</sup>

### *Advanced Degrees*

Some research indicates that teachers with advanced degrees in math and science impact student achievement in these subjects in the upper grades, but analysis of North Carolina data finds little positive effect for advanced degrees. Goldhaber and Brewer concluded that teachers with a B.A. or M.A. in mathematics produce higher student math achievement.<sup>61</sup> However, Clotfelter et al. found that teachers in North Carolina with an advanced degree – whether a Ph.D. or a Masters degree – generally did not increase student achievement.<sup>62</sup> Prior analysis of North Carolina data by Clotfelter et al. discovered a negative effect on student performance associated with teachers with Masters degrees compared to teachers without a Masters degree.<sup>63</sup> Looking specifically at when in their career teachers obtained a Masters degree, Clotfelter et al. found that teachers who obtained an advanced degree before entering the classroom or within the first five years of teaching are, on average, as effective as their peers without advanced degrees.<sup>64</sup> Clotfelter et al. observed that teachers who obtained advanced degrees after their fifth year of teaching are generally less effective than their peers without advanced degrees.<sup>65</sup>

### *National Board Certification*

Teachers who possess National Board for Professional Teaching Standards (NBPTS) certification are on average more effective than teachers without NBPTS certification. However, NBPTS certification may act more as a means of identifying

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<sup>58</sup> Ibid.

<sup>59</sup> Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2007); Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2006).

<sup>60</sup> Boyd, D., Lankford, H., Loeb, S., Rockoff, J., & Wyckoff, J. (2008). The narrowing gap in New York City teacher qualifications and its implications for student achievement in high-poverty schools. *Journal of Policy Analysis and Management*, 27(4), 793-818.

<sup>61</sup> Goldhaber, D.D., & Brewer, D.J. (1997). Evaluating the effect of teacher degree level on educational performance. *Developments in School Finance 1996*. Washington, DC: National Center for Education Statistics, 197-210.

<sup>62</sup> Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2007).

<sup>63</sup> Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2006).

<sup>64</sup> Clotfelter, C. T., Ladd, H. F., & Vigdor, J. (2007).

<sup>65</sup> Ibid.

effective teachers than a process that generates high quality teachers. After looking at student performance of NBTS-certified teachers before and after certification, Clotfelter et al. concluded that NBTS Certification identifies effective teachers in North Carolina, but the certification process does not produce more effective teachers.<sup>66</sup>

### *Teacher Test Scores*

Clotfelter et al. found that higher performance on teacher assessments such as the PRAXIS related to higher student achievement, particularly for math.<sup>67</sup>

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<sup>66</sup> Ibid.

<sup>67</sup> Ibid.

## APPENDIX 2: METHODOLOGY

## *Selection of Teachers*

Working with the developers of EVAAS, we identified sixth-, seventh-, and eighth-grade mathematics teachers characterized as either “effective” or “ineffective” based on two consecutive years of student performance data. Effective teachers were those whose students’ growth on end-of-grade exams, based on past performance, placed the teachers in the top 20 percent of teachers. Conversely, ineffective teachers were those whose students’ growth on end-of-grade exams placed the teachers in the bottom 20 percent. In order to fall into our sample, teachers had to have taught the same grade and subject in both the 2006-2007 and the 2007-2008 school years. Further, their schools had to have provided data that could be used to produce teacher estimates in both years. For nearly all districts, this precondition meant that the district had to have been participating in the North Carolina Window of Information on Student Education (NC WISE) system – an Internet-based student and school management tool – for at least two years as of 2007-2008.<sup>68</sup> To maximize demographic differences, SAS sampled at most eight schools from a district. Each selected school included teachers from at least two different performance quintiles, and no more than six teachers at any school were sampled. No more than two teachers selected at the same school and from the same quintile taught the same subject. The sample was also limited geographically.<sup>69</sup> All research was conducted using a double-blind design to ensure that the observers did not know whether teachers being observed had especially high-achieving or especially low-achieving students. Upon the conclusion of all successfully scheduled observations, SAS revealed information on teacher effectiveness.

After identifying this sample of teachers, we pursued a multi-pronged research strategy: 1) analysis of background characteristics, 2) an electronic survey, 3) classroom observations, and 4) principal interviews.

## *Limitations of Data*

The sample selected for analysis represents an extremely small, non-random subset of teachers in North Carolina. The methods used to select teachers limited the pool of potential subjects first to those teachers who had been teaching in the state for at least two years and, secondly, to teachers in districts that began using the NC WISE system early in its rollout. This selection of districts and teachers is unlikely to be random. Overall, our pool of teachers totaled 52: 22 teachers of low effectiveness, 7 teachers of average effectiveness, and 22 teachers of high effectiveness. This small sample size limits our ability to make causal claims or draw conclusions that apply to a

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<sup>68</sup> By excluding first-year teachers from our sample, we may reduce the effect of years of experience on teachers’ effectiveness since research shows that the effect of experience matters much more at the beginning of a teacher’s career than later in his or her career. However, using two-year estimates reduces the likelihood that any given year represents a fluke or an outlier with respect to a teacher’s contribution to his or her students’ performance.

<sup>69</sup> Teachers were selected from Caswell County Schools, Charlotte-Mecklenburg Schools, Chatham County Schools, Cumberland County Schools, Davidson County Schools, Forsyth County Schools, Franklin County Schools, Granville County Schools, Guilford County Schools, Hoke County Schools, Iredell-Statesville Schools, and Moore County Schools.

broader or larger group of teachers. Even if these results do represent middle school teachers across the state, the processes and characteristics that contribute to teacher effectiveness may differ across grade levels.

Further, the identification of teachers as being of high or low effectiveness for our sample is not meant to be an endorsement of a particular method of measuring effectiveness. While test scores have become a widely accepted measure of teachers' effectiveness for policymakers, other factors (either in addition to or instead of test scores) may be an important rubric by which to measure teachers' effectiveness.

### *Quantitative Data Analysis*

The team requested and received from DPI a range of teacher background characteristics from the state's teacher licensure file. The characteristics requested included teacher's gender, age, race, school, district, years of teaching experience, attainment of an advanced degree, school granting advanced degree, method of entry into teaching (lateral, international, North Carolina teacher education program, or reciprocal entry), licensure type (Visiting International Faculty, continuation, or initial license), licensed area(s), National Board Professional Teaching Standards certification, and name of teacher program completed. This final characteristic was available only for those teachers who had completed a training program in North Carolina.

### *Electronic Survey*

In order to fill the gaps in the data available in the teacher licensure file, the research team developed a short survey to collect information on professional development opportunities and teaching philosophies. The research team e-mailed an introductory letter describing the project's purpose to the principal at each school with one or more teachers identified in our sample. Principals were asked to forward the survey link to every math teacher in their school.<sup>70</sup> Based on discussions with DPI, the research team chose to ask the principals to send the survey to all math teachers so as not to influence principals' opinions on which teachers in their school were especially effective or ineffective and to avoid singling out individual teachers. In total, we received 24 responses to our electronic survey. Because we sent the survey to all math teachers within a school, not only to the teachers in our sample, all but three of the responses came from teachers not identified as effective or ineffective by the EVAAS system.

### *Classroom Observations*

We developed a standard checklist with which we recorded the presence of specific behaviors during teacher observations. Such observational checklists are

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<sup>70</sup> Because of this two-step process for distributing the survey, we cannot identify which teachers may have actually received the survey as intended. We know only that the survey request was sent to principals at all schools that we had received permission to contact. We also had no control over which teachers within a school chose to respond to the survey.

appropriate when the behaviors to be recorded are known in advance.<sup>71</sup> Past research suggests that how teachers implement strategies in the classroom can either facilitate or hinder student learning. In developing the observational tool, the research team selected indicators that focus on the classroom techniques that past research have stated to have an effect on improving student academic performance. These classroom practices include higher-order thinking skills, individualization, collaboration and authentic assessment. The checklist utilized included classroom indicators such as the materials used, transitions between activities, and the organization of the classroom as indicators for whether these effective classroom practices were in place. While the checklist utilized did not include behavior counts, using a simple present/not present measure as opposed to a scale rating the quality of the behavior promotes consistency across observers and across observations.

The research team utilized this checklist during classroom observations of a non-random subsample of the teachers identified by EVAAS. DPI assisted our team in gaining permission to conduct these observations. Specifically, DPI staff contacted the superintendants of all districts in which teachers were located. Upon receiving permission from the superintendants to perform observations in their districts, we contacted each school located within that district. In total, four of the eight superintendants contacted gave permission for the research team to conduct observations in their districts. Principals of individual schools were contacted first by e-mail. In the absence of an e-mail response, team members attempted to reach each principal by telephone. During these contacts, the research team identified which teachers it was hoping to observe and asked the principal to provide dates and times when the research team could enter the school. At several schools – for example, Chatham Middle School in Chatham County – none of the teachers in the sample were still teaching at the school during the 2008-2009 school year. In total, the research team observed 11 teachers at five schools. Two team members conducted teacher observations during a class period lasting from 45 to 90 minutes, depending on school schedules. Observing an entire period allowed us to assess the teacher's introduction and conclusion as well as his or her actual lesson.

### *Principal Interviews*

Individual interviews with the principals of the schools at which we observed teachers lasted for 15 to 20 minutes each. We conducted these interviews either in person during the course of our school visit or on the telephone at a later date. One member of the research team facilitated each interview, with at least one other member of the research team acting as note taker. The questions included were intended to elicit principals' thoughts on characteristics of effective teachers, the characteristics they look for in prospective teachers, and professional development needs. Principals were also asked to provide the research team with the names of the math teachers who, in their opinion, were most effective with their students.

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<sup>71</sup> Carter, P.A. (2008). Defining teacher quality: An examination of the relationship between measures of teachers' instructional behaviors and measures of their students' academic progress. Dissertation. Chapel Hill, NC: University of North Carolina, Department of Education.

APPENDIX 3: ANALYSIS OF TEACHER BACKGROUND  
CHARACTERISTICS

## *Results of Data Analysis*

Quantitative data analysis of our sample of teachers confirms prior research that has found few differences between teachers of high and low effectiveness. T-tests to identify differences between such teachers revealed that highly effective teachers were more likely to have entered the profession through a North Carolina Teacher Education Program than teachers of lower effectiveness. Conversely, highly effective teachers were less likely to have entered teaching laterally. Teachers of lower effectiveness were marginally more likely to have earned a graduate degree than teachers of higher effectiveness, a finding that contradicts previous research. Yet, previous research has found that a graduate degree is slightly associated with better student performance on the high school level if the degree is in the subject matter being taught (i.e., math). As provided to us, the DPI licensure files have no information on the subject matter of a teacher's advanced degree. As such, this unexpected finding on graduate degree causes little concern.

We also conducted several logistic regressions to determine whether any of the background characteristics examined affect a teacher's effectiveness with his or her students. Consistently across different models, having entered through a North Carolina Teacher Education Program was associated with a teacher being of higher effectiveness. Yet this characteristic explained less than ten percent of the variation in teacher effectiveness.

**Table 2. Background Characteristics of Effective and Ineffective Teachers<sup>72</sup>**

	<i>Highly Effective Teachers<sup>73</sup></i>	<i>Highly Ineffective Teachers</i>
<i>Years of Experience</i>	15.50 (2.17)	13.82 (1.95)
<i>Age</i>	42.36 (2.26)	42.95 (2.55)
<i>Race (percentage)</i>		
<i>White</i>	77.27 (0.09)	86.36 (0.07)
<i>Black</i>	18.18 (0.08)	13.63 (0.07)
<i>Another Race</i>	4.54 (0.05)	0.00 (0.00)
<i>Female (percentage)</i>	81.81 (0.08)	77.27 (0.09)
<i>NBPTS Certification (percentage)</i>	13.63 (0.07)	4.54 (0.05)
<i>Entry Method (percentage)</i>		
<i>International</i>	4.54 (0.05)	0.00 (0.00)
<i>Reciprocal</i>	40.91 (0.11)	59.09 (0.11)
<i>NC Teacher Education Program</i>	54.54** (0.11)	22.73** (0.09)
<i>Laterally</i>	0.00* (0.00)	13.64* (0.09)
<i>License Type (percentage)</i>		
<i>Visiting International Faculty</i>	4.54 (0.05)	0.00 (0.00)
<i>Continuation</i>	86.36 (0.07)	81.82 (0.08)
<i>Initial License</i>	9.09 (0.06)	18.18 (0.08)
<i>Primary Certification in Middle School Math (percentage)</i>	22.72 (0.09)	31.82 (0.10)
<i>Primary Certification in Any Math (percentage)</i>	40.91 (0.11)	45.45 (0.11)
<i>Primary Certification in Any Middle School Subject (percentage)</i>	27.27 (0.10)	31.82 (0.10)
<i>Graduate Degree (Percentage)</i>	13.64* (0.07)	36.36* (0.10)

<sup>72</sup> Data for these analyses came from the state teacher licensure file.

<sup>73</sup> Standard errors are in parentheses. \*  $p \leq 0.05$ ; \*\* $p \leq 0.10$ .

## APPENDIX 4: TEACHER SURVEY INSTRUMENTS

Dear Principal XX:

We are graduate students in the Master of Public Policy program at Duke University working on a spring consulting project with DPI to identify characteristics and practices of effective middle school math teachers. The project will entail analyzing data at the state level, surveying teachers, observing classrooms, and interviewing principals.

Surveying teachers is a crucial component of our study. Feedback from teachers will enhance our findings beyond what current statistical data can provide. We are hoping to capture more information on teachers' backgrounds, opinions, and experiences with this survey. A link to the survey is provided below. We would appreciate your help in distributing the link to this survey to every math teacher in your school.

The teachers' responses will be kept confidential and information will only be reported to DPI at the aggregate level. Teacher names will only be used for data collection and analysis purposes. Teacher names will not be included in our report to DPI.

The deadline for completing the survey is Friday, March 20, 2009. We will send out one reminder to teachers to complete the survey prior to the deadline. If you have any questions or concerns, please contact Dan Behrend at [daniel.behrend@duke.edu](mailto:daniel.behrend@duke.edu).

Thank you for your help and participation.

<Insert link to survey>

Sincerely,

Dan Behrend, Maggie Fernandez, Allison Horowitz, & Di Luong  
Master of Public Policy Candidates  
Duke University

## 1. Duke University Graduate Student Survey of Middle School Math Teachers

We are graduate students in the Master of Public Policy Program at Duke University working on a spring consulting project with DPI to identify characteristics and practices of effective middle school math teachers.

The purpose of this survey is to collect information about your background, experience, and opinions as a teacher. Your participation in this survey is voluntary and your answers will be kept completely confidential. All results will be reported to DPI at the aggregated level only. Teacher names will only be used for data collection and analysis purposes. Teacher names will not be included in our report to DPI.

Completion of this study will take about 10-15 minutes of your time. We ask that you please complete the survey by Friday, March 20, 2009.

Thank you in advance for your time and for your candid responses.

If you have any questions about this survey, you may contact Dan Behrend at daniel.behrend@duke.edu.

**\* 1. Please enter your name here. (This information is required; we will not use this information to identify you in any reports associated with this study)**

**2. Please indicate whether you have participated in each of the activities below.**

	Within past 12 months	Within past 3 years	Within past 5 years	Longer than 5 years ago, or not at all
District-based required professional workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
School-based required professional workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Optional professional workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
College courses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional conferences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service in a school committee (e.g., school leadership team, planning or strategy committee)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service in extracurriculars (e.g., athletics, clubs, student government)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**3. Please estimate the approximate number of hours spent in professional development within the past 12 months:**

District-based required professional workshops	<input type="text"/>
School-based required professional workshops	<input type="text"/>
Optional professional workshops	<input type="text"/>
College courses	<input type="text"/>
Professional conferences	<input type="text"/>
Other professional development	<input type="text"/>

**4. Please estimate the number of hours you spend PER WEEK:**

Creating or revising lesson plans for personal use	<input type="text"/>
Developing course curricula at the school or district level	<input type="text"/>

**5. Please check all of the following statements that apply to you**

- Participated in a mentoring program as a **mentee**
- Participated in a mentoring program as a **mentor**
- Was a student teacher
- Participated in Teach for America
- Participated in NC Teaching Fellows
- Participated in NC Teach
- Participated in Troops to Teachers
- Other Program (please specify)

**6. If you were a student teacher, please indicate the duration of the student teaching experience (either observing a veteran teacher or teaching lessons):**

- Was not a student teacher
- Less than 4 weeks
- 4-8 weeks
- more than 8 weeks

**7. Have you received a formal performance review in the past 12 months?**

- Yes
- No
- Unsure

**8. Please indicate how much you agree or disagree with the following statements with regard to your most recent performance review experience:**

	Strongly Disagree	Disagree	Agree	Strongly Agree
I receive valuable feedback as a result of the performance review process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the performance review process is valuable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the performance review process is a waste of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have made changes to the way I teach based on feedback received in a performance review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you have any other comments about the performance review process?

**9. Please list all classes you teach regularly.**

**10. Please indicate the 3 factors that are most important to you in your decision to teach at your current school.**

**11. How would you describe your teaching philosophy?**

## APPENDIX 5: TEACHER SURVEY RESULTS

The responses to the question asking teachers to list the three most important factors that influenced their decision to teach at their current school provided some interesting results. Over half of respondents listed coworkers as one of the most important factors influencing their decision to teach at their school. Of the twenty-four respondents, 14 listed the school's administration or principal as a determining factor, and 14 listed the other teachers in the school as a determining factor. Location represented another important factor that 10 respondents listed. Several respondents noted other working conditions, such as school environment and student characteristics, as determining factors.

A summary of responses regarding participation in professional development activities is included in Table 3. The majority of respondents reported participating in district-based, school-based, and optional professional development workshops in the last 12 months. The vast majority of respondents had also served on a school committee or served in extracurricular activities in the last year. Over half of respondents had taken a college course and participated in a professional conference within the past three years.

**Table 3. Participation in Professional Development and School Functions**

	<i>Within past 12 months</i>	<i>Within past 3 years</i>	<i>Within past 5 years</i>	<i>Longer than 5 years ago or not at all</i>
	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>
<i>District-based required professional workshops</i>	79.2% (19)	16.7% (4)	4.2% (1)	0.0% (0)
<i>School-based required professional workshops</i>	91.7% (22)	8.3% (2)	0.0% (0)	0.0% (0)
<i>Optional professional workshops</i>	62.5% (15)	29.2% (7)	0.0% (0)	8.3% (2)
<i>College courses</i>	21.7% (5)	34.8% (8)	30.4% (7)	13.0% (3)
<i>Professional conferences</i>	29.2% (7)	45.8% (11)	12.5% (3)	12.5% (3)
<i>Service in a school committee</i>	83.3% (20)	12.5% (3)	4.2% (1)	0.0% (0)
<i>Service in extracurricular activities</i>	91.3% (21)	4.3% (1)	4.3% (1)	0.0% (0)

The respondents' report of the number of hours spent in professional development within the past twelve months can be found in Table 4. The number of hours reported for each type of professional development varied quite a bit. On average respondents reported spending 17 hours in district-based workshops, roughly 20 hours in school-based workshops, and 12 hours in optional workshops.

**Table 4. Approximate number of hours spent in professional development within past 12 months**

	<i>Average</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Number of Response</i>
<i>District-based required professional workshops</i>	17.2	2	60	23
<i>School-based required professional workshops</i>	19.7	2	100	24
<i>Optional professional workshops</i>	12.2	0	40	20
<i>Professional conferences</i>	7.2	0	50	21
<i>Other professional development</i>	3.6	0	10	10
<i>College courses†</i>				

†Results excluded due to use of different metrics by respondents

As shown in Table 5, teachers reported spending an average of six hours a week developing personal lesson plans and about three hours a week developing curricula for their school or district.

**Table 5. Number of hours spent developing lesson plans or curricula**

	<i>Average</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Number of Respondents</i>
<i>Creating or revising lesson plans for personal use</i>	6.1	2	15	23
<i>Developing course curricula at the school or district level</i>	3.4	0	10	21

Table 6 shows teachers' reports of participation in mentoring programs or alternative gateway programs. Roughly three-quarters of teachers reported being a mentee in a mentoring program, while less than half of respondents answering served as a mentor in a mentoring program. Roughly 70% of the respondents had experience

as a student teacher. As shown in Table 7, the majority of respondents with student teaching experience had more than eight weeks of experience as a student teacher. Only four respondents participated in teacher gateway programs, such as NC Teaching Fellows or NC Teach.

**Table 6. Participation in a teacher mentoring programs or teacher gateway programs**

	<i>Response %</i>	<i>Response Count</i>
<i>Participated in a mentoring program as a mentee</i>	73.9%	17
<i>Participated in a mentoring program as a mentor</i>	43.5%	10
<i>Was a student teacher</i>	69.6%	16
<i>Participated in Teach for America</i>	0.0%	0
<i>Participated in NC Teaching Fellows</i>	13.0%	3
<i>Participated in NC Teach</i>	4.3%	1
<i>Participated in Troops to Teachers</i>	0.0%	0

**Table 7. Length of Student Teaching Experience**

	<i>Response %</i>	<i>Response Count</i>
<i>Was not a student teacher</i>	15.0%	3
<i>Less than 4 weeks</i>	0.0%	0
<i>4-8 weeks</i>	15.0%	3
<i>More than 8 weeks</i>	70.0%	14

Every respondent reported having a performance evaluation in the past year. Most respondents agree that the evaluation process is valuable, that they receive valuable feedback from the process and that they have changed their teaching based on evaluation feedback. The results of respondents' impressions of their most recent performance review can be found in Table 8.

**Table 8. Respondents' impressions of most recent performance review**

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>Rating Average</i>
	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>	<i>Response % (Response #)</i>	
<i>I receive valuable feedback</i>	0.0% (0)	4.2% (1)	66.7% (16)	29.2% (7)	3.25
<i>I think the process is valuable</i>	0.0% (0)	8.3% (2)	58.3% (14)	33.3% (8)	3.25
<i>I think the process is a waste of time</i>	37.5% (9)	54.2% (13)	8.3% (2)	0.0% (0)	1.71
<i>I have made changes to the way I teach based on feedback received in a performance review</i>	8.3% (2)	20.8% (5)	54.2% (13)	16.7% (4)	2.79

## APPENDIX 6: TEACHER OBSERVATIONAL TOOL

**DESCRIPTIVE INFORMATION:**

Researcher:

Teacher/Grade:

School:

Materials:

Date:

Start time:

End time:

Number of Students:

# Males:

# Females:

**CLASSROOM SET-UP** (description or sketch set up below):

--

**LESSON INTRODUCTION**

Instructions: Provide a brief description of how the lesson started and mark whether each of the indicators was present or absent.

INTRODUCTION	PRESENT?	EVIDENCE/EXPLANATION
a. Provides overview		
b. Relates lesson to previous lessons/activities		
c. Assesses prior knowledge		
d. Uses graphics		
e. Other		

CONTENT	PRESENT?	EVIDENCE/EXPLANATION
Main ideas are clear and specific		
Sufficient variety in supporting information		
Relevancy of main ideas was clear		
Higher order thinking was required		
Instructor related ideas to prior knowledge		
Definitions were given for vocabulary		

<b>ORGANIZATION</b>	<b>PRESENT?</b>	<b>EVIDENCE/EXPLANATION</b>
Introduction captured attention		
Introduction stated organization of lecture		
Effective transitions (clear w/summaries)		
Clear organizational plan		
Concluded by summarizing main ideas		
Reviewed by connecting to previous classes		
Previewed by connecting to future classes		

<b>INTERACTION</b>	<b>PRESENT?</b>	<b>EVIDENCE/EXPLANATION</b>
Instructor questions at different level		
Sufficient wait time		
Students asked questions		
Instructor feedback was informative		
Instructor incorporated student responses		
Good rapport with students		

<b>VERBAL/NON-VERBAL</b>	<b>PRESENT?</b>	<b>EVIDENCE/EXPLANATION</b>
Language was understandable		
Articulation and pronunciation clear		
Absence of verbalized pauses (er, ah, etc.)		
Instructor spoke extemporaneously		

Effective voice quality		
Volume sufficient to be heard		
Rate of delivery was appropriate		
Effective body movement and gestures		
Eye contact with students		
Confident & enthusiastic		

USE OF MEDIA	PRESENT?	EVIDENCE/EXPLANATION
Overheads/Chalkboard content clear & well-organized		
Visual aids can be easily read		
Instructor provided an outline/handouts		
Computerized instruction effective		

GRAPHIC TYPE	DESCRIPTION	THUMBNAIL SKETCH
<input type="radio"/> CHART <input type="radio"/> TABLE <input type="radio"/> BAR GRAPH <input type="radio"/> HISTOGRAM <input type="radio"/> FLOW CHART <input type="radio"/> TIMELINE <input type="radio"/> VENN DIAGRAM <input type="radio"/> LINE GRAPH <input type="radio"/> DOUBLE BUBBLE <input type="radio"/> KWL <input type="radio"/> STEM AND LEAF PLOT <input type="radio"/> OTHER (DESCRIBE)	<b>CHOOSE ONE:</b> <input type="radio"/> TEACHER DRIVEN <input type="radio"/> STUDENT DRIVEN <input type="radio"/> BALANCED	
	<b>DESCRIBE GRAPHIC:</b>	

**EVENT LOG/SYNOPSIS:**

Instructions: Create an event-driven synopsis for the class period describing both teacher and student actions during each event. Shorthand codes for modes of instruction and teaching materials can be found in the table below the log.

<b>Event time</b>	<b>Teacher Actions</b>	<b>Student Actions</b>

## Event Log Coding Scheme

<b>Mode of Instruction</b>	<b>Code</b>	<b>Materials Used</b>	<b>Code</b>
Whole Class Instruction	WCI	Printed Reading Materials	PRM
Hands-on Activities	HOA	Computer or Computer Technology	CT
Lecture or Recitation	LR	Overhead projector or LCD	OP
Drill and Practice	DP	Chalkboard/Whiteboard/Chart Paper	CWC
Reading Textbook or Kit Materials	RT	Videos/Films/Music	VFM
Teacher Demonstration	TD	Demonstration models	DM
Small Group Discussion	SGD	Manipulative/hands on equipment	MHE
Cooperative Group Work	CGW	Worksheets	WS
Individual Seat Work	ISW	Science Notebooks	SN
Open Ended Inquiry	OEI	Homework or Class work Review/Correction	WRC
Data Collection and/or Manipulation	DCM	Group Presentation (student)	GP
Note-taking (includes copying materials and procedures)	NT	Notebook Entry or Log	NE

**LESSON CLOSURE**

Instructions: Write 1-2 sentences describing how lesson ended.

## APPENDIX 7: TEACHER OBSERVATION RESULTS

## *Classroom Management*

In several observations, teachers had established set routines that helped students know their roles and responsibilities throughout the class period. In one classroom, the students knew to begin working with a manual at the beginning of the class period; the teacher did not have to remind students to do so. In another class, the teacher prepared students for their normal class structure by beginning with a math drill. Another effective practice witnessed was consistently keeping the class busy with activities surrounding a single topic. The teacher referred to this strategy as “running a game show.” The teachers visited with well-managed classrooms also held their students accountable for their work.

## *Lessons and Activities*

Teachers varied in how they chose to conduct their lessons. One teacher had a very structured classroom in which the students worked from teacher-developed individual worksheets. The class spent the entire period going over some problems they had completed during the beginning of the class but a majority of their time they checked over their homework together as a group.

In one sixth grade classroom visited, the students transitioned from one activity to the next seamlessly. The activities used included a morning brainteaser, individually-completed worksheets, and group worksheets. The teacher also checked students' homework and assigned the next day's homework so that students who had finished assigned work could remain engaged with the day's topic. Doing so incentivizes those students who grasp the material quickly.

Teachers also frequently utilized outside resources instead of relying solely on the textbook. One teacher created individualized packets for his classes instead of relying on the traditional textbook provided by the state. Another teacher asked students to provide real-life examples of the mathematical concepts they had learned. When one student questioned the need for learning the content, the teacher provided examples of the topic's long-term applicability. For example, she noted that the material could help the artistic students enter an architecture career. Yet a third teacher gets ideas during teacher planning sessions and developed her own activities.

## APPENDIX 8: PRINCIPAL INTERVIEW TOOL

**School:**  
**Principal:**  
**Interviewer:**  
**Date:**

Background:

This project is a partnership between students in the Master of Public Policy program at Duke University and DPI to identify the characteristics and practices of effective middle school math teachers. The project will entail analyzing data at the state level, surveying teachers, observing classroom, and interviewing principals. Thank you for participating in this interview. This interview will take about 20 minutes to complete.

Questions:

- (1) What characteristics or attributes are necessary to be an effective teacher?
- (2) What current tools (or outcomes/rubric/measurements) do you use to evaluate effective teaching?
  - a. Are teachers provided with data on individual student growth in EOG scores?
- (3) Please provide some examples of the most effective math teachers in your school.
- (4) What professional development opportunities have been most successful at increasing teacher effectiveness?
  - a. Which opportunities have been least successful?
  - b. At what point during a teacher's tenure is professional development most crucial?
  - c. Are there professional development opportunities that are not currently provided but should be?
- (5) Describe your role in selecting and/or hiring teachers at your school.
  - a. What criteria do you use in the hiring process for teachers?
- (6) What can DPI do to promote effective teaching in NC?

## APPENDIX 9: PRINCIPAL INTERVIEW RESULTS

Principal interviews asked principals to clarify their definition of an effective teacher. They mentioned looking for passionate and effective teachers first and foremost, followed by student interaction characteristics, personality characteristics, and professional background characteristics.

With respect to teacher-student interactions, principals highlighted teachers who were able to understand students' ability levels and tailor lessons accordingly. One principal highlighted the importance of ensuring student-centered lessons. Principals also highlighted intangible characteristics, including empathy, willingness to learn, and proactiveness. Effective teachers communicate well with students, parents, and colleagues. Principals also reported that they consider hiring teachers with limited content knowledge in their intended subject if such characteristics are obvious.

### *Teacher Evaluation*

Many schools have developed their own rubrics to evaluate teachers in addition to the state-developed rubric. Such rubrics allow schools to quickly assess the classroom environment. Schools also utilize information from tSparta to help track student performance, but several principals reported not receiving enough specific data for such tracking to be effective.

Principals also argued that data present only a limited snapshot of a teacher's effectiveness, reporting that students may have additional challenges for which growth models do not account. Different teachers are differentially effective with low- and high-achieving students. Further, many of teachers' effects with students may not appear on EVAAS reports, as other variables that affect student achievement include emotional and family issues and fall outside of the educational realm. Effective teachers are more often the exceptions to the rule than the actual rule.

### *Professional Development Activities*

All principals interviewed felt that professional development is most crucial during the first few years of a teacher's career but that opportunities should exist across a teacher's career. "Baby teachers" in their first three years of teaching are in the best position to learn appropriate habits. Principals also maintained that one training does not solve all needs and should be differentiated to meet the needs of individual teachers. Principals also reported that the least helpful strategies are mandated, canned programs that present a one-size-fits-all approach. Principals highlighted the importance of teacher buy-in regarding specific professional development opportunities.

Principals expressed a desire for development opportunities that help teachers formulate goals for their students at the beginning of the year. Two principals recommended Marzano training to help teachers improve how they deliver instruction. Principals also point out that teachers serve as potential professional development resources for other teachers within the school and the state, as teachers can capitalize

on the lessons that other teachers have learned. Principals argue that teachers learn more effectively from teachers in the same grade than from paid consultants.

Last, principals reported the need for regional professional development sessions instead of sessions concentrated in Raleigh. Principals believed that teachers should receive credit for participation in professional development sessions and should not have to lose instruction time for participation.

### *Hiring Processes*

Principals attempt to identify applicants who prioritize student needs, who are naturally caring and committed, and have a good attitude. They look for applicants who are “team players” and are willing to share with and learn with each other. They also look at how applicants describe their lesson plans and ask themselves if they would like their child to be taught by this teacher.

### *Potential Role of DPI*

Principals expressed the utility of timely, accurate data that focus not only on overall student achievement but on the subject areas and benchmarks with which students struggle the most. They also expressed a desire for DPI to provide more information on best practices and to allow more latitude for monitoring effective teaching and learning.