KENAN FELLOWS PROGRAM EVALUATION RESULTS
2012-13

PREPARED FOR

Kenan Fellows Program for Curriculum and Leadership Development
Kenan Institute for Engineering, Technology & Science
Campus Box 7006
North Carolina State University
Raleigh, NC 27695

PREPARED BY

Amy A. Germuth, Ph.D.
EvalWorks, LLC
150 Solterra Way
Durham, NC 27705

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EXECUTIVE SUMMARY

The Kenan Fellows Program for Curriculum and Leadership Development supports a networked cohort of educators who have advanced skills, are attuned to significant issues in STEM, and are actively engaged in efforts to improve education. Under this program, outstanding classroom teachers selected as Kenan Fellows participate in a year-long fellowship in partnership with university researchers and business and industry scientists. As part of the fellowship, Fellows participate in a 5-week research externship in the summer and 2 weeks of professional development during the summer and fall. As a result of their Kenan Fellowship and externship, Fellows develop a curriculum project that integrates STEM, inquiry-based learning, and technology that is relevant and research- or industry-based. The project is disseminated through presentations at national, state, and local conferences and workshops to Fellows' colleagues in their school and/or district.

An external evaluation consulting firm, EvalWorks, LLC evaluates the Kenan Fellows Program based on an evaluation plan developed in conjunction with program staff. Findings from 2012-13 include the following:

Overview of Fellows

- For 2013, the number of applications was seven times the number of Fellowships available. Forty-three fellowships were filled based on review of 308 applications and 101 interviews.
- Two Fellows have Doctoral degrees, 28 have Master's degrees, 16 are National Board Certified, and four are former NC Teaching Fellows.
- On average Fellows have ten years teaching experience.
- Nine Fellows entered teaching as Lateral Entry Teachers. Twelve Fellows are male and 32 are female; one is Hispanic, six are African-American, and the rest (n=37) are Caucasian.
- Together Fellows serve 14 rural, 15 suburban, and 19 urban schools across 24 counties in NC.

Professional Development

- The focus of professional development for 2013 Fellows was on integrating inquiry, the engineering design process, and technology into lessons and teacher leadership development.
- Fellows rated the professional development sessions very favorably, especially the first and third weeks, where maximum ratings were at or above 4.68 and no ratings were below 3.38, on a 5-point scale (1 = low, 5 = high).
- When asked about impacts of their professional development, Fellows' mean ratings were highest for the statements, "The Kenan Fellows Program stimulated me to think about ways to improve my teaching." and "The Kenan Fellows Program increased my enthusiasm for teaching."

Teacher Leadership

- Fellows' post-data suggest that they made considerable growth in terms of their knowledge and skills related to being an effective public speaker and knowledge of education policy, with more Fellows seeing themselves as teacher leaders, being recognized as such by others, and taking on more teacher leadership roles within their schools.

- Fellows also agreed or strongly agreed that their Fellowship increased their interests and abilities to network with colleagues and non-educational professionals (means 4.30-4.68) , helped them become better instructional leaders (mean 4.53), and, as a result, increased the likelihood that others come to them for guidance on promoting critical thinking and technology in their classes (means 4.45 and 4.53, respectively).

Teacher Retention

- Of the 85 of 120 alumni responding to a short survey in 2011, 64 or 75% of Kenan Fellows have remained as classroom teachers, with an additional 15 remaining in education as school administrators, district administrators, or in other education positions (e.g., counselor, media specialist, etc.) for a total of 93%. Thus, as a best estimate, 93% of Kenan Fellows remain active in education.
- For 2013-14, only one Fellow has plans to leave education, with the majority (n=31) remaining as classroom teachers. Five will remain in education in non-teaching /administrative roles and one is moving into administration.
- When Fellows were asked to describe the most significant effect their participation as a Kenan Fellow has had on their teaching, many commented that the Kenan Fellows Program greatly renewed their enthusiasm for teaching.

Student Impact

- A total of 143 students responded to a survey at the end of the academic year that asked them about changes based on having worked with a Kenan Fellow math or science teacher. Students ratings of agreement were greatest for the statements, "I am more interested in math and/or science than I was at the start of the school year." and, "I want to be more involved in math or science activities outside of school now than I did at the start of the school year." with overall mean ratings 4.10 and 4.24, respectively.

Dissemination

- This year Fellows provided over 50 presentations/workshops/webinars to disseminate high quality curricula, best practices, and resources to over 3,000 educators (1.5 x as many as were reached last year).

Accomplishments

- 12 Fellows were promoted to new leadership positions.
- 18 Fellows received grants worth over $72,000.
- Two Fellows were recognized as District Teacher of the Year.
- Four Fellows were recognized as Teacher of the Year within their school.
- Two Fellows were recognized as Teacher of the Month in their district.
- Four Fellows received other awards, recognizing their outstanding teaching and contributions.

OVERVIEW

Established in 2000 as a result of a community effort to address teacher retention and recruitment, specifically for Environmental Science teachers, the Kenan Fellows Program for Curriculum and Leadership Development supports a networked cohort of educators who have advanced skills, are attuned to significant issues in STEM, and are actively engaged in efforts to improve education. With the mission to "provide relevant, professional learning and leadership development for exceptional teachers through innovative collaborations with research partners in industry, higher education and government", the program advances teacher professionalism by providing sustained professional development and research externships conducted in collaboration with business and industries, public schools, and institutions of higher learning. The Kenan Fellows Program is administered by the Kenan Institute for Engineering, Technology & Science at NC State University and is supported by grants from foundations, government organizations, corporations, and individual partners. By 2023, the Kenan Fellows Program plans to have 1,000 Fellows and alumni leading K-12 STEM education initiatives with beneficial impacts for students, educators, parents and businesses in all seven North Carolina economic development regions.

The overarching goals of the Kenan Fellows Program are to:

1. Advance relevant and effective STEM instruction that prepares students for success in the workforce and post secondary education;
2. Empower and retain exceptional teachers prepared to impact teaching and learning by sharing the positive effects of the Kenan Fellows Program experience in North Carolina classrooms and beyond;
3. Facilitate collaboration among educators, industry experts, scientists and K-12 students to align STEM education with community and regional economic interests;
4. Design and disseminate creative curriculum that incorporates locally relevant STEM applications;
5. Support organized alumni efforts to scale the education and economic impact of the program across North Carolina; and
6. Build partnerships and leverage intellectual and financial resources to serve as a replicable national model for STEM education.

Six key features distinguish the Kenan Fellows Program from other teacher advancement programs. The Kenan Fellows Program:

1. Recognizes and develops K-12 accomplished “master” teachers;
2. Provides K-12 Teachers professional development that links outstanding teachers to cutting edge science through research experiences in corporate settings and/or university labs and/or externships that are identified as workforce/ economic development needs in a given region;
3. Engages teachers from across disciplines in the development of STEM-focused curriculum and leadership development;
4. Engages teachers in the program for an extended period of time;
5. Provides teachers with a rigorous professional development experience that focuses on contemporary practices in teaching and learning and instructional leadership; and
6. Develops and tracks a cohort of teachers who continue to engage and impact their schools, districts, and communities after the initial fellowship experience has ended (ex. advisors, recognized teacher leaders, new teacher mentors, consultants to KFP, DPI, etc.)

Under this program, outstanding classroom teachers selected as Kenan Fellows participate in a year-long fellowship in partnership with university researchers and business and industry scientists. As part of the fellowship, Fellows participate in a 5-week research externship in the summer and 2 weeks of professional development during the summer and fall. A product of their fellowship is a curriculum project that results from the externship that integrates STEM, inquiry-based learning, and technology that is relevant and research- or industry-based.. The project is disseminated through presentations at national, state, and local conferences and workshops to Fellows' colleagues in their school and/or district. To date, twelve classes of Fellows from across North Carolina have been selected with one active at present (Class of 2014).

EVALUATION METHODS

An external evaluation consulting firm, EvalWorks, LLC evaluates the Kenan Fellows Program based on an evaluation plan developed in conjunction with program staff. Much of the data for this report were provided by Fellows from the Class of 2013. The following instruments and procedures are used to assess the program:

- ***Professional Development Evaluations*** from the 2012 summer proefssional development sessions provide data on whether Fellows find sessions useful for application to the classroom;

- ***Impact Surveys*** completed by Fellows in spring 2013 gauge Fellows' perceptions of program impact related to key goals, including teaching, leadership ability, comfort levels in developing and maintaining partnerships with the community, and relationships with Mentors;

- ***Leadership Data on National Board Certification Rates, Presentations at Conferences, and Grants*** obtained from Fellows via Moodle provide information on how the program has enhanced Fellows' leadership skills and how instructional materials and knowledge have been disseminated;

- ***Teacher Leadership Survey[1] data*** are used to detect changes to Fellows' perceived teacher leadership skills from the beginning to the end of the fellowship;

- ***Professional Efficacy Survey[2] data*** are used to determine whether Fellows' self-efficacy in teaching changed from the beginning to the end of the fellowship;

- ***Teachers' Beliefs About and Use of Inquiry Survey[3] data*** are used to document changes to Fellows' perceptions and use of inquiry in the classroom;

[1] Survey adapted from a Teacher Leader Survey developed by Barnes, N. & Dozier, T., Center for Teacher Leadership, Virginia Commonwealth University, 2003.
[2] Survey adapted from the Teachers' Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001) and Teacher Self-Efficacy Scale (Bandura, undated).
[3] Survey adapted from Marshall, J.C., Horton, R. M., Igo, B. L., & Switzer, D. M. (In Press). K-12 Science and Mathematics Teachers' Beliefs About and Use of Inquiry in the Classroom. International Journal of Science and Mathematics Education.

- ***Student STEM Attitude Surveys*** provide additional data on Fellows' impact on student in the area of STEM interest, a critical aspect of building the STEM pipeline; and

- ***Mentor Surveys*** provide information form Mentors about their Fellows development, their perspectives on the program, and how the program impacted them.

PROFILE OF KENAN FELLOWS

Kenan Fellows are selected through a competitive application process that targets outstanding K-12 teachers within North Carolina across all content areas. Announcements soliciting applications are made via a variety of methods including print notification, email, calls, and radio. Applicants may be nominated by their school or district and must complete an online application that provides information about professional achievement, the nature of their commitment to teaching, and a statement about how they propose to address the specific Fellowship opportunity for which they are applying. Two letters of recommendation are also required.

From the applications received, a Kenan Fellows selection team composed of university faculty, Kenan Fellows staff, NC Department of Public Instruction representatives, and industry partners select candidates for personal interviews. The rubric used as part of the interview selection process ranks teachers on their leadership potential, content knowledge, initiatives taken to grow professionally and recommendations from principals and colleagues.

As is shown below, the number of applications for 2013 was seven times the number of fellowships available. Forty-four were offered and forty-three fellowships were filled based on review of 308 applications and 101 interviews.

Table 1. Overview of Class of 2013 Applications

Number of Fellowships Offered	Number of Applicants	Number of Interviewees	Number of Fellowships Filled
44	308	101	43

Kenan Fellows constitute a group of teachers with recognized teaching and leadership skills. The Kenan Fellows Program seeks to further enhance these teachers' skills and leverage their fellowship experiences by disseminating the products of their work and new knowledge to other teachers in North Carolina. As is shown below, two of the 2013 Fellows have Doctoral degrees, 28 have Master's degrees, 16 are National Board Certified, and four are former NC Teaching Fellows. On average they have ten years teaching experience. Nine teachers entered teaching as Lateral Entry Teachers. Twelve Fellows are male and 32 are female; one is Hispanic, 6 are African-American, and the rest (n=37) are Caucasian. Together they are serving 14 rural, 15 suburban, and 19 urban schools across 24 counties in NC.

Table 2. Demographics of 2013 Fellows

	n	%
Gender		
Female	32	73%
Male	12	27%
Race/Ethnicity		
Caucasian	37	84%
African-American	6	14%
Hispania/Latino	1	2%
Certifications/Degree		
Doctoral Degree	2	5%
Master's Degree	28	64%
National Board Certified	16	36%
Lateral Entry	9	20%

ATTAINMENT OF KEY PROGRAM GOALS

Goal 1: Advance relevant and effective STEM instruction that prepares students for success in the workforce and post-secondary education.

As part of the Kenan Fellowship, Fellows participate in three Professional Development Institutes as well as a Research Externship. The focus of professional development for the 2013 Fellows was utilizing problem-solving with students, integrating the engineering design process in lessons, incorporating instructional technology into lessons, and leadership development. Fellows began in June at the NC Center for the Advancement of Teaching (NCCAT) where they engaged in multiple sessions on inquiry-based learning and technology for the classroom. In July, Dr. Laura Bottomley, Director of NCSU's Engineering Place outreach program, conducted a session on integrating Engineering Design into the classroom and Bonnie Murray, NASA Education Specialist, presented on utilizing NASA resources for teaching. Fellows also shared their new inquiry lessons and the group provided feedback. The final Institute, held in October, concentrated on the tools and skills necessary for effective leadership in schools, districts, and the state.

Fellows completed evaluation forms via SurveyMonkey for each week of professional development attended. These surveys asked for Fellows' perceptions of session quality as well as relevancy to their teaching. Overall, Fellows rated the professional development sessions very favorably, especially Weeks 1 and 3, where the maximum ratings were at or above 4.68 and no ratings were below 3.38, on a scale of 1 (Low) to 5 (High).

Table 3. Professional Development Ratings

		Week 1		Week 2		Week 3	
		Min.	Max.	Min.	Max.	Min.	Max.
a.	Content/material presented was useful.	3.66	4.93	2.95	4.61	4.28	4.68
b.	Presenter provided a good balance between training and application.	3.38	4.84	2.76	4.66	4.12	4.83

Select comments provided by Fellows regarding the most useful aspects, activities, topics, etc. of the Summer Institute are included below:

"Wow!!! Almost everything we have done this week is useful to me. I have never been to a more applicable seminar. I now have more resources, connections, and applications to use in my classroom!!!! This will improve my teaching and my use of curriculum tenfold!!! I will put a lot of it to use immediately and more later."

"This week was a huge eye opener for me. I always felt that I was effectively incorporating technology, but learned that I have so much to learn. This week allowed me to connect with others both professional and personally in order to enhance my teaching practices."

"The amount that I've learned from the presenters and the other fellows this week was amazing. I feel energized to head back to the classroom armed with a variety of useful and applicable technology. It has had a large impact on me and I know that it will affect my teaching in many ways!"

"This week, I have gained a wealth of knowledge about programs, technology and application that I can easily take into my classroom. I have learned how to better motivate students and engage them to hopefully increase student achievement. I certainly look forward to implementing several of the things I have learned here and best of all, I have great tools to take back to many of my peer educators."

"I will be able to engage my students in several of the hands-on engineering activities which I would not have had the knowledge to do before this institute. It also provided me with technology resources and ideas, as well as collaboration with colleagues that will improve the daily curriculum I deliver to students."

"This was the best mini PD Institute of the year. Every session has given me a new nugget of knowledge that I can implement in my classroom."

" I think the professional development I received through Kenan helped me develop the knowledge and expertise to support other teachers who want to fully integrate science, math, technology and engineering with informational reading. As elementary teachers, our focus is on teaching reading comprehension. Teachers at my school ask me for advice on building the background knowledge through inquiry activities that will help students make meaningful connections with non-fiction text. We are striving to build strong connections between the STEM content and Common Core reading standards. My experience with Kenan

has equipped me with the knowledge to see these connections and to support teachers as they plan instruction that meets content and reading standards. Our focus at [my school] is to build a non-fiction reading curriculum that clearly connects content and reading standards at all grade levels. This has helped us see how to connect inquiry activities in science and technology with content reading objectives. It sounds easy, but it is actually very complicated and requires a high level of collaborative discussion to plan and sequence instructional units that address all standards in meaningful ways."

"This week's professional development has helped me to become a more reflective leader. Based on the seminars, I have realized that I need to work on becoming a balanced leader that knows how to delegate responsibility. I have also learned valuable strategies that I can implement when presenting not only to my colleagues, but also to my students."

Kenan Fellows also commented on the professional development that they received as part of an Impact Survey that they completed at the end of their Fellowship. As can be seen, Fellows credited the Kenan Fellow Program highly across all areas noted, with mean ratings at or above 4.60 on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree). **Mean ratings were highest for the statements, The Kenan Fellows Program increased my enthusiasm for teaching.", "The Kenan Fellows Program stimulated me to think about ways to improve my teaching." and "The Kenan Fellows Program resulted in me being a better teacher."**

Table 4. Overall Program Ratings

		n	Min.	Max.	Mean	sd
1.	The Kenan Fellows Program met important professional development needs.	40	2	5	4.78	0.62
2.	The Kenan Fellows Program was appropriate to my knowledge, skills, and interests.	40	1	5	4.68	0.80
3.	The Kenan Fellows Program increased my confidence as a teacher.	40	2	5	4.68	0.66
4.	**The Kenan Fellows Program increased my enthusiasm for teaching.**	**40**	**4**	**5**	**4.83**	**0.38**
5.	The Kenan Fellows Program increased my interest in the way that STEM can be used in my teaching.	40	1	5	4.60	0.87
6.	**The Kenan Fellows Program stimulated me to think about ways to improve my teaching.**	**40**	**4**	**5**	**4.83**	**0.38**
7.	**I believe the Kenan Fellows Program resulted in me being a better teacher.**	**40**	**4**	**5**	**4.80**	**0.41**
8.	The Kenan Fellows Program increased my commitment to teaching.	39	3	5	4.67	0.58

As part of teachers' professional development, Fellows were provided frameworks, technology, and other pedagogical practices to help them better incorporate inquiry into their lesson plans. As is shown below, teachers' pre-post responses indicate that they believe that they are better able to effectively teach students how to participate in inquiry, lead students in inquiry, and assess students' progress in inquiry. Differences marked with an asterisk are statistically significant.

Table 5. Fellows' Thoughts Regarding the Use of Inquiry

	n	Pre Mean	Post Mean	Diff.
1. I can effectively teach students how to participate in inquiry.	**41**	**4.30**	**4.59**	**0.29***
2. I know the content standards for the course students took prior to my course.	41	4.20	4.44	0.24*
3. I can effectively lead students in inquiry.	**41**	**4.33**	**4.56**	**0.23***
4. It is important to help students see the connections between my subject and other subjects.	**41**	**4.70**	**4.93**	**0.23***
5. I can effectively assess my students' progress during inquiry.	41	4.24	4.46	0.22*
6. I know the content standards for the course students take after my course.	41	4.23	4.44	0.21
7. In my content area, I use resources other than textbooks.	41	4.80	4.93	0.13
8. Teaching content is more important than teaching inquiry.	41	2.78	2.90	0.12
9. My school's administration is supportive of inquiry instruction.	41	4.41	4.51	0.10
10. I can manage student behavior during inquiry.	41	4.48	4.54	0.06
11. Inquiry teaching methods motivate students who would otherwise be disengaged.	41	4.50	4.49	-0.01
12. Using inquiry teaching methods increases students' enjoyment of the subject I teach.	41	4.41	4.39	-0.02

**** =Gains are statistically significant at alpha = .05 for a two-tailed t-test.***

Additionally, **Fellows strongly agree that the Kenan Fellows Program helped them develop innovative and challenging instructional materials for their students (mean = 4.70) and that the professional development they received through the Kenan Fellows Program positively impacted their teaching (mean = 4.76).** Additionally, with respect to STEM, Fellows strongly agree that the Kenan Fellows Program enhanced their knowledge of the applications of STEM in everyday life (mean = 4.63) and increased their knowledge of current issues in STEM education (mean = 4.47).

Table 6. Additional Impacts of Kenan Fellows Program

	n	Min.	Max.	Mean	sd
1. The Kenan Fellows Program enhanced my knowledge of the applications of STEM in everyday life.	**38**	**3**	**5**	**4.63**	**0.54**
2. The Kenan Fellows Program increased my knowledge of current issues in STEM education.	38	3	5	4.47	0.69
3. The Kenan Fellows Program increased my knowledge of STEM careers.	38	2	5	4.32	0.77
4. The professional development I received through the Kenan Fellows Program has positively impacted my teaching.	**38**	**2**	**5**	**4.76**	**0.63**

5.	**The Kenan Fellows Program has helped me develop innovative and challenging instructional materials for my students.**	**37**	**2**	**5**	**4.70**	**0.66**

When asked how their lessons reflect new ways of engaging their students, **51% of Fellows reported that their lessons reflect more inquiry, 36% reported greater use of technology within their lessons, and 23% indicated greater incorporation of real-world applications within their lessons.**

Table 7. Fellows' Changes to Lessons to Better Engage Students

	n	%
Use **more** inquiry	20	51%
Utilize **more** technology	14	36%
Incorporate **more** real-world applications	9	23%
Use Engineering Design principles	5	13%
Other	4	10%
Provide **more** flexibility and autonomy	2	5%
Are **more** collaborative	1	3%

Typical responses for how their lessons reflect new ways of engaging their students included the following:

"The way that I teach now is more inquiry based instead of "teaching". My students are understanding more content, by doing rather than listening to me lecture. I also believe that my expectations of students has rose significantly. Knowing what it will take for our future generations to be qualified in any field with all of the competition in the college and work field has made me try to help my students and me reach our full potential and beyond."

"I've applied inquiry based methods into my teaching. I am working to use technology as a tool help students further develop their higher order thinking skills."

"I made my first educational video for my lesson. I also developed several new ways to assess understanding of the material as well as their ability to think critically and solve a problem."

"My Kenan work encouraged me to allow my students to explore more and arrive at learning conclusions more than my guiding them to those conclusions. This form of teaching allowed for more hands on learning approaches along with utilizing cooperative learning structures to foster collaboration."

"The technology and other innovative tools have made a revolutionary change in the way that I approach the craft of teaching. I've also learned many technology tools that have changed how I teach, how my students learn, and how I help fellow educators around me set up learning in their own classrooms. For example, my Professional Learning Team at my school has now started a website with the intention of flipping grammar instruction. It's a work in progress, but I came up with it after seeing Kirk Kennedy's NCCAT Ted Talk on flipping instruction."

"This year with every unit in Earth/Environmental Science I have incorporated the Engineering Design Process as well as having a focus on STEM career options. Students have really enjoyed the engineering challenges and are learning HOW to think."

"I am applying more inquiry and using the engineering states of mind to allow students to become more fully immersed in their own learning. Allowing time for trial and error, observations and reflections make the lessons deeper and more enriching."

"My entire approach to education has changed this year. I have incorporated STEM Fridays in which students are presented with real life applications of topics that we have studied. In addition, we highlight the jobs that are available in the real world that connect to the tasks that they are solving. In addition, I have continued to develop my approach to inquiry based education. I encourage my students to discover topics rather than hear me talk about them. I have learned how to effectively incorporate technology in a meaningful way that enhances student learning."

"I have tried several of the technologies I learned last summer, for instance, blogs. Since we have implemented the CCSS this year, I think my lesson plans have huge differences from years past. However, I think the idea of problem solving and asking students to grapple with their own thinking is the element that has most changed."

Fellows were also asked to indicate how participation in the Kenan Fellows Program had impacted their teaching. Again, a qualitative review of their responses indicated that many were now incorporating STEM and Engineering Design principles, collaborating with other teachers and/or researchers or industry personnel, and trying new pedagogical methods in the classroom.

Table 8. Most Significant Effect of Participation on Teaching

	n	%
Incorporation of STEM / Engineering Design principles	11	28%
Collaborating with other teachers	10	25%
Trying new pedagogical methods	8	20%
Other	6	15%

Taking on Leadership responsibilities	5	13%
Addressing Common Core Standards	2	5%

Typical responses to this question included the following:

"My work as a Kenan Fellow reminded me of how much I still have to learn as an educator. The STEM instruction was significant in defining for me that my instructional approaches have to change to promote and foster critical thinking within our students. This construct will enable me to better prepare my students for the 21st Century workforce and as a citizen."

"The one phrase I loved from this training was that a leader is a "catalyst for change". I am privileged to be on the cutting edge of a sweeping curriculum movement the likes of which public education in this country has never seen. I don't know how to put into words how it will continue to impact the microcosm of my own classroom. (In fact, it'd probably be easier to list how it won't.) Though the curriculum itself would have changed what I am teaching, Fellowship or no. The Fellowship experience is changing how I am teaching it: How I am approaching that change."

"The collaboration with other NC teachers has had the most significant effect on my teaching. Being on the Eastern part of the state can be isolating. Kenan has helped my entire school staff because of the connections that I have made. That may seem like an overstatement but it really has made a great impact on the teachers I work with."

"My participation as a Kenan Fellow has affected my teaching in many ways and has enhanced my ability to lead other teachers to reach our school goal to focus on interdisciplinary, integrated, inquiry-based instruction. I am thinking much more holistically as a result of my participation in Kenan. One of the great ah-ha's I've experienced is how the engineering design process model applies to other disciplines. Whether problem-solving in math, literature or science, it just makes sense to follow this model. Imagine solutions, plan according to your ideas, create models that lead to answers, experiment with your ideas and then revise."

"Kenan Fellows has allowed me to become the best teacher I can be in all areas of my teaching. It has allowed to be a leader in my county in my content field and in my state through NCDPI. It has allowed me to be more respected by parents and students due to my knowledge and mastery of skills and procedures in the classroom."

"The most significant effect has been the use of classroom technology and the bridge to STEM education in the humanities classroom. It has not always been an easy integration, but it has been beneficial for both teachers and students.
I feel that my fellowship has enabled me to be a more well-rounded teacher. My ability to plan, implement, and reflect on my teaching has improved greatly

because of my work as a Kenan Fellow. I see the relationship between content areas, careers, and know how to best connect the two so that it makes sense for children."

"The most significant effect of my fellowship has been the confidence that has allowed me to collaborate more effectively with my colleagues and the willingness to challenge them to travel beyond the confines of their classrooms. Leading this migration at our school and beyond has become my most fulfilling area of focus. It has made me excited and made me feel more valued as an educator."

"The Kenan Fellowship has most significantly impacted me by making me a better collaborator with other educators and community members. I am very confident in my ability to do things well, but I have not always had that same level of trust with other teachers, and this experience has made me become more trusting of others and willing to share ideas."

"It's challenged me to explore ways teachers can manage inquiry based learning and technology in the classroom. The internship also updated my skills in technology and current trends in education."

"My Kenan Fellowship made it so that I was prepared to teach the new curriculum this year without a great amount of stress or frustration. If I had not participated in the fellowship this year, there is no way I would be incorporating Common Core elements in my classroom on a daily basis."

"Through my externship I gained an amazing amount of knowledge regarding the Common Core and its implementation in the classroom. This understanding of the Common Core has changed the way I teach English in my classroom."

"Since the externship, I am able to share with students the opportunities available to them in our community. This year my students have been exposed to industry professionals and have shared with them what they learned through my curriculum project. As far as teaching, the most significant effect the fellowship has had would be that I am working towards relating all concepts covered to specific employment and education options for my students."

"The ability to have NASA webcasts and interactive seminars with my students has sparked their interest and mine in subjects that go beyond the ones taught in school. Being able to tie in other areas of science into my classroom has brought more interest from students into the subject being taught."

When asked at the end of the program to rate overall impacts of the Fellowship using a rating of 1 = Little or no improvement, 2 = Some improvement, 3 = A fair amount of improvement, and 4 = A great deal of improvement, **Fellows' ratings indicated that they made the most gains as it relates to using classroom technology[4], collaborating with other educators, and utilizing inquiry-based instruction.**

[4] The appendix contains a list of 8 technologies and over 50 websites used by Fellows this year.

Table 9. Overall Impacts of Fellowship (4-point scale)

	n	Min.	Max.	Mean	sd
a. Inquiry-based instruction	**40**	**2**	**4**	**3.30**	**0.69**
b. Use of classroom technology	**40**	**1**	**4**	**3.68**	**0.66**
c. Presentation skills	40	1	4	3.15	0.92
d. Knowledge within my content area	40	1	4	2.98	0.97
e. Collaboration with other educators	**40**	**2**	**4**	**3.58**	**0.68**
f. Collaboration with non-educators	40	1	4	3.25	1.01

To assess the impacts of Fellows' new curricula and approaches to teaching, all Fellows who taught middle and high school STEM subjects were asked to survey one of their classes at the end of the year. A total of 143 students across 6 classes (4 elementary and middle and 2 high) responded to this survey. This survey, which asked them about changes based on having worked with a Kenan Fellow math or science teacher, required them to indicate on a scale of 1 (Not true at all) to 5 (Very true) to what degree positively worded statements were true for them. As can be seen, elementary and middle school students were slightly more positive about the impacts of the Fellows on them. **All students noted greatest agreement to the statements, "I am more interested in math and/or science than I was at the start of the school year." and, "I want to be more involved in math or science activities outside of school now than I did at the start of the school year."** with overall mean ratings 4.10 and 4.24, respectively.

Table 10. Student Attitudinal Impacts, Overall and by School Level

	Elem. and Middle	High	Total
1. I now know more about how math and science is used in the real world compared to when I started the school year.	3.57	3.52	3.55
2. This teacher has made me feel more positive about math and science this year.	**3.93**	3.42	3.76
3. Overall, I am more positive about math and/or science in general compared to the start of the school year.	**3.83**	3.46	3.70
4. I now believe that math and/or science is easier to learn than I did before the start of this school year.	3.35	2.67	3.12
5. I enjoy math and/or science much more now than I did at the start of the school year.	3.34	3.23	3.30
6. I am more interested in jobs or careers that use math and/or science now than I was before the start of the school year.	3.47	3.15	3.36
7. I am more interested in math and/or science than I was at the start of the school year.	**4.16**	**3.98**	**4.10**
8. I work more on my own to learn math and/or science now than I did at the start of the school year.	3.40	3.33	3.38

9. I want to take more math and/or science classes now compared to when I started the school year.	**3.91**	3.31	3.71
10. I want to be more involved in math or science activities outside of school now than I did at the start of the school year.	**4.41**	**3.92**	**4.24**

Goal 2: Empower and retain exceptional teachers prepared to impact teaching and learning by sharing the positive effects of the Kenan Fellows Program experience in North Carolina classrooms and beyond.

2013 Fellows' pre-post survey ratings reveal the areas of teacher leadership in which being a Kenan Fellow has had an impact. As can be seen, Fellows indicated that they made considerable growth in terms of how they and others view them as teacher leaders, their knowledge of education policy and leadership roles within their school, and the knowledge and skills needed to serve as mentors to other teachers. In addition, 2013 Fellows indicate that they are taking on more teacher leadership roles within their schools. Differences marked with an asterisk represent statistically significant gains.

Table 11. Fellow Leadership Ratings

	n	Pre Mean	Post Mean	Diff.
1. Others consider me a teacher leader.	**38**	**4.36**	**4.71**	**0.35***
2. I consider myself a teacher leader.	**38**	**4.42**	**4.76**	**0.34***
3. I am knowledgeable about educational policy.	**38**	**3.80**	**4.11**	**0.31***
4. I take on teacher leadership roles within my school.	**38**	**4.40**	**4.68**	**0.28***
5. I have the knowledge and skills needed to serve as a mentor for new teachers.	**38**	**4.51**	**4.74**	**0.23***
6. I have the knowledge and skills needed to write curriculum for my content area so that most students learn at high levels.	38	4.49	4.68	0.19
7. I have the knowledge and skills needed to be an effective public speaker.	38	4.52	4.66	0.14
8. I have the knowledge and skills needed to provide effective professional development for teachers.	38	4.60	4.68	0.08
9. I have the skills needed to work collaboratively with business leaders and other educational stakeholders.	38	4.31	4.39	0.08
10. I reflect on my teaching practice in order to improve my performance.	38	4.76	4.76	0.00

**** =Gains are statistically significant at alpha = .05 for a two-tailed t-test.***

Additional feedback from the Impact Survey show that Fellows agree or strongly agree that their Fellowship increased their interests and abilities to network with colleagues and non-educational professionals (means 4.30-4.68) , helped them become better instructional leaders (mean 4.53), and, as a result, increased the likelihood that others come to them for guidance on promoting critical thinking and technology in their classes (means 4.45 and 4.53, respectively).

Table 12. Additional Fellow Leadership Ratings

	n	Min.	Max.	Mean	sd
1. The Kenan Fellows Program increased my ability to network with teachers.	**40**	**1**	**5**	**4.68**	**0.83**
2. The Kenan Fellows Program increased my interest in networking with non-educational professionals.	40	1	5	4.40	1.03
3. The Kenan Fellows Program increased my ability to network with non-educational professionals.	40	1	5	4.30	1.04
4. The Kenan Fellows Program helped me become an instructional leader in my school.	**40**	**1**	**5**	**4.53**	**0.85**
5. Other teachers consult me for advice or assistance with promoting critical thinking activities in their classroom.	40	1	5	4.45	0.81
6. Other teachers consult me for advice or assistance with integrating technology into their classroom instruction.	**40**	**1**	**5**	**4.53**	**0.85**

Also as part of the Impact Survey, Fellows were asked to identify the elements of Kenan Fellowship program that they believed most significantly impacted their teacher leadership. Fellows' responses indicate that the networking opportunities and professional development that they received had the greatest impact on their teacher leadership.

Table 13. Elements Most Significantly Impacting Teacher Leadership

	n	%
Networking	16	40%
Professional Development	16	40%
Technology	12	30%
Leadership Development	10	25%
Externship	4	10%

Typical responses to this question included:

> *"Understanding how to engage with and utilize human resources has been insightful in my better understanding the concept of stakeholders. The various resources Kenan brought to us in our PD Institutes demonstrated the great wealth of support that is available and ready to be tapped by educators."*

> *"The Kenan Fellows Program allowed me to gain the confidence in myself so that I was able to use the talents and abilities I already have to their fullest while culling and developing new strengths and bolstering my weaknesses so that I could become a full a spectrum teacher using all my achievements to their maximum potential enabling me to be a distinguished teacher."*

> *"I feel the fellow's class of 2013 along with the Kenan Fellow Staff has had the greatest impact on my teacher leadership. Being able to collaborate with so many wonderful people is a great example of sharing the wealth. We all have different*

expertise and the professional development opportunities offered by the Kenan Fellows program allowed us a way to share those expertise and make a stronger group of teacher leaders."

"I definitely had some building of self-confidence in my craft due to this program. Additionally, meeting and sharing, knowledge and experiences with the other Kenan Fellows was a valuable part of the journey. The experiences with my mentor and being able to work at Morehead Planetarium, with the phenomenal staff there, will be one that I will always look at as one of the best of my teaching career. I feel that the professional relationships I have made will be extremely fruitful and long-lasting. And of course, I am eternally grateful to the Kenan Fellows program for the resources I have acquired during this fellowship."

"The program gave me the confidence and knowledge to present more interactive and meaningful professional development with my coworkers. The program also helped increase my knowledge of incorporating instructional technology in the classroom and with staff presentations."

"The resources and technology provided helped me become more excited about teaching. We had great professional development opportunities that made me want to bring the ideas back to my colleagues and students. Thanks Kenan Fellowship!"

"Kenan Fellows most significantly impacted me by providing me with the ability to connect with non-educational professionals and being able to apply more real-world application concepts to my method of teaching. Through Kenan Fellows I have more connections with individuals in the community who can open doors for my students who are looking at specific career pathways and I can help them reach their goals through these outside connections."

An additional question asked Fellows to describe how the Kenan Fellows Program had expanded their professional network. As is shown below in both the table and comments, Fellows reported that teacher collaborations and work with Mentors most impacted their professional networks.

Table 14. Elements Most Significantly Impacting Professional Networks

	n	%
Teacher collaborations	19	48%
Work with Mentor	14	35%
New opportunities	4	10%
Engage with community / business professionals	4	10%
Other	2	5%
New knowledge	1	3%

"My mentor was amazing and we have developed a strong, lasting relationship that will help me and my students learn more about engineering in the future and expose my students to various opportunities available to them in STEM fields."

"I regularly communicate not only with my mentors, but also with many of the people I came in contact with over the summer experience that help out with ideas and information in my classroom in many areas other than just the lesson I prepared for Kenan."

"My professional network has grown exponentially. I am now linked across the state to other educators who are innovative and collaborative. I am so fortunate to have a cohort of educators who are motivated and excited to learn and constantly engage in PD to foster their development as an educator and the learning for their students."

"I don't know if other Fellows have been experiencing some of the same seismic shifts at their schools that I have been undergoing at mine. However, for me the topic of leadership in our chosen profession was a timely one. I am going through something of a second renaissance as a teacher. This period of self-discovery is in part due to this fellowship, in part due to this blog, and I'm sure in part due to some other factors I've not yet identified. In fact, it's hard to separate how much of the new opportunities have changed how others see me versus how much the change in how I'm seen is yielding the new opportunities."

"I've had the good fortune to have another Kenan Fellow in my district. We have forged a strong friendship and collaborative relationship. I know I can call on Cara and pick her brain when I have questions about how to teach or reinforce a math concept. I ask for her advise and value her input. I know I can call on any of the Kenan Fellows for support and great ideas. I enjoyed assessing high school projects upon the request of a Kenan Fellow. That helped me see what lies ahead for my elementary students. I think my input as an elementary teacher was very helpful to my Kenan colleague and her students. This networking is wonderful and offers interesting, new opportunities for all of our students to grow. When we network with each other, we support each other's students which enhance their learning. It's been wonderful to think that I can contribute to the learning process for a high school student in Wake County. It's also wonderful to take ideas from my Kenan colleagues and apply them with my students. The point is all of our students benefit from these professional collaborations. That's good for public education."

"Kenan Fellows are constantly advancing professionally. I know them, and have connections with them. I also had the opportunity to meet other professionals that will remember me because of Kenan Fellows."

"I know have connections to 43 of the best teachers in the state. Furthermore, I know that I can call my mentor up any time I am in need of resources or advice. Being new to NC, this fellowship has introduced me to a network of professionals across the state, as well as, employees at DPI. These relationships have impacted by ability to network and access resources across the state."

"I will be working with my mentor, the NCSU department of plant biology, and companies throughout the southeast on their outreach and extension programs with curriculum development for the next several years. I have been able to give opportunities to my students to work in university settings over the summer, and I have introduced several teachers from my school to my mentor and her colleagues for other possible collaborations."

"Although I haven't had the opportunity to publish or present with my mentor, he has been extremely beneficial in helping my students see the connection between school and the workplace. He came to present about his job to my students which helped them complete their projects. Based on the student feedback, this was invaluable in this project. As a result of this fellowship, my mentor's company has agreed to continue this partnership every year so that students can continue to get the benefit of this networking."

"Through this program, I have formed relationships with educators all over the state. Throughout this year, I have already utilized these relationships for ideas and help in teaching various content to my students. I know that I can count on any of the other Kenan Fellows to help in any way at any time. The relationships that were built are probably the most exciting part of the whole experience."

As a result of their professional development and externship experiences, 12 Fellows took on new roles and responsibilities as teacher leaders. Below are examples of the new leadership positions and responsibilities earned by these Fellows.

Table 15. New Leadership Positions and Responsibilities Earned by Fellows

Fellow	Leadership Position
Annie Jones	Elected to School Improvement Team
Mildred Bankhead-Smith	Promoted to Middle Grade Science Master STEM teacher
Kimberly Mawhiney	Promoted to Science Department Chair
Whitney Masterson	Promoted to Testing Coordinator for Wakefield High
Kellie Perkins	Pilot participant for the Standard 6: Student Growth Portfolio Pilot Project with NCDPI
Julie-Anne Thomasch	Led presentation and focus group Between Wake Co. Science and Biogen Idec For Community Lab
Catherine Hart	ISKME Primary Source Project Working Group Member
Shelly Henry	Board member for The Nature Center at Glencoe Mill Village, Alamance County
Amy Bradley	Promoted to Patterson Science Center Director
Jerolyn Brown	Promoted to Curriculum Facilitator
Talia Swines	Secondary Math Coach
John Scarfpin	Working with the North Carolina Museum of Art as a Big Picture Teacher Fellow, creating art-integrated lessons for STEAM education.

In addition, as part of leadership efforts and to increase their ability to engage in inquiry-based instruction with their students, many Fellows applied for grants to buy classroom equipment and other instructional materials. **A total of 18 2013 Fellows received over $72,000 in grants this year, including the following:**

- Public School Foundation Student Enrichment Grant ($5,500.00) - for "Fostering Scientific Inquiry Using Probeware"
- Donors Choose ($1,100.00) - for chemistry equipment
- EcoLabs ($3,000.00) - for a Red Tide Spectrometer
- Burroughs Welcome Fund ($3,000.00) - for Gas Chromatograph and 2 Vis Spectrophotometers
- Bright Ideas Minigrant($950.00) - for inquiry materials for my Earth/Environmental Science classes
- Bright Ideas Grant($1,000.00) - for "Engineering is Elementary"
- Camden Education Foundation Mini Grant ($500.00) - for Parent Technology Academy
- Tides Foundation ($44,000.00) - for Vernier probeware, a weather station, and apple iPads

Twelve Fellows were also recognized as "Teachers of the Year" within their district (2) or their school (4), "Teacher of the Month" (2), or received other awards (4) such as an "Innovative Teaching Strategies Award", "UNCW Watson School of Education Distinguished Alumni Achievement Award for 2013", or other awards for their teaching. Awardees include Kimberly Mawhiney and Vance Kite, who were recognized as "Teacher of the Year" in their respective districts; Kirk Kennedy, Talia Swiney, Robin Bulleri and Mary Jackson who were recognized as teacher of year in their respective schools; and Karen McPherson and Danielle McCaslin, who were recognized as teachers of the month, Karen McPherson was also awarded an "Innovative Teaching Strategies" award, Ryan Monson was awarded a "GCSNC Celebrating Excellence in Education" award, Michelle Woods was recognized as a Lenovo Community Champion, and Caroline Courter received the UNCW Watson School of Education Distinguished Alumni Achievement Award for 2013. Additionally, Mark Townley became a National Board Certified Teacher and Mildred Bankhead-Smith earned her doctorate.

Table 16. Fellows' Accomplishments At a Glance

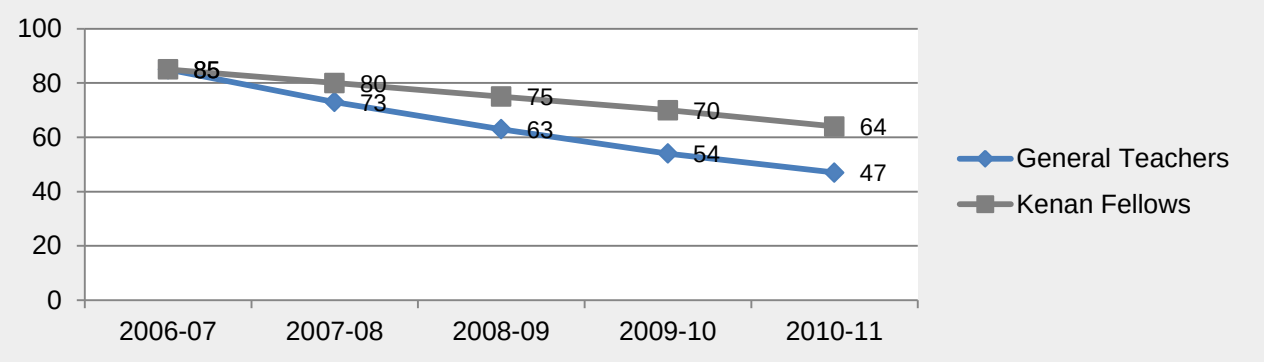
New Leadership Position	Received Grants	Teacher of the Year (District)	Teacher of the Year (School)	Teacher of the Month (School)	Other Awards
12	18	2	4	2	4

In addition to creating teacher leaders, one of the emphases of the Kenan Fellows Program is retaining classroom teachers. Recent statistics for the cohort of teachers who began teaching in North Carolina during 2000-01 show that approximately half of teachers with previous teaching experience, one-third of new teachers with no experience, and fewer than half of lateral entry teachers were retained beyond their third year.[5] North Carolina's annual average attrition rate is approximately 14% each year over the past 5 years. Given this, one would only expect 55% of Kenan Fellows to remain in education. However, as is shown below, of the 85 of 120 alumni responding to a short survey in 2011, 64 or 75% of Kenan Fellows have remained as classroom

[5] Report and Recommendations from the NC State Board of Education Teacher Retention Task Force, February, 2005.

teachers, with an additional 15 remaining in education as school administrators, district administrators, or in other education positions (e.g., counselor, media specialist, etc.) for a total of 93%. Thus, as a best estimate, 93% of Kenan Fellows remain active in education. This may be due to the fact that the Kenan Fellowship promotes teacher leadership and development, potentially providing new opportunities to teachers to rejuvenate their practice and foci, and potentially providing them new opportunities in education outside of the classroom. It is hoped that a renewed interest in teaching will influence other teachers within Fellows' schools and districts.

Figure 1. Comparison of Retention of Kenan Fellows to Other Teachers in NC



For 2013-14, only one Fellow has plans to leave education, with the majority (n=31) remaining as classroom teachers. Five will remain in education in a non-teaching/administrative role and one is moving into administration. In fact, when Fellows were asked to describe the most significant effect their participation as a Kenan Fellow has had on their teaching, many commented that the Fellowship greatly renewed their enthusiasm for teaching.

> *"It's like I am a new teacher this year. As a result of participating in the Kenan Fellows program I have new perspectives on teaching and learning. I now focus on engineering practices and incorporate them into every unit. Other teachers in my school are now incorporating engineering practices into their own lessons. Its infectious!"*

> *"Participation in this program has completely improved the quality of my teaching. It has rejuvenated me in a way that I didn't think was possible. This program has helped me find ways to encourage student discovery and real life application of the content that we are studying. My students are able to think critically about problems and develop strategies for solving problems using the engineering design process. My students are exciting about STEM, and can't wait to find out what project we'll be working on next."*

> *"I feel more inspired and confident as a teacher. I feel that I can bring more pertinent and significant real world applications to my students."*

> *"The amount that I've learned from the presenters and the other fellows this week was amazing. I feel energized to head back to the classroom armed with a variety of useful and applicable technology. It has had a large impact on me and I know that it will affect my teaching in many ways!"*

"I am on the cutting edge of a sweeping curriculum movement the likes of which public education in this country has never seen. I don't know how to put into words how it will continue to impact the microcosm of my own classroom. In fact, it'd probably be easier to list how it won't. The curriculum itself would have changed what I am teaching, Fellowship or no. This experience is changing how I am teaching it. How I am approaching that change. I am diving into uncharted waters with zeal and enthusiasm."

Goal 3: Facilitate collaboration among educators, industry experts, scientists and K-12 students to align STEM education with community and regional economic interests.

A key partner to each Kenan Fellow is the university or business/industry Mentor who serves as a host for the externship experience. Each Fellow/Mentor team develops a plan for the Externship and a plan that details their methods for ongoing work on a curricula project that will translate the externship for the benefit of students. During the summer, Fellows work extensively with their Mentors and Mentors occasionally attend parts of the summer professional development program with their Fellow. Fellows continue to communicate with their Mentors throughout the school year. Some Fellows bring Mentors into their classrooms to talk with students, attend university classes taught by Mentors to enrich their content knowledge, and make joint presentations at conferences.

Current Mentors were surveyed in late spring / early summer 2013 to assess the impact of the Kenan Fellowship on them and to obtain their views of the Kenan Fellow program. A total of 21 Mentors responded (response rate = 48%). As is shown below, Mentors most agreed that the Kenan Fellows Program improved communication channels between K-12 teachers and the university or business setting (mean = 4.00) and that the Kenan Fellows Program provided the right support to Mentors so that they can work effectively with Fellows (mean = 3.86). In fact, all Mentors stated that they would recommend the Kenan Fellows mentoring experience to their colleagues and all but one (who is retiring) indicated that he or she would be willing to serve as a Kenan Fellow Mentor in the future.

Table 17. Impact of Fellowship on Mentors

		n	Min.	Max.	Mean	sd
1.	It is likely that a professional relationship with my Kenan Fellow will continue after the formal end of the fellowship.	21	1	5	3.71	1.38
2.	My relationship with my Kenan Fellow has increased my understanding of the K-12 classroom environment.	21	2	5	3.48	1.03
3.	My participation as a Kenan Fellow mentor has helped me establish relationships with those having similar interests in the community.	21	1	5	3.38	1.28
4.	My work with my Kenan Fellow has increased my awareness of the need for alignment between public education and workforce development.	21	2	5	3.76	1.14
5.	The Kenan Fellows Program has improved communication channels between K-12 teachers and the university or business setting.	21	1	5	3.86	1.11

6.	The Kenan Fellows Program provided the right support for me to be able to work effectively with my Fellow.	21	2	5	4.00	0.89
7.	It is likely that a professional relationship with my Kenan Fellow will continue after the formal end of the fellowship.	21	1	5	3.71	1.38
8.	My relationship with my Kenan Fellow has increased my understanding of the K-12 classroom environment.	21	2	5	3.48	1.03
9.	My participation as a Kenan Fellow mentor has helped me establish relationships with those having similar interests in the community.	21	1	5	3.38	1.28

Mentors also described ways that they and their organization had benefited from mentoring a Kenan Fellow.

> *"Fellow provided leadership for education program, helped with NSF site visit review, and created lessons that bring research into classrooms."*
>
> *"DPI has benefited by having direct interactions with a classroom teacher (Kenan Fellow) to provide input and feedback on various state level education efforts."*
>
> *"This has been a personally rewarding experience for me to be able to reconnect with the school and classroom environment. Our organization is going to benefit from the lesson plan that she submitted. It was truly of high quality."*
>
> *"Too many to list! Her contributions dramatically improved an annual teacher professional development workshop we run in numerous ways. She also became an essential part of a science education working group we run. And, her contributions were so essential that we're going to continue to keep her involved in these projects in the future."*
>
> *"It was good to hear what students are interested in and how we may be able to assist in developing them for our future workforce."*
>
> *"Hopefully our benefit will come many years from now when these youth enter the workforce with skills and drive that match our organizational needs."*
>
> *"Mentoring a Kenan Fellow has provided opportunities to collaborate in addressing education issues."*
>
> *"I benefited from learning what students are interested in the healthcare field. For example, how can they apply their science knowledge to pharmacy."*

Many also recognized and reported that Fellows benefited from the experience by better understanding inquiry teaching, taking on more leadership roles in the school district, participating in state-level trainings, learning more about new curriculum standards, enhancing leadership skills, and by broadening their professional experiences. As one Mentor reported, "I think it broadened her scientific horizons and exposed her to new/cutting edge science. I also

believe that it enhanced her already solid foundation in curriculum development and vastly expanded her professional network."

As is shown below, as part of their Externship, most Fellows read academic or industry literature and designed and implemented their own research under their Mentor's supervision. Fellows agreed that their Externship enabled them to see the application of their content area in the workplace (mean = 3.97) and somewhat agreed that their Mentor helped them enhance their leadership skills through co-presentations, publications, etc. (mean = 3.38).

Table 18. Externship Activities

		n	Min.	Max.	Mean	sd
1.	Observed research activities / industry problem-solving that others were engaged in.	40	1	5	3.00	1.60
2.	Collaborated in decision-making with staff from the organization I was working with.	40	1	5	3.05	1.60
3.	Designed and implemented own research under my Mentor's supervision.	39	1	5	3.46	1.52
4.	Read academic or industry literature.	40	1	5	3.75	1.19
5.	Wrote a paper for submission to a professional research or industry journal.	40	1	5	1.63	1.27
6.	Your Mentor's preparation for his/her work with you.	40	1	5	3.83	1.28
7.	Your Mentor's ability to work with you to meet Kenan Fellows Program goals.	40	1	5	3.90	1.19
8.	Your Mentor's commitment to providing opportunities for you to learn and gain expertise in new areas.	40	1	5	4.00	1.20

Table 19. Impact of Externship Overall

		n	Min.	Max.	Mean	sd
1.	The opportunity to network with other Kenan Fellows has improved my teaching and leadership skills.	39	2	5	4.67	0.70
2.	The experience with my Mentor has enabled me to see the application of my content area in the workplace.	39	1	5	3.97	1.14
3.	I have developed a lasting relationship with my Mentor.	39	1	5	3.72	1.30
4.	My Mentor has helped me enhance my leadership skills through co-presentations, publications, etc.).	39	1	5	3.38	1.48

Fellows were also asked to explain how their Externship impacted the relevancy of their lessons. Many indicated that their lessons now integrate real-world applications while also providing information on careers and addressing Common Core Standards.

Table 20. Impact of Externship on Relevancy of Lessons

	n	%
Integrate real-world applications	13	33%
Address Common Core standards	6	15%

Provide info on careers	5	13%
Include "best practices"	4	10%
Address more or new state curriculum standards	4	10%
Utilize new resources/technologies	2	5%
Are more in-depth	2	5%
Other	2	5%
Utilize Engineering Design principles	1	3%
Are more inquiry-based	1	3%

Typical comments were:

"My mentor and externship was extremely helpful and showed me many different ways that STEM topics could be incorporated with each other. My area of expertise, biology, was easily intertwined with my mentor's, engineering, and provided a wide range of knowledge and real world applications to my students that they otherwise would not have had."

"The project I developed with them was much deeper in content and focus that it would have been otherwise."

"I learned how the Engineering Design Process truly works and how to effectively use it in my classroom. I have focused my entire lesson around teaching this process and utilize it throughout all of my classes and the entire course."

"My students were the first to benefit from my development of lessons that were relevant, engaging, and focused on inquiry and development of 21st Century Skills."

"My students know more about the educational opportunities available at ECSU because of my fellowship. Also, students know more about jobs in the local Aviation Companies because of my fellowship."

"I refer to my externship experience every day in my classroom. The experience has allowed be the ability to provide real world connections for my students."

"The lesson plans I developed filled several areas of need in my syllabus which helped my students to see how several topics connect to each other. This externship also gave career relevance to my students since they were able to meet my mentor and talk about current research and opportunities. The most exciting aspect of this experience was the possibility of having my Earth Science students see different aspects of biofuels all throughout their high school careers."

"Through my externship, I was able to learn about the industry that I was shadowing in great depths and see how the individuals in their field work together

collaboratively to produce an effective work environment and accomplish tasks at hand. This learning experience was helpful in creating student groups and adding in real-world applications to my teaching."

"The instruction in my classroom is module based and all modules directly relate to a career at FRC-East. Since a lot of these students parents work in this facility, the instruction in class is something my students have shared with their parents, which has given all of us something to talk about."

Goal 4: Design and disseminate creative curriculum that incorporates locally relevant STEM applications.

While a major goal of the Kenan Fellows Program is to foster teacher leadership and teaching and curriculum development, an equally important goal is to disseminate the innovative curricula developed by Fellows to other teachers. Each Fellow is expected to create lessons that can be disseminated online, with the support of Kenan Fellow staff, including key outcomes of their curricula project. The curriculum project is aligned with national and state standards. Each Fellow presents at conferences such as the NC Science Teachers Association Conference, National Science Teachers Association conference, or other relevant conferences to share their curricula with teachers locally, statewide, and nationally.

Below are examples of the types of curricula that Fellows are sharing with their colleagues at the local, district, and state levels:

- Flipping Classrooms
- Using Edmodo
- Advanced Placement Biology: Investigating the Changing Framework through Inquiry Based Labs
- Non-fiction Resources and Strategies for Common Core
- Using Guided Literacy and Resource Centers in Upper Elementary Grades
- Increasing Awareness and Understanding of 21st Century Learning through the 4Cs (Collaboration, Creativity, Critical Thinking, and Communication)
- Integrating Engineering and Technology into Math Common Core Instruction
- Using Literature Circles to Scaffold instruction
- Designing Engaging Lessons
- Integrating Clickers into Your Classroom
- Getting Started with Outdoor Inquiry
- Innovative Technologies and Strategies to Teach Common Core
- The Common Core State Standards for Mathematics: Hopes, Fears, and Challenges as We Enter the Brave New World
- Investigating Your Environment
- Problem-based Learning in Science
- Presentation on How to Leverage Technology using Moby Math and Tenmarks
- STEM Integration in the High School Classroom

Places where Fellows presented include:

- Presentation to Teachers Attending the 2 Week Training Session for ALICE at Duke University
- Eastern North Carolina Engineering Forum
- Wake County Common Core Summer Institute

- New Teachers Training
- Ready, Set, Go!
- 2012 Environmental Educators Annual Conference
- PTA Common Core Coffee Chat
- Industry Innovation Council meeting
- Biotech & Ag Industry Innovation Council
- Beginning Teacher Support Teacher Quality Sessions
- Craven County Board of Education and Chamber of Commerce
- NCCTM
- NCABR Bridging the Gap
- NCSTA
- ELA DPI Partnership Webinar
- NCDPI Webinar
- 2013 Collaborative Conference for Student Achievement
- 30th Annual Atlantic Coast Business, Marketing, and Information Technology Education Conference
- NCARE
- Beginning Teacher Institute
- Union County Public Schools Total Quality Education Share Day

Fellows made or presented over 50 presentations, workshops, or webinars this year. Based on the estimated number of attendees, this year Fellows provided high quality curricula, best practices, and resources to over 3,000 educators.

SUMMARY AND DISCUSSION

Results of the evaluation of the Kenan Fellows Program for 2012-2013 provide strong evidence that this program is meeting its goals of (1) advancing relevant and effective STEM instruction, (2) empowering and retaining exceptional teachers, (3) facilitating collaboration among educators, industry experts, and scientists, and (4) designing and disseminating creative curriculum that incorporates locally relevant STEM applications.

Fellows are provided high quality professional development via workshops by those knowledgeable in their fields that focus on teaching, leading, and learning. As multiple data sources indicate, these opportunities, combined with their Externship experiences, have improved Fellows' abilities to lead in and out of the classroom, design relevant curricula that integrate technology and inquiry, and work with educators and non-educators alike to position students to obtain 21st Century and workplace skills.

Evaluation results clearly demonstrate the impact of Fellows on their students and colleagues. When surveyed, students' highest ratings of agreement were to statements indicating that they are more interested in math and/or science than they were at the start of the school year and that they want to be more involved in math or science activities outside of school than they did at the start of the school year. Impacts on teachers are clearly demonstrated when one sees the diversity of the over 50 presentations and workshops developed and conducted by Fellows and the multiple conferences and business where Fellows presented. Estimates indicate that Fellows presented to over 3,000 individuals this year, 1.5x as many as last year. In addition, 18 Fellows received over $72,000 in grants over the course of their Fellowship to support inquiry- and technology-based

teaching and 12 were recognized for their excellence in and out of the classroom with four being recognized as Teacher of the Year in their school and two being recognized as Teacher of the Year for their district. In addition, four teachers received recognition and awards from their district, graduate school, or a local business, one earned National Board certification, and one earned her doctorate.

As compelling as the quantitative findings are, the qualitative reports by Fellows of the changes they have experienced related to their selves and their roles because of their participation in the Kenan Fellowship Program are even more persuasive. Comments support how Fellows believe that the Kenan Fellows Program has benefited them in the area of professional relationship /networking /partnership-building, curricula development, and teacher leadership. Comments also reflect the impact of their Externship experience. These experiences are critical aspects of Fellows' development and place great reliance upon Mentors and program staff to make these experience rich and fulfilling. Perhaps most positive is the fact that Mentors believe in the Kenan Fellows Program and have benefitted from their participation such that they have an increased awareness of the need for alignment between public education and workforce development and have new communication channels between K-12 teachers and their organization.

Finally, not only does the Kenan Fellows Program develop teacher leaders, it retains them. Given that the state average turnover rate for teachers from 2006-2011 years has been 14%, the fact that so few Fellows have left the classroom and far fewer have left education is remarkable. For many, the Kenan Fellowship has rejuvenated their enthusiasm in teaching and has contributed to keeping some active in the classroom instead of choosing retirement. Retaining teachers is hard, even in this economy, and retaining high-quality teachers such as Kenan Fellows is even harder. The Kenan Fellows Program has shown that helping high quality teachers improve their use of inquiry and engage in instructional leadership including developing and sharing relevant STEM-based curricula can spark or support the drive that made them choose to be teachers in the first place.

APPENDIX

Technologies and Websites Used by Fellows

Technology (8)

- Elmo projector
- Flip Camera
- iPad
- iPhone
- LCD media cart
- Lenovo Laptop
- SmartBoard
- SmartPens

Websites (57)

- abetterlesson
- Active Expressions
- ActiveInspire
- Blackboard
- blogger
- Camtasia
- Chrome/google docs
- Clicker Software
- Delicious
- Diigo
- Discovery Education
- Doceri
- DropBox
- Edmodo
- Engrade
- Evernote
- Facebook
- Goanimate
- Google Docs
- Google Drive
- gotomeeting
- HHMI evolution videos and activities
- illuminations
- iMovie
- IXLmath
- Jstor
- Kidsblog
- Learnzillion
- Mastery Connect
- Microsoft Word
- Middle School Portal 2-Science resources
- mobymath
- Moodle

- My website and blog for providing links and communication tools
- NC State STEM resources
- Office 2010
- Padlet
- Pearson SuccessNet
- Pintrest
- poll everwhere site
- PowerPoint
- PREZI
- Promethean Planet
- School Loop
- Scoopit
- S'More Flyers
- Socrative
- Splashtop
- Study Island
- Sumopaint
- Tagxedo
- Teaching Channel
- TechBoo
- TED
- Tenmarks
- Titanpad
- Toondoo