

FastLane Reporting Categories and Questions	NCETE Second Year, Annual, and Final Report Questions
I. Project Participants	

<p>1. What people have worked on your project?</p>	<p><u>Utah State University</u></p> <ul style="list-style-type: none"> • Participant name: Christine E. Hailey • Project role: PI • 160 hours: Yes • Description of involvement: Christine Hailey was the PI and Director of NCETE. She was responsible for the overall management of the NCETE program. She worked closely with the other members of the Management Team to promote effective communication across the center and to insure the work of the center was accomplished in a timely fashion and was of high quality. She was the primary interface with the external evaluation team at WestEd and the NSF program officer. <ul style="list-style-type: none"> • Participant name: Kurt H. Becker • Project role: Co-PI • 160 hours: Yes • Description of involvement: Kurt Becker was a Co-PI and Project Manager for NCETE. He was responsible for project administration and day-to-day operation of the NCETE effort, including facilities, reports and web presentations. Kurt worked closely with Christine Hailey, PI, to facilitate centeredness and overall project coordination. He helped facilitate the on-line management team meetings (bi-weekly), face-to-face meetings with NCETE personnel (three meetings per year), and the summer workshop. Kurt also participated on the NCETE Management Team that was charged with oversight of the work of the Center to be certain tasks are accomplished. <ul style="list-style-type: none"> • Participant name: Maurice Thomas • Project role: Co-PI • 160 hours: Yes • Description of involvement: Maurice Thomas was a Co-PI, USU Site Director and Technology Education Partner. His primary responsibilities were to coordinate the USU program of work, assist with the development of the Ph.D. core courses including detailed development of one of the core courses, recruit
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doctoral students, and to assist with the development of an engineering design challenge.

- **Participant name:** James Dorward
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** James Dorward, served as the internal evaluator for the program. His primary responsibility was to evaluate the effectiveness of NCETE management structure and strategies. He also attended weekly USU NCETE team meetings and conducted surveys of the core courses.

- **Participant name:** A. Bruce Bishop
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Bruce Bishop was Senior Personnel and an Engineering Partner for NCETE. His primary responsibilities were to help develop one of the core courses and to assist with the development of an engineering design challenge.

- **Participant name:** Paul Schreuders
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Paul Schreuders was Senior Personnel and an Engineering Partner for NCETE. His primary responsibilities were to help develop one of the core courses and to assist with the development of an engineering design challenge.

- **Participant name:** Treya Sayad
- **Project role:** Office Assistant
- **160 hours:** Yes
- **Description of involvement:** Treya Sayad worked closely with Kurt Becker, the NCETE project manager. She supported all NCETE activities.

- **Participant name:** Lynette Gittens
- **Project role:** Professional Staff
- **160 hours:** Yes

	<ul style="list-style-type: none"> • Description of involvement: Lynette Gittens provided accounting support for NCETE. • Participant name: Jeff Thurgood • Project role: Undergraduate Student • 160 hours: Yes • Description of involvement: Jeff Thurgood assisted Kurt Becker, the NCETE project manager, with graphical design for Center publications and with web page design and updates. • Participant name: Kristina Glaittli • Project role: Professional Staff • 160 hours: Yes • Description of involvement: Kristina Glaittli was an Associate Project Manager for NCETE. She assisted with the project administration and day-to-day operation of the NCETE project. • Participant name: Zanj Avery • Project role: Doctoral Student • 160 hours: yes • Description of involvement: Zanj Avery was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses. • Participant name: Katrina Cox • Project role: Doctoral Student • 160 hours: Yes • Description of involvement: Katrina Cox was an NCETE Doctoral Fellow. She completed the first year of doctoral course work including the first two NCETE core courses. • Participant name: Nathan Mentzer • Project role: Doctoral Student • 160 hours: Yes • Description of involvement: Nathan Mentzer was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.
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- **Participant name:** Douglas Walrath
- **Project role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** Douglas Walrath was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.

- **Participant name:** Christine Cunningham
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Christine Cunningham, Vice President of Research at the Boston Museum of Science, was a member of the NCETE Advisory Board. She also attended a Center meeting and reported findings of her work on the recruitment of girls and women to engineering and technology.

- **Participant name:** Norman Fortenberry
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Norman Fortenberry, Director of the Center for the Advancement of Scholarship on Engineering Education (CASEE) at the National Academy of Engineering, was a member of the NCETE Advisory Board.

- **Participant name:** Janet Kolodner
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Dr. Kolodner, Professor of Computing and Cognitive Science at Georgia Institute of Technology, was a member of the NCETE Advisory Board. She also attended a Center meeting and described her investigations of effective ways to implement design activities in the classroom.

- **Participant name:** Gene Martin
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Gene Martin, Professor of Education in the Curriculum and Instruction

Department at Texas State University, was a member of the NCETE Advisory Board.

- **Participant name:** Mel Robinson
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Mel Robinson, State Supervisor of Technology and Engineering in the Utah State Office of Education, was a member of the NCETE Advisory Board.

- **Participant name:** Patricia Wilson
- **Project role:** Advisory Board Member
- **160 hours:** No
- **Description of involvement:** Patricia Wilson, Professor of Mathematics Education at the University of Georgia, was a member of the NCETE Advisory Board.

- **Participant name:** Martha Cyr
- **Project role:** Consultant
- **160 hours:** No
- **Description of involvement:** Martha Cyr, Director of K-12 Outreach at Worcester Polytech Institute, provided one day of consulting to help the NCETE Research Team refine the research framework. During the NCETE workshop, she also provided two days of consulting focused on engineering design.

- **Participant name:** Gary Benenson
- **Project role:** Consultant
- **160 hours:** No
- **Description of involvement:** Gary Benenson, Professor of Mechanical Engineering at City College of New York, provided one day of consulting to help the NCETE Research Team refine the research framework.

- **Participant name:** Daniel Householder
- **Project role:** Consultant
- **160 hours:** Yes
- **Description of involvement:** Daniel Householder provided 20 days of consulting. He also consulted with the NCETE PI via email and telephone. He attended the NCETE Fall Meeting, Advisory Board Meeting, Spring

Meeting, and Summer Workshop.

Brigham Young University

- **Participant name:** Thomas Erekson
- **Project role:** Other Senior Personnel
- **160 Hours:** Yes
- **Description of involvement:** Thomas Erekson was the BYU PI and Site Director, and NCETE Co-Director. He was a participant in planning and delivering professional development for K-12 in-service teachers and attends and participates in local and national meetings. Tom also assisted the NCETE Director with overseeing the work of the Center. He led dissemination efforts and served as the liaison with external partners, e.g., ASEE, ITEA and CTTE. He also participated on the NCETE Management Team that was charged with oversight of the work of the Center to be certain tasks are accomplished.

- **Participant name:** Ronald Terry
- **Project role:** Other Senior Personnel
- **160 Hours:** Yes
- **Description of involvement:** Ronald Terry was the BYU Co-PI and Engineering Partner. He was a participant in planning and delivering professional development for K-12 in-service teachers and attended and participated in local and national meetings. He also served as a member of NCETE Research Committee.

- **Participant name:** Steven Shumway
- **Project role:** Other Senior Personnel
- **160 Hours:** Yes
- **Description of involvement:** Steven Shumway was Senior Personnel and a Technology Education Partner. He was a participant in planning and delivering professional development for K-12 in-service teachers and attended and participated in local and national meetings.

- **Participant name:** Jared Berrett
- **Project role:** Other Senior Personnel
- **160 Hours::** Yes
- **Description of involvement:** Jared Berret was Senior Personnel and a Technology Education Partner. He was a participant in planning and delivering professional development for K-12 in-service teachers and attended and participated in local and national meetings.

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| | <ul style="list-style-type: none"> • Participant name: Charles Higby • Project role: Graduate Student • 160 Hours: Yes • Description of involvement: Charles Higby was a graduate research assistant that helped plan and deliver professional development for K-12 inservice teachers. <ul style="list-style-type: none"> • Participant name: Katrina Cox • Project role: Graduate Student • 160 Hours: Yes • Description of involvement: Katrina Cox was a graduate research assistant that helped plan and deliver professional development for K-12 inservice teachers. <ul style="list-style-type: none"> • Participant name: Aaron Cuevas • Project role: Undergraduate Student • 160 Hours: Yes • Description of involvement: Aaron Cuevas was an undergraduate student that helped plan and deliver professional development for K-12 inservice teachers. <ul style="list-style-type: none"> • Participant name: Doug Livingston • Project role: Undergraduate Student • 160 Hours: Yes • Description of involvement: Doug Livingston was an undergraduate student who has significant industrial experience in engineering design who helped plan and deliver professional development for K-12 in-service teachers. <p><u>California State University, Los Angeles</u></p> <ul style="list-style-type: none"> • Participant name: Don Maurizio • Project role: Other Senior Personnel • 160 hours: Yes • Description of involvement: Don Maurizio was the CSULA PI and Site Director, and a Technology Education Partner He was responsible for the administration and day-to-day operation of the CSULA effort, |
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including facilities, supplies, paperwork (including hiring of all participants) and campus coordination. Don was part of the three-person team that conceptualized, developed, organized and delivered the Engineering Design workshop series for the Cal-State-Los-Angeles-based cohort of high school teachers. He was responsible for the coordination with the partner K-12 school district (Long Beach Unified) and the recruiting of the workshop program participants from the high schools in the district. Don added the Montebellos USD for the second year cohort.

- **Participant name:** Ethan B. Lipton
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Ethan Lipton was a CSULA Co-PI and Technology Education Partner. He was part of the three-person team that conceptualized, developed, organized and delivered the Engineering Design workshop series for the Cal-State-Los-Angeles-based cohort of high school teachers. The participants were from various high schools within the Long Beach Unified School District. Dr. Lipton was responsible for the identification and recruitment of the two main faculty consultants on the project. These faculty consultants prepared and delivered instruction on foundational mathematics and physics material. Ethan also provided all of the graphical design for the project. He also conducted a variety of research efforts required to support the workshop series, the engineering design challenge, and the overall mission of the Center.

- **Participant name:** Mark Tufenkjian
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Mark Tufenkjian was a CSULA Co-PI and Engineering Partner. He was one of the three-person team that **conceptualized**, developed, organized and delivered the Engineering Design workshop series for the Cal-State-Los-Angeles-based cohort of high school teachers. As the only engineering professor on the project, Mark has provided meaningful insight into the engineering profession. He has defined what the participants must know and be able to do in order to infuse engineering education into their high school programs. He also developed the project for the Engineering Design Challenge prepared by CSULA.

- **Participant name:** David Dickey
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** David Dickey was a Graduate Research Assistant. He assisted Mark Tufenkjian

with the development of the Seismic Engineering Design Challenge. He was solely responsible for the development and construction of the “shake table” that each participant will receive for use in their classrooms. David also prepared to pilot test the seismic module in his technology education classroom at Temple City High School (CA).

- **Participant name:** Sharri Kornblum
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Sharri Kornblum, Professor of Mathematics, was Senior Personnel. Her specialties were the diagnosis and remediation of mathematics skills. She diagnosed the mathematics skill levels of the participants using a standardized instrument administered by UCLA. She then developed and delivered a program of instruction preparing the participants with the mathematics abilities needed to understand and teach the mathematics required for the program.

- **Participant name:** William Taylor
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Dr. Taylor, Professor of Physics, was Senior Personnel. His specialty was the interactive demonstration of physics principals. He provided an overview of physics principles using a variety of demonstration devices. Dr. Taylor developed and delivered all of the foundational physics instruction to the participants over a series of workshops.

Illinois State University

- **Participants name:** Rodney L. Custer
- **Project Role:** Other Senior Personnel
- **160 hours::** Yes
- **Description of involvement:** Rodney Custer was the ISU PI and Site Director, NCETE Director of Technology Teacher Education. He participated in local professional development in-service planning and delivery, and attended and participated in local and national level meetings. As NCETE Director of Technology Teacher Education, he coordinated the pre-service teacher education programs, the professional development programs, and the engineering design challenges. He also participated on the NCETE Management Team that was charged with oversight of the work of the Center to be certain tasks are accomplished.

	<ul style="list-style-type: none"> • Participant name: Chris P. Merrill • Project Role: Other Senior Personnel • 160 hours:: Yes • Description of involvement: Chris Merrill was an ISU Co-PI and Technology Education Partner. He led the ISU professional development in-service planning and delivery, and attended and participated in local and national level meetings. • Participant name: Michael K. Daugherty • Project Role: Other Senior Personnel • 160 hours:: Yes • Description of involvement: Michael Daugherty was an ISU Co-PI and Technology Education partner. He assisted with the ISU professional development in-service planning and delivery, and attended and participated in local and national level meetings. He was also a member of NCETE Research Team. • Participant name: Micah Larson • Project Role: Graduate Student • 160 hours:: Yes • Description of involvement: Micah Larson took and compiled meeting minutes for ISU professional development activities as well as supporting numerous ISU activities. • Participant name: Katrina Hockin • Project Role: Graduate Student • 160 hours:: No • Description of involvement: Katrina Hockin provided support for Illinois teacher professional development research, and training. • Participant name: Dan Wixted • Project Role: Graduate Student • 160 hours:: No • Description of involvement: Dan Wixted provided support for Illinois teacher professional development, research and training
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North Carolina Agricultural and Technical State University

- **Participant name:** Vincent Childress
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Vincent Childress was the NCA&T PI and Site Director, and a Technology Education Partner. He administered NCETE activities on the campus of NC A&T, which has included finding and purchasing all professional development supplies and resources, collecting data on professional development participants, recruiting participants, developing primary professional development instructional materials and lab activities, hiring and supervising graduate research assistants and a faculty consultant, and coordinating research and development efforts. Vince helped design and deliver the professional development activities, including developing instructional materials and helping public school teacher participants understand lab activities and concepts during the professional development. Vince also helped lead the development of a research study to identify appropriate student outcomes for technology education programs that have the goal of teaching technological literacy while using engineering design and analytical and predictive processes as a vehicle for instruction.

- **Participant name:** Ali Abul-Fadl
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Ali Abul-Fadl was an NCA&T Co-PI and Engineering Partner. He helped design and deliver professional development activities; including developing instructional materials and helping public school teacher participants understand lab activities and concepts during the professional development. Ali also assisted with the development of a research study to identify appropriate student outcomes for technology education programs that have the goal of teaching technological literacy while using engineering design and analytical and predictive processes as a vehicle for instruction.

- **Participant name:** Craig Rhodes
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Craig Rhodes was an NCA&T Co-PI and Technology Education Partner. He helped design and deliver the professional development activities, including developing instructional materials and helping public school teacher participants understand lab activities and concepts during the professional

development. Craig has also helped develop a research study to identify appropriate student outcomes for technology education programs that have the goal of teaching technological literacy while using engineering design and analytical and predictive processes as a vehicle for instruction. Craig worked closely with Don Maurizio, CSULA, in recruiting fellows to the participating Ph.D. granting institutions. One of his focuses in this effort was identifying minority and women recruits.

- **Participant name:** Barbara Tankersley
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Barbara Tankersley, mathematics consultant, developed supplemental mathematics instruction for the professional development effort and has assisted teacher professional development participants in understanding and applying mathematical concepts.

- **Participant name:** Sharon Linton
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Sharon Linton was a Graduate Research Assistant and assisted in all efforts in the NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **Participant name:** Weldon Washington
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Weldon Washington was a Graduate Research Assistant and assisted in all efforts in NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **Participant name:** Thaddeus Pryor
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Thaddeus Pryor was a Graduate Research Assistant and assisted in all efforts in NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **Participant name:** Shameka Harrison
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Shameka Harrison was a Graduate Research Assistant and assisted in all efforts in NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **Participant name:** Thaddeus Lamb
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Thaddeus Lamb was a Graduate Research Assistant and assisted in all efforts in NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **Participant name:** Jaime Thompson
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Jaime Thompson was a Graduate Research Assistant and assisted in all efforts in NCETE project including but not limited to conducting research, developing and delivering professional development, and clerical work.

- **University Of Georgia**
- **Participant name:** Robert Wicklein
- **Project Role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Bob Wicklein was the UGA PI and Site Director and the NCETE Director of Graduate programs. He coordinated the UGA program of work. As NCETE Director of Graduate Programs he coordinated and facilitated PhD recruitment & selection, core course syllabus planning, and presentation planning. He also participated on the NCETE Management Team that was charged with oversight of the work of the Center to be certain tasks are accomplished.

- **Participant name:** David Gattie
- **Project Role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** David Gattie was Senior Personnel and an Engineering Partner. He developed specific engineering details of course syllabi (core course and seminars), as well as the development of conference and workshop presentations. He also assisted with planning for the UGA engineering design challenge.

- **Participant name:** Sidney Thompson
- **Project Role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Sidney Thompson was Senior Personnel and an Engineering Partner. He co-developed specific engineering details of course syllabi (core course and seminars), as well as the development of conference and workshop presentations. He also assisted with planning for the UGA engineering design challenge.

- **Participant name:** Roger Hill
- **Project Role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Roger Hill was Senior Personnel and a Technology Education Partner. He reviewed and contributed to core course development, presentations, and co-developed the NCETE Website. Roger was a member of the Research Team.

- **Participant name:** Cameron Denson
- **Project Role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** Cameron Denson was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.

- **Participant name:** Todd Kelley
- **Project Role:** Doctoral Student
- **160 hours:** Yes

- **Description of involvement:** Todd Kelley was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.
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- **Participant name:** Steven Ferguson
- **Project Role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Steven Ferguson was a Graduate Assistant and worked primarily in support of Bob Wicklein's efforts to coordinate NCETE graduate course development.

University Of Illinois At Urbana Champaign

- **Participant name:** Scott D. Johnson
- **Project Role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Scott Johnson was the UIUC PI and Site Director, and the NCETE Research Director. Primary responsibilities were to coordinate the UIUC program of work, develop one of the core courses for the Ph.D. fellows, and assist with the development of an engineering design challenge. As NCETE Research Director, he coordinated and managed the NCETE research activities. He also participated on the NCETE Management Team that was charged with oversight of the work of the Center to be certain tasks are accomplished.
- **Participant name:** Ty Newell
- **Project Role:** Other Senior Personnel
- **160 hours:** No
- **Description of involvement:** Ty Newell was Senior Personnel and an Engineering Partner. His primary responsibilities were to develop the UIUC design challenge and serve as a consultant on engineering design issues.
- **Participant name:** Jenny Daugherty
- **Project Role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** Jenny Daugherty was an NCETE Doctoral Fellow. She completed the first year of doctoral course work including the first two NCETE core courses.

- **Participant name:** Martin Westrick
- **Project Role:** NCETE Fellow
- **160 hours:** Yes
- **Description of involvement:** Martin Westrick was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.

- **Participant name:** Yong Zeng
- **Project Role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** Yong Zeng was an NCTE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.

University of Minnesota

- **Participant name:** Theodore Lewis
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Theodore Lewis was the UMN PI and Site Director, and a Technology Education Partner. Primary responsibilities were to coordinate the UMN program of work, recruit doctoral students, develop one of the core courses for the Ph.D. fellows, and assist with the development of an engineering design challenge. He also attended and participated in local and national level meetings. Ted was a member of the NCETE research team.

- **Participant name:** Karl Smith
- **Project role:** Other Senior Personnel
- **160 hours:** Yes
- **Description of involvement:** Karl Smith was the UMN Co-PI and an Engineering Partner. He assisted Ted Lewis with development of the core course and the engineering design challenge. He also attended and participated in local and national level meetings. Karl was a member of the NCETE research team.

- **Participant name:** Randy Knapp
- **Project role:** Doctoral Student

- **160 hours:** Yes
- **Description of involvement:** Randy Knapp was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.
- **Participant name:** Wendy Knapp
- **Project role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** Wendy [Knapp](#) was an NCETE Doctoral Fellow. She completed the first year of doctoral course work including the first two NCETE core courses
- **Participant name:** David Stricker
- **Project role:** Doctoral Student
- **160 hours:** Yes
- **Description of involvement:** David Stricker was an NCETE Doctoral Fellow. He completed the first year of doctoral course work including the first two NCETE core courses.

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University of Wisconsin – Stout

- **Participant name:** Brian McAlister
- **Project role:** Other Senior personnel
- **160 hours:** Yes
- **Description of involvement:** Brian McAlister was the UW-Stout PI and a Technology Education Partner. Brian McAlister, along with Kenneth Welty, developed the UW-Stout professional development in-service planning and delivery, and attended and participated in local and national level meetings. He was a member of the NCETE research team.
- **Participant name:** Kenneth Welty
- **Project role:** Other Senior personnel
- **160 hours:** Yes
- **Description of involvement:** Kenneth Welty was the UW-Stout Co-PI and Site Director. Along with Brian McAlister, he developed the UW-Stout professional development in-service planning and delivery, and attended and participated in local and national level meetings.

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| | <ul style="list-style-type: none"> • Participant name: Richard Rothaupt • Project role: Other Senior Personnel • 160 hours: No • Description of involvement: Richard Rothaupt was Senior Personnel and an Engineering Partner. He met with Brian McAlister and Kenneth Welty to help clarify what it means to “do engineering,” to discuss the role of statistical process control in manufacturing engineering, and to review a potential scenario for the proposed technical challenge. He also assisted with professional development by presenting an overview of the kinds of work manufacturing engineers do using a series of projects that manufacturing engineers students have complete in response to the needs of clients in business and industry.
<ul style="list-style-type: none"> • Participant name: Danny Bee • Project role: Other Senior Personnel • 160 hours: No • Description of involvement: Dr. Bee was Senior Personnel and an Engineering Partner. He met with Brian McAlister and Kenneth Welty to discuss the nature of engineering, the uniqueness of manufacturing engineering, the role that statistical process and quality control plan in manufacturing engineering, and a potential scenario for the proposal engineering design challenge.
<ul style="list-style-type: none"> • Participant name: Christopher Neff • Project role: Graduate Student • 160 hours: Yes • Description of involvement: Christopher Neff, Graduate Research Assistant, assisted in the preparation of teacher in-service workshop, worked in the UW-Stout/NCETE booth at Wisconsin Technology Education Conference, developed the UW-Stout NCETE web site, represented UW-Stout at the NCETE meeting in Kansas City, and conducted a review of literature on “lean manufacturing.”
<ul style="list-style-type: none"> • Participant name: Joe Regan • Project role: Graduate Student • 160 hours: Yes • Description of involvement: Joe Regan, Graduate Research Assistant, assisted in the preparation of teacher in-service workshop, worked in the UW-Stout/NCETE booth at Wisconsin Technology Education Conference, developed UW-Stout NCETE web site, represented UW-Stout at the NCETE meeting in Kansas City, and conducted a review of literature on “statistical quality control and statistical process control.” |
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- **Participant name:** Leah Roue
- **Project role:** Graduate Student
- **160 hours:** Yes
- **Description of involvement:** Leah Roue, Graduate Research Assistant, assisted in the preparation of teacher in-service workshop, worked the UW-Stout/NCETE booth at Wisconsin Technology Education Conference, developed UW-Stout NCETE web site, and conducted a review of literature on “out-sourcing.”

- **Participant name:** Tom Lacksonen
- **Project role:** Other Senior Personnel
- **160 hours:** No
- **Description of involvement:** Dr. Lacksonen was Senior Personnel and an Engineering Partner. He met with Brian McAlister and Kenneth Welty to discuss the nature of engineering, the uniqueness of manufacturing engineering, and the role of how statistical process and quality control play in manufacturing engineering. He assisted with professional development by presenting an overview of statistical applications in industrial and manufacturing engineering (e.g. time motion, quality assurance, line balancing, etc.)

- **Participant name:** John Dzissah
- **Project role:** Other Senior Personnel
- **160 hours:** No
- **Description of involvement:** Dr. Dzissah was Senior Personnel and an Engineering Partner. He met with Brian McAlister and Kenneth Welty to discuss how the nature of engineering, the uniqueness of manufacturing engineering, the role of statistical process and quality control techniques play in manufacturing engineering. He assisted with professional development by presenting an overview of how statistical process and quality control are implemented in manufacturing engineering.

- **Participant name:** Ken Nueberg
- **Project role:** Other Senior Personnel
- **160 hours:** No
- **Description of involvement:** Dr. Nueberg was Senior Personnel and an Engineering Partner. He met with Brian McAlister and Kenneth Welty to discuss the nature of packaging engineering, the relationship between packaging engineering, and other areas of engineering and the role it plays in the context of manufacturing engineering. He assisted with professional development by presenting an overview of the kinds of work

packaging engineers do.

- **Participant name:** Karen Zito
- **Project role:** Other Senior Personnel
- **160 hours:** No
- **Description of involvement:** Dr. Zito was Senior Personnel and a STEM Partner from Mathematics. She assisted with professional development by presenting basic statistical concepts, how they can be taught, and the role statistics can play in numeracy.

Participant name: Gregg Slupe

- **Project role:** Graduate Assistant
- **160 hours:** Yes
- **Description of involvement:** Gregg Slupe, Graduate Research Assistant, assisted in the preparation of teacher in-service workshops, worked in the UW-Stout/NCETE booth at Wisconsin Technology Education Conference, represented UW-Stout at the ITEA conference in Baltimore, conducted a review of literature on “lean manufacturing” and created curriculum materials for the implementation of the lean manufacturing design challenge.

• **Participant name:** Jeff Sullivan

- **Project role:** Graduate Assistant
- **160 hours:** Yes
- **Description of involvement:** Jeff Sullivan, Graduate Research Assistant, assisted in the preparation of teacher in-service workshops, worked in the UW-Stout/NCETE booth at the Wisconsin Technology Education Conference. He represented UW-Stout at the ITEA conference in Baltimore, revised the UW-Stout NCETE web site, conducted a review of literature on “lean manufacturing” and created curriculum materials for the implementation of the lean manufacturing design challenge.

• **Participant name:** Theran Peterson

- **Project role:** Graduate Assistant
- **160 hours:** Yes
- **Description of involvement:** Theran Peterson, Graduate Research Assistant, assisted in the preparation of teacher in-service workshop, worked in the UW-Stout/NCETE booth at Wisconsin Technology Education Conference, represented UW-Stout at the ITEA conference in Baltimore, conducted a review of literature on

	<p>“lean manufacturing” and created curriculum materials for the implementation of the lean manufacturing design challenge.</p>
<p>2. What other organizations have been involved as partners?</p>	<p>During project year 2005-06, NCETE involved a number of organizations at partners. Some of the important partners are listed below.</p> <ul style="list-style-type: none"> • Organization name: International Technology Education Association (ITEA) • Partner’s contribution: ITEA assisted NCETE with dissemination and helped establish connections with other individuals and organizations involved in technology and engineering education in grades K-12. • More detail: ITEA provided time for two sessions at the annual conference for NCETE-related presentations. • Organization name: Council on Technology Teacher Education (CTTE) • Partner’s contribution: CTTE is affiliated with ITEA and focuses on technology teacher education. One important role of CTTE is the publication of an annual yearbook that communicates educational material without duplicating commercial textbook activities. • More detail: A proposal has been developed and presented to CTTE to develop a yearbook on Engineering and Technology Education. The proposal was accepted by CTTE for publication in 2008. • Organization name: American Society for Engineering Education (ASEE) • Partner’s contribution: ASEE assisted NCETE with dissemination and helped establish connections with other individuals and organizations involved in engineering education in grades K-12. • More detail: NCETE team members participated in ASEE K-12 Division meetings which helped frame the research directions for engineering education in K-12. • Organization name: Center for the Advancement of Scholarship on Engineering Education (CASEE) • Partner’s contribution: CASEE is part of the National Academy Engineering and has many well-recognized partners in engineering education. CASEE’s goals are similar to NCETE’s and that is to improve engineering education at the pre-college, undergraduate, graduate and continuing education levels. NCETE has been accepted as a CASEE Research Affiliate. <p>NCETE institutional sites have established partnership with local school districts. These partnerships are listed below.</p>

Brigham Young University

- **Organization name:** Jordan School District, Jordan, Utah
- **Partner's contribution:** Provided teacher release time so that teachers could participate in professional development and have committed to infusing engineering concepts into K-12 schools.
- **More detail:** The purpose of establishing this partnership was to identify and support teachers' participation in professional development designed to improve knowledge and skills related to infusing engineering concepts into K-12 schools.

- **Organization name:** Davis School District, Centerville, Utah
- **Partner's contribution:** Provided teacher release time so that teachers could participate in professional development and have committed to infusing engineering concepts into K-12 schools.
- **More detail:** The purpose of establishing this partnership was to identify and support teachers' participation in professional development designed to improve knowledge and skills related to infusing engineering concepts into K-12 schools.

- **Organization name:** Wasatch School District, Heber City, Utah
- **Partner's contribution:** Provided teacher release time so that teachers could participate in professional development and have committed to infusing engineering concepts into K-12 schools.
- **More detail:** The purpose of establishing this partnership was to identify and support teachers' **participation** in professional development designed to improve knowledge and skills related to infusing engineering concepts into K-12 schools.

California State University, Los Angeles

- **Organization name:** Long Beach Unified School District
- **Partner's contribution:** Provided the teachers for the project. Provided the coordination, teacher identification and selection, and district project oversight by Mr. Matt Saldana, District Director of Technology Education. Has agreed to provide the sites (at two high schools in the district) for two fall follow-up meetings, where the participants will share their initial experiences in the classroom.
- **More detail:** The purpose of establishing this partnership was to identify a cohort of teachers that would represent "integration teams" at the various Long Beach high schools. These integration teams consist of a technology teacher (as the team leader), a math teacher, and a science teacher. The long-term goal for each high school could extend to academies, magnet schools, and other focused programs. This district has agreed

to continue to participate until all of their high schools have programs in place. They have also agreed to look beyond the project by participating in research and teacher recruitment initiatives.

Illinois State University

- **Organization name:** National Center for Nano-technology at the University of Illinois
- **Partner's contribution:** The Illinois State University TTE site has worked with the National Center for Nano-technology at the University of Illinois. These activities have included:
 - Placing an undergraduate student in their center for the summer of 2005
 - Contributing to the development of a NSF preliminary proposal
 - Incorporating the Nano technology Center into an ISU design problem solving course in the pre-service program

Technology education teachers from the following high schools have participated in the professional development component of the Center:

- **Organization name:** Normal Community West High School, Normal, IL
- **Partner's contribution** Teachers from this school engaged in 50 hours of professional development during the fall 2005 and spring 2006 semesters. Teachers from this school will be engaged in an additional 50 hours of professional development during the June 2006
- **Organization name:** Bloomington Area Vocational Center, Bloomington, IL
- **Partner's contribution** Teachers from this school engaged in 50 hours of professional development during the fall 2005 and spring 2006 semesters. Teachers from this school will be engaged in an additional 50 hours of professional development during the June 2006
- **Organization name:** St. Charles North High School, St. Charles, IL
- **Partner's contribution** Teachers from this school engaged in 50 hours of professional development during the fall 2005 and spring 2006 semesters. Teachers from this school will be engaged in an additional 50 hours of professional development during the June 2006
- **Organization name:** Wheeling High School, Wheeling, IL
- **Partner's contribution** Teachers from this school engaged in 50 hours of professional development during the fall 2005 and spring 2006 semesters. Teachers from this school will be engaged in an additional 50 hours

of professional development during the June 2006

- **Organization Name:** University of Illinois Doctoral Fellows and Faculty, Champaign, IL
- **Partner's Contribution** Doctoral Fellows and faculty helped to set agendas, perform and present research, lead activities, etc

North Carolina Agriculture And Technical State University

- **Organization name:** Alamance-Burlington Schools.
 - **Partner's contribution:** Provided paid teacher release time so that teachers could participate in professional development. This partner has promised the project access to classrooms in order to conduct research on how students learn about technology and how teachers implement what they learned in professional development.
 - **More detail:** The purpose of establishing this partnership was to more deliberately identify and support teachers to participate in professional development and gain access to teachers and students as the subjects of research. This partnership would then directly benefit the students of the school system, a significant portion of who are on free or reduced lunch. This was deliberately arranged.
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- **Organization name:** Guilford County Schools.
 - **Partner's contribution:** Provided paid teacher release time so that teachers could participate in professional development. This partner has promised the project access to classrooms in order to conduct research on how students learn about technology and how teachers implement what they learned in professional development.
 - **More detail:** The purpose of establishing this partnership was to more deliberately identify and support teachers to participate in professional development and gain access to teachers and students as the subjects of research. This partnership would then directly benefit the students of the school system, a significant portion of who are on free or reduced lunch. This was deliberately arranged.
-
- **Organization name:** Winston-Salem/Forsyth County Schools.
 - **Partner's contribution:** Provided teacher release time so that teachers could participate in professional development. This partner has promised the project access to classrooms in order to conduct research on how students learn about technology and how teachers implement what they learned in professional development.
 - **More detail:** The purpose of establishing this partnership was to more deliberately identify and support teachers to participate in professional development and gain access to teachers and students as the subjects of research. This partnership would then directly benefit the students of the school system, a significant portion of who are on free or reduced lunch. This was deliberately arranged.

University of Wisconsin – Stout

- **Organization name:** Eau Claire North High School
- **Partner’s contribution:**
 - Released technology teachers for professional development activities (e.g., representing the NCETE at the Wisconsin Technology Education Conference, attending workshops at UW-Stout).
 - Integrated units of instruction that target selected national standards as well as pre-engineering concepts and skill into existing curriculum.
 - Supported inquiry that will inform teaching and learning in technology education, especially how students learn concepts and skills that are related to the study of engineering.

- **Organization name:** Brillion High School
- **Partner’s contribution:**
 - Released technology teachers for professional development activities (e.g., representing the NCETE at the Wisconsin Technology Education Conference, attending workshops at UW-Stout).
 - Integrated units of instruction that target selected national standards as well as pre-engineering concepts and skill into existing curriculum.
 - Supported inquiry that will inform teaching and learning in technology education, especially how students learn concepts and skills that are related to the study of engineering.

- **Organization name:** Highland Park Senior High School
- **Partner’s contribution:**
 - Released technology teachers for professional development activities (e.g., representing the NCETE at the Wisconsin Technology Education Conference, attending workshops at UW-Stout).
 - Integrated units of instruction that target selected national standards as well as pre-engineering concepts and skill into existing curriculum.
 - Supported inquiry that will inform teaching and learning in technology education, especially how students learn concepts and skills that are related to the study of engineering.

- **Organization name:** Lynde & Harry Bradley School of Technology and Trade
- **Partner’s contribution:**
 - Released technology teachers for professional development activities (e.g., representing the NCETE at the Wisconsin Technology Education Conference, attending workshops at UW-Stout).

	<ul style="list-style-type: none"> ○ Integrated units of instruction that target selected national standards as well as pre-engineering concepts and skill into existing curriculum. ○ Supported inquiry that will inform teaching and learning in technology education, especially how students learn concepts and skills that are related to the study of engineering. <ul style="list-style-type: none"> ● Organization name: Kern Family Foundation ● Partner’s contribution: UW-Stout aspires to create a leadership academy within its undergraduate technology teacher education program with financial support from the Kern Family Foundation. The development of a school within a school will enable the faculty to create teaching and learning communities that focus on the study of engineering careers, principles, and practices. Furthermore, it will provide a mechanism for pooling the wisdom and experience of veteran teachers with energy and enthusiasm of beginning teachers. ● More detail: Brian McAlister, Robert Hendricks, and Kenneth Welty are currently working with the Kern Family Foundation to soliciting financial support the following initiatives: <ul style="list-style-type: none"> ○ Establish 12 annual scholarships to support gifted undergraduate students that aspire to be technology teachers. ○ Develop a leadership academy within its undergraduate technology teacher education program. ○ Create teaching and learning communities that focus on the study of engineering careers, principles, and practices.
<p>3. Have you had other collaborations or contacts?</p>	<p>In 2005-06, NCETE partners established the following collaborations.</p> <p><u>California State University, Los Angeles</u></p> <ul style="list-style-type: none"> ● Instructional Technology division to develop and offer distance education version of the program. ● MEP/MESA to increase the participation of underrepresented populations. ● SWE (Society of Women Engineers) to increase the participation of women. <p><u>North Carolina Agriculture and Technical State University</u></p> <ul style="list-style-type: none"> ● Vincent Childress is working very closely with the North Carolina Department of Public Instruction to revise the public school curriculum to include engineering design. This is now an ongoing effort which will extend into 2008.

University Of Illinois At Urbana Champaign

Meetings were held with the following individuals to seek ways to develop a collaborative relationship between NCETE and their representative organization.

- George Reese, Project Lead the Way instructor and Head of the Office for Mathematics, Science and Technology Education (MSTE).
- Susan Linnemeyer, Director of Special Programs, College of Engineering
- Cynthia Brya – Director of high school outreach activities in the Dept. of Materials Science and Engineering
- Lenny Pitt, Computer Science Professor
- Paul Parker, Assistant Dean and Director of the Morrill (minority) Engineering Program
- Marty Atwater, Educational Director of the Nanoscale Center
- Sue Larson, Professor of Civil and Environmental Engineering and Director of Women in Engineering

University of Wisconsin – Stout

The College of Technology, Engineering & Management collaborated with NCETE by:

- Providing laboratory facilities for the professional development activities involving the design and rehearsing learning activities that target selected national standards and illustrate engineering design in the context of manufacturing.
- Recruiting students, especially members of under-represented and under-served populations, into UW-Stout’s technology and engineering programs (e.g., technology education, engineering technology, manufacturing engineering).

Specific Technology, Education and Management faculty include:

- Dr. Thomas Lacksonen. He met with Brian McAlister and Kenneth Welty to help clarify the difference between manufacturing engineering and industrial engineer, to share a sample learning activity for manufacturing, and to discuss the role of analysis in engineering manufacturing systems.
- Dr. Robert Meyer, Dean of the College of Technology, Engineering and Management at UW-Stout, presented a professional development session entitled, “What Makes It Engineering.”

Utah State University

Meetings were held with the following individuals to seek ways to develop a collaborative relationship between NCETE and their representative organization.

- Mimi Recker and Yanghee Kim, Instructional Technology
- Gary Stewardson, Engineering and Technology Education, and Ning Fang, Mechanical Engineering

	<ul style="list-style-type: none"> • David Britt, Tim Taylor, and Ron Sims, Biological and Irrigation Engineering
II. Activities and Findings	
<p>1. Describe the major research and education activities of the project.</p>	<p>Major Research and Education Activities: 2005-06</p> <p><u>Research Activities</u></p> <p>A major challenge in the work of the National Center for Engineering and Technology Education has been the need to strengthen the research climate across the institutional settings. A number of activities have been directed at that effort: internal funding of small student and faculty research projects; presentations by researchers at Center meetings; providing a research focus for the required core courses in cognitive science, design, problem solving, and creativity; and the evolution of the research framework for the Center.</p> <p>The internal research program has been successful in providing relatively non-threatening experiences with proposal preparation, review, negotiation, and the conduct of small research projects. Six proposals were funded for exploratory research projects in 2005-2006. As these projects are completed, the researchers have shared their findings with their Center colleagues and at professional conferences. The Research Committee has completed its review of the second internal competition and the successful proposals are being negotiated as this report is being prepared in early June 2006. The internal research program has provided opportunities for students and faculty to develop their research capabilities to investigate new areas. The program has also helped to introduce a collaborative, research-focused interchange among the Center faculty as they establish and monitor the program.</p> <p>The most recent Center meeting included presentations by two researchers, Christine Cunningham and Janet Kolodner. Christine Cunningham reported the findings of her work on the recruitment of girls and women to engineering and technology. Janet Kolodner described her investigations of effective ways to implement design activities in the classroom.</p> <p>Serious attention has been given to the introduction of the cadre of doctoral students to the research process throughout their work at the Center. Specifically, the core courses include comprehensive studies of the research literature in the respective fields, provide specific preparation in research related to the content of the course, and require the students to conduct small research projects and prepare scholarly reports of their work.</p> <p>In the first NCETE core course, The Role of Cognition in Engineering and Technology Education, the Fellows</p>

were expected to be both consumers and producers of educational research. The majority of the course readings described empirical studies of cognition that focused on technical learning and thinking. Each student was expected to critically analyze a research study and present the major concepts from the article to the class. The Fellows were also expected to write and present a major paper that reviewed and synthesized the literature on a critical issue related to cognition in engineering and technology education. Each Fellow was also expected to conduct an analysis of expertise in a domain of his or her choice using the protocol analysis method. This method of research was introduced in class as a way to empirically capture the thought processes that are used as the research participant completes a task. The Fellows designed and conducted the research study and wrote a technical report that included a description of the problem being addressed, the methods used to collect and analyze data, and the results and conclusions. The Fellows also made formal presentations of their research study to the class.

In the second core course, Design Thinking in Engineering and Technology Education, the fellows continue to be consumers and producers of educational research. The course explored the concept that design is the primary conceptual anchor for technology education, drawing the subject ever more tightly toward engineering. As the doctoral students reviewed contemporary literature in design thinking, they were asked to identify the conceptual framework against which the study was set, the quality of the research problem, the design/methodological approach of the study, the findings and recommendations, and study limitations. The students were expected to critically analyze a body of research and develop a journal-quality synthesis paper. The instructor has expressed his willingness to help the students develop their synthesis paper into a journal article at the conclusion of the course.

As the third and fourth core courses are provided to the doctoral cadre during 2006-2007, the research focus will continue. The research emphasis in the core courses will prepare the students for research in their specialty, building upon their course work in research methodology and statistics at their respective institutions.

In March 2005, early in the life of the project, Center faculty and a team of outside consultants developed a research framework to encompass the anticipated research thrust of the Center. The framework identifies three themes: (1) how and what students learn in technology education; (2) how best to prepare technology teachers; and (3) assessment and evaluation. While the research framework is comprehensive and provided a useful starting point for the research endeavors of the group, the panelists at the Reverse Site Visit in May 2006 recommended refocusing the research framework into a more precise agenda. Faculty and fellows have already started that work and will continue the refinement of the research agenda in the months immediately ahead.

Doctoral Activities

The Center faculty gave concerted attention to developing an effective recruitment program for the first cohort of fellows and went through a meticulous selection process to build a strong cadre of beginning doctoral students. An August 2005 orientation session for the fellows was held at the National Academy of Engineering in Washington DC to introduce the fellows to representatives of the National Academy, the professional associations, and faculty members from the collaborating institutions.

During their initial semester of study, the Fellows completed a core course together via distance delivery from the University of Illinois, as well as a schedule of other courses required at their respective institutions. During the second semester, the fellows completed a second core course delivered by a team of two professors at the University of Minnesota.

During the spring semester, three Fellows represented the Center at the CLT PI Conference, where they presented poster sessions. They also reported their impressions of the PI Conference to their cohort colleagues via an interactive video session of the second core course. The Fellows participated in the Center workshop in Baltimore, reporting to the entire group on the research they completed in the first core course, working in the NCETE booth in the ITEA trade show, and hosting the ITEA leadership at a reception early during the convention.

At the conclusion of the first year of doctoral study, the Fellows participated in the summer workshop at the University of Georgia. (All twelve Fellows were retained through the experiences of the first year.) At the summer workshop, the Fellows provided individual and small group reports of work completed in core courses one and two as well as reports of research completed under the internal research program. All participated in a focus group seeking to reconfigure the Center research agenda and reported their suggestions to the faculty later in the workshop. They also participated in community-building activities hosted by the faculty and Fellows at the University of Georgia.

Several of the Fellows are working with partner professional development programs during summer 2006. Their levels of involvement vary from observation to workshop facilitation to evaluation. In addition, several are taking graduate courses at their home institutions during the summer session.

Both internal and external evaluations of the first two core courses have been completed. These studies have provided recommendations that will be useful in revising the courses before they are offered again in 2007. While there was no formal ethnographic study of the first year experiences of the graduate students, consideration is being given to the possibility of such a study in the years ahead.

	<p><u>Professional Development Activities</u></p> <p>The long-term goal of the professional development program is the identification of effective practices for professional development in engineering and technology education. In order to move toward that goal, each professional development institution identified short-term goals for the current year, shared those goals with the group, and then implemented activities to accomplish the goals in the local setting.</p> <p>Faculty from each institution provided an in-depth report of their success in meeting their goals at the summer workshop at the University of Georgia. Also at that meeting, the faculty from the professional development institutions responded to questions raised at the Reverse Site Visit by developing a preliminary draft of the conceptual base for professional development and a preliminary list of criteria for assessing effective practices in professional development. These products represent important progress toward the evolution of a Center model for professional development and will provide a basis for further refinement during the year ahead.</p>
<p>2. Describe the major findings resulting from these activities.</p>	<p>Findings: 2005-06</p> <p>This section contains findings from the activities of year two as well as a summary of internal evaluation activities. The external evaluation report from WestEd is included as a separate file uploaded through FastLane.</p> <p>Year Two Findings</p> <p>Research is at a relatively immature state in engineering and technology education, particularly in comparison with mathematics education and science education, both of which have decades-long traditions of disciplined inquiry to guide professional practice.</p> <p>We have discovered that fostering a research attitude in engineering and technology education is especially difficult, because the action orientation of the field tends to preclude reflective investigations. The Center continues to address this issue in an attempt to assist Fellows and faculty in the development of habits of disciplined inquiry.</p> <p>We have also found that many of the doctoral students were initially ill-prepared to deal with the theoretical constructs in pedagogy and in design that were an integral part of their doctoral programs. Their lack of understanding of the value of research-based knowledge sometimes appears as an anti-intellectual bias that interferes with the development of research competence. Faculty involved in teaching the first two core courses worked patiently with the doctoral students to help them begin to establish their identities as researchers in engineering and technology education. We sense that the doctoral students made great strides toward</p>

	<p>understanding the importance of research in their first year and we are optimistic they will continue to grow in this understanding.</p> <p>The cohort has proven invaluable to the individual Fellows and to the groups of Fellows at each of the institutions. Fellows from different institutions are able to work together on tasks that facilitate mutual interests and clusters of fellows at the institutions have developed strong working relationships. The value of diversity is well demonstrated among the cohort. Their professional backgrounds in design, engineering, technology, and education at a wide range of institutions strengthen their development as a community of scholars engaged in the building of a new discipline.</p> <p>It is important for the Center to devise an evaluation process to capture the experiences of the doctoral students and the evolution of their research identities, individually and as a cohort. Individual student logs, web logs, engineering journals, institutional and inter-institutional seminars, and collaborative research activities offer promise for strengthening the evaluation design.</p> <p>The place of engineering and technology education in the high schools is somewhat tenuous in many parts of the country. The central themes of the field and the boundaries of the area of study are indistinct at this time in its development. As the Center participates in the effort to establish engineering and technology education as a critical area for high school students to study, it faces major hurdles because of the lack of a supporting infrastructure in most states. One of the most significant hurdles is the limited availability of instructional materials for high school students. This problem is further complicated by the fact that there is little professional development material available, as well. The teacher education programs in the Center have attempted to address this dearth of instructional materials in different ways, with widely varying levels of success.</p> <p>Attracting motivated teachers and helping them resolve conflicts between the demands of their jobs, their personal lives, and Center professional development activities has become a more significant problem than the Center anticipated. It was difficult to attract the targeted numbers of technology education teachers during the second year of the project. Our original concept of designing professional development activities to serve local audiences may be flawed. It may be that teachers would be more attracted to a Center program with more of a national focus and higher national visibility.</p> <p><u>Reflections on Reverse Site Visit Feedback</u></p> <p>The Reverse Site Visit presentation by the Center team at NSF May 1, 2006 generated a generally positive response</p>
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from the CLT program officer, who noted our success in incorporating engineering into technology education, the progress of the cohort of Fellows toward becoming a leadership cadre in the field, and the research emphasis accomplished in the doctoral program. We were, however, asked to focus and prioritize our mission and goals, to align the research framework more closely with the revised Center goals, and to strengthen the plans and protocols for the evaluation of the work of the Center.

The Management Team has reviewed the responses to the Reverse Site Visit and has discussed possible avenues of response to each of the areas of concern. Several efforts to frame Center responses are under way as this report is prepared in early June 2006. A Management Team meeting is scheduled July 7 in Chicago for face-to-face discussion and decision making on revisions in mission and goals and to identify needed changes in plans for future Center activities. The internal evaluator and the PI are drafting a request for proposals for a strengthened evaluation plan and protocol for the third year of the Center's work. Preliminary inquiries have identified four evaluation groups that indicate an interest in receiving the RFP. Work on the refinement of the research framework was initiated at the summer workshop at the University of Georgia and will be continued by the Management Team and the Research Committee. It is expected that additional meetings of the Management Team will occur during the summer as work continues on the development of the response describing the focused goals, the revised research framework, and the revised evaluation plan. This written response will be submitted to NSF by August 30, 2006.

Summary of Internal Evaluation Activities

Submitted by Jim Dorward, Evaluation Consultant

On-going

Evaluation consulting in weekly NCETE staff meetings and as needed
Analysis of internal communication and project artifacts

December, 2005

Developed and disseminated professional cohort logic model
Developed and administered Core Course One evaluation
Reviewed and commented on professional development workshop reflective analysis

January, 2006

	<p>Analyzed and reported on Core Course One evaluation</p> <p><u>February, 2006</u></p> <p>Reviewed and commented on two surveys developed by the external evaluation team at WestEd: the teacher educator evaluation survey and a high school student survey</p> <p><u>March, 2006</u></p> <p>Developed Core Course two midterm course survey Reviewed revised project goals statement</p> <p><u>April, 2006</u></p> <p>Administered, analyzed, and submitted report on Core Course Two midterm evaluation</p> <p><u>May, 2006</u></p> <p>Reviewed external evaluator plans for review of summer workshop activities Drafted UGA workshop survey</p>
<p>3. Describe the opportunities for training and development provided by your project.</p>	<p><u>Training and Development Opportunities: 2005-06</u></p> <p>An important aspect of NCETE is to strengthen the backgrounds of current faculty at the doctoral and teacher education partner institutions in the areas of engineering analysis, problem solving, and design. The summer workshop held during May 23-26, 2005, at Utah State focused on professional development of NCETE investigators. The goal of the workshop was to help NCETE team members develop answers to the following questions: 1) what is engineering design, 2) what are the differences between engineering design and technology education design, 3) what are the important aspects of engineering design that should be taught in grades 9-12, and</p>

4) how do we assess learning in engineering design? A number of activities were planned to answer these questions. The workshop began with a half-day panel discussion, lead by Martha Cyr, a mechanical engineering and director of K-12 outreach at WPI, addressing these questions. Engineering faculty from the University of Georgia led NCETE partners in a one and one-half day engineering design experience where partners were placed in teams and stepped through the process of designing and testing a projectile launcher. Practicing engineers from a local biomedical product company, Medicine Lodge, spent half a day leading a discussion on their view of engineering design in prosthetics.

Professional development activities for teachers were also conducted by teacher education institutions. These activities are highlighted below.

Brigham Young University

- Teachers from partner schools were provided with 100 hours of professional development in order to develop knowledge and skills in engineering design and analytical and predictive processes in preparation for infusing such concepts into K-12 schools. The professional development consisted of lectures, demonstrations, field trips to exemplary schools, and lab design activities. Data were collected from participants regarding the quality and outcomes of the professional development.
- Five teachers were selected to participate in the professional development based on recommendation from Melvin Robinson, State Supervisor for Technology and Engineering Education, Utah State Office of Education. The four teachers were white males and one teacher was a white female. Four faculty members participated, Thomas Erekson, Ronald Terry, Steven Shumway, and Jared Berrett, all white males. Three undergraduate students participated, Doug Livingston, Taylor Newill, and Jeff Baxter, all white males. One NCETE Fellow from USU participated, Nathan Mentzer, a white male.
- A challenge was scheduling the professional development dates as the teachers had various commitments in their districts (e.g., coaching, serving on district committees) that conflicted. The solution was to schedule the spring sessions on two consecutive days (Friday/Saturday) which worked well. Another challenge was travel associated with the professional development because the focus was on teachers in rural and small schools, and the spring sessions were held in southwestern Utah. Travel was required for the teacher from the rural parts of the state to attend the summer capstone week that was held in Provo at BYU.

California State University, Los Angeles

- Teachers from partnership school district are being provided with 100 hours of professional development in

three phases. The first phase was designed to lay a foundation with the math, science (mostly physics), and engineering design principles to prepare the teachers to infuse engineering design into their programs. The second phase involves the use of our seismic engineering design challenge as a module that the teachers will take back to their programs. The third phase involves fall follow-up meetings of the cohort. The plan was to consider the cohort to be one group over the five years. One group that will simply grow larger each year, rather than five separate cohorts. Data was collected from participants regarding the quality and outcomes of the professional development. The participants also developed a portfolio of resource materials collected in a project binder.

- There were seven teachers participating. Four of the participants are women and three are men. All of the men are white. Three of the women are white, and one was African-American. There are five faculty members participating. Four are male and one was female. All are white.
- The only challenge incurred was that the district balked at the prospect of the teachers leaving the classroom for so many days during the spring. Since this was made clear early in the discussion, we scheduled all spring workshop dates on Saturdays. The teachers all agreed to this schedule, and it has worked extremely well.
- One graduate student has participated in the design of our engineering design challenge. Another graduate student will commence work on the project during our summer quarter.

Illinois State University

- Two members of the Illinois State University faculty have been involved in the professional development planning and delivery. In addition to the faculty, graduate Fellows from the University of Illinois have been actively involved in all professional development activities, including planning and delivery of professional development activities. One key role of the doctoral fellows involved designing and presenting activities specifically designed to create an understanding of major engineering concepts that provided the conceptual focus for the year's activities. Doctoral fellow involvement provided a mechanism for linking graduate level research with teacher professional development and, ultimately, learning in 9-12 level classrooms.
- Throughout year two, the primary focus of the TTE professional development has been on three major engineering concepts. These include: predictive analysis, constraints/requirements, and optimization. A complex technological system (robotics) has served as the major theme for exploring these concepts. Robotics was selected for a number of reasons including: the complex technical nature of the system, an emerging awareness of important social and cultural impacts of automation on society and the economy, and strong appeal for teachers and students. Throughout the year, the three primary engineering concepts

were examined within the context of major robotic subsystems, including end-effector design, kinematics, robotic arm configuration, and electronics and power systems. Popular media were also used to facilitate discussion of robotics and automation (e.g., Bicentennial Man, and I-Robot).

- As a direct result of the conceptual focus of the spring workshops and in conjunction with the doctoral fellows, a research project was conceptualized, proposed and awarded focused on effectively delivering the three concepts to high school level technology education students. The 2006 summer TTE workshop will be dedicated to developing a unit of instruction specifically designed to be delivered to grades 10-12 level students focused explicitly on predictive analysis, constraints/requirements, and optimization. In addition to the year two technology teacher cohort, full participants will include the UIUC doctoral fellows, secondary level mathematics and physics teachers, and engineers. The study, which will be conducted throughout the 2006-07 academic year, is designed to assess the effectiveness of the treatment (unit of instruction) on students' understanding of core engineering concepts.

North Carolina Agriculture and Technical State University

- Teachers from partnership school systems have been provided with 100 hours of high quality professional development in order to learn engineering design and analytical and predictive processes in order to implement these processes into their technology education curricula and instruction. The professional development consisted of lectures and demonstrations followed by the solving of Engineering Design Challenges in a design and laboratory setting. There was also a focus on keeping teacher-participant portfolios and how to implement what was learned into the technology education public school classroom and laboratory. Data was collected from participants regarding the quality and outcomes of the professional development. This data is being compiled into an inventory of best practices for technology teacher professional development.
- There were 12 teachers participating. Five participants are African-American and seven were white. Two of the participants are women and 10 are men. Four faculty members participated. Two are African-American and two are white. Three are male and one was female. Four GRA students participated. All are African-American. Two are female. Four undergraduates participated and all are African American.
- On an exploratory basis, the researchers at A&T have observed professional development teachers for indicators that they are implementing what they learned in professional development. Students of participants have been observed applying those same concepts and skills that teachers learned in professional development. The next phase of this research is to get permission to videotape what is happening in the technology education classroom and laboratory in order to document how students learn technology, how they learn engineering, how teachers implement professional development, and what

effects the instruction has on achievement and attitudes.

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- Three professional development workshops were conducted during Spring Semester, 2006. The remainder of the workshops will be conducted over the summer of 2006. The workshops provided the following content:
 - Explained the four fundamental purposes of the proposed case study associated with the summer workshop
 - Talked about potential themes that a pre-engineering curriculum should exemplify (e.g., pursuit of efficiency, predictive value of mathematics, grounding in science, model current technology)
 - Outlined potential engineering thrusts that the case study might emphasize (e.g., lean manufacturing, statistical process control, statistical quality control, automation, and tooling).
 - Identified potential limitations that must be addressed to ensure implementation and replication across a variety of technology education settings (e.g., current curricula, existing equipment, laboratory limitations, time constraints, student capabilities in mathematics).
 - Brainstormed potential scenarios for implementing pre-engineering in existing technology education programs.
 - Examined the nature of engineering. More specifically, what distinguished engineering from other branches of technology.
 - Reviewed the scenario for the technical challenge (e.g., parts made in different locations, parts needing to fit together, making Toys for Tots, focusing on statistical process control, designing production tooling, integrating electronics, pursuing efficiency under the auspices of lean manufacturing, capitalizing on the concept of outsourcing).
 - Discussed curriculum/instructional design issues.

 - Conducted introductory training sessions on topics related to manufacturing engineering with participation from engineering faculty.
 - Reviewed and discussed potential resources for facilitating the scenario for a unit of instruction in the proposed case study.
 - Reviewed potential design criteria for developing and documenting the unit of instruction at the center of the proposed case study.

4. Describe outreach activities your project has undertaken.	<p><u>Outreach Activities: 2005-06</u></p> <p>No Change</p>
<p>III. Publications and Products</p>	
What have you published as a result of this work?	<p><u>Major Publications and Products: 2005-06</u></p> <p>Journal Articles</p> <ul style="list-style-type: none"> • Hailey, C. E., Erikson, T., Becker, K., Thomas, M. (2005). National center for engineering and technology education, <i>The Technology Teacher</i>, 64(5), 23-26. • Lewis, T., (2005) Coming to terms with engineering design as content. <i>Journal of Technology Education</i>, 16(2), 34-51. • Lewis, T. (2006). Creativity: a framework for the design/problem solving discourse in technology education, <i>Journal of Technology Education</i>, 17(1), 36-53. • Lewis, T., (2006) Design and inquiry: bases for an accommodation between science and technology education in the curriculum? <i>Journal of Research in Science Teaching</i>, 43(3), 255-281. • Wicklein, R.C. (2006). 5 good reasons for engineering as the focus for technology education. <i>The Technology Teacher</i>, 65(7), 25-29. <p>Conference Presentations</p> <ul style="list-style-type: none"> • Becker, K., Hailey, C. E., and Thomas, M (October, 2004) Frontiers in Education, Savannah, GA. Paper entitled: <i>Work in progress: national center for engineering and technology education</i>. • Erikson, T. L. & Thomas, M. (April, 2005). International Technology Association Conference, Kansas City, MO. Paper entitled: <i>Infusing engineering into technology education</i>. • Erikson, T. L., Hailey, C., Becker, K., & Thomas, M. (April, 2005). International Technology Association Conference, Kansas City, MO. Paper entitled: <i>National center for engineering and technology education</i>. • Hailey, C., Becker, K., Thomas, M. and Erikson, T. (June, 2005). American Society for Engineering Education Annual Conference and Exposition, Portland, OR. Paper entitled: <i>The national center for</i>

	<p><i>engineering and technology education.</i></p> <ul style="list-style-type: none"> • Gattie, D. and Wicklein, R. (June, 2005). American Society for Engineering Education Annual Conference and Exposition, Portland, OR. Paper entitled: <i>Curricular value and instructional needs for infusing engineering design into k-12 technology education</i> • Becker, K. and Custer, R., (October 2005) Frontiers in Education, Indianapolis, IL. Paper entitled: <i>Work in progress – the national center for engineering and technology education: supporting teacher professional development and reviewing K-12 schooling.</i> • Merrill, C., Childress, V., Rhodes, C. and Custer, R. (June 2006) American Society for Engineering Education Annual Conference and Exposition, Chicago, IL, Paper entitled: <i>Infusing engineering concepts into technology education.</i> • Becker, K. (June 2006) American Society for Engineering Education Annual Conference and Exposition, Chicago, IL, Paper entitled: <i>Supporting K-12 teacher professional development through the national center for engineering and technology education.</i> <p>Accepted Publication: Books</p> <ul style="list-style-type: none"> • Custer, R., & Erekson, T. L., Editors. (2008). <i>Engineering and Technology Education. CTTE Yearbook</i>, Peoria, IL: Mission Hills, CA: Glencoe/McGraw-Hill Publishers (proposal approved March 2006). <p>Internet Dissemination</p> <ul style="list-style-type: none"> • The NCETE Web Site (http://www.ncete.org) was launched early November, 2004. • NC A&T-specific Web site for promoting the program (http://www.ncat.edu/%7Egillispc/gc08000.html); NC A&T professional development supplemental Web site used to support participant achievement and reduce time away from the public school classroom (http://www.ncat.edu/%7Egillispc/nceteprofdev.html)
IV. Contributions	
1. Contributions within discipline.	Roger Hill is chair of the Georgia Department of Education committee charged with developing performance standards in engineering and technology education for that state. Similarly, faculty members at BYU and USU are working with the Utah Department of Education in the redesign of the state framework for technology and engineering education.

	<p>The 2008 Yearbook of the Council on Technology Teacher Education, which will deal with engineering and technology education, is currently under development, with chapter drafts due in August. The team of authors, led by Tom Erikson and Rod Custer, includes a large number of Center faculty members.</p> <p>Vince Childress Rod Custer, Ethan Lipton, and Chris Merrill served on the Board of the International Technology Education Association during the current year. Rod Custer also served as a member of the Academy of Engineering Committee on the Assessment of Technological Literacy.</p> <p>Tom Erikson serves as the permanent Chair of the Mississippi Valley Industrial Teacher Education Conference; Chris Hailey was inducted as a new Member-at Large in 2005; Rod Custer, Ted Lewis, Brian McAlister, Chris Merrill, Maurice Thomas and Ken Welty also participated in the 2005 Conference.</p> <p>Chris Hailey, Rod Custer, and Kurt Becker serve on the K-12 Committee of the American Society for Engineering Education.</p>
2. Contributions to other disciplines.	Nothing Significant Yet
3. Contributions to human resource development.	<p>The Center has pioneered in the evolution of a distinct knowledge base for doctoral study in engineering and technology education. The model features cognitive science, design, problem solving, and creativity. It is currently exemplified in the first two core courses, The Role of Cognition in Engineering and Technology Education and Design Thinking in Engineering and Technology Education.</p>
4. Contributions to resources for research and education.	Nothing Significant Yet

5. Contributions beyond science and engineering.	Nothing Significant Yet
V. Special Requirements (First Year and Annual reports only)	
1. Objective and Scope	No
2. Special Reporting Requirements	No
3. Unobligated funds	No
4. Animal, Human Subjects, Biohazards	No