



**KENAN INSTITUTE**

ENGINEERING, TECHNOLOGY & SCIENCE

**NC STATE UNIVERSITY**

**Fiscal Year 2016 - 2017**

**Kenan Institute Goals and Accomplishments  
Aligned with the NC State University Strategic Plan Goals**

**NC State Strategic Plan Goal 1: Enhance the Success of Our Students through  
Educational Innovation**

**KIETS Goal:** Identify and support NC State student led initiatives and novel educational approaches to enhance undergraduate and graduate education.

**Accomplishments:**

- KIETS supported *The Entrepreneurs Living and Learning Village*, a program of the NC State Entrepreneurship Initiative (EI) led by Dr. Tom Miller. BroZone Layer, a concept designed in part by an Albright Entrepreneurs Village resident, won the IBM Built on Cloud Prize at the second annual University Housing Make-A-Thon. Nine Albright Entrepreneurs Village residents received scholarships to attend the annual EI trip to New York City, the annual EI trip to Silicon Valley and the annual NC State Village Alternative Service Break. KIETS Associate Director continued to collaborate with and advise former EI Fellow Leigh Kathryn Bonner, CEO and Founder of *Bee Downtown*. In April 2017, Bee Downtown installed a new apiary on NC State's Centennial Campus.
- KIETS actively engaged and advised *TEC program* graduate students regarding their potential initiation and launch of high-tech companies based on technology developed at NC State and other university, government, and industry partners. One of the TEC teams *SaKaroTec* placed second winning \$7K in the Lulu EGames competition New Venture category. SaKaroTec is developing an innovative new way to preserve red blood cells that seeks to revolutionize the blood supply industry. KIETS Associate Director Raj Narayan served as an executive mentor and advisor to TEC teams.
- KIETS collaborated with the *NC State Social Entrepreneurship* initiative led by the NC State Institute for Nonprofits to provide students with opportunities to engage and learn from social entrepreneurs in North Carolina, nationally, and internationally. In October 2016, KIETS helped organize and host a roundtable luncheon discussion at the Hunt Library featuring Eisenhower Fellows from Africa Salim Mohamed, James Wanjohi, and Ayodeji Adewunmi to speak with NC State students about social entrepreneurship. KIETS Associate Director Raj Narayan facilitated the roundtable discussion.

- KIETS supported the Goodnight Scholars annual interviews providing space and organizational support. KIETS University Program Associate Shelley Sutton helped organize and support the annual interviews, which were held at the Kenan Institute offices in February 2017.

## **NC State Strategic Plan Goal 2: Enhance Scholarship and Research by Investing in Faculty and Infrastructure**

**KIETS Goal:** Identify programs that support faculty research efforts, promote career development and help enhance the research infrastructure at the university.

### **Accomplishments:**

KIETS is supporting several research programs involving NC State faculty and students.

- KIETS supported the *Hybrid Solar Redox Process* led by Prof. Fanxing Li
- KIETS supported the *Research Triangle MRSEC on Soft Matter* led by Profs. Jan Genzer, Carol Hall, Michael Dickey, Orlin Velev.
- KIETS enabled the *Bioseparations/Bioprocessing Development Center (BBDC)* initiative led by KIETS Director Dr. Ruben Carbonell in partnership with BTEC. In 2016, BTEC announced a partnership with Bio Process International (BPI) to conduct a yearlong outreach campaign targeting industry leaders. The partnership will focus attention on industry-specific education, training, and professional development. BPI Theater talks and related content were collected, printed, and distributed to BPI's 30,000 subscribers in a December 2016 supplement to the Bio Process International publication. Dr. Ruben Carbonell gave a keynote lecture at the International Society of Pharmaceutical Engineers (ISPE) in San Francisco in the fall of 2016 that led to another partnership between BTEC and the ISPE journal *Pharmaceutical Engineering*.
- KIETS supported the *NASA Use of Satellite Measurements to Validate and Improve Air Quality Predictions of Ammonia and Fine Particulate Matter* led by Professor Viney Aneja.
- KIETS supported the College of Agriculture and Life Sciences' *Stewards of the Future* conference held at the McKimmon Center on October 20, 2016 on the topic *Microbiome: Unseen Opportunities for Agriculture and Health*. This conference was recognized by the White House Office of Science & Technology Policy and promoted in a press release concerning the formation of the National Microbiome Initiative.

- KIETS supported NC State Professor Roy He's Gordon Research Conference on *Coastal Ocean Dynamics*.
- KIETS supported a collaboration led by Dr. Keith Gubbins and Dr. Erik Santiso of NC State's Department of Chemical and Biomolecular Engineering with visiting professor Dr. Erich Müller of Imperial College London for development of the graduate course "Multi-Scale Modeling of Matter", CHE 775, as well as a graduate textbook of the same title. This course was offered during the Spring 2017 semester, to both on campus students and as an Engineering Online (EOL) course.

### **NC State Strategic Plan Goal 3: Enhance Interdisciplinary Scholarship to Address the Grand Challenges of Society**

**KIETS Goal:** Identify, develop and foster new interdisciplinary approaches in research, education, outreach that address the Grand Challenges of Society.

#### **Accomplishments:**

- KIETS supported the development of the *National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)* initiative. KIETS Director Professor Ruben G. Carbonell was one of the lead investigators that led to the establishment of NIIMBL, an institute that will become part of the Manufacturing USA Network to enhance the nation's manufacturing-based economy. NIIMBL's mission is to advance the economic competitiveness of the US biopharmaceutical industry, to create jobs and improve the economy by accelerating the development and implementation of high-impact biomanufacturing innovations that can be applied to current and future biopharmaceutical products, and to educate and train a world-leading workforce for the future of this industry. NIIMBL was formally established on March 1, 2017 by a \$70M collaborative agreement over five years from the National Institute for Standards and Technology (NIST), an institute that is part of the Department of Commerce. The aggregate cash and in-kind cost share from state and local government, industry partners, university, and non-profit partners is estimated at \$250 million, which represents roughly a three-to-one non-federal to federal funding ratio. Dr. Carbonell is serving as the initial Chief Technology Officer (CTO) of NIIMBL.
- KIETS provided support for the *Research Innovation Seed Funding (RISF) program*. RISF projects selected for support in fiscal year 2016-17 include the following:

- Dr. Christopher Adin, College of Veterinary Medicine, Development of Synthetic Bilirubin Analogues as Therapeutic Agents for Pancreatic Islet Transplantation;
- Dr. Albert Keung and Dr. Adriana San Miguel, College of Engineering, Fluidic Strategies to Shape Robust Patterning of Human Cerebral Organoids;
- Dr. Detlef Knappe, College of Engineering, Development of Appropriate Technologies to Treat Drinking Water Co-Contaminants Associated with Chronic Kidney Disease;
- Dr. Gnanamanikam Mahinthakumar, College of Engineering, Towards Understanding Nitrate Contamination Risk at the Regional Scale: A High Performance Computing Enabled Simulation-Optimization Framework;
- Dr. Barbara Quorollo, College of Veterinary Medicine, Untangling Human-Animal Transmission of Cutaneous Leishmaniasis;
- Dr. Hong Wang, College of Sciences, Single-Molecule Visualization and High-Resolution Structure of the Cohesin Complex;
- Dr. Gavin Williams, College of Sciences, Engineering Antibiotic-Producing Microbes with CRISPR for the Affordable Production of Novel Antibiotics;
- Dr. Elsa Youngsteadt, College of Sciences, Effects of Climate and Atmospheric Change on Plant-Pollinator Interactions.

To date, RISF projects have generated approximately 84 follow on proposals to external organizations of which 21 were awarded with awards totaling \$4,750,055 that represents a 4.90 leverage ratio when compared to the total ORIED/KIETS awards of \$1,274,630. In addition, 51 students have been supported, 130 publications or presentations made and 19 workshops/symposia held. KIETS Director Ruben Carbonell serves on the RISF selection and steering committee.

- KIETS is helping to support several large NC State Centers including the *FREEDM Center* and the *Statistical and Applied Mathematical Sciences Institute*. In addition, KIETS is collaborating with these centers as well as with the *ASSIST Center* to extend the value of university research to the K-12 community through its Kenan Fellows Program. The FREEDM Center collaborated with 2016-17 Kenan Fellow Deborah Scherr-Freedman of Wake Forest Middle School. SAMSI collaborated with 2016-17 Kenan Fellow Angela Stabler of Enloe High School in Raleigh.

- KIETS collaborated with the Vice-Chancellor for Research, Innovation, and Economic Development to develop and launch the *Game Changing Research Incentive Program (GRIP)*. KIETS Director Ruben Carbonell serves on the GRIP selection and steering committee. Four awards were announced in fiscal year 2016-17 as follows:
  - Water Sustainability through Nanotechnology: Nanoscale Science and Engineering at the Solid-Water Interface; Collaborators: Jacob Jones, David Berube, Douglas Call, Jan Genzer, Detlef Knappe, Yaroslava Yingling, Mohammed Zikry (NCSU); Young Chul Choi, Khara Grieger (RTI); Susan White (WRRRI); and many other participants at NC State, RTI, UNC, and Duke;
  - Computer Science for All K-12 Students; Collaborators: Glenn Kleiman, Eric Wiebe, James Lester, Tiffany Barnes (NCSU); Kimberly O’Mally (RTI);
  - 3D Printing of Fibrous Tissue Engineered Medical Products: A New Paradigm for Tissue Biofabrication and Therapeutics; Collaborators: Behnam Pourdeyhimi, Frances S. Ligler, Benoit Maze, Matthew B. Fisher, Rohan A. Shirwaiker, Kyle G. Mathews (NCSU); Shawn D. Hintgen, Jeffrey T. Spang, Bruce Cairnes (UNC-Chapel Hill);
  - The NCSU/RTI Program In Genetic Discovery and Prediction (PGDP); Collaborators: Fred Wright, Alison Motsinger, Jung-Ying Tzeng, Zhao-Bang Zeng, Yi-Hui Zhou, Marie Davidian, Spencer Muse, Siddhartha Thakur (NCSU); Carol Hamilton, Wayne Huggins, Rebecca Boyles, James Balhoff, Stephen Hwang, Michelle Krzyzanowski.

**NC State Strategic Plan Goal 4: Enhance Organizational Excellence by Creating a Culture of Constant Improvement**

**KIETS Goal:** Seek opportunities for professional training, to save costs, maximize efficiency and enhance resources for KIETS operations and improve services to our stakeholders.

**Accomplishments:**

- The Kenan Fellows Program continue refine its processes and adapt novel strategies for improved program effectiveness, outcomes, and impact while implementing strategies for long-term sustainability. The Kenan Fellows Program implemented recommendations from a recent sustainability review by developing collaborations with school districts in NC including the Greene County school system and the Charlotte – Mecklenburg school system.

- In 2016-17, KIETS core operating and program investments of \$1,396,670 were leveraged by approximately \$16,105,957 in complementary funding from NC State University and external partners. While only a portion of these funds flows directly through KIETS, the resulting impact of the Institute's ability to enable leveraged support for its programs is significant and continues to grow annually. KIETS continued to maintain a healthy and active portfolio of 30 supported projects representing a 62% turnover ratio and 33% new projects in fiscal year 2016-17.
- KIETS is working collaboratively with the NC State Advancement on the NC State Campaign to identify and develop resources for priority initiative such as the Kenan Fellows Program. KIETS Board member John Atkins is serving as the Chair of the KIETS Campaign cabinet in collaboration with KIETS Director Ruben Carbonell and Kenan Fellows Program Assistant Director of Development Kelly Vogel.
- The Kenan Institute successfully managed the transition of three staff members Craig Tucker, Shelley Sutton and Ena Meng. Craig Tucker took a new position with the NC DPI working with Charter Schools. Ms. Shelley Sutton left the Kenan Institute pursuant to a personal move. Ms. Ena Meng retired after 16 years of service to NC State University. Ms. Cordella Rashid was named the KIETS Assistant Director of Grants and Finance in March 2017 and Ms. Tara Spivey joined the Kenan Institute as a University Program Associate in June 2017. In response to the staff transitions, KIETS made improvements to its administrative structure that enabled more efficient and effective use of Institute resources.
- KIETS' Kenan Fellows Program won the "Golden Gear" award for Higher Education Department of the Year on Wednesday, May 24, 2017 at the second annual STEMmy Awards hosted by US2020 Research Triangle Park (RTP) at the Research Triangle Park Headquarters. This represents the second year in a row that the KFP has been selected for this honor among many other well-regarded programs.
- KIETS continued to update its website ([www.ncsu.edu/kenan](http://www.ncsu.edu/kenan)) and identity materials to better align with the branding of NC State, provide easier website and social media management, and enhance the overall website visitor experience.

### **NC State Strategic Plan Goal 5: Enhance Local and Global Engagement Through Focused Strategic Partnerships**

**KIETS Goal:** Seek and support efforts that will inform public policy and engagement for the benefit of North Carolina and the Nation.

## Accomplishments:

- KIETS continued its partnership with the Gordon Research Conferences, helping young scientists and engineers throughout the world to be exposed to state of the art research through the *Gordon-Kenan Graduate Research Seminars*. From 2001 to 2013, GKRS/GRC Chairs have raised \$44 million from federal funding and \$90 million from private industry partners. 5,920 North Carolina scientists representing 507 organizations attended GRC and GKRS programs during that time. In addition, five GRC chairs and 88 GRC speakers were from NC State University. In fiscal year 2016-17, three new GKRS programs have been held to date with 139 attendees participating and an average attendance of 46 attendees per seminar. The Gordon Research Conferences (GRC) grew its offering of Gordon Research Seminars from 88 in 2013 to 147 Gordon Research Seminars in 2017. The GRC credits the Kenan Institute for their explosive growth of the GKRS program.
- KIETS supported and advised the *IEI Faculty Fellows for Public Policy Engagement program* to help enable faculty engagement in significant research and outreach activities associated with recent IEI Forum topics. In fiscal 2016-17 year, IEI has used Kenan funding to collaborate purposefully with five faculty members and eleven students. Projects supported include the following:
  - *FutureWork (three projects: 1 faculty member, 3 students).*
  - *InnovateNC (2 projects: 2 faculty members, 5 students).*
  - *Emerging Issues Commons (1 project: 1 faculty member, 1 student).*
  - *Text, Talk, Future (1 project: 1 faculty member, 3 students).*
- KIETS helped support and advise two Kenan Creative Collaboratory supported programs including the *Innovate NC* initiative and the *NC Venture Labs* initiative. Innovate NC has developed an Asset Map which is believed to be the first turnkey tool of its kind developed for community-led innovation mapping. KIETS Associate Director Raj Narayan participated with the Innovate NC strategic partnership / steering committee. The Innovate NC Initiative continues to make great progress and the local innovation councils have received their quantitative data and are synthesizing the extensive comments into strategic plans. Students from Chapel Hill and Duke have been working with communities to assess their policy landscapes and assist with their strategic plans. The Innovate NC initiative has also led to the development of a proposal for a North Carolina Community Innovation Fund led by the NC Board of Science and Technology that would be a competitive

grant program to help accelerate entrepreneurial activity in select communities. This proposal and budget has been included in the Governor's budget proposal for fiscal year 2017-18. UNC-TV is producing a story that will feature the Innovate NC initiative. The NC Venture Lab initiative is currently in the fourth semester of implementation and has grown in enrollment of students from six students in the Fall 2015 semester to 22 students in the Spring 2017 semester. The Spring 2017 presentations were held on April 27, 2017 featuring student project sponsors Bell and Howell, Biologics, GoLoCo, Pentair, Ply Gem, NC Biotechnology Center, State of NC Innovation Lab, Technoflex, and USAA.

- KIETS supported the NC Sea Grant Community Collaborative Research Grant Program. KIETS Associate Director Raj Narayan serves on the CCRG review and steering committee. As a result of KIETS support, four successful proposals were awarded in 2016-17 including the following:
  - *Spatial and Biogeomorphic Properties of Oligohaline Marshes in Currituck Sound: Implications for Response to Sea-Level Rise*; James “Bo” Dame of Chowan University, with Heather L. McGuire of Chowan, along with Brandon Puckett of the North Carolina Coastal Reserve and Robbie Fearn of the National Audubon Society;
  - *Cape Shark Project*; Evan Ferguson of Cape Hatteras Secondary School, along with Jeffrey Aiken of Jeffrey’s Seafood, and Rev. Richard Joyner of the Conetoe Family Life Center;
  - *Quantifying and Communicating the Function of Restored Estuarine Habitats*; Michael F. Piehler of the University of North Carolina at Chapel Hill’s Institute of Marine Science, with Pat Donovan-Potts of the City of Jacksonville, Carolyn Currin of the NOAA National Ocean Service, Jennifer Dorton of the N.C. Sentinel Site Cooperative and Susan Cohen of U.S. Marine Corps Base Camp Lejeune;
  - *The 1997 Fisheries Reform Act: An Oral History Perspective*; Susan West of Buxton, with Jimmy Johnson of the Albemarle-Pamlico National Estuary Partnership, Sandra Davidson of Bit & Grain, Mary Williford of the Southern Historical Collection at UNC-CH, Barbara J. Garrity-Blake of Duke University Marine Lab, and Karen Amspacher of the Core Sound Waterfowl Museum and Heritage Center.
- KIETS supported a partnership with the NC Coastal Federation and NC Sea Grant regarding their *Environmental Restoration as a Viable Economic Strategy for Success in Rural Coastal Communities Initiative*. Kenan Institute support led to the development of an economic strategy that would use environmental restoration as an economic development tool. The strategy was presented at an economic summit held in Raleigh on March 22 and 23,



2017. At the foundation of this strategy is the need to expand aquaculture for oysters and finfish to provide the catalyst for a broader and coordinated environmental restoration program along the entire coast. The Coastal Federation is working actively with the N.C. Department of Environmental Quality and the N.C. General Assembly to engage these critical stakeholders in the development of the plan. As a result, the N.C. General Assembly has already charged the new UNC Policy Collaboratory to study shellfish aquaculture needs and report those needs to lawmakers by December 31, 2018.

- KIETS participated in the NC State Global Training Initiative Entrepreneurship Pitch Sessions with visiting international scholars in September 2016 helping provide feedback on their business plan development. KIETS Associate Director Raj Narayan served as a panel member providing feedback to the participants.
- KIETS supported the 2016 Research Triangle Environmental Health Collaborative Summit held on December 8-9, 2016 titled *Community Engaged Research and Citizen Science: Advancing Environmental Public Health to Meet the Needs of Our Communities*.
- KIETS supported the 2016 Agricultural Biotechnology Summit organized by the NC Biotechnology Center and held in September 2016 at the Friday Center in Chapel Hill. Over 130 attendees from approximately 60 organizations, including national and international industry and academia and their scientists, business development professionals participated in the meeting. The AgBiotech Initiative has continued to implement the Ag Biotech Industry in the Classroom, a hands-on professional development workshop for middle and high school science and agriculture teachers with activities, lectures and discussions on biotechnology's role in agriculture. To date, more than 100 K-12 teachers have received this training. Some of the instructors for this workshop are Kenan Fellows.
- KIETS collaborated with the Research Triangle Park (RTP) Foundation and TUCASI to launch the *Catalysts for Innovation* initiative. The purpose of the initiative is to support university activities that would benefit from a partnership leveraging the RTP, Triangle universities, and the private sector. The vision is to make North Carolina the leading incubator for innovative ideas leveraging the intellectual, physical and economic assets located in the Research Triangle Park Region and North Carolina. Two projects selected for support through the Catalysts for Innovation include the following:
  - *Biomedical Innovation Collaborative for Veteran Entrepreneurs at the Frontier*. The UNC/NC State Department of Biomedical Engineering (BME) will lead the effort in close collaboration with Bunker Labs RDU to

help veteran entrepreneurs identify and develop innovative biomedical solutions that can positively impact quality of life. Since October 2016, this effort has hosted or co-hosted four events that have brought together the biomedical community. This includes an event on European Medical Device Regulations in partnership with NC BIO, an “Industry Showcase Event” with the Biomedical Engineering Society (BMES) RTP Industry chapter, a Fireside Chat focused on Medical Economic Trends in collaboration with the Duke MedX NeuroInnovations group, and a professional forum on Advanced Manufacturing. In partnership with the Triangle Global Health Consortium, the PIs have also started a 5-month long innovation bootcamp focusing on two problem areas: Clinic-in-a-Box and Disease Vectors. 10 faculty members, 15 undergraduates, and four graduate students are engaged in this project.

- *EcoPRT Automated Transit in Research Triangle Park* – This effort is a collaboration of NC State’s Department of Mechanical and Aerospace Engineering along with NC State and UNC’s Departments of Computer Science as well as NC State’s Department of Electrical and Computer Engineering. The PIs are developing a novel transit solution called EcoPRT exploring its uses on RTP and establishing RTP as an automated transportation R&D hub with multi-university collaboration. The PIs have indicated that they are in the process of building their second prototype vehicle, conducting autonomous testing including aspects of networking, mapping and obstacle detection and exploring the interests of demand routes within the RTP with potential users and corporate partners in collaboration with the RTP Foundation. 4 faculty members are involved, 10 undergraduate students, 10 graduate students, 3 corporate partners engaged, and 1 invention disclosure submitted.

**KIETS Goal:** Support strategic partnership among industry, state government, federal agencies, and state school districts to enhance STEM education in our schools.

**Accomplishments:**

- KIETS continued to support the growth of the *Kenan Fellows Program for Curriculum and Leadership Development*, engaging a large number of industrial partners, non-profits, federal agencies such as the NSF, the DPI, and numerous communities and individuals throughout NC. The Class of 2016-17 was chosen through a competitive application process from 128 applications submitted from 39 school districts. The 41 Fellows selected from this group represent 13 North Carolina counties, one of which (Anson) was new to the program. Each of the 41 Fellows in the cohort for 2016-17 completed a 3-5 week internship with a mentor in a STEM research or applied STEM setting. They also completed 80 hours of professional development provided through two Professional Advancement Institutes

(PAI) and 24 hours of personalized independent learning. Based on reports from the cohort of 2016-17, more than 1,200 K-12 students were engaged in lessons designed through the Kenan Fellowship, or experienced new instructional strategies that Fellows learned through professional development sessions. Parents, school administrators, teachers and others were among the more than 1400 individuals to whom the 2016-17 cohort made presentations. Three Fellows are recipients of the 2017 Burroughs Wellcome Fund Career Award for Science and Mathematics Teachers. The award provides \$175,000 over a five-year period as well as professional development opportunities to recipients. The Fellows include Kirk Kennedy, Duplin County Schools, Brad Rhew, Winston-Salem Forsyth and Melaine Rickard, Alamance-Burlington Schools. Kenan Fellow Erin Lawrence was the winner of the 2017 NC SMT Outstanding 9-16 Educator Award in Science, Mathematics, and Technology Education. Kenan Fellow LaTanya Patillo was named the Governor's Teacher Advisor. The Kenan Fellows Program published the second edition of the Journal of Interdisciplinary Teacher Leadership (JoITL) in January. The third issue is scheduled to be published online July 31, 2017. With support from the Biogen Foundation, the Kenan Fellows Program for Teacher Leadership is planning its inaugural North Carolina Teacher Leadership Symposium on Tuesday, Aug. 1 in Greenville, NC. Kenan Fellows Alumni will lead the one-day Symposium. Over the past year, 58 Kenan Fellows alumni have volunteered their time to the Kenan Fellows Program serving on application review and interview teams, the Journal editorial team, Professional Development Steering Committee. In the past year, Kenan Fellows have led approximately 2,961 hours of professional development courses averaging 37 hours per fellow with an estimated value to NC of approximately \$1.7- \$3.5 million. The Kenan Fellows Program also launched its first Education Policy Summit in June 2017.

- KIETS supported the *NC Museum of Natural Sciences Educators of Excellence Institutes Program*. Laura Cochrane participated in 2016. She participated as a Kenan Fellow in the Students Discover project and became one of the Museum's outstanding representatives for teacher education. She was invited to meet with the evaluators from the American Alliance of Museums due to her deep understanding and appreciation of the Museum. Kenan Fellow Kayla Norville was also a Students Discover participant chosen to participate in the Tropical Ecology Institute.
- In 2015-16, KIETS collaborated with the National Academy of Engineering to support the *EngineerGirl* initiative. *EngineerGirl* impacts thousands of students around the world each day and has received over 57,000 unique visitors per month in 2016. The program generated 817 individual entries to the 2017 essay contest (up from 770 entries in 2016) from students around the world. In January of 2017, EngineerGirl launched the Where They Work Directory on the site to highlight the many organizations where engineers

work and make a difference. Christy Wilson, a Kenan Fellow, served on the program's steering committee and provided valuable guidance in developing the essay contest topics for 2017 and for 2018, plans for dissemination of materials, and plans for future improvements on the site.

- KIETS supported the collaboration with the *NC Public School Forum Education Policy Fellows* program. For 2016-17, Kenan Fellows Jordan Hohm and Jerica Morgan participated in the program.
- In 2016-17, on the referral of Kenan Fellow Nancy Cattrell, Apex Friendship High School teacher Dan Jackson worked with KIETS Associate Director Raj Narayan to develop the Applied Synergies Partnership (ASaP) Entrepreneurship Leadership Program focused on enabling entrepreneurial analytical skills in his high school students. Jackson worked closely with Narayan and the NC State TEC Program faculty in the Poole College of Management to develop a clinical education program for his high school students similar to the TEC program model. 16 local industry executives including Narayan mentored 16 student teams to help them develop business plans that would be submitted for competition in the NC DECA Career Development Conference. The students were also hosted by the Kenan Institute to visit NC State University including the Hunt Library, BTEC, and NC State Entrepreneurship Clinic. Moreover, student teams who were finalists for the state DECA competition were also invited to present their business plans at the TEC program in preparation for their competition and some collaborated with NC State STEM faculty in the ASSIST program on their product development. The result of this effort was an experiential entrepreneurial pedagogical model aligned with the NC Standard course of study, which culminated through the DECA state competition. Of the sixteen teams that participated, eleven competed at the state competition and three teams were invited to the international competition in Anaheim, CA. Moreover, 97% of the students who participated in the program and took the state-mandated end-of-course-assessment met or exceeded the test proficiency levels in contrast to the state average of 73% for all test takers.
- KIETS supported Ingenuitas, a 501(c) (3) not-for-profit organization led by Kenan Institute Trustee Dr. Juan Luis Torres, to develop pragmatic solutions to health problems in the developing world, particularly in areas with significant deficiencies in infrastructure, such as lack of electricity, adequate water supply, or clean environment. Over fifty STEM HS students have been involved with Ingenuitas and the attendance has averaged between 30-40 students five days a week during after-school hours. Currently, the principal project is the construction of a prototype mosquito trap of low cost and high efficiency.

**KIETS Goal:** Support the *launch of high technology start-ups* based on NC State innovations and support *technology commercialization programs* at NCSU, the State and the Nation.

**Accomplishments:**

- KIETS provided matching funds for the *Richard and Marlene Daugherty Centennial Campus Entrepreneurism Endowment* that support start-up firms initiated with university intellectual property. The Daugherty Initiative continued its collaboration with the NC State Entrepreneurship Initiative to feature the selection of the Daugherty Initiative recipients as part of the Lulu eGames. The 2016 awardees *Smart Material Solutions* and *Third Floor Materials* have gone on to raise close to \$1.7 million in follow on funding. 2017 award winners include *Lumeova*, *Brestrem*, and *Insight Finder*. The Daugherty Initiative reports a 4,714% ROI to date. KIETS Director Ruben Carbonell serves on the Daugherty Initiative Governance committee.
- In 2016-17, KIETS continued to work collaboratively with the NC State Office of Technology Transfer, NC State Entrepreneurship Initiative, and NC State Poole College of Management to develop the *Wolfpack Investor Network (WIN)* initiative focused on connecting alumni investors with promising NC State-affiliated startup companies to facilitate angel investments. KIETS Associate Director Raj Narayan serves on the WIN Managing Director Selection Committee and the WIN Steering Committee. WIN has grown to 58 members in less than 8 months and invested in five portfolio companies. Over 12 NC State MBA students and MS/PhD students have served on the diligence teams. Approximately 10 faculty members have aided in the WIN screening processes. More than 80 company applications have been reviewed and the WIN program has generated approximately \$950K in investments in portfolio companies through the network. In addition, the NCSU Endowment Board approved a university sidecar fund named the Seed Capital Endowment Fund (SCEF) to invest in WIN deals that qualify for SCEF funding.

**KIETS staff also served in leadership and advisory roles in several initiatives at NC State and with external groups.**

**Accomplishments:**

- KIETS Director Dr. Ruben Carbonell served on the RISF Selection Committee, the GRIP Selection Committee, the IEI National Advisory Board, the COE Executive Committee, the Daugherty Endowment Board, the Advisory Board for the FSU-FAMU Chemical Engineering Department, the BRITE Director Search Committee, the NC BioImpact Implementation Group, the NCBC Ag Biotechnology Council, the National Academy of Engineering's Audit

Committee and President's Circle, the Plant Sciences Initiative Leadership Committee, the Kenan Institute for Private Enterprise Advisory Board, the IEI Director Recruitment and Selection Committee, the Executive Committee of the NC Association for Biomedical Research, and as Chief Technology Officer for the National Institute for Innovation in Manufacturing Biopharmaceuticals.

- KIETS Associate Director Raj Narayan served on the Chancellor's Innovation Fund selection committee, as a TEC Program Executive in Residence and Mentor, NC State Industry Liaisons Working Group, the NC Sea Grant CCRG Review Committee, the Wolfpack Investor Network (WIN) Steering Committee, the WIN Managing Director Recruitment and Selection Committee, the Kenan Institute of Private Enterprise (KIPE) Review Committee, and the Board of Directors of Xanofi, a startup company based on NC State innovation. He was also an active participant in the NC Eisenhower Fellows, Marshall Memorial Fellows, and NC William C. Friday Fellows alumni initiatives.
- KIETS Assistant Director for Grants and Finance Cordella Rashid participated in the ORIED eRA focus group and on the Chancellor's Unit Award for Excellence selection committee.
- KIETS University Program Associate Shelley Sutton served as the Hunt Library building liaison team on behalf the tenants of the tenants in our Hunt Library office suite. Ms. Sutton worked collaboratively with CHASS units (SPIA, Institute for Non-Profits) to successfully administer the needs of units located in the Hunt Library 5<sup>th</sup> floor office suite.
- Kenan Fellows Program Director Dr. Elaine Franklin served as the Executive Editor, Amneris Solano served as the Managing Editor, and Randy Pinion served as the Copy Editor of the Kenan Fellows Program Journal for Interdisciplinary Teacher Leadership.
- Ms. Lisa Hibler, Associate Director for Program Operations for the Kenan Fellows Program served as a member of the NC State RET Advisory Board, as a reviewer for the Albert Einstein Distinguished Educator Fellowship, as a reviewer for the Presidential Awards for Excellence in Mathematics and Science Teaching, and as a member of the Education Committee for the Wake County Chapter of the American Chemical Society.
- Ms. Kelly Vogel, Assistant Director of Development for the Kenan Fellows Program served on the NC State Campaign Operation Workgroup on Volunteer Leadership Management and as a participant in the Triangle Chapter of the Association of Fundraising Professionals Mentor / Professional Development program. She will serve as a new NC State Staff

Senator Effective July 1, 2017, representing groups under the Chancellor's Unit.

### **Recommendations and Concerns for the Future**

In order to build on its past successes, the Kenan Institute will require continued commitment and financial support from its partners including NC State University, the Kenan Fund for Engineering, Technology & Science, and other universities, foundations, and government partners.

In addition, it will be essential for leadership from within the University, Kenan Fund, and industry to work closely with the Institute's leadership to serve as high-level advocates on behalf of Institute programs such as the Kenan Fellows Program. This strategic advocacy will help the Institute promote the impact of its programs and build its reputation as an honest broker of best practices in research, education, entrepreneurship, and public policy. In addition to financial support, the Institute will need continued in-kind support from the University such as the office space provided in the Hunt Library and support from units such as the Office of Advancement, Office of Communications, and Office of Sponsored Programs' Integrated Support Services Center.

Ultimately, these are issues related to the sustainability of the Institute and its programs and how the Kenan Institute is regarded in terms of University fundraising priorities.