The University of Georgia

Office of the Vice President for Research

April 10, 2015

To the Franklin College Faculty Senate:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. The Office of the Vice President for Research has agreed to serve as the institutional home for the Center, because the Center will provide a rallying point and infrastructure for scholars across UGA's campus to engage in research of national and international importance about undergraduate education in Science, Technology, Engineering, and Mathematics (STEM). Research of this caliber will bring additional funding to UGA and will position UGA to lead the nation in this important area.

In the past year, members of the nascent SEER Center have made significant progress. More than twenty faculty have been engaged in formal and informal discussions of how the SEER Center can bring about more research funding and higher-impact research. SEER Center members are currently planning, within the next several months, to submit cross-college proposals for research on the development of active-learning expertise among college instructors, to improve STEM preparation for pre-service K-12 teachers, and to create and test technology-based learning tools in undergraduate classrooms at UGA.

In the past, OVPR has supported individual UGA STEM education researchers, and they have succeeded in obtaining more than $6 million in funding in the past five years. Yet given calls from the White House and other federal and private agencies to improve U.S. STEM education and increase the STEM workforce, even more significant amounts of funding are available for groups doing research on STEM education.

For these reasons, I offer the support of OVPR by committing to serve as the institutional home of the SEER Center.

Sincerely,

David Lee, Ph.D.
Vice President for Research

150 Paul D. Coverdell Center for Biomedical and Health Sciences
Athens, Georgia 30602 • Telephone 706-542-5969 • Fax 706-542-5978

1785
The University of Georgia

Franklin College of Arts and Sciences
Office of the Dean

April 22, 2015

To the Franklin College Faculty Senate:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. I believe the Center will provide the appropriate institutional structure for a group of scholars who are developing an innovative cross-college collaboration that will generate cutting-edge findings about undergraduate education in Science, Technology, Engineering, and Mathematics and will translate those findings for faculty, postdocs, graduate students, and undergraduates. The proposed work of the SEER Center will benefit the University of Georgia community and will also position UGA to lead the nation in this area of research that addresses important national needs.

The SEER Center initiative has made significant and validating initial progress during the past year. Starting with a retreat at the State Botanical Garden of Georgia in August, more than twenty faculty have been engaged in discussions of how the SEER Center can bring about more research funding, higher-impact research, and new creative opportunities for UGA academic units to align their teaching practices with current findings from STEM education research. Already plans are underway among proposed SEER Center members to submit cross-college proposals for research on the development of active-learning expertise among college instructors, to improve STEM preparation for pre-service K-12 teachers, and to create and test technology-based learning tools in undergraduate classrooms at UGA.

Through past and recent efforts UGA has positioned itself to lead the nation in STEM education research. We have done this by hiring and promoting a significant number of individuals who conduct STEM Education research and implement this knowledge into STEM classrooms; supporting these faculty to succeed in obtaining funding and recognition for their research; constructing the Science Learning Center that will open in 2016 to promote improved methods of STEM teaching and learning; and creating the Endowed Professorship in Innovative Science Education to recruit to UGA a scholar who can join an already distinguished group of STEM education researchers who are Meigs Professors, USG and UGA teaching award winners, and endowed professors.

With the attached proposal, we have another opportunity to be a leader in educational research at the undergraduate level. The SEER Center can leverage UGA's current contributions in order to encourage the acquisition of additional funds and, thus, to generate and translate more knowledge.

For these reasons, I offer the support of Franklin College by committing to provide administrative support to the SEER Center for the first three years of its existence.

Sincerely,

Alan T. Dorsey, Dean
Franklin College

The University of Georgia

Department of Mathematics

July 9, 2015

To the Franklin College Senate:

I am writing in support of the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. As outlined in the proposal, research in STEM education is a recognized area of national need. In 2012 the President's Council of Advisors on Science and Technology reported to President Obama the need to produce one million additional STEM graduates over the next decade. The report specifically called for research into better teaching methods and federal agencies have responded by directing grant dollars for this purpose.

There are several faculty in the Franklin College already engaged in STEM Education research. In the Mathematics Department, Meigs Professor Sybilla Beckmann is a nationally recognized leader in the reform of early and middle school mathematics education, Professor Jason Cantarella has an NSF funded project studying the engagement of calculus students through robotics projects, and we have just hired an Academic Professional, Kelly Black, who currently holds NSF funds to study the engagement of calculus students through physics intuition. The creation of the SEER center will help these faculty network with other UGA faculty involved in STEM educational research, forming new opportunities for collaboration, funding, and dissemination of the their research findings.

The SEER Center will also help to communicate new STEM education methods and best practices to all of our faculty through seminars and professional development events. This is critical in bringing to scale new research findings for our undergraduate courses. Our STEM gateway courses (pre-calculus through differential equations, with over 5500 seats per year) stand to benefit immensely from these new findings. To support this, I am willing to contribute $500 of departmental funds to bring in a speaker on mathematics (higher ed) education in FY 16 for the SEER seminar series.

Sincerely,

Malcolm R. Adams
Professor and Department Head
Mathematics

The University of Georgia

I. Jonathan Amster, *Head*
Geoffrey D. Smith, *Associate Head*
Lauren Bowman, *Administrative Assistant*

Department of Chemistry

Chemistry Building
Athens, Georgia 30602-2556
Telephone (706)542-2726
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jamster@uga.edu
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April 17, 2015

Franklin College Faculty Senate
University of Georgia

Dear Colleagues:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. Professors Norbert Pienta and Richard Morrison are Department of Chemistry faculty members who engage in Chemistry Education Research education research. Norb Pienta is proposed to be a Core Faculty in the SEER Center. Profs. Pienta and Morrison already conduct research of the type being promoted as part of SEER but also are involved in applying that work and the similar work of others into the General Chemistry and Organic Chemistry programs. However, we anticipate that with their SEER colleagues, the Center will provide a rallying point and cross-college collaboration with other STEM education researchers that will yield more research funding, higher-impact research, and creative opportunities for the Department of Chemistry and the University to align our teaching practices with current findings from STEM education research.

Chemistry is happy to support the SEER Center because of its potential to improve the productivity of STEM education researchers like Drs. Morrison and Pienta. Federal and private agencies are providing significant amounts of funding for individuals and groups doing research on STEM education; collaborations promoted by the SEER Center will help this group obtain new research grants from NSF and NIH, among others. Moreover, we expect that the SEER Center will provide resources to expedite aspects of research and scholarship, including a graduate assistant who will assist core faculty members with the collection and analysis of data.

Chemistry will continue to support other activities of the Chemistry Education Research Division. We will partner with the SEER Center to host one event in an annual seminar series featuring nationally recognized leaders in STEM education research. Also, the SEER Center will host professional development events to assist our faculty in translating current findings about teaching and learning in STEM to our introductory courses in general and organic chemistry, that serve over 7000 course enrollments per year. Finally, I expect our department to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of our department for grant dollars.

Chemistry is willing to contribute $1000 of department funds in FY16 and FY17 as seed funding for the SEER Center and to work with Profs. Pienta and Morrison to negotiate an appropriate percentage of indirect cost returns to the SEER Center on future grants.

Sincerely,

Jon Amster

Jon Amster
Professor and Head of Chemistry

The University of Georgia
Franklin College of Arts & Sciences
Department of Plant Biology

April 17, 2015

To the Franklin College Faculty Senate:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. Drs. Peggy Brickman and Kathrin Stanger-Hall are members of the Plant Biology faculty who engage in STEM education research and are proposed to be a Core Faculty in the SEER Center. While both Dr. Brickman and Stanger-Hall already produce high-quality scholarship and assist our department by translating their findings in their classes and with their colleagues, the SEER Center will provide a rallying point and cross-college collaboration with other STEM education researchers that will yield more research funding, higher-impact research, and creative opportunities for the Department of Plant Biology and the University to align our teaching practices with current findings from STEM education research.

I am eager to support the SEER Center because of its potential to improve the productivity of STEM education researchers like Dr. Brickman and Dr. Stanger-Hall. Federal and private agencies are providing significant amounts of funding for individuals and groups doing research on STEM education. The collaborations promoted by the SEER Center will help UGA obtain new research grants from NSF and NIH, among others. Moreover, the SEER Center will provide resources to make Dr. Brickman and Dr. Stanger-Hall research more efficient, including a graduate assistant who will assist core faculty members with the collection and analysis of data.

The SEER Center will help our department in other ways too. We will partner with the SEER Center to co-sponsor one lecture in their annual seminar series that will feature nationally recognized leaders in STEM education research. Also, the SEER Center will host professional development events to assist our faculty in translating current findings about teaching and learning in STEM to our undergraduate courses, particularly PBIO1210 and PBIO1220 which serve more than 300 UGA undergraduates per year. Finally, I expect our department to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of our department for grant dollars.

For these reasons, I am willing to contribute $700 of department funds in FY16 and FY17 as seed funding for the SEER Center. I am also willing to work with Drs. Brickman and Stanger-Hall to negotiate an appropriate percentage of future indirect cost returns that result from grants involving SEER faculty that generate new indirect funds that can be used to run the Center for the benefit of the research teaching mission of SEER faculty, their home departments, and UGA, as a whole. Implementation of any indirect cost return policy would also be scrutinized to assure it is applied fairly across departments involved in the Center

Sincerely,

Dr. Lisa Donovan
Distinguished Research Professor and Department Head, Plant Biology

2502 Plant Sciences • Athens, Georgia 30602-7271 • Telephone (706) 542-3732 • Fax (706) 542-1805

The University of Georgia

Department of Statistics

Nicole A. Lazar, PhD
Professor and Interim Head
Department of Statistics
University of Georgia
Athens, GA 30602
tel: (706) 542-0632
email: nlazar@stat.uga.edu

To the Franklin College Senate:

I am writing in support of the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. As outlined in the proposal, research in STEM education is a recognized area of national need. In 2012 the President's Council of Advisors on Science and Technology reported to President Obama the need to produce one million additional STEM graduates over the next decade. The report specifically called for research into better teaching methods and federal agencies have responded by directing grant dollars for this purpose.

There are several faculty in the Franklin College already engaged in STEM Education research. In the Statistics Department, Associate Professor Jennifer Kaplan is a nationally recognized leader in statistics education at the undergraduate level, whose research on lexical ambiguity and reforming the introductory statistics class is funded by NSF. Senior Lecturer Christine Franklin is internationally known for her work on reforming statistics education at all levels. The creation of the SEER center will help these faculty network with other UGA faculty involved in STEM educational research, forming new opportunities for collaboration, funding, and dissemination of the their research findings.

The SEER Center will also help to communicate new STEM education methods and best practices to all of our faculty through seminars and professional development events. This is critical in bringing to scale new research findings for our undergraduate courses. Our STEM gateway courses (primarily introductory statistics, STAT 2000 and MSIT 3000, which together train thousands of students a year) stand to benefit immensely from these new findings. As part of my support for the SEER Center initiative, we are sponsoring a talk by Amy Froelich (Iowa State University) in the Science of Teaching and Learning seminar series, also part of our departmental colloquium series.

Sincerely,

Nicole Lazar

The University of Georgia

Franklin College of Arts and Sciences
Department of Cellular Biology

April 15, 2015

To the Franklin College Faculty Senate:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. Dr. Julie Stanton is a member of the Cellular Biology faculty who engages in STEM education research and is proposed to be a Core Faculty in the SEER Center. While Dr. Stanton already produces high-quality scholarship and assists our department by translating her findings in her classes and with her colleagues, the SEER Center will provide a rallying point and cross-college collaboration with other STEM education researchers that will yield more research funding, higher-impact research, and creative opportunities for the Department of Cellular Biology and the University to align our teaching practices with current findings from STEM education research.

I am eager to support the SEER Center because of its potential to improve the productivity of STEM education researchers like Dr. Stanton. Federal and private agencies are providing significant amounts of funding for individuals and groups doing research on STEM education. The collaborations promoted by the SEER Center will help Dr. Stanton obtain new research grants from NSF and NIH, among others. Moreover, the SEER Center will provide resources to make her research more efficient, including a graduate assistant who will assist core faculty members with the collection and analysis of data.

The SEER Center will help our department in other ways too. We will partner with the SEER Center to host one event in an annual seminar series featuring nationally recognized leaders in STEM education research. Also, the SEER Center will host professional development events to assist our faculty in translating current findings about teaching and learning in STEM to our undergraduate courses, particularly Cell Biology CBIO3400, Developmental Biology CBIO3300, Neurobiology CB3800, and Immunology CBIO4100, which serve more than nine hundred UGA undergraduates each year. Finally, I expect our department to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of our department for grant dollars.

For these reasons, the Cellular Biology Department will contribute $2000 in FY16 and FY17 as seed funding for the SEER Center.

Sincerely,

Kojo Mensa-Wilmot, Professor
Head of Department

Email cbiohead@uga.edu • Telephone 706-542-3355 • 724 Biological Sciences Building • Athens, GA 30602-2607

The University of Georgia

The Department of Genetics

April 15, 2015

To the Franklin College Faculty Senate:

I am pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center. Drs. Tessa Andrews, Mary Bedell and Norris Armstrong are members of the Genetics faculty who engage in STEM education research and are proposed to be Core Faculty in the SEER Center. While they already produce high-quality scholarship and assist our department by translating their findings in their classes and with their colleagues, the SEER Center will provide a rallying point and cross-college collaboration with other STEM education researchers that will yield more research funding, higher-impact research, and creative opportunities for the Department of Genetics and the University to align our teaching practices with current findings from STEM education research.

The SEER Center has great potential to improve the productivity of STEM education researchers in my department. Federal and private agencies are providing significant amounts of funding for individuals and groups doing research on STEM education. The collaborations promoted by the SEER Center will help my faculty obtain new research grants from NSF and NIH, among others. Moreover, the SEER Center will provide resources to make their research more efficient, including a graduate assistant who will assist core faculty members with the collection and analysis of data.

The SEER Center will help our department in other ways too. We will partner with the SEER Center to host one event in an annual seminar series featuring nationally recognized leaders in STEM education research. Also, the SEER Center will host professional development events to assist our faculty in translating current findings about teaching and learning in STEM to our undergraduate courses, particularly GENE 3000 and GENE 3200, which together serve more than 1200 UGA undergraduates per year. Finally, I expect our department to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of our department for grant dollars.

For these reasons, I will contribute $700 of department funds in FY16 and FY17 as seed funding for the SEER Center and to work with Genetics faculty to negotiate an appropriate percentage of indirect cost returns to the SEER Center on future grants that are facilitated by SEER.

Sincerely,

Allen J. Moore
Distinguished Research Professor
Head of Department of Genetics
ajmoore@uga.edu

The University of Georgia

Christopher M. West
Professor & Head

Department of Biochemistry and Molecular Biology

Fred C. Davison
Life Sciences Complex, B129
120 East Green Street
Athens, Georgia 30602-7229

August 4, 2015

Re: Proposal for **Scientists Engaged in Education Research**

To the Franklin College Faculty Senate:

The Department of Biochemistry & Molecular Biology (BCMB) is pleased to support the attached proposal to establish the SEER (Scientists Engaged in Education Research) Center at UGA. Dr. Paula Lemons, who would be a Core Faculty member of the proposed center, is a tenured member of BCMB. She is already strongly engaged in STEM education research, with substantial extramural funding to support her high-quality scholarship, and she contributes importantly to our departmental educational enterprise by translating her findings to classes taught by both herself and her colleagues. The SEER Center will help her and peers elevate their efforts to the next level by providing a platform to partner with other STEM education researchers across campus to generate yet more research funding, higher-impact research, and creative opportunities for their respective home departments. The increased alignment of our teaching practices with current findings from STEM education research will substantially enhance the quality of and accessibility to our science curricula at UGA.

I am excited to support the SEER Center because of its potential to improve the productivity of STEM education researchers like Dr. Lemons. Federal and private agencies are providing substantial funding for individuals and groups doing research on STEM education. The collaborations promoted by the SEER Center will help Dr. Lemons obtain new research grants from NSF and NIH, among others. The proposed Center is expected to support other departmental faculty, such as Dr. Amy Medlock, in education research. Moreover, the SEER Center will provide resources to make their research more efficient, potentially including a graduate assistant who will assist core faculty members with the collection and analysis of data.

The SEER Center would synergize with our department in multiple ways as well. We will partner with the SEER Center to host one event in an annual seminar series featuring nationally recognized leaders in STEM education research. The SEER Center will host professional development events to assist our faculty in translating current findings about teaching and learning in STEM to our undergraduate courses, particularly BCMB 3100, 4010, and 4020, which serve more than 1500 UGA undergraduates per year. Finally, I expect our department to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of our department for grant dollars.

Thus, on behalf of the department, I am willing to commit $700 of department funds in both FY16 and FY17 as seed funding for the SEER Center and to work with Dr. Lemons and other potential Center members to negotiate an appropriate percentage of indirect cost returns to the SEER Center on future grants.

Sincerely,

Christopher M. West, Ph.D.
Professor and Head of Biochemistry & Molecular Biology

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Georgia Regents University | The University of Georgia

MEDICAL PARTNERSHIP

July 31, 2015

To the Franklin College Faculty Senate:

I am pleased to express my enthusiastic support for this proposal to establish the SEER (Scientists Engaged in Education Research) Center. The faculty of the GRU/UGA Medical Partnership recognize the primary importance of undergraduate STEM programs in producing strong students who have the foundational knowledge and critical thinking skills to be successful in medical school. We are therefore supportive of any research that could further strengthen undergraduate STEM education, and view establishment of the SEER center as critical for providing the environment, resources and faculty development opportunities that would greatly enhance this type of research across the UGA campus.

While the various activities fostered by the SEER Center would undoubtedly lead to the acquisition of new funding for undergraduate STEM education research and ultimately help faculty in undergraduate STEM disciplines to implement more innovative teaching strategies, it is important to recognize that medical education on the UGA Health Sciences Campus would also benefit from the presence of this center. Because the requirements for effective basic science teaching and learning are fundamentally the same in undergraduate education and in medical education, the sharing of ideas and best practices between Medical Partnership faculty and undergraduate STEM faculty during center-sponsored activities would be of benefit to both groups.

At the Medical Partnership, we also have a cadre of basic science educators who have either recently become active in medical education research or are interested in adopting this form of scholarship. Seven of our faculty members attended the planning retreat for the SEER Center last August because these individuals are excited at the prospect of developing new scholarly collaborations with undergraduate STEM educators on the UGA campus. Medical Partnership faculty who are new to educational research would greatly benefit from the mentorship provided by the established investigators who would form the core faculty of the SEER center. The participation of our medical educators with undergraduate faculty in cross-disciplinary educational research teams would likely enhance their competitiveness for medical education research funding. Just as importantly, this could also lead to more innovative funding proposals from the larger group that recognize undergraduate science education and medical education not as separate entities but rather as interdependent phases of the same learning continuum.

For these reasons, I offer my full support for the establishment of the SEER Center as a critical step in strengthening both undergraduate STEM and medical education on the UGA campus, and in helping the University of Georgia achieve national status as a leader in STEM education research.

Sincerely,

Matthew A. Boegehold, PhD
Professor of Physiology and Basic Sciences Chair,
GRU/UGA Medical Partnership

Proposal for the UGA SEER (Scientists Engaged in Educational Research) Center
August 5, 2015

Summary of the Center:

UGA has a significant number of individuals who conduct STEM Education research and implement this knowledge in STEM classrooms. Federal and private agencies are providing significant amounts of funding for individuals and groups doing research on STEM education. The opening of the Science Learning Center in 2016 presents an opportunity to conduct research into undergraduate STEM teaching and learning. The **SEER (Scientists Engaged in Education Research) Center** will leverage these opportunities to facilitate the acquisition of new research grants in undergraduate STEM education by raising the profile and highlighting the quality and quantity of research and researchers already in this area at UGA. New grants and the research findings they generate will raise the status of UGA as a leader in educational research at the undergraduate level. We therefore propose the creation of the **SEER Center** which has as its goals to:

- *Develop grant proposals to obtain additional sources of funding for basic and applied research in STEM education*
- *Foster collaborations and professional development of faculty who engage in STEM education research across the university*
- *Raise the profile of SEER members by disseminating basic and applied research results to STEM faculty at UGA, other institutions across the Southeast, and nationally*

The SEER Center does not duplicate other efforts at UGA

More than 25 faculty at UGA conduct STEM education research focused on undergraduates. The academic homes of these faculty span six Colleges and even more departments. The infrastructure to facilitate collaborations in undergraduate STEM education at UGA is lacking, because no single unit on campus has undergraduate education research as its primary mission. For example, the Center for Teaching and Learning and Office of STEM Education focus heavily on supporting the application of research to teaching, and the College of Education focuses most heavily on research pertaining to K-12 education. The SEER center will provide the infrastructure for synergy among faculty conducting undergraduate STEM education research. It will also create the opportunity for more faculty, as well as postdoctoral associates and students, to enter the field of STEM education research and to have greater access to findings from STEM education research and experts in this field.

The SEER Center will add value to departments and Colleges at UGA

The SEER Center will improve the productivity of STEM education researchers housed in departments and Colleges across campus and will create opportunities for new research avenues for the UGA community as a whole. First, the collaborations promoted by the SEER Center will help current and future STEM education researchers obtain new research grants from NSF and NIH, among others. Second, the SEER Center will provide resources to make the research more efficient, including graduate assistants for the collection and analysis of data. Third, the SEER Center will partner with departments and Colleges to host an annual STEM education research seminar series featuring nationally recognized leaders in this area. Fourth, the SEER Center will lead professional development events to assist faculty, including STEM researchers who are not part of the Center, in translating current findings about teaching and learning into undergraduate courses. Fifth, we expect departments and Colleges to take advantage of the expertise offered by SEER Center members to design high-quality broader impact plans for their grants, potentially improving the funding rate of all academic units on campus.

Proposed Center Home: Office of Vice President for Research. *See letter of support.*

Proposed Funding for First Three years: Initial operation costs for the Center will be met through seed funding from the academic units whose faculty participate (see *letters of support*) and by applying for competitive mini-grants from UGA's Office of STEM Education. SEER Center faculty have a long track record of success in securing these mini-grants that are typically used to pay graduate research assistants. For the first three years of the Center, costs for staff support will be met via administrative assistance provided by the Franklin College Dean's Office. In the first year of Center operation, we will explore a variety of fiscal models to ensure sustainability. Potential revenue streams include the following: fees for faculty professional development events, gifts from various sources, and IDC returns from new extramural grants awarded for STEM education research. Current funding for STEM education research conducted by the proposed faculty (Appendix A) provides an estimate of the level of indirect costs that could be available for the operating costs of the Center in the future, although we expect the existence of the center will catalyze even more funding.

I. Context

There is a growing demand to transform how science is taught and learned in colleges and universities in order to meet the demand for an educated workforce and to generate a scientifically literate populace. It is widely acknowledged that the US is not rising to this challenge (AAAS 2011; White House 2012). To address this issue, federal and private agencies are increasing their investment in science, technology, engineering, and math (STEM) education. For example, the President's 2015 Budget recommends an investment of $2.9 billion in STEM education. This represents a funding increase in an environment of overall budget cuts, illustrating the high national priority being placed on STEM education (http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf).

The University of Georgia is poised to become a national leader in science STEM education research. Currently, approximately 25 faculty, across six colleges, are engaged in nationally-recognized STEM education research. These faculty have in-depth disciplinary knowledge in STEM fields, as well as rich knowledge of education theory and research, and bring diverse research approaches to complex research questions. This diverse and accomplished group of faculty puts UGA in the unique position to become the national leader in STEM education research. Several US Institutions have already invested in creating STEM centers dedicated to education research: University of Minnesota (STEM Education Center); Southern Illinois University (STEM Education Research Center); Michigan State University (CREATE for STEM Institute); and University of Colorado (Center for STEM Learning). The UGA SEER Center will serve as a catalyst for interactions and research collaborations among research faculty across colleges. These collaborations will result in competitive grant proposals in basic and applied research in the field of STEM education at the University level and will further strengthen the national leadership role of UGA in this field.

II. Mission Statement:

The UGA SEER Center will promote learning among members of the STEM community at UGA, in the Southeast region, and nationally by generating cutting-edge educational

research and disseminating that research to STEM faculty, postdocs, graduate students, and undergraduates.

III. Goals and Outcomes

Goal 1: Develop grant proposals to obtain additional sources of funding for basic and applied research in STEM education

1.1. Identify and develop new competitive projects in basic and applied STEM education research
1.2. Expand and diversify the funding portfolio for competitive programs at NSF (up to $2 million), NIH Postbaccalaureate Research Education Program (PREP) up to $400,000), HHMI (up to $2.5 million), SLOAN ($125,000 and higher), and others.
1.3. Create a stream of funding for the SEER Center
1.4. Collaborate with STEM faculty across UGA on education research projects that promote and investigate the broader impacts of science research
1.5. Collaborate with the UGA development office to identify potential sponsors and invite potential sponsors to STEM education research showcases and symposia

Expected Outcomes: Accomplishment of this aim is expected to generate four grant applications and one funded grant per year, totaling an estimated $750,000 annually in new grants. These new grants will be in addition to the funding that has already been obtained for STEM Education research by Center faculty, which totals more than $6 million in the past five years (see Appendix A). Through the development of cross-college collaborations, five new proposals a year will be launched that involve multiple colleges. These projects will focus on STEM learning and teaching at the undergraduate level. It is expected that these collaborations will also result in the leveraging of broader impact projects that are associated with several national grants. By offering assistance in using STEM signature pedagogies (for instance) the broader impact statements can be leveraged. There is the potential for coherent broader impact projects that impact undergraduate STEM education. With the prominence achieved by the SEER Center, revenue will be generated through symposia or workshops on undergraduate STEM education. These workshops will target small colleges, as well as research universities. Furthermore, by collaborating with the UGA development office, we expect to generate gifts to the Center by the end of the first three years of operation.

Goal 2: Foster collaborations and professional development of faculty, postdocs, graduate students, and undergrads who engage in STEM education research across the university

2.1. Facilitate mentoring relationships between those new to STEM education research, including faculty, postdocs, graduate students, and undergraduates, with experienced education researchers
2.2. Help advise junior faculty located in disciplinary based departments, but working on STEM education research, with regard to progress towards promotion and tenure
2.3 Foster inter- and intra-disciplinary collaborations among STEM education researchers from across the university
2.4 Provide a repository of resources for researchers engaged in STEM education research

Expected outcomes: Accomplishment of this aim is expected to lead to the development of a document that serves as a template for academic units with junior faculty who are STEM Education researchers, including among others the Department of Cell Biology and the medical

partnership. To accomplish the goals of mentoring and collaboration, a STEM learning community will be created, leveraged through the Center for Teaching and Learning and the Office of STEM Education. This learning community will meet at least monthly to discuss current STEM education initiatives that are local, regional or national. Additionally, there will be a lecture series that will be focused on undergraduate learning in STEM. This lecture series will give faculty, postdocs, graduate students, and undergraduates an opportunity to interact in the area of STEM education. Finally, we expect to develop a repository of resources that can be accessed through the Center website. The repository will include annotated bibliographies, funding resources, and training materials for writing manuscripts and grant proposals.

Goal 3: Disseminate basic and applied research results to other STEM community members at UGA, locally, other institutions across the Southeast, and nationally

3.1. Develop the Center website to increase visibility of STEM education research at UGA, and publicize Center events, funding successes and research
3.2. Support faculty to share Center results at national and international meetings
3.3. Consult with STEM faculty who are not education researchers to develop more competitive broader impacts for grant proposals
3.4. Organize local and regional faculty professional development events including collaborating and assisting the events coordinated by the Office of STEM Education at UGA
3.5. Contribute to outreach activities for the public, e.g. science cafés
3.6. Organize symposia and workshops with nationally-recognized STEM education researchers to disseminate the findings of education research broadly at UGA

Expected Outcomes: Accomplishment of this aim is expected to lead to the completion of a Center website that will house information about core faculty and their research interests as well as the repository of developed resources (Goal 2). Faculty associated with SEER will be supported, as the funds are available, to disseminate the work of SEER nationally and internationally., There will be at least one regional event for STEM Education Research each year STEM education researchers will also work in the community by participating in science cafes, and by engaging in local events. Finally, we expect to develop resources that will be shared electronically, or that can be accessed through the Center website. Shared information will be through email and will consist of research summaries, current speakers, and STEM news in undergraduate education. The repository, which will be in the website, will include (but not be limited to): video summaries of research, annotated bibliographies, funding resources, and training materials for writing manuscripts and grant proposals.

VI. Administrative Unit and Leadership Position within that unit to which the center reports and the process by which the center will be reviewed.

1. **Operating Procedures and Policies**

A. Description of structure

The Center will operate under the authority of the Office of Vice President for Research with a broad mandate for collaborative research in education, assessment, and teaching environments in STEM. The Center is a joint endeavor of Franklin College, College of Agriculture and Environmental Science, College of Education, College of Engineering, College of Veterinary Medicine, and the GRU/UGA Medical Partnership, in coordination with the Office of the Vice President for Research. The Vice President for Research, in partnership with the Deans of the

participating Colleges, is identified as the primary authority for communications, budget development, program review and other functions. The Vice President for Research will also appoint the Director of the Center. The Director will work with an Executive Committee of four Core Faculty, nominated by the Director and elected by all core faculty. Executive Committee members will represent the diversity of the units involved.

B. Description of roles and responsibilities of participating units:

Partnership Among Franklin College, College of Education, College of Engineering, College of Agriculture and Environmental Sciences, College of Veterinary Medicine, and the GRU/UGA Medical Partnership

This proposal stems from a conviction of faculty across all of these units that our programs have a significant opportunity for synergy by developing new research programs together that draw on complementary expertise. This partnership will position the University of Georgia to achieve the goals outlined in this proposal.

Franklin College Expertise and Role

Units within Franklin College have extensive experience and expertise in discipline-based education research. The expertise includes scientific literacy among undergraduate non-science majors; problem solving in biology, biochemistry, and chemistry; student learning of disciplinary content knowledge such as evolution, biochemistry, chemistry, and genetics; the impact of undergraduate study practices on learning; and the impact of TA and faculty development on classroom instruction. Moreover, Franklin College faculty are experts in diverse methodologies, including statistics and qualitative research. Key departments include Biochemistry, Cell Biology, Chemistry, Genetics, Mathematics, Physics, Plant Biology, and Statistics.

Franklin College is the original home of the tenure-track position in education research. Members of the Franklin College faculty have leveraged their tenured and tenure-track positions at UGA to achieve status as national leaders in discipline-based education research. Indeed, the idea for a SEER Center for STEM Education Research originated among faculty in Franklin College.

College of Agricultural and Environmental Sciences, College of Education, College of Engineering, College of Veterinary Medicine, and GRU/UGA Medical Partnership Expertise and Role

Units within these colleges have extensive experience and expertise in education research, including research on university education. Areas of research include student motivation for learning science, pedagogical content knowledge of college faculty, the use of technology to improve science learning, and the use of tests to measure science students' knowledge, skills, and attitudes. Additionally, each of these units continues to increase the number of faculty who are interested in beginning to pursue STEM education research.

Other Units:

Across campus, faculty in the sciences are interested in investigating questions related to the teaching and learning of their particular discipline. Many science faculty are also interested in learning from STEM education researcher, even if their research is not focused on education. Although the Center has its origin in collaboration among the units named above, its relevance and potential impact is campus-wide.

C. An advisory committee structure

There will be two advisory committees associated with the SEER Center. One committee will be centered at UGA and include Deans or Associate Deans from the partnering Colleges and units and will be chaired by a representative from OVPR. The Advisory Board will also include a representative from the UGA Center for Teaching and Learning. This committee will provide yearly advice to the Director and Executive Committee about the strategic direction of the Center and suggest ways to maximize the benefits of the Center's activities for the university and the region.

Another advisory committee will be configured that is comprised of three leaders of STEM Centers at other institutions (e.g., Michigan State University, Penn State University). These individuals will meet twice a year initially, via the web, to provide direction to the SEER Center administrators and to suggest emerging directions.

D. The processes for appointment or reappointment

Core Faculty engage in STEM education research by pursuing extramural funding and/or publishing in peer-reviewed journals. Specifically, core faculty have demonstrated success in extramural funding and/or publication of STEM education research within the past five years. Alternatively, core faculty have an appointment at UGA that carries with it the expectation for funding and publication in STEM education research. Core faculty contribute to the Center by (1) attending most Center activities and (2) leading or assisting in the leadership of Center activities, and (3) generating IDC returns for the Center, on a grant-by-grant basis as negotiated with their department heads or Deans.

To apply to be a Core member of the Center, interested faculty members will send a CV and a letter of application explaining the reasons they would like to join the core faculty to the Director. Candidates for Core membership will be invited to give a seminar on their educational research. Core Faculty vote on membership applications quarterly.

Affiliated Faculty are interested in STEM education research, but do not necessarily engage in STEM education research. Affiliated faculty contribute to the Center by attending at least two Center activities per year and by allowing education research to be conducted in their classes and trying new classroom practices for which efficacy has been empirically demonstrated. There is no expectation of IDC returns from affiliated faculty.

To apply to be an Affiliate member of the Center, interested faculty members will send a CV and a letter of application explaining the reasons they would like to be an Affiliate member to the Director. Core faculty vote on affiliate membership applications quarterly.

Postdoc, Graduate Student, and Undergraduate Affiliates engage in STEM education research with Core Faculty members or are interested in STEM education research. Postdoc Affiliates and Graduate Student Affiliates contribute to the Center by attending at least five Center activities each year.

2. Funding

The Office for the Vice President of Research is the logical home for our Center, because of our primary focus on pursuing extramural funding for research in STEM education. However, for the first three years of operation, SEER Center members will work with the departments and Colleges whose faculty are Core or Affiliate SEER Center members to secure funding. Evidence of these commitments can be seen under Letters of Support. Additionally, members will apply for mini-grants through UGA's Office of STEM Education for funds that can be used in ways that are mutually beneficial to the mission of the Office of STEM Education and the SEER Center. These mini-grants are awarded on a competitive basis, and the SEER-center related applications will need to be reviewed and ranked for funding as part of the normal process. Additionally, for the first three years of the Center, costs for staff support will be met via administrative assistance provided by the Franklin College Dean's Office. A primary aim of Year 1 (see Goal 1.3) will be to create a stream of funding for the SEER Center by exploring various fiscal models for sustainability.

By FY18, we expect to have arrived at a sustainable funding model. Potential revenue streams may include fees from professional development events, fees from consultation with those outside the UGA community, sponsorship and gifts. Also by this time, additional faculty should become involved in funded STEM education research and current STEM education researchers will have applied for new grants through the Center. Upon negotiation with the appropriate deans and department heads, core faculty who receive extramural funding for research conducted in association with the Center may be able to return a portion of their indirect costs to the Center. Current and recent past funding for STEM education research associated with the proposed core faculty is described in Appendix A; these grants fund work that aligns with the goals of the Center and provide an estimate of the level of indirect costs that could be available for the operating costs of the Center.

Year 1 Budget – FY16

Revenue	
Seed funding from departments and colleges	$5,000
Value of administrative support time (i.e., Leslie Morrow) provided by Franklin College	$10,000
Expenditures	
SEER Center seminar series, co-sponsored with Franklin College Departments	$2500
Annual SEER Center retreat	$500
UGA-hosted Professional Development event	$2,000
Administrative support time (i.e., Leslie Morrow) in Franklin College	$10,000

Year 2 Budget – FY17[1]

Revenue	
Seed funding from departments and colleges	$5,000
Value of administrative support time (i.e., Leslie Morrow) provided by Franklin College	$10,000
Expenditures	
SEER Center seminar series, co-sponsored with Franklin College Departments	$2,500
Annual SEER Center retreat	$500
UGA-hosted Professional Development event	$2,000
Administrative support time (i.e., Leslie Morrow) in Franklin College	$10,000

Year 3 Budget – FY18[1]

Revenue[2]	
Revenue from UGA-hosted Professional Development Event	$2,000
Indirect cost returns from new extramural grants[3]	$3,000
Value of administrative support time (i.e., Leslie Morrow) provided by Franklin College	$10,000
Expenditures	
Annual SEER Center retreat	$500
SEER Center seminar series, co-sponsored with Franklin College Departments	$2,500
Scholarship to Grant Writers' Seminars and Workshops	$2,000
Administrative support time (i.e., Leslie Morrow) in Franklin College	$10,000

[1] The Year 2 and 3 budgets are estimates and will be refined based on the sustainable fiscal model we develop in Year 1.

[2] Looking beyond Year 3, we expect revenue to increase, if the Center is viable and meeting its goals. Additional revenue would come from (1) support from OVPR; (2) increased revenue from professional development events and other services-for-fee offered by Center faculty, (3) revenue from broader impacts projects with STEM researchers; (4) additional indirect cost returns from new grants; and potentially (5) gifts and contributions from friends of the SEER Center formed in collaboration with UGA's development office.

[3]This is an estimate based on the core faculty being awarded $1.5 million in grants by the beginning of Year 3 and spending $300,000 of that money by the end of Year 3. Doing so would provide ~$150,000 of indirect costs to the University with $30,000 returned to academic units (i.e., based on practices for Franklin College). The portion of IDC that will be returned to the Center will be negotiated by Core faculty with their academic units on a grant-by-grant basis, so we have budgeted conservatively and assumed that the Center would receive 10% of the portion returned to academic units, or $3,000.

3. Faculty and staff - first three years

The Center will be led by a Director who works with an Executive Committee of four officers-at-large. Staff members will include an administrative assistant. Additionally, we hope to leverage the combined efforts of Core faculty members in obtaining mini-grants from the Office of STEM Education to hire graduate assistants who will work on one or more SEER Center research projects.

4. Physical resources - first three years

The Center will need office space for the Director and one staff member. Members will also need a core facility consisting of two more rooms suitable for conducting education research methods such as interviews and think aloud protocols. Most faculty in the Center currently do not have appropriate spaces for doing this research. Part of the need for the Center derives from current UGA faculty with an interest in STEM education research not being familiar with the standards, practices, and protocols of the social science research approaches which are part of STEM education research. Potentially there may be suitable space available after the opening of the Science Learning Center, and the move of some laboratory classes to it.

5. Participating faculty with: their home units, and their roles in the center/institute.
(See Appendix B)

6. Letters of support from affected departments, schools, colleges, other units, and the administrator who would have oversight responsibilities.

See attached letters from the following:
David Lee, Vice President for Research
Alan Dorsey, Dean, Franklin College
Malcolm Adams, Department Head, Mathematics
Jonathan Amster, Department Head, Chemistry
Lisa Donovan, Department Head, Plant Biology
Nicole Lazar, Department Head, Statistics
Kojo Mensa-Wilmot, Department Head, Cellular Biology
Allen Moore, Department Head, Genetics
Chris West, Department Head, Biochemistry and Molecular Biology
Matt Boegehold, Basic Sciences Chair, GRU/UGA Medical Partnership

8. References

AAAS. 2011. Vision and change in undergraduate biology education: A call to action. Washington, D.C.

Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century. 2003. BIO 2010: Transforming Undergraduate Education for Future Research Biologists. National Academies Press: Washington, D.C.

White House. 2012. Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics. Report from PCAST, President's Council of Advisors on Science and Technology. Accessed on May 21, 2013.

Appendix A – Funding Requested by Center Faculty Over the Past Five Years

Researchers	Funding Agency	Amount	Year	Status	Research topic
Jennifer Kaplan, PI	NSF-DUE IUSE	$223,529	2014	Funded	Professional development for statistics TAs to facilitate active laboratories in introductory statistics
Jennifer Kaplan, Co-PI	NSF-DUE IUSE	$215,371	2014	Funded	Using a faculty learning community to develop and test high impact-little time activities to address lexical ambiguity in statistics
Jennifer Kaplan, PI; Paula Lemons, Co-PI	NSF-DUE TUES	$502,755	2013	Funded	Automated analysis of constructed response items in biology, chemistry, engineering, and statistics
Jennifer Kaplan, PI; Tessa Andrews, Co-PI	NSF-DUE IUSE	$398,452	2014	Declined	Ambiguous language in statistics education and teaching professional development
Julie Luft, Co-PI with Kutal and Knauff	American Association for the Advancement of Science	$1,000	-	Funded	ReFOCUS
Julie Luft, PI with Bang and Wong	NSF REAL	$500,000	-	Declined	Breaking Barriers by Educating Science Teachers for Out-of-Field Flexibility
Julie Luft, PI with Calabrese Barton	National Association for Research in Science Teaching	$38,000	2012	Funded	Sandra K. Abell Summer Research Institute,
Julie Luft, PI with Semken et al.	NSF	$850,000	2008	Funded	Science Teachers in Arizona-Retention and Recruitment (STARR). PI
Julie Luft, PI with	NSF	$875,000	2012	Funded	Persistent, Enthusiastic, Relentless; Study

Thompson					of Induction Science Teachers (PERSIST)
Julie Luft, with Kutal and Price	NSF DRK12	$450,000	-	Declined	Alternative Support for Induction Secondary Science Teachers (ASISST)
Julie Stanton, PI Barbara Crawford, Co-PI	NSF REU	$260,236	2013	Funded	Research Experiences for Undergraduate in Undergraduate Biology Education Research
Kathrin Stanger-Hall, co-PI	NIH	$1,259,183	2009	Declined	Evaluating the impact of FLASH sex education.
Kathrin Stanger-Hall, co-PI	NSF FIRE	$399,964	2010	Declined	Imaging student visualization of STEM processes with fMRI.
Kathrin Stanger-Hall, co-PI	NSF RCN-UBE Incubator	$41,189	2013	Funded	Animated Discussions: Biologists and Visual Artists Foster Learning through Animations
Kathrin Stanger-Hall, Director, Southeast Region	HHMI	$160,000	2011	Funded	Dissemination of Scientific Teaching through Summer Institutes: Southeastern Regional Summer Institute at UGA.
Kathrin Stanger-Hall, PI	NSF-DUE TUES	$191,617	2011	Funded	ACSIS: Animated Case Studies in Science
Kathrin Stanger-Hall, PI	NSF-DUE CCLI	$150,000	2009	Declined	The effects of visual dynamics on learning of biological principles by undergraduate biology students.
Kathrin Stanger-Hall, Project Leader	HHMI 2010 University Competition: Experiment. Undergraduate Science Education Universities	$599,940	2009	Declined	Evaluation of student-generated 2-D and 3-D animations and interactive video games in undergraduate biology.
Kathrin Stanger-Hall, Senior Personnel	NSF FIRE	$392,798	2011	Funded	Designing Transformative Assessments for Interdisciplinary Learning in Science.
Norbert Pienta, Co-PI	NSF Noyes	$950,000	-	Funded	

	Scholarship				
Norbert Pienta, PI	NSF DUE IUSE	$530,000	2014	Declined	
Norbert Pienta, PI	NSF-DUE CCLI	$529,000	-	Funded	
Paula Lemons, Co-PI, Norris Armstrong and Peggy Brickman, Senior Personnel	NSF-DUE CCLI	$499,664	2009	Funded	Case study teaching and critical thinking
Paula Lemons, PI	NSF-CAREER	$913,450	2014	Funded	Problem-solving in biochemistry
Paula Lemons, PI	NSF-DUE WIDER	$225,557	2013	Funded	Faculty learning communities as a propogation tool for automated analysis of constructed response
Peggy Brickman Co-Director, Norris Armstrong Senior Personnel, Erin Dolan, Director	HHMI Undergraduate Science Education Universities	$2,450,655	2013	Declined	Engaging Majors in Biology Research
Peggy Brickman, CoPI, Cara Gormally, PI,	NSF-CUE ECR	$316,062	2013	Declined	STEMitude
Peggy Brickman, CoPI, Cara Gormally, PI,	NSF-CUE REAL	$177,208	2014	Declined	Relevancy or Resistance
Peggy Brickman, PI	NSF-DUE CCLI	$290,000	2009	Funded	Project-based learning in large-enrollment courses
Tessa Andrews, PI; Peggy Brickman, Co-PI; Paula Lemons, Co-PI	NSF-DUE IUSE	$853,583	2014	Declined	Teacher expertise in active-learning instruction
Tessa Andrews, PI; Peggy Brickman, Co-PI; Paula Lemons, Co-PI	NSF-DUE IUSE	$250,000	2014	Recommended for funding	Teacher expertise in active-learning instruction
	Total Funding Obtained	**$7,168,166**			

Appendix B: Initial List of Participating Faculty

UGA Franklin College Faculty

Name	Department
Tessa Andrews	Genetics – Assistant Professor
Norris Armstrong	Genetics- Associate Professor
Peggy Brickman	Plant Biology – Professor
Jennifer Kaplan	Statistics – Associate Professor
Paula Lemons	Biochem & Mol Biol - Associate Professor
Kristen Miller	Biology – Academic Professional
Norbert Pienta	Chemistry – Professor
Kathrin Stanger-Hall	Plant Biology – Associate Professor
Julie Stanton	Cellular Biology - Assistant Professor
Craig Wiegert	Physics – Associate Professor

UGA College of Education Faculty

Barbara Crawford	Math & Sci Ed – Professor
Allan Cohen	Ed Psychology - Professor
Julie Luft	Math & Sci Ed – Professor
Steve Oliver	Math and Sci Ed - Professor

UGA faculty from the College of Engineering:

Tim Foutz	Engineering - Professor
Joachim Walther	Engineering - Associate Professor

UGA faculty members from the Medical College

DeLoris Hesse	Cellular Biology – Assistant Professor
Amy Medlock	Biochem & Mol Biol - Assistant Professor

UGA faculty members from the College of Agriculture

Maria Navarro	Ag Leadership, Ed & Communication - Associate Professor
Jennifer Jo Thompson	Crop & Soil Science – Assistant Professor

UGA faculty members from the College of Veterinary Medicine

Scott Brown	Physiology and Pharmacology - Professor
Jim Moore	Large Animal Medicine - Professor

UGA/GRU Medical Parternship Faculty

Matthew Boegehold	Physiology - Professor
Eve Gallman	Neuroscience – Associate Professor
Michele Monteil	Immunology - Professor
Michael Russell	Physiology – Associate Professor
Clive Slaughter	Biochemistry – Associate Professor

Emeritus Faculty

Shawn Glynn	Math & Sci Ed – Professor

Faculty from neighboring campuses without education research who have been active members:

Cara Gormally	Gallaudet College
Julia Schmitz	Piedmont College
Miriam Segura-Totten	University of North Georgia

Post-Doctoral Fellows:

Jill McCourt	Biochem & Mol Biol - Post Doc
Cheryl Sensibaugh	Biochem & Mol Biol – Post Doc